CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

California Regional Water Quality Control Board Central Coast Region

Total Maximum Daily Loads for Chlorpyrifos and Diazinon in Lower Salinas River Watershed in Monterey County, California

Final Project Report For the May 4-5, 2011 Water Board Meeting

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Central Coast Region
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http://www.waterboards.ca.gov/centralcoast/TMDL/303dandTMDLprojects.htm

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LIST OF ACRONYMS AND ABBREVIATIONS

CDPR	California Department of Pesticide Regulation
CDFG	California Department of Fish and Game
GC/MS	Gas Chromatography/Mass Spectrometry
CCAMP	Central Coast Ambient Monitoring Program
CCC	Criterion Continuous Concentration
CCoWS	Central Coast Watershed Studies at California State University, Monterey Bay
CMC	Criterion Maximum Concentration
ELISA	Enzyme-linked immunosorbant assays
GIS	Geographic Information System
LC50	Median lethal concentration
MS4s	Municipal Separate Storm Sewer Systems
NPDES	National Pollutant Discharge Elimination System
OP	Organophosphate
PUR	Pesticide Use Report
TIEs	Toxicity Identification Evaluations
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
Water Board	Regional Water Quality Control Board, Central Coast Region
WDR	Waste Discharge Requirements

EXECUTIVE SUMMARY

The following Chlorpyrifos and Diazinon Total Maximum Daily Load (TMDL) Report (TMDL Report) evaluates loading to waterbodies that are impaired by these two pesticides in the Lower Salinas River Watershed. The TMDL Report evaluates the current concentrations of chlorpyrifos and diazinon in area waterbodies, estimations on where the pesticides are coming from, responsible parties, and how much their contribution should be reduced. Implementation actions and monitoring requirements are also included in this TMDL Report.

Total Maximum Daily Load

This TMDL Report presents TMDLs for chlorpyrifos and diazinon in the Lower Salinas River Watershed. A TMDL is a term used to describe the maximum amount of pollutants—in this case, chlorpyrifos and diazinon—that a waterbody can receive and still meet water quality standards. A TMDL study identifies the probable sources of pollution, establishes the maximum amount of pollution a waterbody can receive and still meet water quality standards, and allocates that amount to all probable contributing sources. By “allocating” an amount to a contributing source, we are assigning responsibility to someone, an agency, group or individuals, to reduce their contribution in order to meet water quality standards.

The federal Clean Water Act requires every state to evaluate its waterbodies, and maintain a list of waters that are considered “impaired” either because the water exceeds water quality standards or does not achieve its designated use. For each waterbody on the Central Coast’s 303(d) Impaired Waters List, the Central Coast Regional Water Quality Control Board (Central Coast Water Board) must develop and implement a plan to reduce pollutants so that the waterbody is no longer impaired and can be de-listed.

Water Quality Objectives for Chlorpyrifos and Diazinon

Chlorpyrifos and diazinon are man-made organophosphate (OP) pesticides used almost exclusively for the control of agricultural pests. These OP pesticides are present in the project area at concentrations that result in toxicity to aquatic organisms. Therefore, water quality objectives and the beneficial uses they are designed to protect are not attained.

Sixteen waterbodies in the Lower Salinas River Watershed are impaired due to exceedance of narrative water quality objectives for toxicity and pesticides. The toxicity and pesticides narrative water quality objectives pertain to all inland surface waters, enclosed bays and esturaries. The narrative water quality objective for toxicity states, in part, that

“*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…”*

The narrative water quality objective for pesticides states, in part, that

"*No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses…"*

Chlorpyrifos and/or diazinon are present in the impaired waterbodies at levels that are not protective of several beneficial uses associated with aquatic life, including, but not limited to the following beneficial uses: cold fresh water habitat, warm fresh water habitat, estuarine habitat, wildlife habitat, rare threatened or endangered species, migration of aquatic organisms, and spawning, reproduction and/or early development uses. The Water Board must determine the reason these waterbodies are exceeding objectives and propose a solution to improve water quality in order to protect these beneficial uses.

Impaired Waterbodies

The geographic scope of this project includes approximately 195,000 acres within the Lower Salinas River Watershed in northern Montery County. The Lower Salinas River watershed includes the watershed area from the lower Salinas River at Gonzales Road near the city of Gonzales downstream to Moss Landing Harbor and Monterey Bay.

The following 16 waterbodies are impaired for chlorpyrifos and/or diazinon and/or unknown toxicity: Moss Landing Harbor, Old Salinas River Estuary, Old Salinas River, Salinas River Lagoon (North), Tembladero Slough, Alisal Slough, Blanco Drain, Salinas Reclamation Canal, Lower Salinas River[1], Espinosa Slough, Espinosa Lake, Natividad Creek, Quail Creek, Chualar Creek, Merritt Ditch, and Gabilan Creek.

Additionally, some waterbodies in the project area are listed as impaired due to "unknown toxicity." Several listings were driven by laboratory tests resulting in mortality of indicator organisms subjected to water samples from the listed waterbodies. At the time of the laboratory tests, analysis did not demonstrate which chemical(s) were causing the water toxicity, hence the term "unknown toxicity," because the pollutant/stressor was not identified. Staff subsequently reviewed pesticide data and reports and conclude that water toxicity in the waterbodies listed as impaired for unknown toxicity is driven by chlorpyrifos and diazinon. Therefore, these TMDLs address these listings. The waterbodies listed as impaired due to unknown toxicity in the project area are: Old Salinas River, Tembladero Slough, Alisal Slough, Salinas Reclamation Canal, Lower Salinas River, Espinosa Slough, Natividad Creek, Quail Creek, Chualar Creek, Merritt Ditch, and Gabilan Creek.

Further discussion is provided regarding the impairments in Section 2.7.

The watershed is primarily comprised of forest/grassland/shrubs (48%), cropland (42%), and built-up areas (10%).

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[1] Throughout this document the Lower Salinas River refers to the segment of the Salinas River between Salinas River Lagoon (North) to Gonzales Road.

Numeric Targets and Allocations
Numeric targets are water quality targets developed to ascertain when and where water quality objectives are achieved, and hence, when beneficial uses are protected. The numeric targets for these TMDLs are identical to numeric water quality criteria that were derived by the California Department of Fish and Game and the Central Valley Regional Water Quality Control Board for chlorpyrifos and diazinon, which were subsequently approved by U.S. EPA. Numeric targets for the TMDLs include acute and chronic water column numeric targets for chlorpyrifos and diazinon when only one of the compounds is present and water column numeric targets for additive toxicity of chlorpyrifos and diazinon when both compounds are present.

Discharges of chlorpyrifos and diazinon from irrigated agriculture are causing exceedance of the water quality objectives for pesticides and toxicity. Owners and operators of irrigated lands are assigned allocations for chlorpyrifos and diazinon to achieve the TMDL.

These TMDLs are concentration-based TMDLs equal to the numeric targets.

Responsible parties are assigned allocations for chlorpyrifos and diazinon equal to the numeric targets as represented in the table below (next page).

TMDL Implementation, Monitoring, and TMDL Timeline
TMDL implementation and monitoring requirements are established in the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Agricultural Order); *this includes the order currently in effect and renewals thereof.* Detailed requirements and milestones to achieve the TMDL in the established timeframe will be implemented through the Agricultrual Order. See the recommendations discussed in Chapter 6 Implementation and Monitoring, of this report.

The timeframe to achieve the allocations, numeric targets, and TMDLs in the impaired waterbodies addressed in this TMDL is year 2025; this date coincides with the measurable goals established by the Central Coast Water Board.

The discharge of pesticides at levels toxic to the environment affects a spectrum of beneficial uses and is, therefore, a serious water quality problem. As such, implementation should occur at an accelerated pace to achieve the allocations and TMDL in the shortest time-frame feasible.

The Agricultural Order should establish timeframes for individual dischargers to achieve water quality standards; achieving water quality standards will result in achieving TMDL allocations. Highest priority dischargers should have the shortest timeframe, such as those dischargers who pose the greatest risk to water quality due to toxicity from chlorpyrifos or diazinon. Lower prioritized dischargers that are also contributing to the impairments could have a longer timeframe, with the ultimate goal of verifiable progress towards achieving water quality objectives, and therefore the TMDL, no later than the year 2025.

Water Board staff will reevaluate impairments caused by chlorpyrifos and diazinon when monitoring data is submitted and during renewals of the Agricultural Order. Water Board staff will modify the conditions of the Agricultural Order, if necessary, to address remaining impairments.

The table below identifies the allocations assigned to responsible parties and the affected waterbodies.

LOAD ALLOCATIONS		
Waterbodies Assigned TMDLs	**Responsible Party Assigned Allocation (Source)**	**Receiving Water Allocation**
• Moss Landing Harbor • Old Salinas River Estuary • Old Salinas River • Salinas River Lagoon (North) • Tembladero Slough • Alisal Slough • Blanco Drain • Salinas Reclamation Canal • Lower Salinas River • Espinosa Slough • Espinosa Lake • Natividad Creek • Quail Creek • Chualar Creek • Merritt Ditch • Gabilan Creek	Owners/operators of irrigated agricultural lands in the Lower Salinas River Watershed (Discharges from irrigated lands)	Allocation-1 & Allocation-2

Allocation 1: For diazinon and chlorpyrifos when present individually.

Compound	CMC [A] (ppb)	CCC [B] (ppb)
Chlorpyrifos	0.025	0.015
Diazinon	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.

Allocation 2 For additive toxicity of diazinon and chlorpyrifos when both are present.

$$S = \leq 1.0 = \frac{C_D}{LC_D} + \frac{C_C}{LC_C}$$

Where:

C_D = diazinon concentration in waterbody

C_C = chlorpyrifos concentration in waterbody

LC_D =Criterion Continuous Concentration (0.10 µg/L) or Criterion Maximum Concentration (0.16 µg/L) diazinon loading capacity.

LC_C =Criterion Continuous Concentration (0.015 µg/L) or Criterion Maximum Concentration (0.025 µg/L) chlorpyrifos loading capacity.

Value of S cannot exceed 1.0 more than once in any consecutive three year period.

1 INTRODUCTION

1.1 Clean Water Act Section 303(d)

Section 303(d) of the federal Clean Water Act (CWA) requires states to: 1) identify those waters not attaining water quality standards (these waters are referred to as listed and impaired waters); 2) set priorities for addressing the identified pollution problems; and 3) establish a "Total Maximum Daily Load" (TMDL) for each identified water body and pollutant to attain water quality standards. The State is required to incorporate TMDLs into the State Water Quality Management Plan (40 CFR 130.6(c)(1), 130.7). The Water Quality Control Plan-Central Coast Region (Basin Plan), and other applicable plans, serve as the State Water Quality Management Plan that governs impaired waters in the Central Coast Region.

USEPA reviews TMDLs to determine whether TMDL requirements are met. When approved by USEPA, the TMDL is then applicable (CWA, Section 303(d)).

A TMDL represents the maximum load expressed in mass per time, toxicity, or other appropriate measure of a pollutant that a waterbody can receive and still achieve water quality standards (40 CRF130.2(c)i).

Several waterbodies in the Lower Salinas River watershed are listed as impaired due to chlorpyrifos and/or diazinon and/or unknown toxicity. This project addresses the following 16 waterbodies: Moss Landing Harbor, Old Salinas River Estuary, Old Salinas River, Salinas River Lagoon (North), Tembladero Slough, Alisal Slough, Blanco Drain, Salinas Reclamation Canal, Lower Salinas River, Espinosa Slough, Espinosa Lake, Natividad Creek, Quail Creek, Chualar Creek, Merritt Ditch, and Gabilan Creek.

1.2 Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Qualtiy Control Act establishes responsibilites and authorities of each of the Regional Water Quality Control Boards, including responsibility and authority for regional water quality control and planning. The Central Coast Water Board establishes water quality objectives and programs by amending the Basin Plan. The Central Coast Water Board also regulates discharges, in order to achieve water quality objectives, through Waste Discharge Requirements (WDRs), waivers of WDRs, and prohibitions of discharge.

1.3 FIFRA/FQPA

Since 2001, the USEPA has mandated diazinon and chlorpyrifos use cancellations (phase-outs) and restrictions for urban and agricultural uses (USEPA Diazinon and Chlorpyrifos Interim Reregistration Eligibility Decisions (IREDs)). The USEPA has undertaken the reregistration process for diazinon and chlorpyrifos to ensure that the pesticides meet the safety standards under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Food Quality Protection Act (FQPA) of 1996.

Under the diazinon IRED (USEPA, 2004), all indoor residential use product registrations were cancelled and retail sale of these products ended as of December 31, 2002. All outdoor residential use product registrations were cancelled and retail sale ended in December 31, 2004.

Under the chlorpyrifos IRED, (USEPA, 2002) virtually all products labeled for homeowner use have been canceled effective December 31, 2001, except containerized ant and roach baits in child-resistant packaging which have not been canceled because they present minimal exposure. Distribution and sale of products for all other residential uses were prohibited since December 31, 2001. The application rate for termite treatments was reduced as of December 1, 2000. Full-barrier (wholehouse) termite treatment products are no longer distributed or sold as of December 31, 2001. Spot and local post-construction use was canceled on December 31, 2002, and pre-construction termiticide uses were canceled on December 31, 2005, unless acceptable exposure data are submitted and demonstrate that postapplication risks to residents are not of concern.

Many additional diazinon and chlorpyrifos use restrictions and cancellations apply to agricultural uses. The total elimination of diazinon use in the urban environment and substantial reduction of chlorpyrifos use in the urban environment are expected to facilitate diazinon and chlorpyrifos concentration reductions in impaired waters of the Lower Salinas River Watershed.

1.4 Project Area

The Total Maximum Daily Load (TMDL) project area is located in the Lower Salinas River Watershed, Monterey County, California. See Figure 1-1 (next page).

The lower Salinas River includes all reaches of the Salinas River downstream of Gonzales Road near the city of Gonzales. The Lower Salinas River watershed includes the watershed area from the lower Salinas River at Gonzales Road near the city of Gonzales downstream to Moss Landing Harbor and Monterey Bay.

Figure 1-1. Location of TMDL Project Area

For the purposes of the TMDLs addressed in the project area, the Lower Salinas River Watershed consists of the Salinas River valley floor north of Gonzalez (CalWater 2.2 Hydrologic Area 309.10, Lower Salinas Valley) out to the dunes along the Monterey Bay. The project area includes subwatersheds draining to waters of Moss Landing Harbor, Old Salinas River Estuary, Old Salinas River, Salinas River Lagoon (North), Tembladero Slough, Alisal Slough, Blanco Drain, Salinas Reclamation Canal, Lower Salinas River, Espinosa Slough, Espinosa Lake, Natividad Creek, Quail Creek, Chualar Creek, Merritt Ditch, and Gabilan Creek.

1.5 Pollutants Addressed

This project addresses impairments due to chlorpyrifos, diazinon, and unknown toxicity (water column toxicity) caused by chlorpyrfos and diazinon. Chlorpyrifos and diazonin are organophosphate (OP) pesticides.

2 PROBLEM IDENTIFICATION

2.1 Watershed Description

2.1.1 Drainages

The Lower Salinas River Watershed is comprised of two major drainage ways leading to Moss Landing Harbor and Salinas River Lagoon (North). Major drainages to Moss Landing Harbor include Old Salinas River Estuary, Old Salinas River, Tembladero Slough, Merritt Ditch, Alisal Slough, Espinosa Slough, Salinas Reclamation Canal (Lower and Upper)[2], Gabilan Creek, and Natividad Creek. The drainages to Salinas River Lagoon (North) include the Salinas River, Blanco Drain, Quail Creek, and Chualar Creek. There is hydraulic connectivity between the Salinas River Lagoon (North) and the Old Salinas River via a slide gate at the northwest end of the Salinas River Lagoon (North). There is occasional hydraulic connectivity between Alisal Slough Remnant and the Lower Salinas Reclamation Canal via an agricultural ditch.

Figure 2-1 (next page) displays the individual project-area subwatershed deliniations and identifies a numeric code in the figure to the subwatershed area name and size. Note that the extent of Salinas River watershed (ID No. 8) was obtained from CalWater version 2.2 (California Interagency Watershed Map of 1999) for Lower Salinas Valley Hydrologic Area 309.10; this subwatershed area identifies the project area of this watershed and not the entire subwatershed. Table 2-1 tabulates the areas for each of the subwatersheds.

[2] Note that the Salinas Reclamation Canal is segmented into upper and lower portions throughout much of this report to provide greater detail of water quality conditions (e.g., impairment assessment).

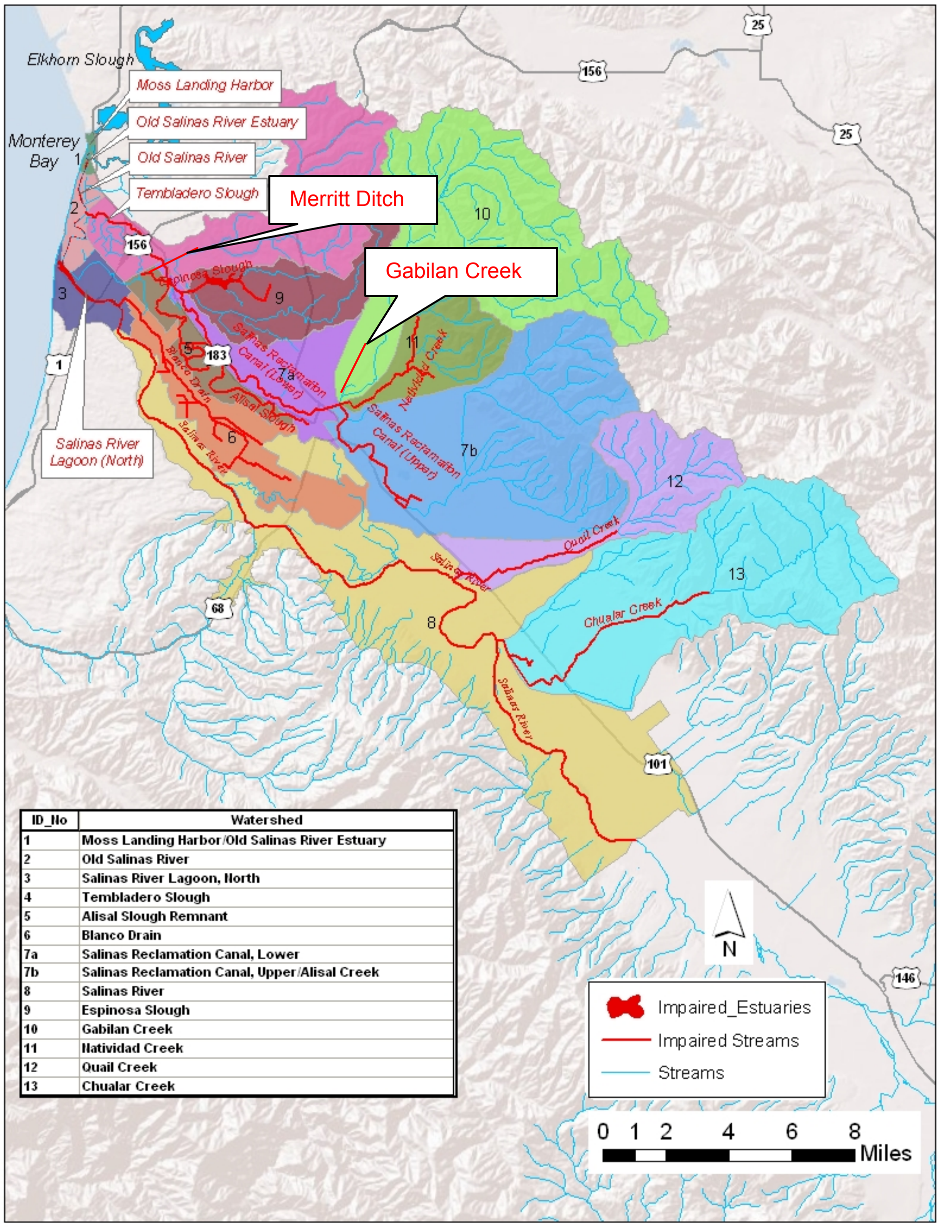


Figure 2-1 Watersheds within the project area. (Impaired waterbodies shown in red)

Table 2-1. Watershed areas illustrated in Figure 2-1.

Watershed Number	Watershed	Area (Acres)
1	Moss Landing Harbor/Old Salinas River Estuary	273
2	Old Salinas River	1,462
3	Salinas River Lagoon, North	3,058
4	Tembladero Slough	16,737
5	Alisal Slough	3,703
6	Blanco Drain	8,300
7a	Salinas Reclamation Canal, Lower	6,563
7b	Salinas Reclamation Canal, Upper/Alisal Creek	29,601
8	Lower Salinas River	40,595
9	Espinosa Slough	8,646
10	Gabilan Creek	27,713
11	Natividad Creek	7,405
12	Quail Creek	11,236
13	Chualar Creek	29,888
Total Acreage Project Area		195,180

Note: Merritt Ditch drains to and is within Tembladero Slough watershed.

2.1.2 Land Use/Land Cover (LULC)

Staff estimated the acreage of different land uses within the various watersheds using the National Land Cover Data (NLCD) provided by the Multi-Resolution Land Characteristics Consortium (MRLC, 1992). The MRLC membership includes the U.S. Geological Survey (USGS), U.S. Environmental Protection Agency (USEPA), National Oceanic and Atmospheric Administration (NOAA), U.S. Forest Service (USFS), National Atmospheric and Space Administration (NASA), and the Bureau of Land Management (BLM).

The NLCD was derived from images acquired by Landsat's Thematic Mapper (TM) sensor, as well as a number of ancillary data sources. Land use categories are aggregate categories based on the original level II classification scheme for the NLCD.

Table 2-2 tabulates the relative areas of landuses in the subwatersheds.

Table 2-2. Land Use/Land Cover % of Project Area (MRLC 1992)

	Watershed	Total Watershed Acreage	% Agriculture	% Bare	% Developed	% Forest	% Grassland	% Quarries	% Shrub	% Water Feature/ Wetlands
1	Moss Landing Harbor/Old Salinas River Esturary	273	5.7	14.9	25.7	0.6	12.5		16.1	24.6
2	Old Salinas River	1,462	81.7	2.7	4.3	0.0	0.7		9.9	0.7
3	Salinas River Lagoon, North	3,058	70.6	10.0	3.4	0.4	4.1		6.5	4.8
4	Tembladero Slough	16,737	31.8	1.3	12.2	11.9	24.1	0.2	17.4	1.2
5	Alisal Slough	3,703	94.9	1.4	3.4	0.0	0.2		0.1	
6	Blanco Drain	8,300	92.8	1.0	4.7	0.0	0.8		0.6	
7a	Salinas Reclamation Canal, Lower	6,563	55.9	1.7	34.6	0.0	5.7		2.1	
7b	Salinas Reclamation Canal, Upper/Alisal Creek	29,601	39.3	1.6	7.9	9.7	22.1		19.3	
8	Lower Salinas River	40,595	58.2	2.7	6.5	1.4	26.7	0.2	3.9	0.3
9	Espinosa Slough	8,646	81.0	1.5	7.8	0.8	6.9		0.9	1.0
10	Gabilan Creek	27,713	12.8	0.5	2.8	25.9	34.8	1.2	21.9	
11	Natividad Creek	7,405	48.4	0.8	3.8	11.3	25.9	0.3	9.2	0.2
12	Quail Creek	11,236	21.6	3.7	1.7	18.0	16.4		38.5	0.0
13	Chualar Creek	29,888	26.6	1.2	0.5	16.3	33.6		21.8	0.0
	Totals	**195,180**	**42.7**	**1.8**	**6.2**	**10.5**	**23.6**	**0.2**	**14.6**	**0.3**

Note: Merritt Ditch drains to and is within Tembladero Slough watershed.

The Alisal Slough watershed maintains the greatest percentage of irrigated agriculture land use at 95%, followed by Blanco Drain (92%), Old Salinas River (82%), and Espinosa Slough (81%). The Salinas Reclamation Canal (lower) contains the greatest percentage of developed land use at 34%, followed by Moss Landing Harbor/Old Salinas River Estuary (26%).

2.1.3 Topography

The project area encompasses portions of the Gabilan Range to the east, the Salinas Valley floor north of Gonzalez and the associated coastal plain as well as the rolling sand hills between the north end of the Gabilan Range and Elkhorn Slough. Johnson Peak in the Gabilan Range east of Chualar reaches an elevation of 3,465 feet.

2.1.4 Climate and Hydrology

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 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.

Precipitation is concentrated in winter. Rain totals range from about 10 inches in drier locations to near or slightly above 80 inches in the coastal mountains. Snowfall in the county is generally insignificant, although a limited amount is received each winter at the higher elevations.

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

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).

Streams in the 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 streams during dry seasons. Some of the waterbodies are tidally influenced, especially those connected to the Elkhorn Slough; these waterbodies include Moss Landing Harbor, Moro Cojo Slough, the Old Salinas River Estuary and lower portions of Tembladero Slough. Releases from from Lake Nacimiento and Lake San Antonio are used to replenish groundwater in the Salinas Valley.

2.2 Beneficial Uses

The designated beneficial uses identified in the Basin Plan for the listed waterbodies are shown in Table 2-3 and Table 2-4. There are two separate Beneficial Use tables because the Basin Plan has one table for inland surface waters and one for coastal waters.

Table 2-3. Basin-Plan designated Beneficial Uses for Inland Waters

Waterbody Names	MUN	AGR	PROC	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRESH	COMM	SHELL
Old Salinas River Estuary						X	X	X	X	X	X	X	X	X	X		X	X
Salinas River Lagoon (North)						X	X	X	X	X	X	X	X	X	X		X	X
Tembladero Slough						X	X	X		X		X		X	X		X	X
Espinosa Lake						X	X	X		X							X	
Espinosa Slough						X	X	X		X							X	
Salinas Reclamation Canal						X	X	X		X							X	
Alisal Creek	X	X			X	X	X	X	X	X		X					X	
Blanco Drain						X	X	X		X							X	
Salinas River, dnstr of Spreckels Gage	X	X					X	X	X	X	X					X	X	
Salinas River, Spreckels Gage-Chualar	X	X	X	X	X	X	X	X	X	X	X						X	

Beneficial uses are regarded as existing whether the water body is perennial or ephemeral, or the flow is intermittent or continuous. Beneficial uses are not specifically assigned to the Old Salinas River, Alisal Slough, Natividad Creek, Quail Creek, and Chualar Creek; however, all waterbodies are assigned: 1) municipal and domestic water supply, and 2) protection of both recreation and aquatic life.

Table 2-4. Basin Plan Existing and Anticipated Uses of Moss Landing Harbor (Coastal Waters)

Coastal Water	REC-1	REC-2	IND	NAV	MAR	SHELL	COMM	RARE	WILD
Moss Landing Harbor	E	E	E	E	E	E[a]	E	E	E

[a] 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.
NOTE: E = Existing beneficial water use.

2.2.1 Beneficial Use Explanations

<u>Municipal and Domestic Supply (MUN)</u> - Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. According to State Board Resolution No. 88-63, "Sources of Drinking Water Policy" all surface waters are considered suitable, or potentially suitable, for municipal or domestic water supply except where:

a. TDS exceeds 3000 mg/l (5000 uS/cm electrical conductivity);

b. Contamination exists, that cannot reasonably be treated for domestic use;

c. The source is not sufficient to supply an average sustained yield of 200 gallons per day;

d. The water is in collection or treatment systems of municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff; and

e. The water is in systems for conveying or holding agricultural drainage waters.

Agricultural Supply (AGR) - Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Industrial Process Supply (PROC) - Uses of water for industrial activities that depend primarily on water quality (i.e., waters used for manufacturing, food processing, etc.).

Industrial Service Supply (IND) - Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Ground Water Recharge (GWR) - Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers. Ground water recharge includes recharge of surface water underflow.

Freshwater Replenishment (FRESH) - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity) which includes a water body that supplies water to a different type of water body, such as, streams that supply reservoirs and lakes, or estuaries; or reservoirs and lakes that supply streams. This includes only immediate upstream water bodies and not their tributaries.

Navigation (NAV) - Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels. This Board interprets NAV as, "Any stream, lake, arm of the sea, or other natural body of water that is actually navigable and that, by itself, or by its connections with other waters, for a period long enough to be of commercial value, is of sufficient capacity to float watercraft for the purposes of commerce, trade, transportation, and including pleasure; or any waters that have been declared navigable by the Congress of the United States" and/or the California State Lands Commission.

Water Contact Recreation (REC-1) - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

<u>Non-Contact Water Recreation</u> (REC-2) - Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

<u>Commercial and Sport Fishing</u> (COMM) - Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

<u>Warm Fresh Water Habitat</u> (WARM) - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

<u>Cold Fresh Water Habitat</u> (COLD) - Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

<u>Estuarine Habitat (EST)</u> - Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds). An estuary is generally described as a semi-enclosed body of water having a free connection with the open sea, at least part of the year and within which the seawater is diluted at least seasonally with fresh water drained from the land. Included are water bodies which would naturally fit the definition if not controlled by tidegates or other such devices.

<u>Marine Habitat</u> (MAR) - Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

<u>Wildlife Habitat</u> (WILD) - Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

<u>Preservation of Biological Habitats of Special Significance</u> (BIOL) - Uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

<u>Rare, Threatened, or Endangered Species</u> (RARE) - Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Migration of Aquatic Organisms (MIGR) - Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Spawning, Reproduction, and/or Early Development (SPWN) - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Shellfish Harvesting (SHELL) - Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries.

2.3 Water Quality Objectives

The Central Coast Region's Water Quality Control Plan (Basin Plan) contains specific water quality objectives that apply to all inland surface waters, enclosed bays and estuaries (CCRWQCB, 1994, pg. III-4). Relevant water quality objectives for this project include:

2.3.1 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.

2.3.2 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.

2.4 Listing Basis

Refer to Section 1.1 for discussion of Clean Water Act 303(d) listing. Waterbodies were listed for chlorpyrifos and/or diazinon in accordance with the State Water Resources Control Board Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List, September 2004 (Listing Policy. SWRCB, 2004). Table 3.1 of the Listing Policy specifies the minimum number of measured exceedances needed to place a water segment on the Section 303(d) list for toxicants (SWRCB, 2004, pg. 9).

Staff used evaluation guidelines of 0.025 micrograms per liter (µg/L) for chlorpyrifos and 0.160 µg/L for diazinon (CDFG, 2000; CDFG, 2004) for the development of the 2010 Clean Water Act section 303(d) List; these concentrations are protective of aquatic life beneficial uses. Note that a minimum of two samples is required to conclude waterbody impairment. Additional information pertaining to evaluation guidelines are contained in Section 3, and in APPENDIX B - Derivation of Water Column Numeric Targets.

2.5 Data Analysis

This section provides information pertaining to data sources and an analysis of water quality data used to assess water quality conditions and impairment,

To assess water quality conditions and impairment, staff used evaluation guidelines of 0.025 micrograms per liter (µg/L) for chlorpyrifos and 0.16 µg/L for diazinon (CDFG, 2000; CDFG, 2004) to protect aquatic life beneficial uses. The CDFG concentrations are criterion maximum concentrations (CMC) expressed as 1-hour averages (acute); however, because water quality data was only available on a daily interval (e.g., not hourly), staff conducted the impairment assessment by treating the daily instantaneous water quality results as a 1-hour average. In addition to the CMCs, CDFG published criterion continuous concentrations (CCC) for chlorpyrifos and diazinon (CDFG, 2000; CDFG, 2004), which are expressed as a 4-day average (chronic). Staff was not able to assess chronic toxicity conditions because water quality data for comparison to the 4-day average was not available. Therefore staff will propose a water quality monitoring plan to encorporate a sampling frequency amenable for comparison to CDFG CCC criteria during the implementation phase. Additional information pertaining to numeric targets and their derivation are contained in Section 3 and in APPENDIX B - Derivation of Water Column Numeric Targets.

2.6 Data Sources

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

- *Ambient Toxicity due to Chlorpyrifos and Diazinon in a Central California Coastal Watershed*, by John Hunt et. al., in Environmental Monitoring and Assessment 82-112, 2003. (Hunt, 2003).
- California Department of Pesticide Regulation (CDPR) water quality data (2003-2005).

- Central Coast Ambient Monitoring Program (CCAMP) and Surface Water Ambient Monitoring Program (SWAMP) water quality data (March 2004).
- *Monitoring Chlorpyrifos and Diazinon in Impaired Surface Waters of the Lower Salinas Region*, by Central Coast Watershed Studies, Watershed Institute, California Statue University, Monterey Bay. March 31, 2004. (CCoWS, 2004).
- *Phase I Follow-Up Water Quality Monitoring: Organophosphate Pesticide Sampling Final Report*, Central Coast Region Conditional Waiver Cooperative Monitoring Program, by Central Coast Water Quality Preservation, Inc. May 19, 2008. (CCWQP, 2008).
- *Supplemental Water Quality Monitoring for Organophosphate Pesticides and Aquatic Toxicity*, Central Coast Region Conditional Ag Waiver Cooperative Monitoring Program, by Central Coast Water Quality Preservation, Inc. May 28, 2009. (CCWQP, 2009).

Staff also used data contained in the California Department of Pesticide Regulation's (CDPR) Surface Water Database to evaluate pesticide use.

2.6.1 Hunt, et. al. (2003)

This study investigated sources and causes of aquatic toxicity in the Lower Salinas River watershed by sampling four sites along the main stem of the Salinas River (located 6, 7, 13.5, and 38.5 kilometers upstream of Monterey Bay) and four sites in representative tributaries (Tembladero Slough, two in Blanco Drain, and Quail Creek). The study included 15 surveys conducted between September 1998 and January 2000. In 96 hr toxicity tests, significant *Ceriodaphnia dubia* mortality was observed in 11% of the main river samples, 87% of the samples from a channel draining an urban/agricultural watershed (Tembladero Slough), 13% of the samples from channels conveying agricultural tile drain runoff (Blanco Drain), and in 100% of the samples from a channel conveying agricultural surface furrow runoff (Quail Creek). In six of nine toxicity identification evaluations (TIEs), the organophosphate pesticides diazinon and/or chlorpyrifos were implicated as causes of observed toxicity, and these compounds were the most probable causes of toxicity in two of the other three TIEs. Every sample collected in the watershed that exhibited greater than 50% *C. dubia* mortality (n = 31) had sufficient diazinon and/or chlorpyrifos concentrations to account for the observed effects [e.g., concentrations above median lethal concentrations (LC50) of 0.053 µg/L for chlorpyrifos and 0.32 µg/L for diazinon for the water flea *Ceriodaphnia dubia* or greater than one joint toxic unit when both pesticides are combined].

The study reported maximum concentrations of 3.2 µg/L for chlorpyrifos (average of 1.49 µg/L, n=7) and 5.8 µg/L for diazinon (average 1.48 µg/L, n=7) from agricultural surface furrow runoff in Quail Creek.

2.6.2 California Department of Pesticide Regulations and Surface Water Ambient Monitoring Program/Central Coast Ambient Monitoring Program

The California Department of Pesticide Regulation (CDPR) collected water quality data from eight sites within the Lower Salinas River watershed. Chlorpyrifos and diazinon data was obtained from 2003 through 2005. Table 2-5 lists the monitoring site codes and site descriptions and Figure 2-2 depicts monitoring site locations. A summary of water quality sampling results is contained in Table 2-7.

The Surface Water Ambient Monitoring Program (SWAMP) and the Central Coast Ambient Monitoring Program (CCAMP) conducted a joint sediment toxicity study in March 2004 that consisted of three sites within the project area. Though the study focused on sediment chemical analysis, interstitial water samples were collected and analyzed for chlorpyrifos and diazinon. Table 2-6 lists the monitoring site codes and site descriptions and Figure 2-2 depicts monitoring site locations. A summary of water quality sampling results is contained in Table 2-8.

Table 2-5. CDPR monitoring sites.

CDPR Site Code	Site Description
309REC-DLT_DPR	Alisal Slough (Reclamation Ditch), Moffett St. ca 0.15 mi SE of Airport Blvd.
309BLA-COO_DPR	Blanco Drain at Cooper Rd, ca 0.2 mi. S of Nashua Rd, drains to Salinas R.
309CRR_DPR	Chualar Creek at Chualar River Rd., ca. 1.2 mi. from HWY 101 (trib. to Salinas R.)
309QUI_DPR	Quail Creek at HWY 101, btwn Spence and Potter Roads (trib. to Salinas R.)
309DAV_DPR	Salinas River at Davis Rd.
309POT_DPR	Old Salinas River at Potrero
309JON_DPR	Reclamation Ditch at San Jon Road
309SBR_DPR	Salinas River at Del Monte (Hwy 1)

Table 2-6. SWAMP/CCAMP monitoring sites.

SWAMP/CCAMP Site Code	Description
309TDW	SWAMP_CCAMP Tembledero Sl at Monterey Dunes
309DAV	SWAMP_CCAMP Salinas R. at Davis Rd
309OLD	SWAMP_CCAMP Old Salinas R. at Monterey Dunes

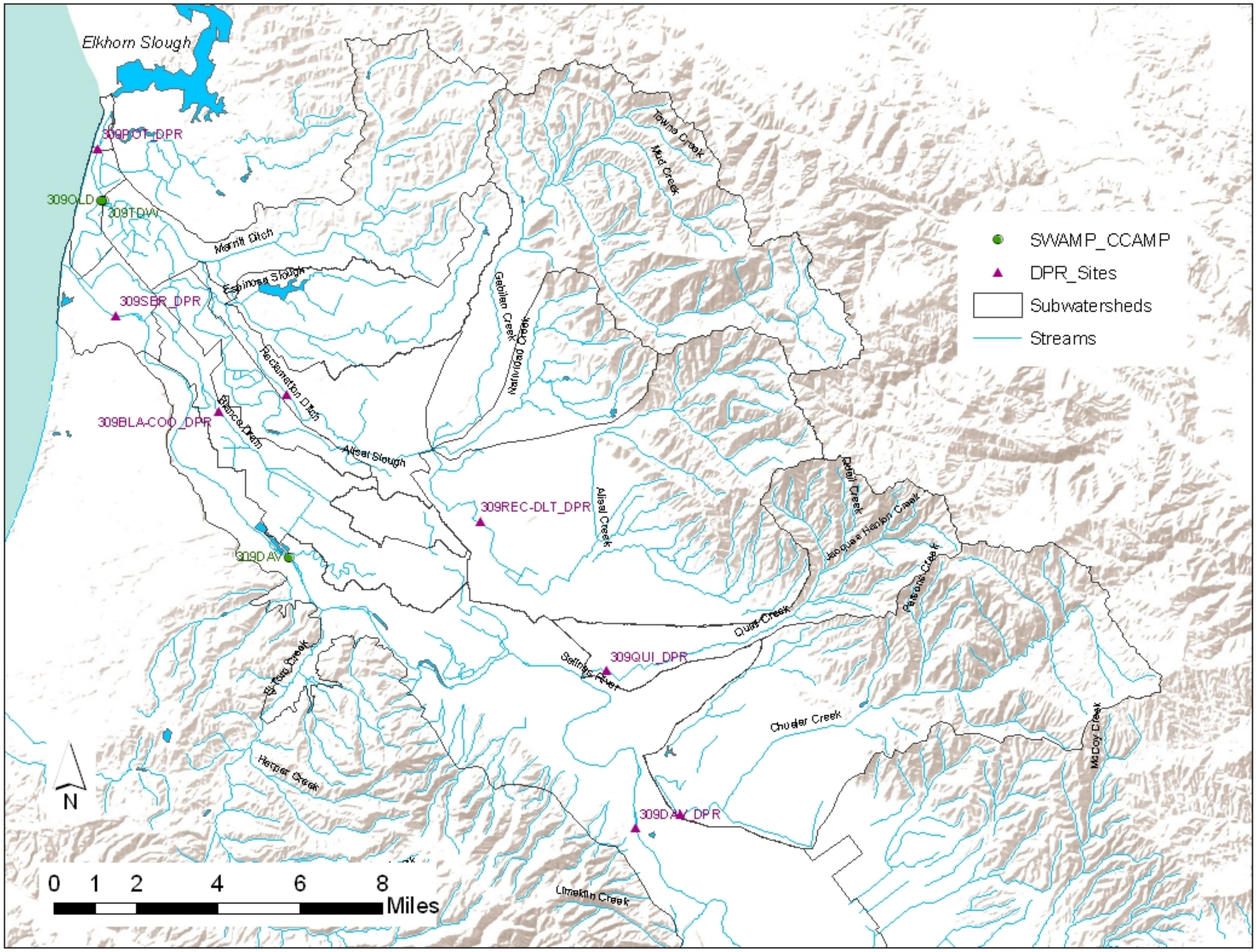


Figure 2-2. CDPR and SWAMP_CCAMP monitoring sites.

Table 2-7. Summary of CDPR water column monitoring results.

CDPR Site Code	# Chlorpyrifos samples	# Chlorpyrifos Exceedances [1]	% Chlorpyrifos Exceedances	# Diazinon Samples	# Diazinon Exceedances [2]	% Diazinon Exceedances
309POT_DPR	3	2	66.7	3	1	33.3
309SBR_DPR	3	0	0.0	3	0	0.0
309BLA-COO_DPR	16	1	6.3	16	6	37.5
309JON_DPR	3	3	100.0	3	2	66.7
309REC-DLT_DPR	16	1	6.3	16	16	100.0
309DAV_DPR	3	0	0.0	3	0	0.0
309QUI_DPR	19	19	100.0	19	9	47.4
309CRR_DPR	16	12	75.0	16	6	37.5

[1] Chlorpyrifos exceedance criteria of 0.025 µg/L.
[2] Diazinon exceedance criteria of 0.160 µg/L.

Staff used water column guidance criteria of 0.025 micrograms per liter (µg/L) for chlorpyrifos and 0.160 µg/L for diazinon (CDFG, 2000; CDFG 2004) to assess protection of aquatic life beneficial uses. Note that the Listing Policy states the minimum number of measured exceedances needed to assert impairment for toxicants are two exceedances in a minimum sample size of 2 – 24 samples (see Table 3.1 of the Listing Policy).

For the CDPR data, staff concluded that chlorpyrifos guidance criteria were exceeded at 6 of the 8 monitoring stations and that chlorpyrifos impairment may be asserted for 4 monitoring stations (309POT_DPR, 309JON_DPR, 309QUI_DPR, and 309CRR_DPR). Staff also concluded that diazinon guidance criteria were exceeded at 6 of the 8 stations and that diazinon impairment may be asserted for 5 monitoring stations (309BLA-COO_DPR, 309JON_DPR, 309REC-DLT_DPR, 309QUI_DPR, and 309CRR_DPR).

Table 2-8. Summary of SWAMP/CCAMP water column monitoring results

SWAMP/CAMP Site Code	# Chlorpyrifos samples	# Chlorpyrifos Exceedances [1]	% Chlorpyrifos Exceedances	# Diazinon Samples	# Diazinon Exceedances	% Diazinon Exceedances [2]
309OLD	1	1	100.0	1	0	0.0
309TDW	1	1	100.0	1	0	0.0
309DAV	1	1	100.0	1	0	0.0

[1] Chlorpyrifos guidance criteria of 0.025 µg/L.
[2] Diazinon guidance criteria of 0.160 µg/L.

For the SWAMP/CCAMP data, staff concluded that chlorpyrifos guidance criteria was exceeded at all three sites, however the minimum number of exceedances and minimum sample size was not met (e.g., only one sample and one exceedance). Diazinon concentrations were not above 0.160 µg/L.

2.6.3 Central Coast Watershed Studies (CCoWS)

The CCoWs study established nine different sites on listed waterbodies. Twelve samples were collected at each site during the summer dry seasons of 2002-2003 and three samples were collected at each site during storms occurring in November 2002, February 2003 and March 2003. Each sample consisted of a water column, a suspended sediment sample and a bottom sediment sample that were analyzed for chlorpyrifos and diazinon concentrations using enzyme-linked immunosorbant assays (ELISA) technology.

Table 2-9 describes the sites and Figure 2-3 depicts the site locations within the project area.

Table 2-9. CCoWS monitoring sites.

Waterway	Location	Site Code	Waterbody type
Salinas River	Davis Rd.	SAL-DAV	Large river
Salinas Lagoon	Del Monte Rd.	SAL-MON	Seasonal lagoon
Blanco Drain	Cooper Rd.	BLA-COO	Large ag. ditch
Blanco Drain	Pump-out station	BLA-PUM	Slough
Reclamation Ditch	San Jon Rd.	REC-JON	Large ag./urban canal
Old Salinas River	Potrero Rd.	OLS-POT	Back-beach swale
Moss Landing Harbor	Sandholdt Rd.	MOS-SAN	Artificial harbor
Espinosa Slough tributary	Rogers Rd.	EP1-ROG	Ag. ditch
Espinosa Slough	NE end of lake	EPL-EPL	Perennial lake

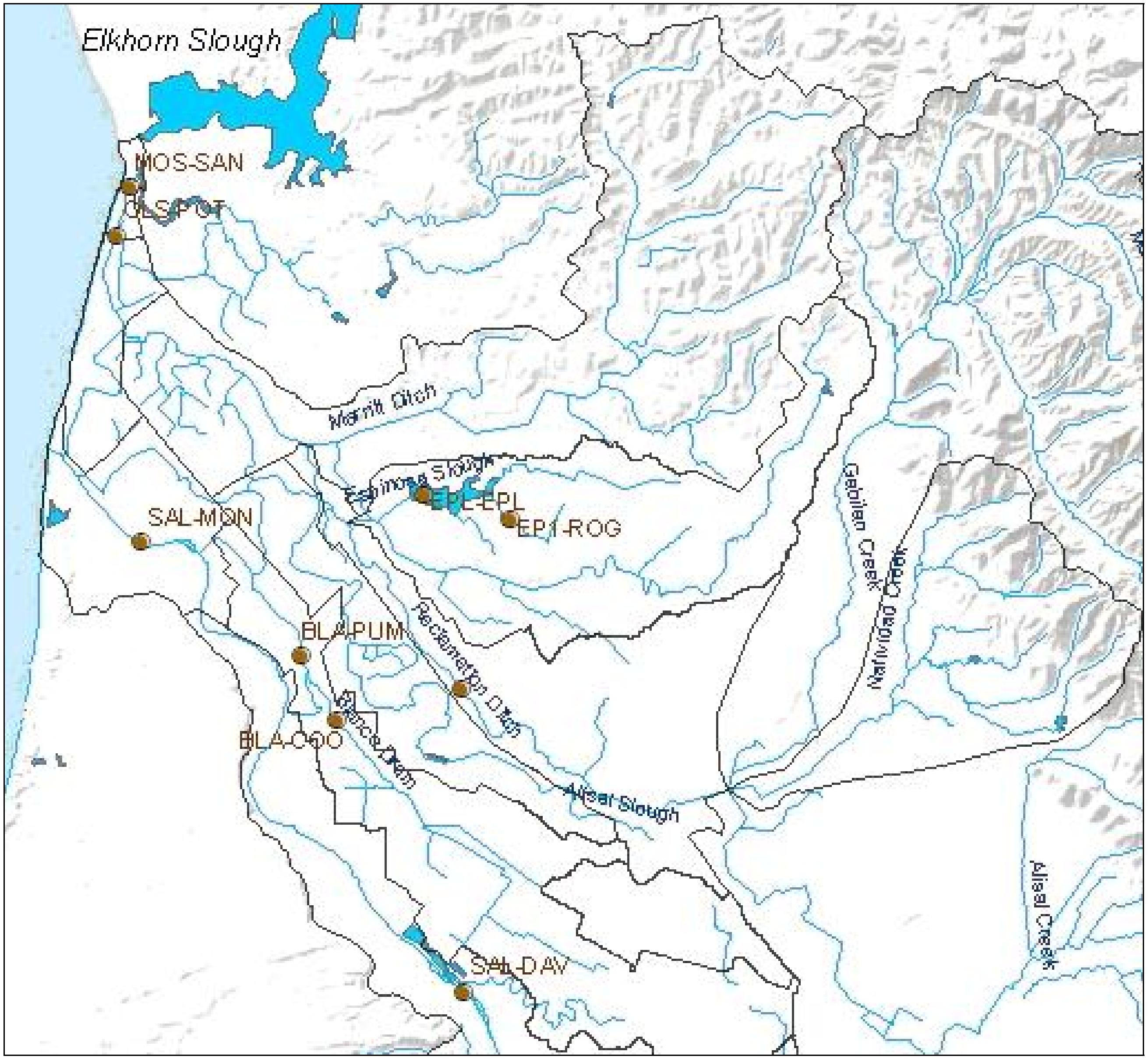


Figure 2-3. CCoWS monitoring sites.

Table 2-10. Summary of CCoWS water column monitoring results

CCoWS Site Code	# Chlorpyrifos samples	# Chlorpyrifos Exceedances [1]	% Chlorpyrifos Exceedances	# Diazinon Samples	# Diazinon Exceedances	% Diazinon Exceedances [2]
MOS-SAN	18	18	100.0	18	3	16.7
OLS-POT	22	22	100.0	22	10	45.5
SAL-MON	19	17	89.5	19	1	5.3
BLA-PUM	18	17	94.4	18	4	22.2
BLA-COO	23	22	95.7	22	7	31.8
REC_JON	24	24	100.0	24	22	91.7
SAL-DAV	22	20	90.9	22	6	27.3
EP1-ROG	23	23	100.0	22	21	95.5
EPL-EPL	16	16	100.0	16	2	12.5

[1] Chlorpyrifos guidance criteria of 0.025 μg/L.
[2] Diazinon guidance criteria of 0.160 μg/L.

For the CCoWS data, staff concluded that water column guidance criteria for both chlorpyrifos and diazinon were exceeded at all of the monitoring stations, with the exception of diazinon at station SAL-MON. Staff concluded that all of the waterbodies are impaired due to excessive levels of both chlorpyrifos and diazinon, with the exception of diazinon at station SAL-MON.

2.6.4 Cooperative Monitoring Program

The Cooperative Monitoring Program fulfills 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. Monitoring and reporting is conducted by Central Coast Water Quality Preservation, Inc. (CCWQP). Phase I of the monitoring program began in January of 2005 with monthly surface water grab sampling. Many of the sites showed significant, repeated toxicity to invertebrates which prompted a Phase I Follow-up and subsequent report.

Phase I Follow-up monitoring was conducted between August, 2006 and March, 2007 and included 15 sites within the TMDL project area (CCWQP, 2008). Sampling was conducted in August and September 2006 and in February and March 2007. The sites were distributed as follows: three sites in the mainstem Salinas River, eight in creeks or sloughs receiving agricultural drainage, one in an agricultural drain, two in the Salinas Reclamation Canal, and one site in a slough receiving tidal inputs influenced by water from the Salinas River. Table 2-11 describes the sites and Figure 2-4 depicts the site locations within the project area. Two sites, Chualar Creek (309CRR) and Gabilan Creek (309GAB), did not have flowing water during any of the sampling events and therefore were not sampled.

Table 2-11. CCWQP monitoring sites

Site Description	Site_ID	Site_Type
Moro Cojo Slough at Highway 1	306MOR	Tributary Creek
Old Salinas River at Monterey Dunes Way	309OLD	River
Tembladero Slough at Haro	309TEH	Tributary Creek
Merritt Ditch u/s Highway 183	309MER	Drain
Espinosa Slough u/s Alisal Slough	309ESP	Tributary Creek
Alisal Slough at White Barn	309ASB	Tributary Creek
Blanco Drain Below Pump	309BLA	Drain
Salinas Reclamation Canal at San Jon Road	309JON	Canal
Gabilan Creek at Boronda Road	309GAB	Tributary Creek
Natividad Creek u/s Salinas Reclamation Canal	309NAD	Tributary Creek
Salinas Reclamation Canal at La Guardia	309ALG	Canal
Salinas River at Spreckels Gauge	309SSP	River
Quail Creek at Highway 101	309QUI	Tributary Creek
Salinas River at Chualar Bridge on River Road	309SAC	River
Chualar Creek at Chualar River Road	309CRR	Tributary Creek

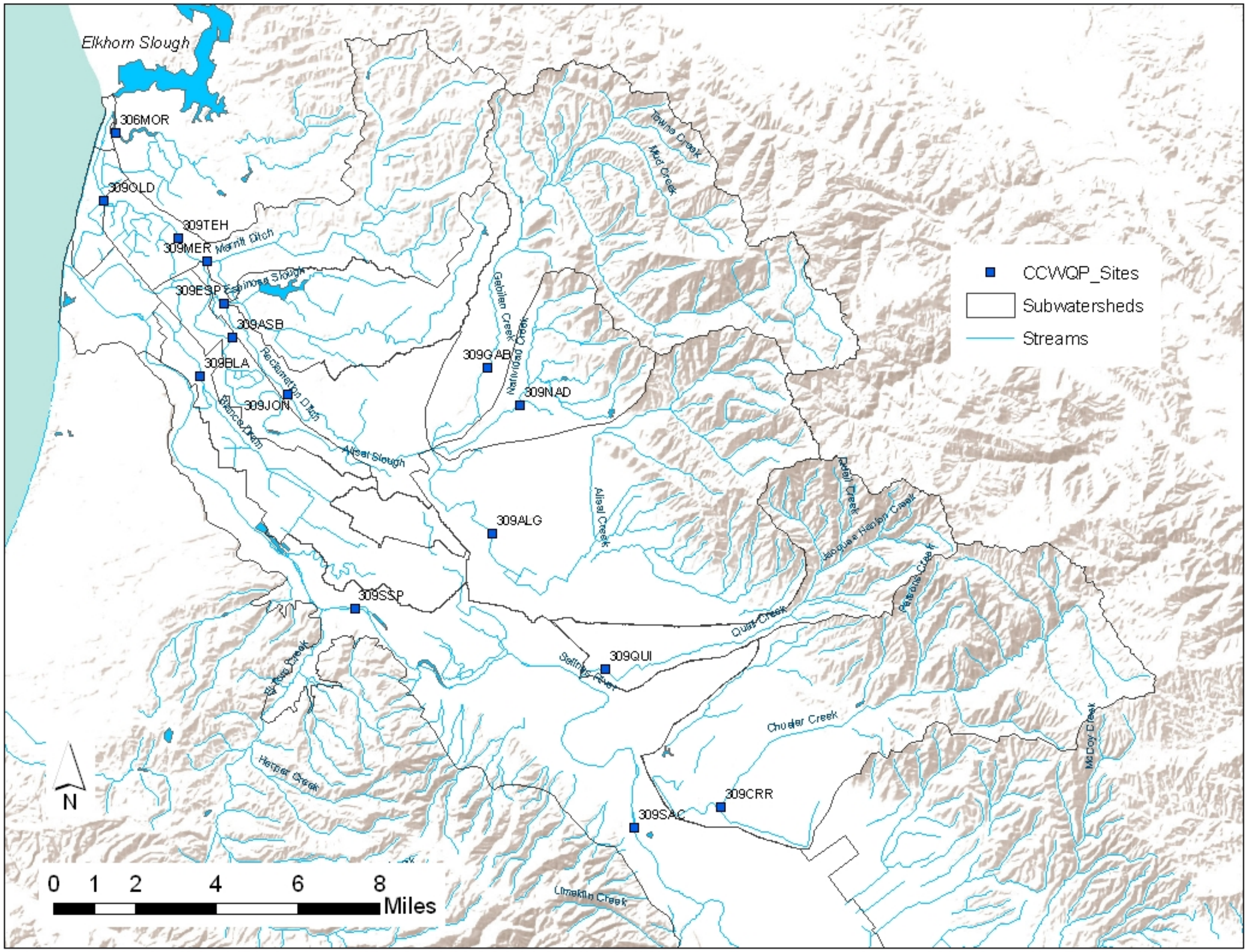


Figure 2-4. CCWQP monitoring sites.

Figure 2-5 depicts flow and water column concentrations of chlorpyrifos and diazinon from the CCWQP Phase 1 Follow-up study that was conducted from August 2006 to March 2007.

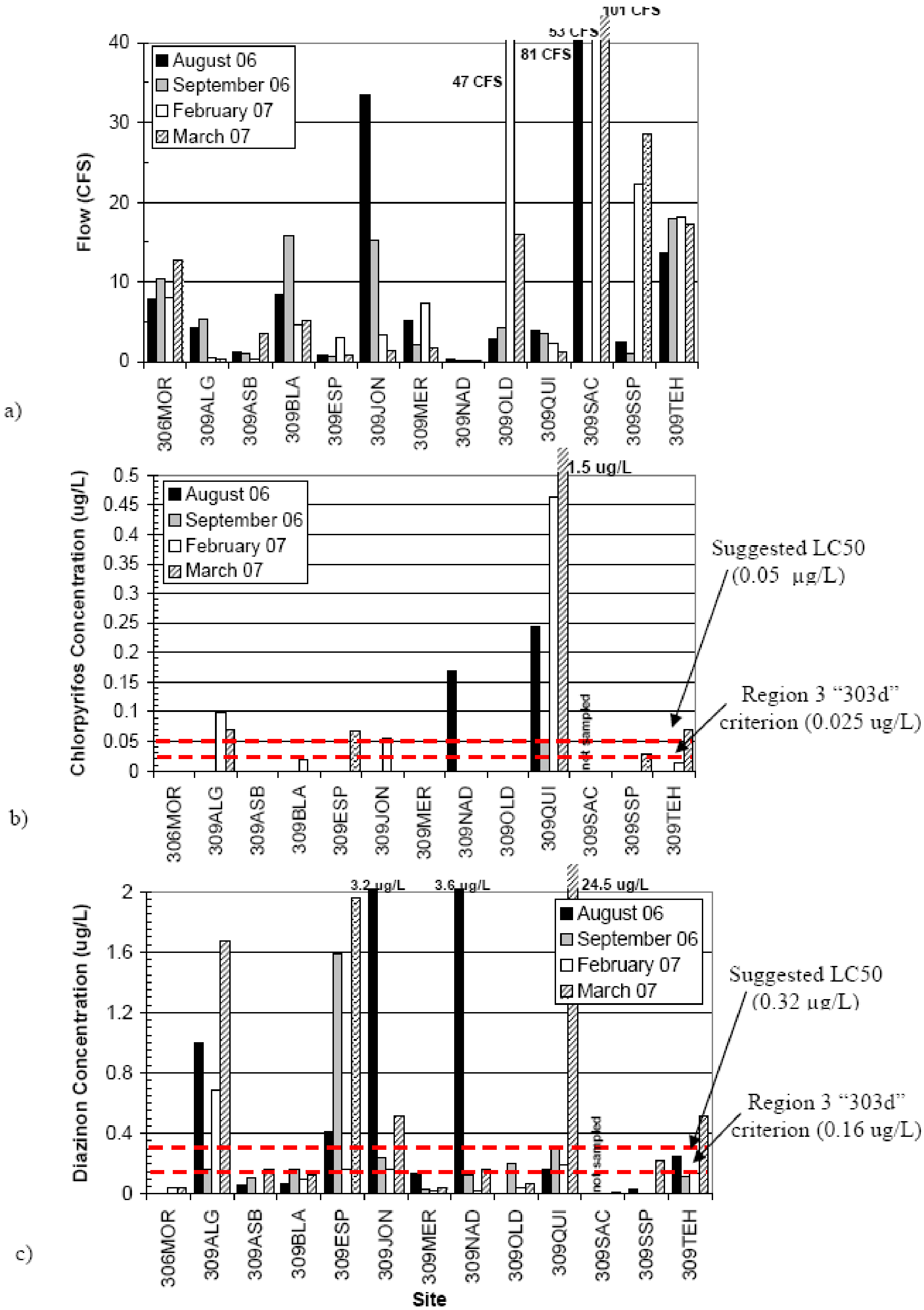


Figure 2-5. CCWQP flow and concentration results.
Flows (a), and concentrations of chlorpyrifos (b), and diazinon (c) for CCWQP monitoring sites. Suggested median lethal concentrations (LC50s) (Bailey et al., 1997) and Central Coast Water Board 303(d) listing criterion indicated by red dashed lines (from CCWQP, 2008).

The highest concentrations for both chlorpyrifos and diazinon were observed at the Quail Creek monitoring station in March 2007 at 1.5 µg/L and 24.5 µg/L, respectively. In addition, guidance criteria for chlorpyrifos and diazinon were exceeded in every water sample obtained from the Quail Creek monitoring station.

Chlorpyrifos and/or diazinon guidance criterion was exceeded at all monitoring stations with the exception of Moro Cojo Slough (306MOR), Merritt Ditch (309MER), and Salinas River at Chualar Bridge (309SAC). A temporal (seasonal) association could not be established for either chlorpyrifos and/or diazinon exceedances.

The CCWQP conducted additional monitoring to supplement the Phase 1 Follow-up and also collaborated with Dow Agrosciences and the CDPR for additional water quality monitoring (CCWQP, 2009). In September 2007 and September 2008, water samples from 15 Phase 1 sites in the Lower Salinas River watershed were again analyzed for OP pesticides. The September 2007 effort was identical to the four original Phase 1 Follow-up OP monitoring events described in the preceeding paragraphs. The September 2008 effort was a collaborative effort with Dow Agrosciences, who was conducting OP pesticide monitoring in response to a CDPR reevaluation of chlorpyrifos products (Bret and Poletika 2009). This work was conducted similarly to the CMP's original Phase I Follow-up OP monitoring project, with a few minor differences in site locations to explore areas beyond the CMP's Phase 1 watersheds. Finally, in August 2008, CMP staff collected samples for several classes of chemical constituents with CDPR staff at four sites in the Lower Salinas and Lower Pajaro areas. The monitoring of chemical constituents by CDPR was part of a long-term pesticide monitoring effort in progress by CDPR in high-use agricultural areas (Starner 2008).

Table 2-12 provides a summary of CCWQP, Dow Agrosciences, and CDPR monitoring results.

Table 2-12. Summary of CCWQP water column monitoring results (includes Dow Agrosciences and CDPR monitoring results).

CCWQP Site Code	# Chlorpyrifos samples	# Chlorpyrifos Exceedances [1]	% Chlorpyrifos Exceedances	# Diazinon Samples	# Diazinon Exceedances [2]	% Diazinon Exceedances
306MOR	5	0	0.0	5	0	0.0
309OLD	5	0	0.0	5	1	20.0
309TEH	8	2	25.0	8	3	37.5
309MER	5	0	0.0	5	1	20.0
309ASB	5	0	0.0	5	2	40.0
309BLA	6	0	0.0	6	1	16.7
309JON	6	1	16.7	6	5	83.3
309ALG	8	3	37.5	8	8	100.0
309SSP	4	1	25.0	4	1	25.0
309SAC	4	0	0.0	4	0	0.0
309ESP	6	1	16.7	6	5	83.3
309GAB	Dry	Dry	Dry	Dry	Dry	Dry
309NAD	5	1	20.0	5	2	40.0
309QUI	6	6	100.0	6	6	100.0
309CRR	1	1	100.0	1	0	0.0

[1] Chlorpyrifos guidance criteria of 0.025 µg/L.
[2] Diazinon guidance criteria of 0.160 µg/L.

Staff concluded from the data above that guidance criteria for chlorpyrifos were exceeded at Tembladero Slough (309TEH), the Salinas Reclamation Canal (309ALG), and Quail Creek (309QUI). Diazinon criteria were exceeded at Tembladero Slough (309TEH), Alisal Slough (309ASB), Salinas Reclamation Canal at Jon Road (309JON), Salinas Reclamation Canal at White Barn (309ALG), Espinosa Slough (309ESP), Natividad Creek (309NAD), and Quail Creek (309QUI).

2.7 Impairment Assessment

Waterbodies listed on the 2010 CWA section 303(d) for impairment due to chlorpyrifos and/or diazinon include Moss Landing Harbor, Old Salinas River, Tembladero Slough, Blanco Drain, Salinas Reclamation Canal (Lower and Upper/Alisal[3]), Lower Salinas River, Espinosa Slough, Espinosa Lake, Quail Creek, and Chualar Creek.

Waterbodies not listed for 2010 list due to chlorpyrifos and/or diazinon are Old Salinas River Estuary, Salinas River Lagoon (North), Alisal Slough, and Natividad Creek.

[3] The terms Salinas Reclamation Canal and Salinas Reclamation Ditch are used interchangeably in this document and refer to State Water Resources Control Board Waterbody ID CAR3091101019980828112229. For the impairment assessment, the Salinas Reclamation Canal was divided into two segments; Lower refers to the segment between Natividad Creek and Tembladero Slough, and Upper/Alisal refers to the segment between Natividad Creek and Alisal Creek.

Waterbodies listed as impaired due to “unknown toxicity” in the project area are: Old Salinas River, Tembladero Slough, Alisal Slough, Salinas Reclamation Canal, the Lower Salinas River, Espinosa Slough, Natividad Creek, Quail Creek, Chualar Creek, Merritt Ditch, and Gabilan Creek.

Staff performed an impairment assessment of the currently listed waterbodies and also assessed non-listed waterbodies within the project area to determine if any waterbodies currently not listed on the 303(d) list are impaired due to chlorpyrifos and/or diazinon.

To determine waterbody impairment due to excessive levels of chlorpyrifos and/or diazinon, staff performed an assessment in accordance with the State Water Resources Control Board Water Quality Control Policy for Developing California’s Clean Water Act Section 303(d) List, September 2004 (Listing Policy. SWRCB, 2004). Table 3.1 of the Listing Policy specifies the minimum number of measured exceedances needed to place a water segment on the Section 303(d) list for toxicants (SWRCB, 2004, pg. 9). Staff used evaluation guidelines of 0.025 micrograms per liter (µg/L) for chlorpyrifos and 0.16 µg/L for diazinon (CDFG, 2000; CDFG, 2004) to protect aquatic life beneficial uses. Additional information pertaining to numeric targets and their derivation are contained in Appendix B.

Table 2-13 tabulates all of the monitoring sites, waterbodies, monitoring programs that formulated this impairment assessment and Table 2-14 summarizes the results of the impairment assessment for each waterbody.

Table 2-13. Summary of monitoring programs, monitoring sites, and waterbodies assessed.

			Monitoring Programs and Site Identification Codes			
Site Description	Watershed ID [1]	Waterbody	CCWQP Code [2]	CCoWs Code	CDPR Code	SWAMP CAMP
Moro Cojo Slough at Highway 1	1	Moro Cojo Slough	306MOR			
Moss Landing Harbor at Sandholdt Rd	1	Moss Landing Harbor/Old Salinas R Estuary		MOS-SAN		
Old Salinas River at Monterey Dunes Way	2	Old Salinas River	309OLD			309OLD
Old Salinas River at Potrero Rd.	2	Old Salinas River/Old Salinas R Esuary		OLS-POT	309POT_DPR	
Salinas River Lagoon at Del Monte Rd	3	Salinas River Lagoon		SAL-MON	309SBR_DPR	
Tembladero Slough at Haro	4	Tembladero Slough	309TEH			
Merritt Ditch u/s Highway 183	4	Merritt Ditch	309MER			
Tembladero Slough at Monterey Dunes	4	Tembladero Slough				309TDW
Alisal Slough at White Barn	5	Alisal Slough	309ASB			
Blanco Drain Below Pump	6	Blanco Drain	309BLA	BLA-PUM		
Blanco Drain at Cooper Rd	6	Blanco Drain		BLA-COO	309BLA-COO_DPR	
Salinas Reclamation Canal at San Jon Road	7a	Salinas Reclamation Canal (Lower)	309JON	REC-JON	309JON_DPR	
Salinas Reclamation Canal at La Guardia	7b	Salinas Reclamation Canal (Upper)	309ALG			
Salinas Reclamation Canal at Moffett St.	7b	Salinas Reclamation Canal (Upper)			309REC-DLT_DPR	
Salinas River at Spreckels Gauge	8	Salinas River	309SSP			
Salinas River at Chualar Bridge on River Road	8	Salinas River	309SAC			
Salinas River at Davis Rd	8	Salinas River		SAL-DAV	309DAV_DPR	309DAV
Espinosa Slough u/s Alisal Slough	9	Espinosa Slough	309ESP			
Espinosa Slough tributary at Rogers Rd.	9	Espinosa Slough tributary		EP1-ROG		
Espinosa Slough at NE end of lake	9	Espinosa Slough		EPL-EPL		
Gabilan Creek at Boronda Road	10	Gabilan Creek	309GAB			
Natividad Creek u/s Salinas Reclamation Canal	11	Natividad Creek	309NAD			
Quail Creek at Highway 101	12	Quail Creek	309QUI		309QUI_DPR	
Chualar Creek at Chualar River Road	13	Chualar Creek	309CRR		309CRR_DPR	

[1] Correspond with Watershed ID's contained in Figure 2-1.
[2] Includes follow-up sampling in coordination with California Department of Pesticide Regulation (CDPR) and DOW AgroSciences, LLC.

Table 2-14. Summary of monitoring programs, monitoring sites, exceedances, and impaired waterbodies.

Watershed ID [1]	Waterbody	Program/Site Code	# Chlorpyrifos samples	# Chlorpyrifos Exceedances [2]	% Chlorpyrifos Exceedances	# Diazinon Samples	# Diazinon Exceedances [3]	% Diazinon Exceedances	Chlor Impaired	Diaz Impaired
1	Moro Cojo Slough	CCWQP/306MOR	5	0	0.0	5	0	0.0		
1	Moss Landing Harbor and Old Salinas R. Estuary	CCOWs/MOS-SAN	18	18	100.0	18	3	16.7	X	X
2	Old Salinas R.	CCWQP/309OLD	5	0	0.0	5	1	20.0		
		SWAMP_CAMP/309OLD	1	1	100.0	1	0	0.0		
		Site Total	6	1	16.7	6	1	16.7		
2	Old Salinas R.	CCOWs/OLS-POT	22	22	100.0	22	10	45.5		
		DPR/309POT_DPR	3	2	66.7	3	1	33.3		
		Site Total	25	24	96.0	25	11	44.0		
		Old Salinas River Total	31	25	80.6	31	12	38.7	X	X
3	Salinas R. Lagoon North	CCOWs/SAL-MON	19	17	89.5	19	1	5.3		
		DPR/309SBR_DPR	3	0	0.0	3	0	0.0		
		Salinas R. Lagoon North Total	22	17	77.3	22	1	4.5	X	
4	Tembladero Slough	CCWQP/309TEH	8	2	25.0	8	3	37.5		
4	Tembladero Slough	SWAMP_CAMP/309TDW	1	1	100.0	1	0	0.0		
		Tembladero Slough Total	9	3	33.3	9	3	33.3	X	X
4	Merritt Ditch	CCWQP/309MER	5	0	0.0	5	1	20.0		
5	Alisal Slough	CCWQP/309ASB	5	0	0.0	5	2	40.0		X
6	Blanco Drain	CCWQP/309BLA	6	0	0.0	6	1	16.7		
		CCOWs/BLA-PUM	18	17	94.4	18	4	22.2		
		Site Total	24	17	70.8	24	5	20.8		
6	Blanco Drain	CCOWs/BLA-COO	23	22	95.7	22	7	31.8		
		DPR/309BLA-COO_DPR	16	1	6.3	16	6	37.5		
		Site Total	39	23	59.0	38	13	34.2		
		Blanco Drain Total	63	40	63.5	62	18	29.0	X	X
7a	Salinas Reclamation Canal (Lower)	CCWQP/309JON	6	1	16.7	6	5	83.3		
		CCOWs/REC_JON	24	24	100.0	24	22	91.7		
		DPR/309JON_DPR	3	3	100.0	3	2	66.7		
		Salinas Reclamation Canal (Lower) Total	33	28	84.8	33	29	87.9	X	X

[1] Correspond with Watershed ID's contained in Figure 2-1.
[2] Chlorpyrifos guidance criteria of 0.025 µg/L.

[3] Diazinon guidance criteria of 0.160 µg/L.

Table 2-14 (cont'd).

Watershed ID [1]	Waterbody	Program/Site Code	# Chlorpyrifos samples	# Chlorpyrifos Exceedances [2]	% Chlorpyrifos Exceedances	# Diazinon Samples	# Diazinon Exceedances [3]	% Diazinon Exceedances	Chlor Impaired	Diaz Impaired
7b	Salinas Reclamation Canal (Upper)	CCWQP/309ALG	8	3	37.5	8	8	100.0		
7b	Salinas Reclamation Canal (Upper)	DPR/309REC-DLT_DPR	16	1	6.3	16	16	100.0		
		Salinas Reclamation Canal (Upper) Total	24	4	16.7	24	24	100.0	X	X
8	Salinas River	CCWQP/309SSP	4	1	25.0	4	1	25.0		
8	Salinas River	CCWQP/309SAC	4	0	0.0	4	0	0.0		
8	Salinas River	CCOWs/SAL-DAV	22	20	90.9	22	6	27.3		
		DPR/309DAV_DPR	3	0	0.0	3	0	0.0		
		SWAMP_CAMP/309DAV	1	1	100.0	1	0	0.0		
		Site Total	26	21	80.8	26	6	23.1		
		Salinas River Total	34	22	64.7	34	7	20.6	X	X
9	Espinosa Slough	CCWQP/309ESP	6	1	16.7	6	5	83.3		
9	Unnamed tributary to Espinosa Lake	CCOWs/EP1-ROG	23	23	100.0	22	21	95.5		
9	Espinosa Lake	CCOWs/EPL-EPL	16	16	100.0	16	2	12.5		
		Espinosa Slough and Espinosa Lake	45	40	88.9	44	28	63.6	X	X
10	Gabilan Creek	CCWQP/309GAB	Dry	Dry	Dry	Dry	Dry	Dry		
11	Natividad Creek	CCWQP/309NAD	5	1	20.0	5	2	40.0		X
12	Quail Creek	CCWQP/309QUI	6	6	100.0	6	6	100.0		
		DPR/309QUI_DPR	19	19	100.0	19	9	47.4		
		Quail Creek total	25	25	100.0	25	15	60.0	X	X
13	Chualar Creek	CCWQP/309CRR	1	1	100.0	1	0	0.0		
		DPR/309CRR_DPR	16	12	75.0	16	6	37.5		
		Chualar Creek Total	17	13	76.5	17	6	35.3	X	X

[1] Correspond with Watershed ID's contained in Figure 2-1.
[2] Chlorpyrifos guidance criteria of 0.025 µg/L.
[3] Diazinon guidance criteria of 0.160 µg/L.

Staff's impairment assessment of chlorpyrifos and diazinon confirmed that all of the listed waterbodies are impaired and, additionally, that there are four impairments not currently 303(d) listed. The non-listed impaired waterbodies are Old Salinas River Estuary, Salinas River Lagoon (North), Alisal Slough, and Natividad Creek. Staff has developed and assigned TMDLs for these non-listed but impaired waterbodies, as well as for the impaired waterbodies as presented in this report.

Waterbodies assessed in this project, their current 303(d) listing status and determination of impairment are listed in summarized in Table 2-15. The waterbodies in the columns under the heading titled "Listed on 2010 303(d) List are listed as impaired due one or more of the following: chlorpyrifos, diazinon, and unknown toxicity. All waterbodies identified in the table area assigned TMDLs in this project, and address the listings identified. Note that some of the waterbodies in this column are not currently 303d listed (indicated by a "O" in the table), but are impaired and have TMDLs assigned in this project. The impaired waterbodies are illustrated in Figure 2-6.

Some waterbodies in the project area are listed as impaired due to "unknown toxicity." Several listings were driven by laboratory tests resulting in mortality of indicator organisms, e.g. aquatic invertebrates, subjected to water samples from the listed waterbodies. At the time of the laboratory tests, analysis did not demonstrate which chemical(s) were causing the water toxicity, hence the term "unknown toxicity," because the pollutant/stressor was not identified. It is not appropriate to develop TMDLs and allocations for unknown toxicity; TMDLs and allocations should be developed for specified pollutants. Therefore, staff must at some point conclude which pollutants are causing the unknown toxicity, and propse TMDLs. Staff reviewed pesticide data and reports and concludes that water toxicity in the waterbodies listed as impaired for unknown toxicity is driven by chlorpyrifos and diazinon. Follow-up monitoring and reporting the by Cooperative Monitoring Program concluded that "chlorpyrifos and diazinon were the only OP's [e.g. chlorpyrifos and diazinon] present at concentrations likely to impact survival rates of sensitive aquatic invertebrates," and "…when chlorpyrifos and/or diazinon are detected at concentrations of known toxicity to aquatic invertebrates, survival rates in correspondting laboratory toxicity tests are typically very low" (CCWQP, 2009). Staff's analysis of chlorpyrifos and diazinon concentrations in the impaired waterbodies clearly demonstrate levels toxic to indicator organisms, e.g. aquatic invertebrates.

Therefore, staff concludes that the 303(d) listings for "unknown toxicity" were driven by toxicity caused by chlorpyrifos and/or diazinon. To be sure, staff is recommending (see section 6.1 Recommendations for Regulatory Requirements) that in cases where the cause of water column toxicity is unknown, that further analysis, e.g. toxicity identification evaluation (TIE) be performed during the implementation phase.

Table 2-15. Summary of Waterbodies Assessed, Waterbodies Listed, and Waterbodies Assigned TMDLs

State Water Resources Control Board Waterbody ID	Waterbodies Assessed for Impairment [a]	Listed on 2008-2010 303(d) List		
		Chlor[1]	Diaz[2]	UnkTox[3]
CAB3060001419981214121135	Moss Landing Harbor[b]	X	X	
CAE3060001419981214143807	Old Salinas River Estuary	O	O	
CAR3091101020080611145518	Old Salinas River	X	X	X
CAE3091101019980828143232	Salinas River Lagoon (North)	O		
CAR3091101019981209131830	Tembladero Slough	X	X	X
CAR3091101020090311204028	Alisal Slough		O	X
CAR3091101019981209161509	Blanco Drain	X	X	
CAR3091101019980828112229	Salinas Reclamation Canal	X	X	X
CAR3091101020021007193102	Lower Salinas River [c]	X	X	X
CAR3091101019981230135152	Espinosa Slough[d]		X	X
CAL3091900020020117151744	Espinosa Lake [e]	X	X	
CAR3091101020050531125140	Natividad Creek		O	X
CAR3091900020011227140647	Quail Creek	X	X	X
CAR3091900020080604161337	Chualar Creek	X	X	X
CAR3091101020080604152147	Merritt Ditch			X
CAR3091900019990304092345	Gabilan Creek			X
	Total waterbody/pollutant combinations	11	13	11

X Indicates listed on 303(d) list for the stressor/pollutant shown, e.g. chlorpyrifos
O Indicates NOT listed on the 303(d) list, but staff concludes impaired for the stressor/pollutant shown.
[a] Includes entire waterbody except as noted.
[b] Moss Landing Harbor: south of the Pacific Gas and Electric intake to Sandholt Bridge.
[c] Salinas River: All reaches downstream of Gonzales Road.
[d] Espinosa Slough: From confluence of Salinas Reclamation Canal (Lower) to Espinosa Lake.
[e] Espinosa Lake: Espinosa Lake and the unnamed agricultural ditch flowing into Espinosa Lake upstream of monitoring site EP1-ROG.
[1] Chlorpyrifos
[2] Diazinon
[3] Unknown toxicity

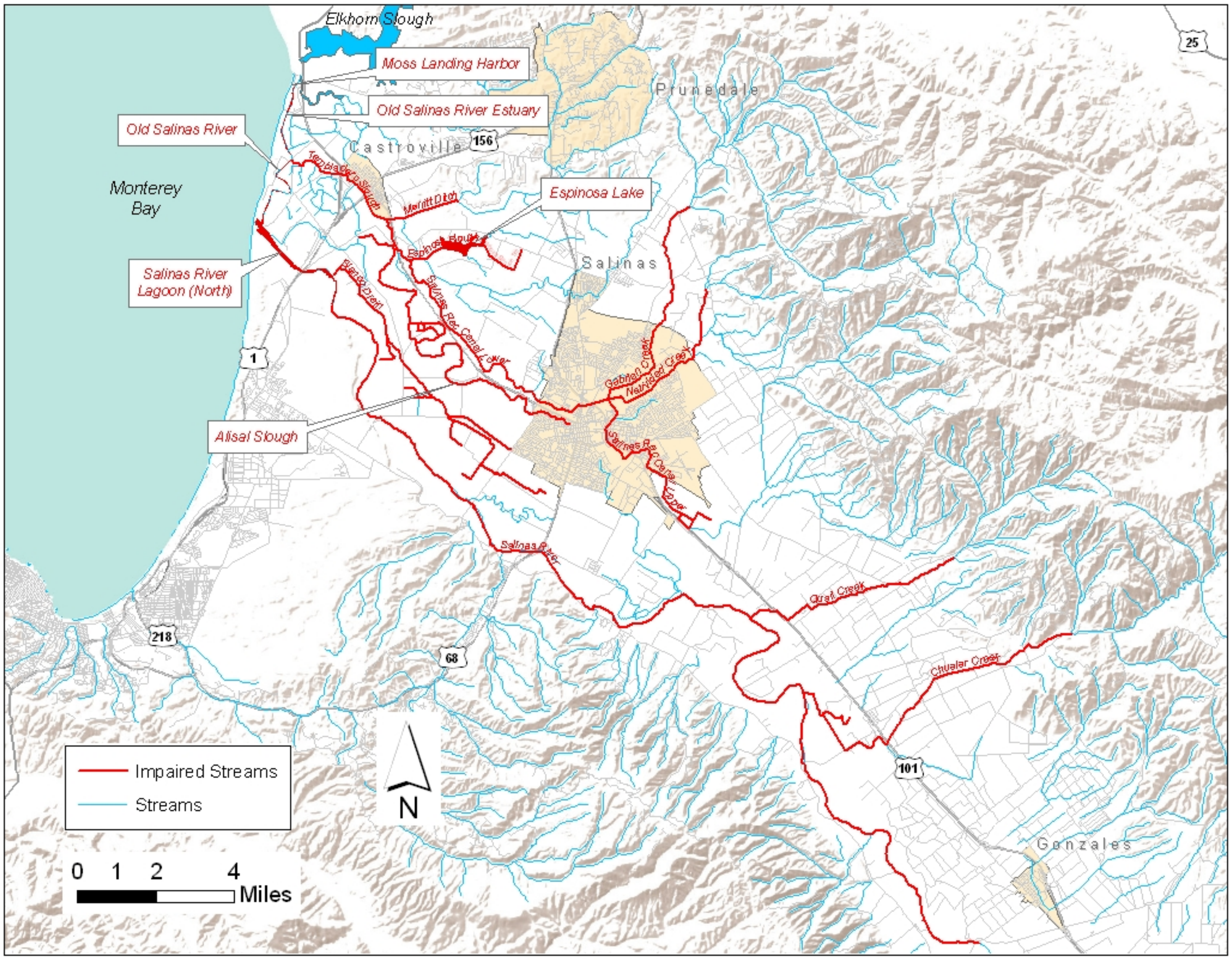


Figure 2-6. Impaired waterbodies within the TMDL Project Area.

2.7.1 Problem Statement

Sixteen waterbodies in the Lower Salinas River watershed are impaired due to exceedance of the narrative toxicity and pesticides water quality objectives. The pesticides chlorpyrifos and/or diazinon are present in the impaired waterbodies at levels that are not protective of several beneficial uses associated with aquatic life, including, but not limited to the following beneficial uses: cold fresh water habitat, warm fresh water habitat, estuarine habitat, wildlife habitat, rare threatened or endangered species, migration of aquatic organisms, and spawning, reproduction and/or early development uses.

Of the 16 impaired waterbodies, 14 are currently listed as impaired on the Clean Water Act section 303(d) list for chlorpyrifos, diazinon, or unknown toxicity. These waterbodies are:

1. Moss Landing Harbor (listed for chlorpyrifos and diazinon)
2. Old Salinas River (listed for chlorpyrifos, diazinon, and unknown toxicity)
3. Tembladero Slough (listed for chlorpyrifos, diazinon, pesticides, and unknown toxicity)
4. Alisal Slough (listed unknown toxicity)
5. Blanco Drain (listed for chlorpyrifos and diazinon)
6. Salinas Reclamation Canal (listed for chlorpyrifos, diazinon, and unknown toxicity)
7. Lower Salinas River (listed for chlorpyrifos, diazinon, and unknown toxicity)
8. Espinosa Slough (listed for diazinon, pesticides, and unknown toxicity)
9. Espinosa Lake (listed for chlorpyrifos and diazinon)
10. Natividad Creek (listed for unknown
11. Quail Creek (listed for chlorpyrifos and diazinon)
12. Chualar Creek (listed for chlorpyrifos, diazinon, and unknown toxicity).
13. Merritt Ditch (listed for unknown toxicity)
14. Gabilan Creek (listed for unknown toxicity)

Of the 16 impaired waterbodies, four are not currently listed on the Clean Water Act section 303(d) list for either chlorpyrifos or diazinon. These waterbodies are:

15. Old Salinas River Estuary (impaired for chlorpyrifos and diazinon)
16. Salinas River Lagoon-North (impaired for chlorpyrifos)
17. Alisal Slough (impaired for diazinon)
18. Natividad Creek (impaired for diazinon).

All 16 impaired waterbodies are assigned TMDLs in this project for chlorpyrifos and diazinon to address 303d listings (or impairments but not listed) due to chlorpyrifos, diazinon, pesticides, and unknown toxicity in this project.

3 NUMERIC TARGETS

This section describes the numeric targets used to develop the TMDL. Numeric targets are water quality targets developed to ascertain when and where water quality objectives are achieved, and hence, when beneficial uses are protected. Recall that the toxicity objective is a narrative objective (see Section 2.3).

Note that the targets presented below are consistent with the numeric targets approved by USEPA for chlorpyrifos and diazinon TMDLs for the Central Valley Regional Water Quality Control Board.

3.1 Water Column 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 and diazinon as a direct measure of water quality conditions for the protection of aquatic life that are consistent with the toxicity and pesticide objectives described in Section 2.3.

In 2000, CDFG published freshwater water quality criteria for diazinon and chlorpyrifos (CDFG, 2000) using USEPA methodology (USEPA, 1985). Using this data set, CDFG recalculated the diazinon criteria to exclude the questionable *Grammarus fasciatus* study and revised water quality criteria for diazinon (CDFG, 2004). Staff selected the CDFG water quality criteria as numeric targets for these TMDLs. Additonal information regarding the derivation of water column numeric targets is provided in APPENDIX B - Derivation of Water Column Numeric Targets. The numeric targets are presented in Table 3-1.

Table 3-1. Water Column Numeric Targets

Compound	CMC [A] (ppb)	CCC [B] (ppb)
Chlorpyrifos [C]	0.025	0.015
Diazinon [C]	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

[C]. A toxicity ratio is used to account for the additive nature of these compounds. The ratio calculation is provided in this Section 3.2.

3.2 Additive Toxicity Numeric Target

Diazinon and chlorpyrifos have the same mechanism of toxic action and exhibit additive toxicity to aquatic invertebrates when they co-occur (Bailey et al., 1997; CDFG, 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 diazinon and chlorpyrifos needs to be assessed, even when one or both 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 following additive toxicity numeric target formula is a numeric target of this TMDL:

$$\frac{C_{Diazinon}}{NT_{Diazinon}} + \frac{C_{Chlorpyrifos}}{NT_{Chlorpyrifos}} = S; \; S \leq 1$$

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.

The additive toxicity numeric target formula shall be applied when both diazinon and chlorpyrifos are present in the water column.

4 Source Analysis

4.1 Introduction

Chlorpyrifos and diazinon are man-made pesticides. Agricultural sources of chlorpyrifos and diazinon found in the Lower Salinas River watershed are causing exceedance of water quality objectives. The following is a general discussion of the sources followed by more detailed sections that address the sources by pollutant type.

4.1.1 Agricultural Sources

Chlorpyrifos and diazinon are actively applied and can be found in the water column, suspended sediment in the water column, and the bottom sediments. Staff tracked agricultural application location and amount applied using the Pesticide Use Report (PUR) provided by the Department of Pesticide Regulation. Applications of currently registered pesticides are reported at the section, or square mile, level. The PUR allows for fairly accurate identification of sources in time and space.

4.1.2 Urban Storm Water Sources

See Section 1.3 for discussion of restricted use of chlorpyrifos and diazinon. USEPA has severely restricted non-agricultural use of chlorpyrifos and diazinon.

4.2 Chlorpyrifos and Diazinon Use in the Salinas River Watershed

Chlorpyrifos and diazinon are actively applied within the Lower Salinas River watersheds. These pesticides can be found both in the water column (including suspended material) and in bottom sediments (CCoWs, 2004). The source analysis is based on 2002 and 2007 application data that was contained in the Pesticide Use Reports (PUR) provided by the Department of Pesticide Regulation (CDPR).

4.2.1 Approach and Methods

Agricultural source analysis for chlorpyrifos and diazinon was performed using PUR provided by the CDPR. The analysis was confined to the Lower Salinas Valley because monitoring data indicates that the Salinas River upstream of Gonzales Road does not exceed the current numeric targets and/or does not cause toxicity.

4.2.1.1 Agricultural Sources

The PUR data for agricultural pesticide use is reported at the section (square mile) level in pounds of chemical applied. Staff used GIS to assign sections, and portions of sections, to specific watersheds. This allowed the application data to be summed at the watershed level.

Where watershed boundaries cross a section, the amount of the chemical applied is apportioned based on the ratio of the area of the section lying within a watershed divided by the original area of the section. For example, if 100 lbs of diazinon was applied to a section, and half of that section lies in the Quail Creek watershed, then 50 lbs (100 lbs x 0.50 = 50 lbs) of diazinon would be apportioned to the Quail Creek watershed.

The CSUMB study (CCoWS, 2004) contained estimates of the amount of applied pesticides that reach waterbodies within the Lower Salinas River watershed. The estimates used data derived during ambient low flow conditions between July and November (e.g., the annual period coinciding with the greatest pesticide application rates). CSUMB estimated pesticide runoff ratios (PRR's) using the amount of pesticides applied within four watersheds; two watersheds associated with Blanco Drain, the Salinas Reclamation Canal watershed, and a small watershed draining to Espinosa Slough. Pesticide applications were later compared to pesticide loads in the waterways to derive PRR's. For three of the watersheds, CSUMB concluded that the total ambient low-flow load represents approximately 0.01% (1 lb in 10,000 lbs) of the amount of chlorpyrifos and diazinon applied. For the Espinosa Slough watershed, CSUMB estimated PRR's of 6% for chlorpyrifos and 41% for diazinon. It is important to note that samples from the Espinosa Slough monitoring station consistently contained very high chlorpyrifos and diazinon water column concentrations, the highest observed during the entire CSUMB study period. The Espinosa Slough watershed contains several nurseries and the CSUMB study concluded that these high concentrations are most likely attributable to nursery discharges.

Table 4-1 displays the estimated amount of chlorpyrifos and diazinon reaching the waterbodies within the study area based on the CSUMB PRR of 0.01% and watershed areas computed by staff. Staff did not use PRRs derived for the Espinosa Slough watershed because the watershed was small in size and contained a greater number of nurseries than other subwatersheds within the Lower Salinas River study area.

Figure 4-1 and Figure 4-2 display the 2002 agricultural application data graphically by subwatershed.

Table 4-1. 2002 Agricultural diazinon and chlorpyrifos application by watershed and estimated mass reaching waterbodies under low flow conditions.

WS Number [a]	Watershed	Watershed Area (Acres)	Diazinon			Chlorpyrifos		
			lbs Active Ingredient applied	Lbs/acre	Estimated amount reaching waterbodies (lbs)[b]	lbs Active Ingredient applied	Lbs/acre	Estimated amount reaching waterbodies (lbs) [b]
3b	Moss Landing Harbor/Old Salinas R Estuary	274	37	0.14	0.0037	3	0.01	0.0003
4	Old Salinas River	1,463	274	0.19	0.0274	30	0.02	0.003
5	Tembladero Slough	16,737	3,044	0.18	0.3044	530	0.03	0.053
6a	Salinas Reclamation Canal, Lower	6,563	5,138	0.78	0.5138	911	0.14	0.0911
6b	Salinas Reclamation Canal, Upper/Alisal Creek	29,662	8,706	0.29	0.8706	2,431	0.08	0.2431
7	Espinosa Slough	8,646	6,811	0.79	0.6811	940	0.11	0.094
8	Salinas River Lagoon, North	3,058	2,033	0.66	0.2033	485	0.16	0.0485
9	Lower Salinas River	40,595	23,999	0.59	2.3999	12,263	0.30	1.2263
10	Blanco Drain	8,300	9,015	1.09	0.9015	2,866	0.35	0.2866
11	Alisal Slough Remnant	3,703	3,544	0.96	0.3544	914	0.25	0.0914
12	Gabilan Creek	27,713	1,510	0.05	0.151	361	0.01	0.0361
13	Natividad Creek	7,405	404	0.05	0.0404	35	0.00	0.0035
14	Quail Creek	11,278	1,974	0.18	0.1974	2,216	0.20	0.2216
15	Chualar Creek	29,888	6,870	0.23	0.687	5,326	0.18	0.5326

[a] Note that watershed numbers (WS) correspond to numbering scheme developed by CCoWs as represented in Figure 2-1.

[b] Estimated amount based on CSUMB low flow (ambient) pesticide runoff ratio of 0.01%.

Blanco Drain received the greatest rate of both diazinon application (1 lb/acre) and chlorpyrifos application (0.35 lbs/acre); Blanco Drain watershed is comprised of 93% agricultural land use. The CSUMB report concluded that agricultural loads are significant based on exceedance of water quality criteria for both chlorpyrifos and diazinon in the Blanco Drain waterway.

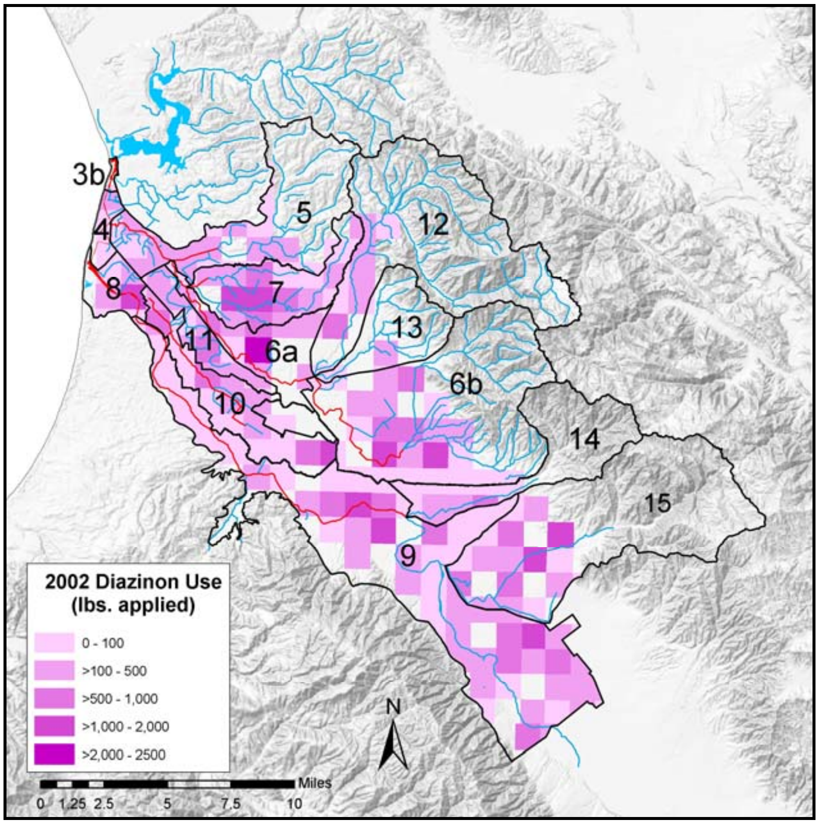


Figure 4-1. 2002 Agricultural Diazinon Use

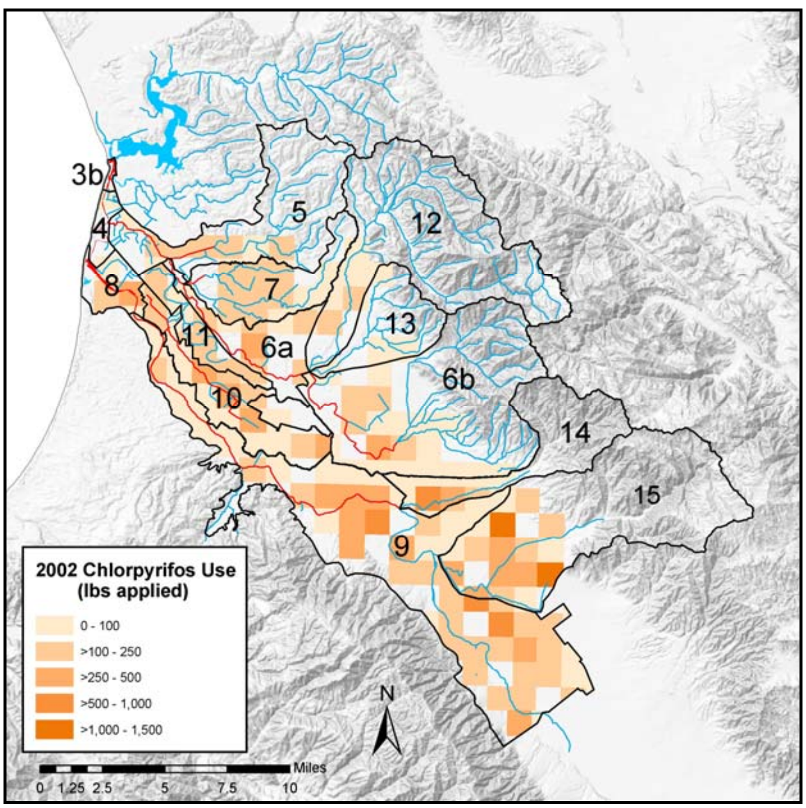


Figure 4-2. 2002 Agricultural Chlorpyrifos Use.

Staff performed additional analysis using the most current CDPR data (2007) to evaluate potential changes in pesticide use patterns throughout the study area. Figure 4-3 and Figure 4-4 represent 2007 agricultural use of diazinon and chlorpyrifos, respectively. The distribution of chlorpyrifos and diazinon application is consistent between the 2002 and 2007 periods. Note from the figures that chlorpyrifos and diazinon use flank the impaired waterbodies addressed in this project.

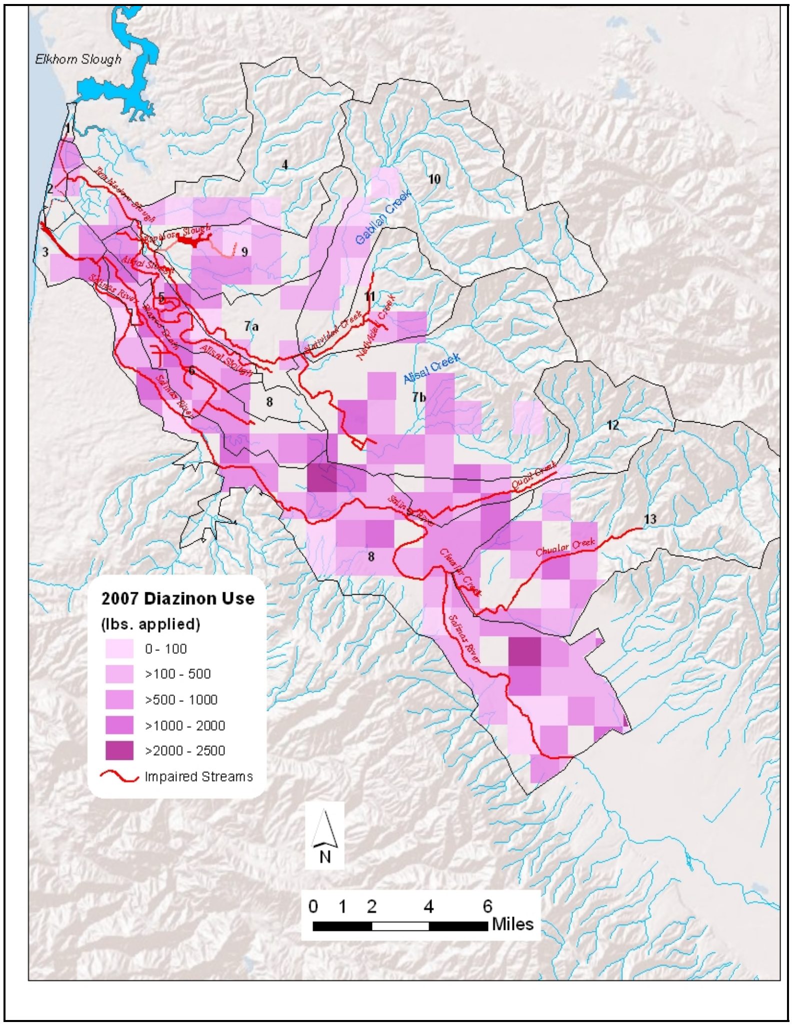


Figure 4-3. 2007 Agricultural Diazinon Use.

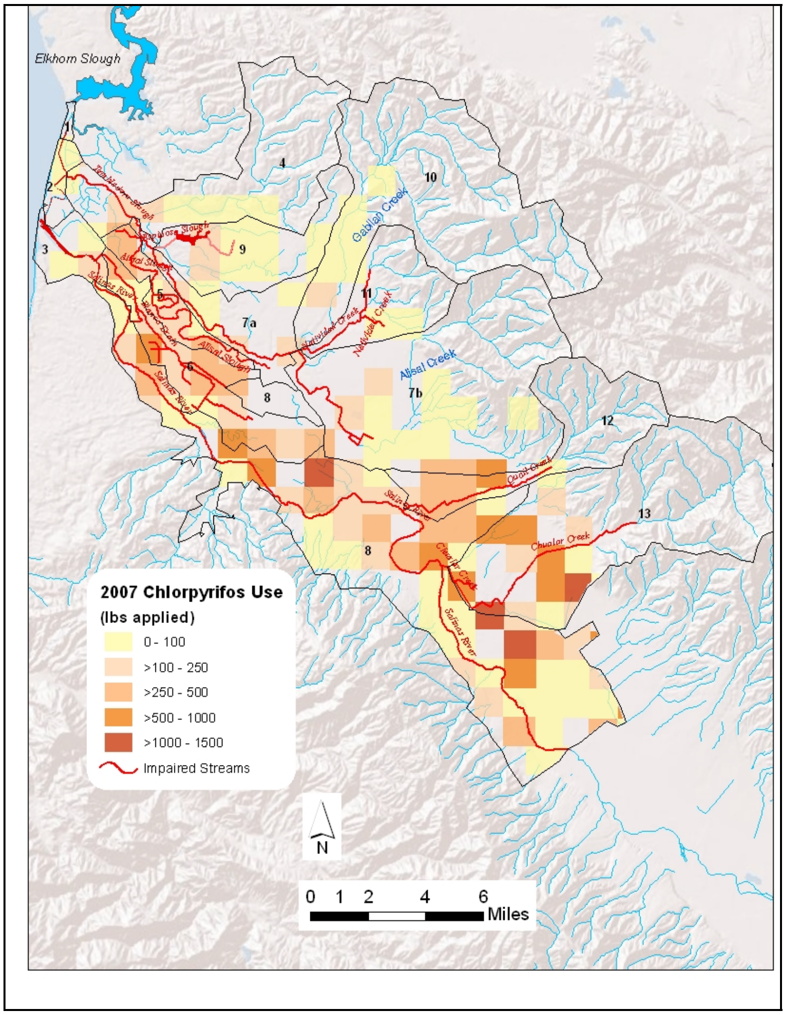


Figure 4-4. 2007 Agricultural Chlorpyrifos Use.

The Department of Pesticide Regulation has tracked pesticide use in the Salinas River watershed since 1990. Annual amounts of chlorpyrifos and diazinon used in the Salinas River watershed (Hydrologic Unit 309) are shown in Figure 4-5. Note in the figure, that diazinon use has nearly tripled between 1997 and 2004. Figure 4-6 shows Monterey County monthly chlorpyrifos usage information for the period 2002 to 2006. Seasonal use is a function of the patterns associated with the crops to which the pesticide is applied. In 2002, the crops with the heaviest use of chlorpyrifos were broccoli, cauliflower, and wine grapes. The February peak is associated with heavy applications on wine grapes and broccoli. Another peak is observed in July driven by use on broccoli. Figure 4-7 shows the monthly usage of diazinon in Monterey County for the period 2002 to 2006. In 2002, the heaviest use of diazinon was head lettuce, leaf lettuce, and spinach. The use of diazinon on head lettuce peaks in July and use on leaf lettuce peaks in August.

In 2007, the crops with the heaviest use of chlorpyrifos were broccoli, wine grapes, and cauliflower (see Table 4-2). The crops with the heaviest use of diazinon were head lettuce, leaf lettuce, and spinach (see Table 4-3).

These illustrations depict the long-term use of diazinon and chlorpyrifos on agricultural lands in the project area.

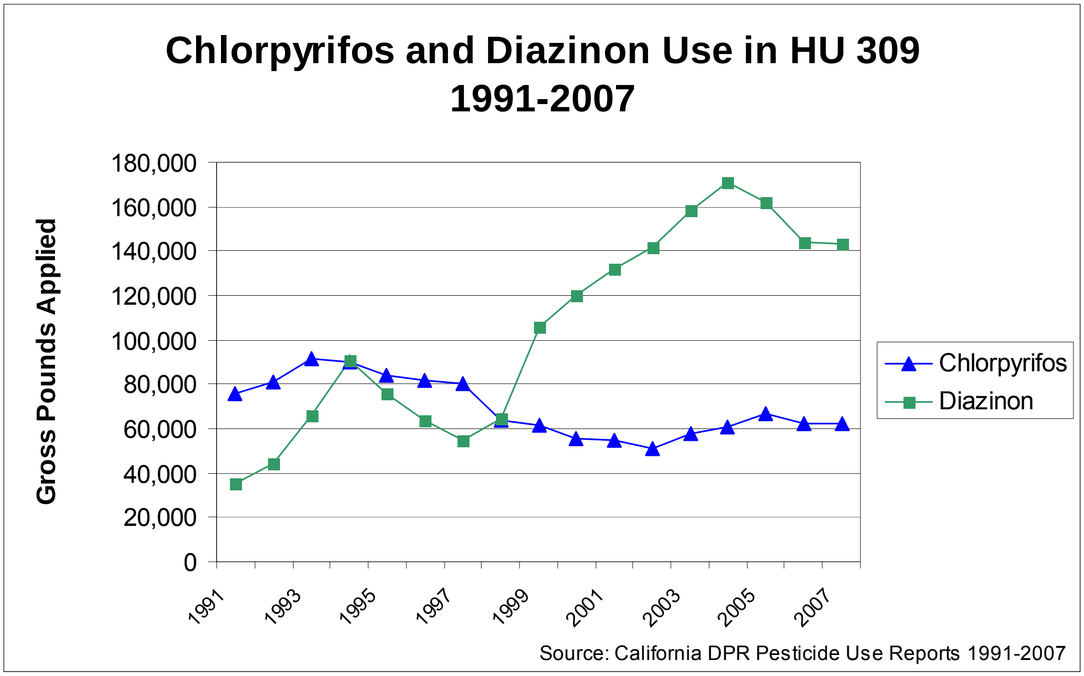


Figure 4-5. Annual Chlorpyrifos and Diazinon Use in Salinas River Watershed (HU309)

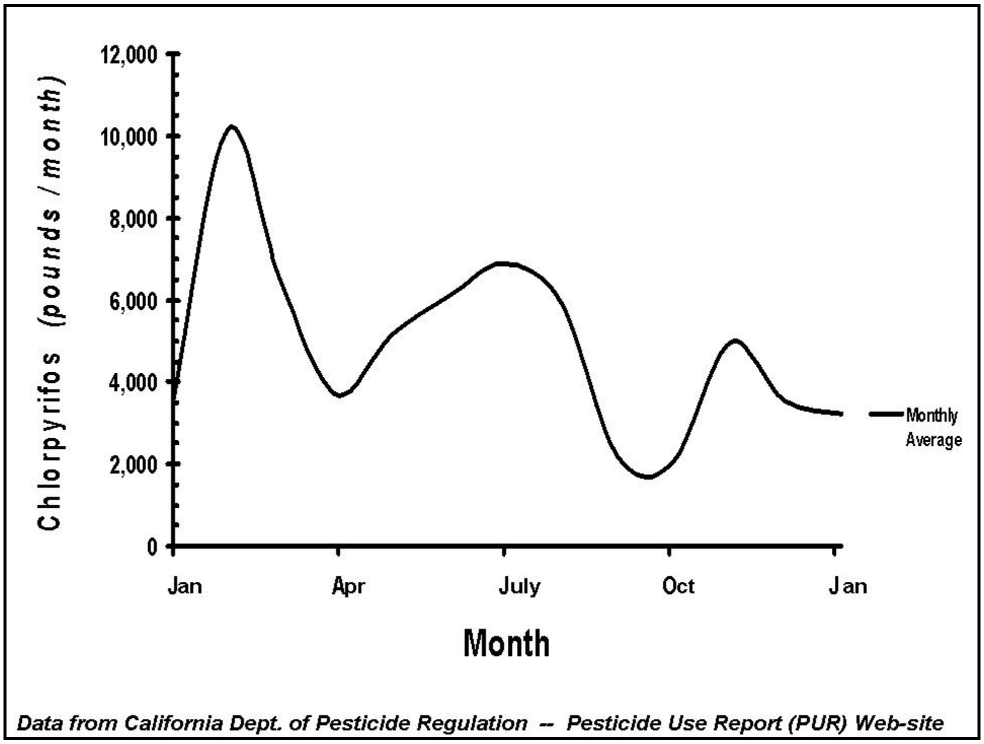


Figure 4-6 Chlorpyrifos monthly use patterns in Monterey County – 2002 to 2006.

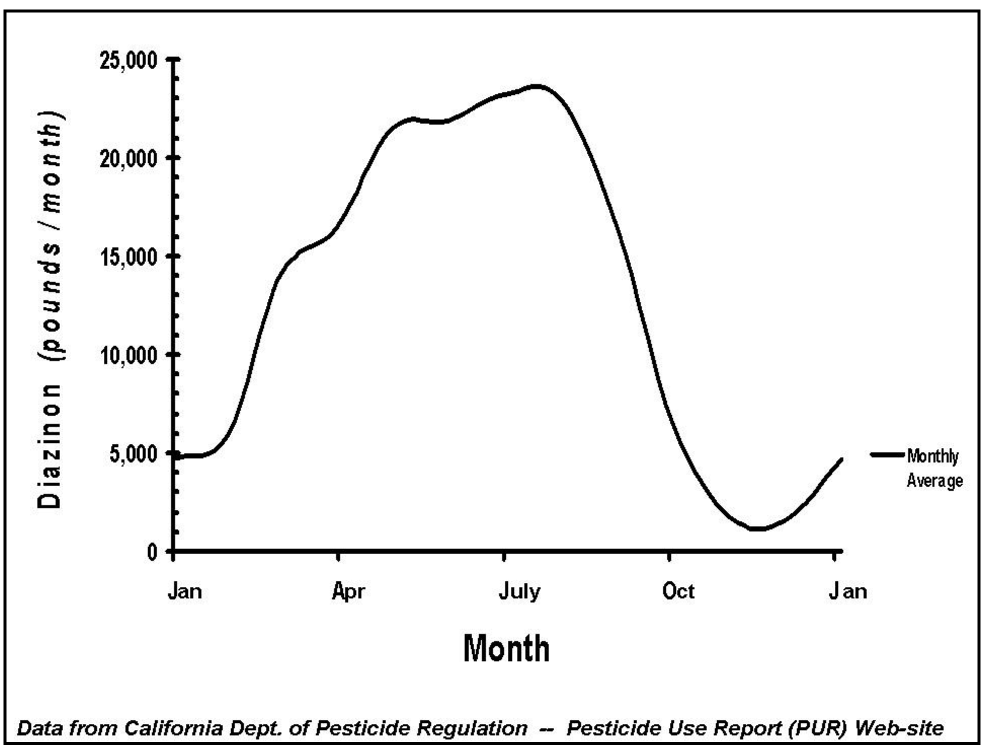


Figure 4-7. Diazinon monthly use patterns in Monterey County – 2002 to 2006

Table 4-2. 2007 Chlorpyrifos Use on Crops

Crop	Gross lbs applied	Percent of total
Broccoli	30,518	49%
Wine Grapes	18,394	30%
Cauliflower	8,196	13%
Brussel Sprouts	1,543	3%
All others	3,358	5%
All crops	61,984	100%

Table 4-3. 2007 Diazinon Use on Crops

Crop	Gross lbs applied	Percent of total
Leaf Lettuce	63,647	44%
Head Lettuce	52,357	37%
Spinach	8,352	7%
Broccoli	7,068	5%
Cauliflower	4,528	3%
All others	7,482	5%
All crops	143,434	100%

Staff concludes that discharges from agricultural lands (cropland and greenhouses) are the primary source of chlorpyrifos and diazinon in the impaired waters addressed in the project area. This conclusion is based on the following:

- In 2004, agricultural applications accounted for over 99% of chlorpyrifos use and 98% of diazinon use in Monterey County (see Figure 4-8, next section).
- Agricultural lands are adjacent to and often surround waterbodies that are impaired due to chlorpyrifos and diazinon in the project area.
- Domestic usage of chlorpyrifos and diazinon was canceled by USEPA in 2001 and 2004, respectively.

4.2.1.2 <u>Urban Storm Water: City of Salinas and County of Monterey</u>

The various uses of diazinon and chlorpyrifos in an urban setting include landscape applications and structural pest control (termites). Both pesticides can be transported to surface water via urban storm water conveyance systems. Urban uses of these compounds have become more restricted as the USEPA has canceled or restricted many uses due to concerns for human health. Any estimate of the amount of diazinon and chlorpyrifos that is attributable to non-agricultural uses within the City will be approximate because much of the data that has been used to generate estimates of the urban contribution to surface waters were collected prior to the implementation of the USEPA's cancellations.

Reported uses of diazinon and chlorpyrifos in 2004 for Monterey County/Salinas River Watershed were obtained from the California Department of Pesticide Regulation (CDPR) pesticide use reporting (PUR) website. Reported uses for 2004 are contained in Table 4-4 and Figure 4-8. Categories of reported pesticide use include agricultural applications, structural pest control applications, landscape maintenance applications, and right of way applications.

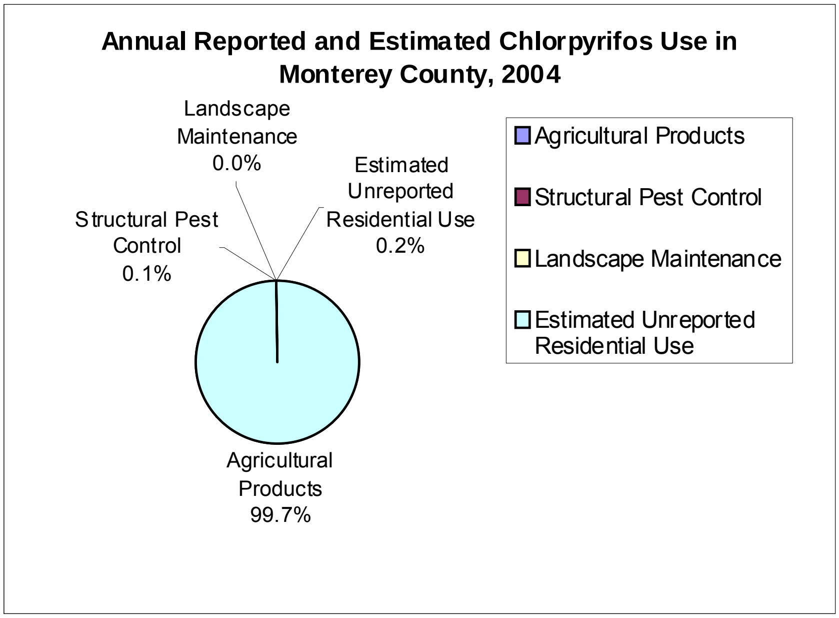
Staff estimated unreported diazinon and chlorpyrifos urban uses in Monterey County based on diazinon and chlorpyrifos sales and use information determined in the Survey of Residential Pesticide Use and Sales in Orange County, California (Wilen, 2001). In the Orange County study, Wilen estimated that the total pounds of active ingredient of products containing chlorpyrifos and diazinon to be 710 and 10,103 respectively. The estimated unreported residential uses for Monterey County was found by multiplying the ratio of Monterey County to Orange County 2000 (estimated) populations by the estimated unreported urban use for Orange County found by Wilen. This is the same methodology for estimating unreported residential use of pesticides used in the TMDL for Diazinon and Chlorpyrifos in Sacramento County Urban Creeks (CVRWQCB, 2004).

Using this approach, staff estimated that 0.2% (99 pounds) of chlorpyrifos active ingredient use, and 1.4% (1,414 pounds) of diazinon active ingredient use in Monterey County can be attributed to unreported residential applications. *Note that these estimates are based on survey statistics collected prior to the cancellation of these pesticides; consequently, staff's estimates are likely over-estimates.* Figure 4-8 depicts the comparison between estimated unreported residential and reported chlorpyrifos and diazinon applications in Monterey County for 2000. These data demonstrate that virtually all (98 to 99.7%) applications of chlorpyrifos and diazinon in Monterey County can be attributed to agricultural applications, with only small, nominal amounts attributable to structural, landscape maintenance, and (estimated) unreported residential urban applications.

Table 4-4. 2004 Non-Agricultural Reported Pesticide Use in Monterey County

Application	(lbs. active ingredient applied)	
	Chlorpyrifos	Diazinon
Landscape Maintenance	1.4	367
Research Commodity	15	0
Rights of Way	0.5	5
Structural Pest Control	37	208
Uncultivated, non-Ag Areas		
Totals	54	580

Source: CDPR PUR, 2004.



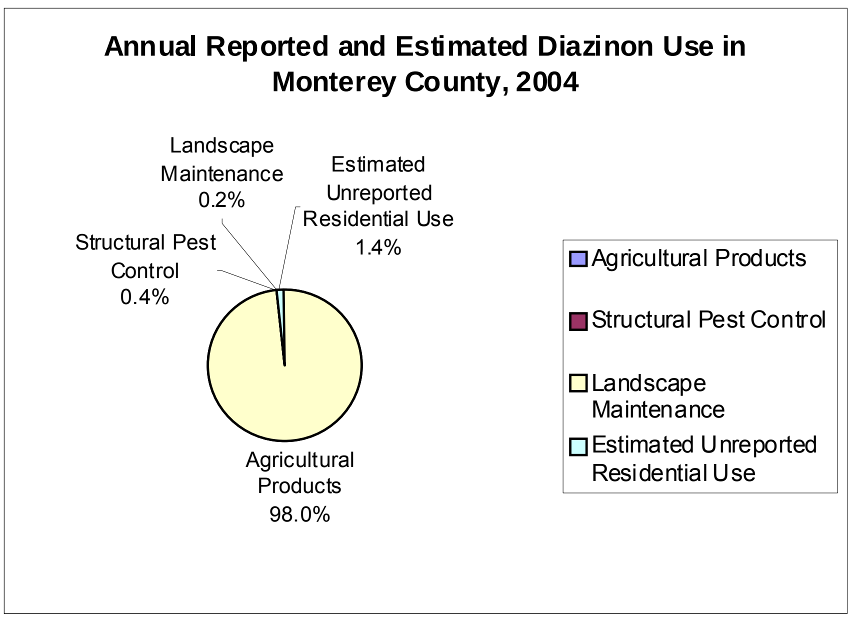


Figure 4-8. Annual Reported and Estimated Chlorpyrifos and Diazinon Use in Monterey County, 2004.

Staff concludes that urban stormwater discharges of chlorpyrifos and diazinon are not causing exceedances of water quality criteria within the project area. This conclusion is based on the following:

- Very low application rates for structural pest control and landscape maintenance relative to agricultural applications.
- Low estimates for unreported residential use relative to agricultural applications.

4.2.2 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, e.g. weathering.

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

4.3 Conclusions from Source Analysis

Staff concludes that discharges of chlorpyrifos and diazinon from agricultural lands are the sole source causing impairment from these pesticides.

Staff concludes that agricultural lands contribute greater than 98% of the load.

5 LOADING CAPACITY AND ALLOCATIONS

5.1 Technical Approach and Methods

TMDLs are "[t]he sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background. 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 the establishment of concentration-based TMDLs in accordance with this provision of the Clean Water Act.

5.2 Loading Capacity (TMDL)

The TMDLs are set equal to the loading capacity. The loading capacity for water body segments in the Lower Salinas River watershed is the amount of chlorpyrifos or diazinon that can be assimilated without exceeding the water quality objectives, i.e., when either occurs without the presence of the other. In addition, because diazinon and chlorpyrifos can both be present at the same time at levels of concern, the loading capacity must be defined in terms of additive toxicity. Therefore, the loading capacity is defined under these two scenarios.

The loading capacity, or Total Maximum Daily Load, for chlorpyrifos and diazinon, when either is present individually, meaning in the absence of each other, is a water column concentration-based Total Maximum Daily Load and is applicable to each day of all seasons as indicated in Table 5-1.

Table 5-1. Concentration-based TMDLs for diazinon and chlorpyrifos when present individually.

Impaired Waterbodies[a] Assigned TMDLs	TMDL			
	Chlorpyrifos		Diazinon	
	CMC[A] (ppb)	CCC[B] (ppb)	CMC[A] (ppb)	CCC[B] (ppb)
Moss Landing Harbor [b]	0.025	0.015	0.16	0.10
Old Salinas River Estuary	0.025	0.015	0.16	0.10
Old Salinas River	0.025	0.015	0.16	0.10
Salinas River Lagoon (North)	0.025	0.015	0.16	0.10
Tembladero Slough	0.025	0.015	0.16	0.10
Alisal Slough	0.025	0.015	0.16	0.10
Blanco Drain	0.025	0.015	0.16	0.10
Salinas Reclamation Canal	0.025	0.015	0.16	0.10
Lower Salinas River [c]	0.025	0.015	0.16	0.10
Espinosa Slough [d]	0.025	0.015	0.16	0.10
Espinosa Lake [e]	0.025	0.015	0.16	0.10
Natividad Creek	0.025	0.015	0.16	0.10
Quail Creek	0.025	0.015	0.16	0.10
Chualar Creek	0.025	0.015	0.16	0.10
Merritt Ditch	0.025	0.015	0.16	0.10
Gabilan Creek	0.025	0.015	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

[a] Includes entire waterbody segment except as noted.

[b] Moss Landing Harbor south of the Pacific Gas and Electric Intake to Sandholt Bridge..

[c] From Salinas River Lagoon (North) to Gonzales Road.

[d] From confluence of Salinas Reclamation Canal (Lower) to Espinosa Lake.

[e] Espinosa Lake and all unnamed tributaries.

Diazinon and chlorpyrifos can and do co-occur in the impaired waters of the Lower Salinas River watershed. Therefore, the additive (joint) toxicity of these chemicals must be expressed in the TMDL. Table 5-2 shows the Total Maximum Daily Load for the impaired waterbodies when both chlorpyrifos and diazinon are present.

Table 5-2. Total Maximum Daily Loads for additive toxicity of diazinon and chlorpyrifos when both are present.

Impaired Waterbodies[a] Assigned TMDL	TMDL for chlorpyrifos and diazinon when both present
Moss Landing Harbor [b]	$S \leq 1.0$[1]
Old Salinas River Estuary	
Old Salinas River	
Salinas River Lagoon (North)	
Tembladero Slough	
Alisal Slough	
Blanco Drain	
Salinas Reclamation Canal	
Lower Salinas River [c]	
Espinosa Slough [d]	
Espinosa Lake [e]	
Natividad Creek	
Quail Creek	
Chualar Creek	
Merritt Ditch	
Gabilan Creek	

1: $$S(sum) = \frac{C_D}{NT_D} + \frac{C_C}{NT_C}$$

Where:

C_D = diazinon concentration in waterbody.

C_C = chlorpyrifos concentration in waterbody.

NT_D = Criterion Continuous Concentration (CCC = 0.10 µg/L) or Criterion Maximum Concentration (CMC = 0.16 µg/L) diazinon loading capacity.

NT_C = Criterion Continuous Concentration (CCC = 0.015 µg/L) or Criterion Maximum Concentration (CMC = 0.025 µg/L) chlorpyrifos loading capacity.

CCC and CMC are not to be exceeded more than once in a three-year period

[a] Includes entire waterbody segment except as noted.

[b] Moss Landing Harbor south of the Pacific Gas and Electric Intake to Sandholt Bridge.

[c] From Salinas River Lagoon (North) to Gonzales Road.

[d] From confluence of Salinas Reclamation Canal (Lower) to Espinosa Lake.

[e] Espinosa Lake and all unnamed tributaries.

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."* This loading capacity is also consistent with the narrative pesticide objective, which states in part *"No* *individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses."*

5.3 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 numeric targets, which are the same as the TMDLs. Therefore, reductions in chlorpyrifos and/or diazinon loading to the extent allocated will result in achieving the water quality standards.

5.4 Load Allocations

Table 5-3 (next page) shows load allocations assigned to responsible parties. The allocations are equal to the TMDLs. The allocations are receiving water allocations.

Table 5-3. Load Allocations

LOAD ALLOCATIONS		
Waterbodies Assigned TMDLs	**Responsible Party Assigned Allocation (Source)**	**Receiving Water Allocation**
• Moss Landing Harbor • Old Salinas River Estuary • Old Salinas River • Salinas River Lagoon (North) • Tembladero Slough • Alisal Slough • Blanco Drain • Salinas Reclamation Canal • Salinas River • Espinosa Slough • Espinosa Lake • Natividad Creek • Quail Creek • Chualar Creek • Merritt Ditch • Gabilan Creek	Owners/operators of irrigated agricultural lands in the Lower Salinas River Watershed (Discharges from irrigated lands)	Allocation-1 & Allocation-2

Allocation 1: For diazinon and chlorpyrifos when present individually.

Compound	CMC [A] (ppb)	CCC [B] (ppb)
Chlorpyrifos	0.025	0.015
Diazinon	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.

Allocation 2 For additive toxicity of diazinon and chlorpyrifos when both are present.

$$S = \leq 1.0 = \frac{C_D}{LC_D} + \frac{C_C}{LC_C}$$

Where:
C_D = diazinon concentration in waterbody
C_C = chlorpyrifos concentration in waterbody
LC_D =Criterion Continuous Concentration (0.10 µg/L) or Criterion Maximum Concentration (0.16 µg/L) diazinon loading capacity.
LC_C =Criterion Continuous Concentration (0.015 µg/L) or Criterion Maximum Concentration (0.025 µg/L) chlorpyrifos loading capacity.

Value of S cannot exceed 1.0 more than once in any consecutive three year period.

Available samples collected within the applicable averaging period (e.g., 1-hour CMC and 4-day CCC) for the numeric targets will be used to determine compliance with the allocations and loading capacity. Prior to performing any averaging calculations, only chlorpyrifos and diazinon data from the same sample will be used in calculating the sum (S) indicated in the TMDL and allocations. For purposes of calculating the sum (S), analytical results that are reported as “nondetectable” concentrations are considered to be zero.

5.5 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 and diazinon. Since this is a concentration-based TMDL the TMDL is the same as the loading capacity for each compound.

The assigned TMDL assumes no significant reductions in diazinon or chlorpyrifos 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 water column numeric criteria for chlorpyrifos and diazinon, developed by the California Department of Fish and Game (CDFG, 2000: CDFG, 2004) following USEPA protocols (USEPA 1985), to establish the loading capacity. Therefore, the loading capacity has the same conservative assumptions used in those procedures.

Estimates for non-agricultural use of chlorpyrifos and diazinon are based on survey statistics collected prior to the cancellation of these pesticides; consequently, staff's estimates are likely over-estimates.

5.6 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, i.e., that a slight 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 additive toxicity numeric targets to address critical conditions where both chlorpyrifos and diazinon 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, flow-regimes, etc. Therefore, TMDLs and allocations developed on the basis seasonal variation is not appropriate in this case.

6 IMPLEMENTATION AND MONITORING

This TMDL is being implemented by the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Agriculltural Order); *this includes the order currently in effect and renewals thereof.* Central Coast Water Board staff will conduct a review of implementation activities when monitoring and reporting data is submitted as required by the Agricultural Order. Central Coast Water Board staff will pursue modification of Agricultural Order conditions or other regulatory means (e.g. waste discharge requirements), as necessary, to address remaining impairments from chlorpyrifos, diazinon, or unknown toxicity during the TMDL implementation phase.

The following implementation and monitoring language represent suggestions for incorporation into the Agricultural Order in order to facilitate TMDL implemation, monitoring and tracking TMDL progress; the actual requirements of implementing parties are described in the Agricultural Order.

The Porter-Cologne Water Quality Control Act grants the Water Boards the authority to implement and enforce water quality laws. Water Board staff ensures compliance with the Agricultural Order using the authority and regulatory mechanisms granted through the California Water Code, including application of enforcement actions described in the Water Quality Enforcment Policy. Therefore, the Central Coast Water Board does not need an additional regulatory program (e.g., a new plan or policy adopted through a Basin Plan Amendment) to address impairments caused by chlorpyrifos and diazinon in the project area, because the Agricultural Order is the regulatory mechanism in place to redress these impairments.

The California Department of Pesticide Regulations (DPR) is developing surface water regulations to address the adverse effects of urban and agricultural use of pesticides on surface water quality. DPRs surface water monitoring program identified pesticides that have a high potential to contaminate surface water, including diazinon and chlorpyrifos (DPR 2009). The proposed regulations will address the movement of these pesticides into surface waters. DPR initiated an informal review and comment of the regulations from the State Water Boards, the County Agricultural Commissioners and key stakeholders in February 2009. Staff anticipates that the formal review period will be in 2011; regulations will follow some time after the formal review period, likely in 2012.

Irrigation and stormwater runoff are primary routes of transport of chlorpyrifos and diazinon that are addressed in the initial proposed regulations (DPR 2010a). Some of the proposed measures to prevent degradation of the aquatic environment include holding runoff for at least 72 hours after pesticide application or using technologies that rapidly degrade the pesticides before discharging the runoff into the environment.

An additional regulatory tool of DPR is the reevaluation of pesticide products (DPR 2010b). DPR is required to evaluate pesticides prior to permitting use in California. Once a pesticide is in use, California regulations require DPR to investigate possible adverse effects to people and the environment. If the effects are significant, DPR is required to reevaluate the registration of the pesticide. Both chlorpyrifos and diazinon are linked to significant adverse effects to surface water quality. These pesticides are currently in reevaluation and the registrants are required to evaluate the extent of the water quality problem and identify appropriate mitigation measures. Reevaluation is a lengthy scientific review process where the registrant is required to provide information to DPR. If the adverse effects cannot be mitigated, DPR can cancel or suspend the registration of the pesticide.

DPR placed chlorpyrifos into reevaluation in 2004 and the registrant, DOW AgroSciences, began investigating the problem. Dow submitted a report to DPR entitled, “Surface Water Monitoring and Use Investigations for determining Effectiveness of Chlorpyrifos Mitigation Measures” (DOW AgroSciences 2008). In the report, DOW AgroSciences concluded that chlorpyrifos applications on the Central Coast are primarily on grapes and cole crops. DOW AgroSciences further concluded that grapes were not grown in the watersheds with chlorpyrifos surface water detections and that the applications to cole crops were the likely source of chlorpyrifos in surface water. Chlopyrifos is applied on cole crops to control soil maggots. DOW AgroSciences assessed chlorpyrifos use on cole crops, product formulations and cropping practices. DOW AgroSciences found that chlopryrifos applications on cole crops were primarily pre-plant granular applications and that irrigation runoff was the most likely transport mechanism to surface waters.

DOW AgroScience identified methods that could eliminate organophosphate in surface waters, including: use of drip irrigation to eliminate runoff, improvement of granular application methods to eliminate spills, use of treatment enzymes that degrade the pesticides, and the use of vegetative treatment systems (DOW AgroSciences 2009). DOW AgroScience noted that multiple crops on a field, sometimes three crop rotations in a year, may lead to an increase in crop residue left behind in a field that provides a host for adult and larval root maggots. Rotating non-host crops and fallow periods would reduce soil infestations.

DPR is collecting information from DOW AgroScience and other sources and will make a recommendation for surface water regulations. Staff anticipates DPR will have a formal comment period in 2011.

6.1 Recommendations for Regulatory Requirements

Implementation and monitoring requirements are established in the Agricultural Order; the following are recommendations to help facilitate implementation of the requirements.

The Agricultural Order should prioritize implementation and monitoring efforts in waterbodies impaired due to chlorpyrifos, diazinon or toxicity. The impaired waterbodies addressed in this TMDL are listed in Table 2-15.

The Agricultural Order should prioritize implementation and monitoring efforts in impaired watersheds where crops are grown that have a high potential for chlorpyrifos and/or diazinon application (see Table 4-2 and Table 4-3).

The Agricultural Order should prioritize implementation and monitoring efforts toward eliminating or minimizing irrigation and stormwater runoff from areas where chlorpyrifos or diazinon are applied, especially where chlorpyrifos is applied to the soil.

The Agricultural Order should include monitoring and reporting requirements that assess progress toward achieving these TMDLs. Monitoring and reporting requirements should include:

1. Subwatershed scale receiving water monitoring for all the impaired waterbodies assigned TMDLs (see Table 6-1).
2. Monitoring frequency spanning a spectrum of flow regimes and consistent with numeric targets outlined in Section 3.1, including acute (1-day), chronic (4-day), and additive toxicity numeric targets;
    a. Quarterly water column chlorpyrifos and diazinon monitoring. There should be a minimum of one sample per quarter; two quarters during the dry season (about May 15 – Oct 15) and two quarters during wet the season (about Oct 15 – March 15). One wet season quarterly monitoring event should include a 7-day continuous sampling event during and/or following a storm event.
3. Individual discharge monitoring requirements for farming operations using chlorpyrifos or diazinon that discharge to waterbodies impaired for chlorpyrifos, or diazinon, or toxicity; individual monitoring and reporting will facilitate a high-resolution source analysis of impaired waterbodies.
4. Laboratory analytical methods rigorous enough for data comparison with the numeric targets.
5. In waterbodies listed as impaired for toxicity, or unknown toxicity, monitoring and reporting requirements should include toxicity identification evaluation (TIE) analysis of water column samples. If TIEs help determine that chlorpyrifos or diazinon are contributing to toxicity in a waterbody, the implementation, monitoring and reporting requirements suggested here should be applied to that waterbody.

Receiving water monitoring sites in subwatersheds should be located in the lower portions of the watershed, whenever feasible. Use of previsously established monitoring sites would be useful for showing trends. Recommended watershed monitoring sites are listed in Table 6-1 (see Table 2-9 and Table 2-11 for site descriptions); these or similar sites should be used to assess progress toward achieving the TMDLs assigned to the impaired waterbodies.

Table 6-1 Recommended receiving water monitoring sites for TMDL progress assessment.

Impaired Waterbody	Recommended Monitoring Site
Moss Landing Harbor	MOS-SAN
Old Salinas River Estuary	MOS-SAN
Old Salinas River	309OLD
Salinas River Lagoon, North	309SBR
Tembladero Slough	309TEH
Alisal Slough	309SSB
Blanco Drain	309BLA
Salinas Reclamation Canal (Upper)	309ALG
Salinas Reclamation Canal (Lower)	309JON
Salinas River	309SSP
Espinosa Slough	309ESP
Espinosa Lake	EPL-EPL
Natividad Creek	309NAD
Quail Creek	309QUA
Chualar Creek	309CRR
Merrit Ditch	Mouth of waterbody w/public access
Gabilan Creek	Mouth of waterbody w/public access

6.2 Load Duration Curves

Based on USEPA guidance, staff has provided daily load expressions to supplement the concentration-based expression of the TMDLs and allocations (see APPENDIX D – Flow Duration Curves, Load Duration Curves, and Percent Load Reductions).

The daily load expressions contained in Appendix D are not the TMDLs. However daily load expressions can facilitate the development of management actions to achieve the allocations and TMDL. For example, the load duration curves may show that exceedance of the numeric targets during a particular flow regime is excessive, or no exceedance at all. This information could be useful to determine implementation strategies. To this end, staff will continue to update the load duration curves when data become available, and when appropriate.

USEPA (2007) recommends that TMDLs include a daily time increment in conjunction with other temporal or concentration-based expressions; the load-duration curves achieve this recommendation.

6.3 Timeline and Milestones

Discharge of pesticides at levels toxic to the environment affects a spectrum of beneficial uses and is, therefore, a serious water quality problem. As such, implementation should occur at an accelerated pace to achieve the allocations and TMDL in the shortest time-frame feasible.

The target date to achieve the allocations, numeric targets, and TMDLs in the impaired waterbodies addressed in this TMDL is 2025; this date coincides with the measurable goals established by the Central Coast Water Board. The Agricultural Order should establish timeframes for individual dischargers to achieve water quality standards; achieving water quality standards will result in achieving TMDL allocations. Highest priority dischargers should have the shortest timeframe, such as those dischargers who pose the greatest risk to water quality due to toxicity from chlorpyrifos or diazinon. Lower prioritized dischargers that are also contributing to the impairments could have a longer timeframe, with the ultimate goal of verifiable progress towards achieving water quality objectives, and therefore the TMDL, no later than the year 2025.

Water Board staff will reevaluate impairments caused by chlorpyrifos and diazinon when monitoring data is submitted and during renewals of the Agricultural Order. Water Board staff will modify the conditions of the Agricultural Order, if necessary, to address remaining impairments.

6.4 Environmental and Economic Analysis

Existing regulaltory requirements are sufficient to attain water quality standards for chlorpyrifos and diazinon in the project area. The Regional Board is not approving any new activity, but merely finding that ongoing activities and regulatory requirements are sufficient. Therefore, this TMDL is not a “project” that requires compliance with the California Environmental Quality Act (California Public Resources Code § 21000 et seq.) and the Central Coast Water Board is not directly undertaking an activity, funding an activity or issuing a permit or other entitlement for use by this action (Public Resources Code § 21065; 14 Cal. Code of Regs. §15378).

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APPENDIX A – WATER QUALITY DATA

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Analyte Name	Unit	Basis	Result	Result Qual Code	RL
309BLA-COO_DPR	6/17/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.044		0.04
309BLA-COO_DPR	6/23/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	6/30/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	7/7/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	7/14/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	7/21/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	7/28/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	8/4/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	8/11/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	8/18/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	8/25/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	9/2/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	9/8/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	9/15/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	9/22/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309BLA-COO_DPR	9/29/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309CRR_DPR	6/16/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.243		0.04
309CRR_DPR	6/23/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.179		0.04
309CRR_DPR	6/30/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.114		0.04
309CRR_DPR	7/7/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.144		0.04
309CRR_DPR	7/14/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.215		0.04
309CRR_DPR	7/21/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.118		0.04
309CRR_DPR	7/28/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.127		0.04
309CRR_DPR	8/4/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.188		0.04
309CRR_DPR	8/11/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.097		0.04
309CRR_DPR	8/18/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.684		0.04
309CRR_DPR	8/25/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309CRR_DPR	9/2/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309CRR_DPR	9/8/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Analyte Name	Unit	Basis	Result	Result Qual Code	RL
309CRR_DPR	9/15/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0435		0.04
309CRR_DPR	9/22/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309CRR_DPR	9/29/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0394		0.04
309DAV_DPR	9/13/2004	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.01	ND	0.01
309DAV_DPR	1/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.01	ND	0.01
309DAV_DPR	5/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.01	ND	0.01
309JON_DPR	9/13/2004	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0325		0.01
309JON_DPR	1/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0571		0.01
309JON_DPR	5/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0293		0.01
309POT_DPR	9/13/2004	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.01	ND	0.01
309POT_DPR	1/4/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0294		0.01
309POT_DPR	5/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0358		0.01
309QUI_DPR	6/16/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.113		0.04
309QUI_DPR	6/23/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	1.297		0.04
309QUI_DPR	6/30/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.197		0.04
309QUI_DPR	7/7/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.107		0.04
309QUI_DPR	7/14/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.179		0.04
309QUI_DPR	7/21/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	3.96		0.04
309QUI_DPR	7/28/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.344		0.04
309QUI_DPR	8/4/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.156		0.04
309QUI_DPR	8/11/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.371		0.04
309QUI_DPR	8/18/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.123		0.04
309QUI_DPR	8/25/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.132		0.04
309QUI_DPR	9/2/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0594		0.04
309QUI_DPR	9/8/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.106		0.04
309QUI_DPR	9/15/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.073		0.04
309QUI_DPR	9/22/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0936		0.04
309QUI_DPR	9/29/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.066		0.04
309QUI_DPR	9/13/2004	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.055		0.01
309QUI_DPR	1/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.471		0.01
309QUI_DPR	5/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.109		0.01
309REC-DLT_DPR	6/16/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Analyte Name	Unit	Basis	Result	Result Qual Code	RL
309REC-DLT_DPR	6/23/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.04		0.04
309REC-DLT_DPR	6/30/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	7/7/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	7/14/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	7/21/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	7/28/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	8/4/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	8/11/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	8/18/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	8/25/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	9/2/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	9/8/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	9/15/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	9/22/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309REC-DLT_DPR	9/29/2003	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.04	ND	0.04
309SBR_DPR	9/13/2004	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.01	ND	0.01
309SBR_DPR	1/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	0.0102		0.01
309SBR_DPR	5/3/2005	Grab	DPR	SampleWater	chlorpyrifos	ug/L	ww	-0.01	ND	0.01
309BLA-COO_DPR	6/17/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.156		0.04
309BLA-COO_DPR	6/23/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.208		0.04
309BLA-COO_DPR	6/30/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.097		0.04
309BLA-COO_DPR	7/7/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0644		0.04
309BLA-COO_DPR	7/14/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0939		0.04
309BLA-COO_DPR	7/21/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.073		0.04
309BLA-COO_DPR	7/28/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.066		0.04
309BLA-COO_DPR	8/4/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.471		0.04
309BLA-COO_DPR	8/11/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0445		0.04
309BLA-COO_DPR	8/18/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.395		0.04
309BLA-COO_DPR	8/25/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0891		0.04
309BLA-COO_DPR	9/2/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.114		0.04
309BLA-COO_DPR	9/8/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.4		0.04
309BLA-COO_DPR	9/15/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.684		0.04

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Analyte Name	Unit	Basis	Result	Result Qual Code	RL
309BLA-COO_DPR	9/22/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.221		0.04
309BLA-COO_DPR	9/29/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0606		0.04
309CRR_DPR	6/16/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.16		0.04
309CRR_DPR	6/23/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.241		0.04
309CRR_DPR	6/30/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.068		0.04
309CRR_DPR	7/7/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0681		0.04
309CRR_DPR	7/14/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.726		0.04
309CRR_DPR	7/21/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.13		0.04
309CRR_DPR	7/28/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.15		0.04
309CRR_DPR	8/4/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.254		0.04
309CRR_DPR	8/11/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	5.33		0.04
309CRR_DPR	8/18/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.34		0.04
309CRR_DPR	8/25/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0605		0.04
309CRR_DPR	9/2/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.13		0.04
309CRR_DPR	9/8/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.16		0.04
309CRR_DPR	9/15/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.158		0.04
309CRR_DPR	9/22/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.24		0.04
309CRR_DPR	9/29/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.128		0.04
309DAV_DPR	9/13/2004	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0295		0.01
309DAV_DPR	1/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	-0.01	ND	0.01
309DAV_DPR	5/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0169		0.01
309JON_DPR	9/13/2004	Grab	DPR	SampleWater	diazinon	ug/L	ww	1.16		0.01
309JON_DPR	1/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0199		0.01
309JON_DPR	5/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.582		0.01
309POT_DPR	9/13/2004	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.106		0.01
309POT_DPR	1/4/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0318		0.01
309POT_DPR	5/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.393		0.01
309QUI_DPR	6/16/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.126		0.04
309QUI_DPR	6/23/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0825		0.04
309QUI_DPR	6/30/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.118		0.04
309QUI_DPR	7/7/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.053		0.04
309QUI_DPR	7/14/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.212		0.04

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Analyte Name	Unit	Basis	Result	Result Qual Code	RL
309QUI_DPR	7/21/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0809		0.04
309QUI_DPR	7/28/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.066		0.04
309QUI_DPR	8/4/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	4.09		0.04
309QUI_DPR	8/11/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.327		0.04
309QUI_DPR	8/18/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	1.06		0.04
309QUI_DPR	8/25/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.128		0.04
309QUI_DPR	9/2/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.85		0.04
309QUI_DPR	9/8/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	10.6		0.04
309QUI_DPR	9/15/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	7.25		0.04
309QUI_DPR	9/22/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.63		0.04
309QUI_DPR	9/29/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.203		0.04
309QUI_DPR	9/13/2004	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.156		0.01
309QUI_DPR	1/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0264		0.01
309QUI_DPR	5/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0705		0.01
309REC-DLT_DPR	6/16/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.616		0.04
309REC-DLT_DPR	6/23/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.698		0.04
309REC-DLT_DPR	6/30/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.602		0.04
309REC-DLT_DPR	7/7/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.413		0.04
309REC-DLT_DPR	7/14/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	1.097		0.04
309REC-DLT_DPR	7/21/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	2.37		0.04
309REC-DLT_DPR	7/28/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.841		0.04
309REC-DLT_DPR	8/4/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.762		0.04
309REC-DLT_DPR	8/11/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	3.16		0.04
309REC-DLT_DPR	8/18/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	1.5		0.04
309REC-DLT_DPR	8/25/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	1.68		0.04
309REC-DLT_DPR	9/2/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.95		0.04
309REC-DLT_DPR	9/8/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	2.03		0.04
309REC-DLT_DPR	9/15/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.282		0.04
309REC-DLT_DPR	9/22/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.643		0.04
309REC-DLT_DPR	9/29/2003	Grab	DPR	SampleWater	diazinon	ug/L	ww	2.48		0.04
309SBR_DPR	9/13/2004	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.017		0.01
309SBR_DPR	1/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	-0.01	ND	0.01

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Analyte Name	Unit	Basis	Result	Result Qual Code	RL
309SBR_DPR	5/3/2005	Grab	DPR	SampleWater	diazinon	ug/L	ww	0.0115		0.01

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
BLA-COO	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
BLA-COO	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
BLA-COO	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		62
BLA-COO	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		51
BLA-COO	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		61
BLA-COO	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		45
BLA-COO	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		110
BLA-COO	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		1065
BLA-COO	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		1219
BLA-COO	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		123
BLA-COO	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		57
BLA-COO	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		79
BLA-COO	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		68
BLA-COO	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		53
BLA-COO	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		5317
BLA-COO	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		65
BLA-COO	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		0
BLA-COO	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
BLA-COO	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
BLA-COO	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		68
BLA-COO	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		70
BLA-COO	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		65
BLA-COO	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		94
BLA-PUM	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		63
BLA-PUM	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		51
BLA-PUM	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		56
BLA-PUM	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		60
BLA-PUM	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
BLA-PUM	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		59
BLA-PUM	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		123
BLA-PUM	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		69
BLA-PUM	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		83
BLA-PUM	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		54

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
BLA-PUM	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		107
BLA-PUM	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		52
BLA-PUM	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		52
BLA-PUM	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
BLA-PUM	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
BLA-PUM	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		82
BLA-PUM	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		60
BLA-PUM	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		0
EP1-ROG	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		119
EP1-ROG	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		132
EP1-ROG	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		849
EP1-ROG	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		386
EP1-ROG	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		294
EP1-ROG	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		347
EP1-ROG	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		230
EP1-ROG	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		497
EP1-ROG	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		603
EP1-ROG	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		860
EP1-ROG	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		511
EP1-ROG	3/13/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		788
EP1-ROG	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		938
EP1-ROG	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		374
EP1-ROG	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		340
EP1-ROG	5/31/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		114
EP1-ROG	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		98
EP1-ROG	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		108
EP1-ROG	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		116
EP1-ROG	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		190
EP1-ROG	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		858
EP1-ROG	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		619
EP1-ROG	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		477
EPL-EPL	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		91
EPL-EPL	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		55

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
EPL-EPL	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		55
EPL-EPL	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
EPL-EPL	10/23/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		87
EPL-EPL	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		73
EPL-EPL	11/15/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		56
EPL-EPL	3/13/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		47
EPL-EPL	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		71
EPL-EPL	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		41
EPL-EPL	5/31/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		74
EPL-EPL	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		63
EPL-EPL	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		75
EPL-EPL	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		66
EPL-EPL	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		68
EPL-EPL	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		45
MOS-SAN	7/9/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		85
MOS-SAN	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		70
MOS-SAN	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		68
MOS-SAN	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		56
MOS-SAN	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		91
MOS-SAN	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		90
MOS-SAN	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		104
MOS-SAN	2/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		145
MOS-SAN	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		86
MOS-SAN	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		97
MOS-SAN	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		51
MOS-SAN	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		61
MOS-SAN	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		88
MOS-SAN	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		90
MOS-SAN	7/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		81
MOS-SAN	8/4/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		74
MOS-SAN	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		88
MOS-SAN	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		57
OLS-MON	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Chlorpyrifos	ng/L		58

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
OLS-POT	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Chlorpyrifos	ng/L		60
OLS-POT	7/9/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		111
OLS-POT	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		64
OLS-POT	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		53
OLS-POT	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		44
OLS-POT	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		72
OLS-POT	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		55
OLS-POT	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		222
OLS-POT	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		110
OLS-POT	2/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		101
OLS-POT	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		125
OLS-POT	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		98
OLS-POT	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		75
OLS-POT	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		106
OLS-POT	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		122
OLS-POT	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		75
OLS-POT	5/31/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		59
OLS-POT	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		59
OLS-POT	7/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		84
OLS-POT	8/4/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		62
OLS-POT	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		107
OLS-POT	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		53
REC-183	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Chlorpyrifos	ng/L		60
REC-JON	4/13/2000	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		184
REC-JON	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Chlorpyrifos	ng/L		45
REC-JON	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		81
REC-JON	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		86
REC-JON	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		62
REC-JON	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		69
REC-JON	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		121
REC-JON	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		101
REC-JON	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		266
REC-JON	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		150

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
REC-JON	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		148
REC-JON	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		184
REC-JON	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		107
REC-JON	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		212
REC-JON	3/13/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		84
REC-JON	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		283
REC-JON	3/17/2003	Grab	R3_CCOWS	samplewater	Grab*	Chlorpyrifos	ng/L		180
REC-JON	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		65
REC-JON	5/31/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		73
REC-JON	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		93
REC-JON	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		100
REC-JON	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		96
REC-JON	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		153
REC-JON	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		71
REC-VIC	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Chlorpyrifos	ng/L		47
SAL-DAV	3/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		59
SAL-DAV	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		139
SAL-DAV	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		48
SAL-DAV	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		76
SAL-DAV	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		54
SAL-DAV	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		55
SAL-DAV	11/7/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		76
SAL-DAV	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		175
SAL-DAV	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		186
SAL-DAV	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		96
SAL-DAV	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		63
SAL-DAV	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		112
SAL-DAV	3/13/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		59
SAL-DAV	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		222
SAL-DAV	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		119
SAL-DAV	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		63
SAL-DAV	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		0
SAL-DAV	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		51

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
SAL-DAV	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		61
SAL-DAV	8/4/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		88
SAL-DAV	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		66
SAL-DAV	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		0
SAL-MON	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		69
SAL-MON	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		53
SAL-MON	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		45
SAL-MON	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		53
SAL-MON	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
SAL-MON	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		58
SAL-MON	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		85
SAL-MON	2/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		107
SAL-MON	2/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		85
SAL-MON	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		85
SAL-MON	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		87
SAL-MON	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		0
SAL-MON	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		68
SAL-MON	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		0
SAL-MON	7/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		59
SAL-MON	7/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		61
SAL-MON	8/4/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		52
SAL-MON	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		55
SAL-MON	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Chlorpyrifos	ng/L		45
TEM-HAR	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Chlorpyrifos	ng/L		44
TEM-MOL	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Chlorpyrifos	ng/L		50
BLA-COO	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		68
BLA-COO	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		100
BLA-COO	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		449
BLA-COO	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		202
BLA-COO	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		50
BLA-COO	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
BLA-COO	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		386
BLA-COO	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		4497

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
BLA-COO	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		58
BLA-COO	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		1170
BLA-COO	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		53
BLA-COO	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		28
BLA-COO	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		26
BLA-COO	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		3003
BLA-COO	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		36
BLA-COO	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		40
BLA-COO	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		66
BLA-COO	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		164
BLA-COO	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		137
BLA-COO	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		33
BLA-COO	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		130
BLA-COO	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		120
BLA-PUM	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		121
BLA-PUM	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		124
BLA-PUM	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		940
BLA-PUM	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		334
BLA-PUM	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		53
BLA-PUM	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		44
BLA-PUM	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		205
BLA-PUM	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		68
BLA-PUM	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		90
BLA-PUM	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		55
BLA-PUM	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		548
BLA-PUM	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		66
BLA-PUM	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		52
BLA-PUM	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		131
BLA-PUM	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		130
BLA-PUM	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		31
BLA-PUM	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		122
BLA-PUM	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		88
EP1-ROG	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		26489

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
EP1-ROG	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		3519
EP1-ROG	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		12419
EP1-ROG	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		26078
EP1-ROG	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		15950
EP1-ROG	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		3252
EP1-ROG	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		2759
EP1-ROG	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		5537
EP1-ROG	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		714
EP1-ROG	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		1003
EP1-ROG	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		2341
EP1-ROG	3/13/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		900
EP1-ROG	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		1660
EP1-ROG	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		538
EP1-ROG	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		22721
EP1-ROG	5/31/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		509
EP1-ROG	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		302
EP1-ROG	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		178
EP1-ROG	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		20
EP1-ROG	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		579
EP1-ROG	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		669
EP1-ROG	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		199
EPL-EPL	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		103
EPL-EPL	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		43
EPL-EPL	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		52
EPL-EPL	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		81
EPL-EPL	10/23/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		36
EPL-EPL	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
EPL-EPL	11/15/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		24
EPL-EPL	3/13/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		87
EPL-EPL	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		345
EPL-EPL	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		101
EPL-EPL	5/31/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		44
EPL-EPL	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		60

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
EPL-EPL	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		53
EPL-EPL	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		20
EPL-EPL	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		54
EPL-EPL	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		174
MOS-SAN	7/9/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		31
MOS-SAN	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		73
MOS-SAN	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
MOS-SAN	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
MOS-SAN	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		25
MOS-SAN	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
MOS-SAN	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		32
MOS-SAN	2/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		115
MOS-SAN	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		94
MOS-SAN	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		682
MOS-SAN	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		624
MOS-SAN	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		305
MOS-SAN	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		77
MOS-SAN	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		96
MOS-SAN	7/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		21
MOS-SAN	8/4/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		46
MOS-SAN	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		20
MOS-SAN	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
OLS-MON	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Diazinon	ng/L		301
OLS-POT	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Diazinon	ng/L		424
OLS-POT	7/9/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		74
OLS-POT	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		102
OLS-POT	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		192
OLS-POT	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		104
OLS-POT	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		71
OLS-POT	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
OLS-POT	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		360
OLS-POT	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		78
OLS-POT	2/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		204

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
OLS-POT	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		61
OLS-POT	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		235
OLS-POT	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		410
OLS-POT	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		489
OLS-POT	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		385
OLS-POT	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		366
OLS-POT	5/31/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		261
OLS-POT	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		93
OLS-POT	7/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		60
OLS-POT	8/4/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		26
OLS-POT	9/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		127
OLS-POT	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		80
REC-183	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Diazinon	ng/L		479
REC-JON	4/13/2000	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		390
REC-JON	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Diazinon	ng/L		801
REC-JON	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		335
REC-JON	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		697
REC-JON	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		2571
REC-JON	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		262
REC-JON	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		344
REC-JON	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		86
REC-JON	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		651
REC-JON	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		520
REC-JON	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		370
REC-JON	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		390
REC-JON	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		965
REC-JON	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		976
REC-JON	3/13/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		208
REC-JON	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		826
REC-JON	3/17/2003	Grab	R3_CCOWS	samplewater	Grab*	Diazinon	ng/L		376
REC-JON	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		954
REC-JON	5/31/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		160
REC-JON	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		395

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
REC-JON	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		374
REC-JON	8/3/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		334
REC-JON	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		298
REC-JON	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		291
REC-VIC	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Diazinon	ng/L		581
SAL-DAV	3/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		33
SAL-DAV	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		36
SAL-DAV	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		29
SAL-DAV	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		387
SAL-DAV	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		86
SAL-DAV	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		22
SAL-DAV	11/7/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
SAL-DAV	11/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		310
SAL-DAV	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		357
SAL-DAV	2/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		94
SAL-DAV	2/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		52
SAL-DAV	2/20/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		101
SAL-DAV	3/13/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		33
SAL-DAV	3/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		350
SAL-DAV	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		342
SAL-DAV	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		223
SAL-DAV	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		38
SAL-DAV	6/9/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		30
SAL-DAV	7/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		27
SAL-DAV	8/4/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		29
SAL-DAV	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		36
SAL-DAV	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		20
SAL-MON	7/8/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		89
SAL-MON	8/29/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		26
SAL-MON	9/13/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		108
SAL-MON	9/25/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		203
SAL-MON	10/22/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		27
SAL-MON	11/6/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0

Station Code	Sample Date	Sample Type Code	ProjectID	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result
SAL-MON	11/11/2002	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
SAL-MON	2/14/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		23
SAL-MON	2/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		41
SAL-MON	3/12/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		24
SAL-MON	3/17/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		34
SAL-MON	4/19/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		40
SAL-MON	5/30/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		40
SAL-MON	6/10/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		27
SAL-MON	7/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		18
SAL-MON	7/15/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		25
SAL-MON	8/4/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		18
SAL-MON	9/18/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		24
SAL-MON	10/21/2003	Grab	R3_CCOWS	samplewater	PumpMobile	Diazinon	ng/L		0
TEM-HAR	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Diazinon	ng/L		287
TEM-MOL	7/1/2002	Grab	R3_CCOWS	samplewater	Grab*	Diazinon	ng/L		552

ProjectID	Site Tag	Sample Date	Sample Type Code	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result	Result Qual Code
R3_CMPNorth	306MOR	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	306MOR	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309ALG	08/24/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309ALG	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309ALG	09/27/2006	FieldDup	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309ALG	09/27/2006	FieldBlank	blankwater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309ASB	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309ASB	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309BLA	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309BLA	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309ESP	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309ESP	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309JON	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309JON	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309MER	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309MER	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309NAD	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		155	
R3_CMPNorth	309NAD	08/23/2006	FieldDup	samplewater	EPA 625m	Chlorpyrifos	ng/L		184	
R3_CMPNorth	309NAD	08/23/2006	FieldBlank	blankwater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309NAD	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309OLD	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309OLD	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309QUI	08/24/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		245	
R3_CMPNorth	309QUI	09/28/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		53.7	
R3_CMPNorth	309SAC	08/24/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309SSP	08/24/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309SSP	09/28/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309TEH	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	309TEH	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPSouth	312BCJ	08/22/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		356	
R3_CMPSouth	312BCJ	09/26/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		144	
R3_CMPSouth	312GVS	08/22/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		127	
R3_CMPSouth	312GVS	09/26/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		43.3	
R3_CMPSouth	312MSD	08/22/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		421	

ProjectID	Site Tag	Sample Date	Sample Type Code	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result	Result Qual Code
R3_CMPSouth	312MSD	09/26/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		71.1	
R3_CMPSouth	312MSD	09/26/2006	FieldDup	samplewater	EPA 625m	Chlorpyrifos	ng/L		63.8	
R3_CMPSouth	312MSD	09/26/2006	FieldBlank	blankwater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPSouth	312OFC	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		183	
R3_CMPSouth	312OFC	08/23/2006	FieldDup	samplewater	EPA 625m	Chlorpyrifos	ng/L		167	
R3_CMPSouth	312OFC	08/23/2006	FieldBlank	blankwater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPSouth	312OFC	09/26/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPSouth	312OFN	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPSouth	312OFN	09/26/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPSouth	312ORC	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		400	
R3_CMPSouth	312ORC	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		978	
R3_CMPSouth	312ORI	08/22/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		110	
R3_CMPSouth	312ORI	09/26/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		69.9	
R3_CMPSouth	312SMA	08/23/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		187	
R3_CMPSouth	312SMA	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		697	
R3_CMPSouth	312SMI	09/27/2006	Grab	samplewater	EPA 625m	Chlorpyrifos	ng/L		-1	ND
R3_CMPNorth	306MOR	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPNorth	306MOR	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPNorth	309ALG	08/24/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		1000	
R3_CMPNorth	309ALG	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		159	
R3_CMPNorth	309ALG	09/27/2006	FieldDup	samplewater	EPA 625m	Diazinon	ng/L		163	
R3_CMPNorth	309ALG	09/27/2006	FieldBlank	blankwater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPNorth	309ASB	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		58.4	
R3_CMPNorth	309ASB	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		110	
R3_CMPNorth	309BLA	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		71.3	
R3_CMPNorth	309BLA	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		166	
R3_CMPNorth	309ESP	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		414	
R3_CMPNorth	309ESP	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		1590	
R3_CMPNorth	309JON	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		3160	
R3_CMPNorth	309JON	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		236	
R3_CMPNorth	309MER	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		133	
R3_CMPNorth	309MER	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		31	
R3_CMPNorth	309NAD	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		3550	
R3_CMPNorth	309NAD	08/23/2006	FieldDup	samplewater	EPA 625m	Diazinon	ng/L		3900	

ProjectID	Site Tag	Sample Date	Sample Type Code	Matrix Name	Method Name	Analyte Name	Unit	Basis	Result	Result Qual Code
R3_CMPNorth	309NAD	08/23/2006	FieldBlank	blankwater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPNorth	309NAD	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		128	
R3_CMPNorth	309OLD	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPNorth	309OLD	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		206	
R3_CMPNorth	309QUI	08/24/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		163	
R3_CMPNorth	309QUI	09/28/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		296	
R3_CMPNorth	309SAC	08/24/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPNorth	309SSP	08/24/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		27	
R3_CMPNorth	309SSP	09/28/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPNorth	309TEH	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		248	
R3_CMPNorth	309TEH	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		118	
R3_CMPSouth	312BCJ	08/22/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312BCJ	09/26/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312GVS	08/22/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312GVS	09/26/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312MSD	08/22/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312MSD	09/26/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312MSD	09/26/2006	FieldDup	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312MSD	09/26/2006	FieldBlank	blankwater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312OFC	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312OFC	08/23/2006	FieldDup	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312OFC	08/23/2006	FieldBlank	blankwater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312OFC	09/26/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312OFN	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312OFN	09/26/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312ORC	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		304	
R3_CMPSouth	312ORC	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		53.3	
R3_CMPSouth	312ORI	08/22/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		46.3	
R3_CMPSouth	312ORI	09/26/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND
R3_CMPSouth	312SMA	08/23/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		414	
R3_CMPSouth	312SMA	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		74.3	
R3_CMPSouth	312SMI	09/27/2006	Grab	samplewater	EPA 625m	Diazinon	ng/L		-2	ND

StationCode	EventType	SampleDate	MatrixName	AnalyteName	Unit	Basis	Result	MDL	RL
309DAV001	SedTox_Chem	29-Mar-04	interstitialwater	Chlorpyrifos	µg/L	ww	0.238	0.05	0.05
309OLD001	SedTox_Chem	29-Mar-04	interstitialwater	Chlorpyrifos	µg/L	ww	0.122	0.05	0.05
309TDW001	SedTox_Chem	29-Mar-04	interstitialwater	Chlorpyrifos	µg/L	ww	0.156	0.05	0.05
309DAV001	SedTox_Chem	29-Mar-04	interstitialwater	Diazinon	µg/L	ww	0.052	0.03	0.03
309OLD001	SedTox_Chem	29-Mar-04	interstitialwater	Diazinon	µg/L	ww	0.123	0.03	0.03
309TDW001	SedTox_Chem	29-Mar-04	interstitialwater	Diazinon	µg/L	ww	0.129	0.03	0.03

APPENDIX B - DERIVATION OF WATER COLUMN NUMERIC TARGETS

Staff used water column numeric target values that were derived from the California Department of Fish and Game's (CDFG) *Water Quality Criteria for Diazinon and Chlorpyrifos* (CDFG, 2000) and later modified based on information provided by staff of the Central Valley Regional Water Qualtiy Control Board. A description of this modification is contained in the following paragraphs.

For the diazinon section of the CDFG criteria, forty acceptable acute toxicity values were available to calculate freshwater criteria. Acceptable acute toxicity tests were available for nine invertebrate and nine fish species. Five acute to chronic ratios for four species were available to calculate a chronic criterion for diazinon. CDFG calculated an acute criterion for diazinon of 80 nanograms per liter (ng/L) and a chronic criterion of 50 ng/L.

Following development of the CDFG diazinon criteria (CDFG, 2000), the manufacturer of diazinon (Makhteshim Agan of North America, Inc. or MANA) provided new information showing that the results from one of the toxicity tests used to derive the CDFG diazinon criteria were reported incorrectly. The toxicity test in question used the species *Gammarus fasciatus,* which had the lowest acceptable acute toxicity test result identified by CDFG or USEPA. The toxicity test data sheets MANA provided came from the microfiche archives of the USGS laboratory that conducted the toxicity tests. The USGS researcher who obtained the data sheets concluded that the toxicity value for *Gammarus fasciatus* was an order of magnitude higher than originally reported. However, Central Valley Water Board staff and the CDFG concluded that it was impossible to discern the correct toxicity test results for the questionable *Gammarus fasciatus* study from the toxicity test data sheets.

CDFG recalculated the diazinon criteria to exclude the questionable toxicity test values for *Gammarus fasciatus*, but has also noted that the recalculation assumes no new information has been collected that would affect the criteria (CDFG, 2004). CDFG believed that it was impossible to discern the correct toxicity test results for the questionable *Gammarus fasciatus* study. The data set that CDFG used in recalculating the diazinon criteria also did not include the toxicity values for *Gammarus pseudolimnaeus* test that USEPA used in their criteria. CDFG found the *Gammarus pseudolimnaeus* study used by USEPA was unacceptable for use in calculating water quality criteria because it did not meet American Society for Testing and Materials (ASTM) standards for acute toxicity tests. The recalculated CDFG values are an acute criterion for diazinon of 160 ng/L and a chronic criterion of 100 ng/L (CDFG, 2004). Central Valley Water Board staff confirmed these recalculated values.

For the chlorpyrifos section of the CDFG criteria derivation (CDFG, 2000) forty-three acceptable acute toxicity values were available to calculate freshwater criteria. Acceptable acute toxicity tests were available for thirteen invertebrate and seven fish species. Eight acute to chronic ratios for seven species (both freshwater and saltwater) were available to calculate a chronic criterion for chlorpyrifos. CDFG calculated an acute criterion for chlorpyrifos of 20 ng/L and a chronic freshwater criterion of 14 ng/L. The calculations that are part of the USEPA methodology (EPA, 1985) can include interim calculations before the final criterion is calculated. The USEPA methodology states that interim calculations should be rounded to four significant figures and the final criterion should be rounded to two significant figures. When the freshwater chlorpyrifos criteria are rounded to two significant figures using the data set that CDFG found acceptable, the acute criterion is 25 ng/L, rather than 20 ng/L, and the chronic criterion is 15 ng/L, rather than 14 ng/L.

APPENDIX C – ASSESSMENT OF AGRICULTURAL SERVICE FACILITIES

Staff assessed other potential urban storm water sources of chlorpyrifos and diazinon that may be transported into receiving waters. These other potential urban storm water sources are industrial facilities that provide agricultural products such as fertilizer and pesticide products as well as crop and field application services. These facilities would potentially store, transport, and apply pesticides within the Lower Salinas River watershed.

Staff identified three agriculture service facilities in the Lower Salinas River watershed that operate under Waste Discharge Requirements (WDR's) issued by the Water Board. These facilities provide fertilizer and pesticide products and application services to agricultural producers. Table 1 lists these facilities.

Table 1. Agriculture Service Facilities with Waste Discharge Requirements (WDRs)

Name	Address	WDR Order No.
Soilserv Inc	1427 Abbott St., Salinas	01-051
Western Farm Service , Inc	1127, 1143, 1151 Terren Ave., Salinas	00-30
NH3 Service Company	945 Johnson Ave., Salinas	R3-2002-0039

Soilserv Inc is located approximately 0.75 miles west of the Salinas Reclamation Canal. Staff issued a notice of violation following an inspection on March 10, 2007. The inspection report cited poor management of facility waste water systems and discharges to the Salinas Reclamation Canal via City of Salinas storm drains. Staff concluded that this facility discharged pesticides to the Salinas Reclamation Canal; however, the facility has since taken appropriate corrective action to cease storm water discharges as required by Water Board staff and the City of Salinas.

Western Farm Service discharged pesticides and un-ionized ammonia into the Salinas Reclamation Canal. On March 7, 2007, stormwater monitoring staff from City of Salinas inspected the facility storm drains and observed and sampled water flowing from the facility storm drain. These storm drains are connected to and flow into the Salinas Reclamation Canal. Chemical analysis of the water samples indicated elevated concentrations of the pesticides diazinon, chlorpyrifos, and dimethoate, as well as un-ionized ammonia. On March 21, 2007, Water Board conducted compliance inspections and found several violations. On August 13, 2007, the Water Board issued a Notice of Violation to the Discharger for the alleged violations. Among the alleged violations were: inadequate storage of pesticides and fertilizers; inadequate secondary containment or hazardous materials; inadequate staff training on operation of facility underground sump valves; improper storm drain connections between pesticide and fertilizer storage and handling areas and surface waters;

improper rinsing of pesticide and fertilizer containers to facility drains discharging to surface waters; and failure to clean up dry fertilizer product covering a dock area before a rain event. Staff concluded that this facility has discharged pesticides to the Salinas Reclamation Canal; however, the facility has completed the necessary corrective actions to cease storm water discharges under the direction of Water Board staff and the City of Salinas.

NH3 Service Company is approximately 0.4 miles west of the Salinas Reclamation Canal. Past management practices discharged nitrogen fertilizer into site soil and groundwater. The Water Board issued a cleanup and abatement order in 1992 requiring the facility to treat nitrate contaminated groundwater. On March 15, 2007, staff conducted an inspection of the facility and found no violations. Staff concluded that the facility does not discharge pesticides or toxic substances into the Salinas Reclamation Canal.

Staff has concluded that these agricultural service facilities are currently in compliance with their respective waste discharge requirements and that they are not discharging chlorpyrifos and/or diazinon into receiving waters via storm water runoff.

APPENDIX D – FLOW DURATION CURVES, LOAD DURATION CURVES, AND PERCENT LOAD REDUCTIONS

Staff used a load duration curve analysis approach to estimate existing loads and assimilative capacity for both chlorpyrifos and/or diazinon in the impaired stream segments in the project area. Load duration curves allow for the calculation of flow-based daily load expressions. The load duration curve approach involves calculating the allowable loadings over the range of flow conditions expected to occur in the impaired stream by taking the following steps:

1. Develop Flow Records for Key Water Quality Monitoring Stations. A flow duration curve for the impaired segment (or subsegments) is developed using the available flow data. This is done by generating a flow frequency record consisting of ranking all of the observed flows from the least observed flow to the greatest observed flow and plotting those points. Direct flow measurements are not available for all of the water quality monitoring stations addressed in this report. This information, however, is important to understanding the relationship between water quality and stream flow. Therefore, to characterize flow in some cases, flow records were derived from commonly used flow estimation methods. Flow data to support development of flow duration curves were derived for key water quality monitoring sites from USGS daily flow records generally in the following priority; however, the final methodology is subject to best professional judgment:

i) In cases where a USGS flow gage coincides with, or occurs within one-half mile upstream or downstream of a water quality monitoring station and simultaneous daily flow data matching the water quality sample dates are available, these flow measurements will be used. If flow measurements at a USGS flow gage are missing for some dates on which water quality samples were collected, gaps in the flow record will be filled, or the record extended, by estimating flow based on measured stream flows at a nearby gage. First, the most appropriate nearby stream gage is identified. The station with the strongest flow relationship, as indicated by the highest correlation coefficient (R), or based on similar land use and hydrologic factors, is selected as the index gage. Data from the flow gage with the partial flow record is then compared to the flow record from the index gage using regression analysis. The regression equation is then used to estimate flow at the gage to be filled/extended from flows at the index station. Flows will not be estimated based on regressions with r-squared values less than 0.25, even if that is the best regression. This value was selected based on technical guidance for using regression analysis in estimating flows (USEPA 2007, and State of South Carolina DHEC, 2005). R-squared indicates the fraction of the variance in flow explained by the regression

ii) In cases where no USGS flow gage data is located within one-half mile upstream or downstream of a monitoring site, but instantaneous flow data is available at the monitoring site, mean daily discharge will be estimated by regressing the instantaneous flow measurements against mean daily values from the most appropriate nearby USGS flow gage. Flows will not be estimated based on regressions with r-squared values less than 0.25, even if that is the best regression.

iii) In cases where no USGS flow gage data is available within one half mile upstream or downstream of a monitoring site, and no instantaneous flow data are available, but a USGS flow gage is located within the same stream reach (upstream or downstream) of the monitoring site, the Drainage Area Ratio method (see Section 7.2.2) will be used to estimate mean daily flow at the ungaged site using the USGS flow data that is located along the same stream reach.

iv) In drainages where there is no USGS flow gage or instantaneous flow data, mean daily flows will be estimated with the modified SWRCB proration drainage area method (see Section 7.2.2), using the mean daily flows from the most appropriate USGS flow gage record from a nearby drainage. The modified SWRCB proration drainage area method accounts for spatial variability in precipitation and runoff characteristics that might be expected between different drainages.

v) For monitoring sites in drainages where there is no USGS flow gage or instantaneous flow data, but an estimated flow record has been created for a monitoring site within the same stream reach upstream or downstream of the ungaged site, flow statistics will be transferred to the ungaged site from the site with the estimated flow record by using the Drainage Area Ratio method.

2. Develop Flow Duration Curves. Flow duration curves are graphical representations of the flow regime of a stream at a given site. Flow duration curves serve as the foundation for developing load duration curves and they are a type of cumulative distribution function. The flow duration curve represents the fraction of flow observations that exceed a given flow at the site of interest. The observed flow values are first ranked from highest to lowest, then, for each observation, the percentage of observations exceeding that flow is calculated. 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, while the highest measured flow is found at an exceedance frequency of 0 percent. The median flow occurs at a flow exceedance frequency of 50 percent. Flow duration curves can be subjectively divided into several hydrologic flow regime classes. These hydrologic classes facilitate the analytical uses of load duration curves, in terms of water quality response to flow and to pollutant loading conditions.

3. Develop Load Duration Curves. Load duration curves are based on flow duration curves. Load duration curves display the allowable loading capacity (based on the relevant water quality criterion) across the continuum of flow percentiles and also display historical pollutant load observations at the monitoring site. In lieu of flow, the y-axis is expressed in terms of OP pesticide load in grams per day (g/day). For this Project Report, the curve represents the instantaneous sample water quality criterion for chlorpyrifos and diazinon (0.025 and 0.160 µg/L, respectiviely) expressed in terms of a load curve by multiplying each flow from the ranked flow record by the applicable water quality criterion and a conversion factor and plotting the resulting points.

4. Plot Observed Loads. Each pollutant data point from observed 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. Points plotting above the curve represent exceedances of the water quality objective (i.e., the allowable load, or total maximum daily load). Those plotting below the curve represent compliance with water quality objective and therefore represent compliance with the maximum daily loads.

5. Use Load Duration Curve to Develop Daily Load Expressions. The load duration curve itself can be established as the TMDL. The TMDL would be dynamic and based on flow. Essentially, the loading capacity is the load corresponding to the flow selected along the curve. Alternatively, a static TMDL can be established based on the area beneath the TMDL curve, representing the loading capacity of the stream. The difference between this area and the area representing current loading conditions is the load that must be reduced to meet water quality standards. As noted previously, Staff are establishing 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 indicated below:

> *"For TMDLs that are **<u>expressed as a concentration of a pollutant</u>**, **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 "Options for Expressing Daily Loads in TMDLs", Office of Wetlands, Oceans and Watersheds, June 22, 2007.*
>
> * emphasis added

Development of Flow Duration Curves

<u>Flow Data</u>

To develop flow duration curves, and ultimately conduct a load duration curve analysis, it is necessary to have a continuous flow record covering a broad range of flow conditions during times of water quality sampling in the impaired streams. In those cases where flow data is not available, flow was estimated for the impaired waterbody based on nearby USGS gages draining creeks with similar watershed characteristics, or from instantaneous flow measurements and water budget analyses from literature sources.

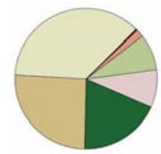
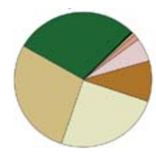
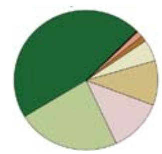
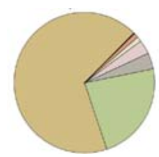
Based on knowledge of watershed characteristics, El Toro Creek (USGS 11153540) was initially chosen as the surrogate flow gage for several of the ungaged impaired streams which drain mountainous headwater reaches in the project area. Additionally, the Reclamation Canal (USGS 11152650) was used as a surrogate flow gage for impaired waterbodies located in low-gradient, valley floor subwatersheds in the project area. However, the El Toro Creek gage only has a partial flow record, and does not have flow data after October 2001. Much of the water quality data collected in the project area is subsequent to October 2001. To fill in this gap in flow data for the El Toro Creek gage, a reference stream approach was used. The reference stream approach involves evaluating flows from surrounding gages with similar watershed characteristics, for similarity to El Toro Creek flows. The flow data from a selected reference stream are then used to supplement the El Toro Creek partial flow record; i.e. to create a complete flow record. The complete El Toro Creek flow record can then be projected into the ungaged impaired streams in the project area.

Once several possible reference watersheds were selected, a correlation analysis was performed on the flow measurements of the reference stream gages and the target gage (El Toro Creek). Usually the reference gauge with the strongest correlation to the target gage is selected; however, the final decision is subject to best professional judgment. The reference stream gages selected were Corrilitos Creek (Santa Cruz County), Gabilan Creek (Monterey County), and Clear Creek (San Benito County).

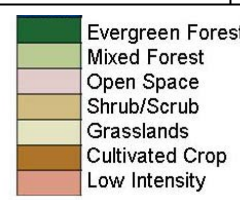
The reference stream correlation was performed by entering the flow measurement data from the target stream (El Toro Creek) into an Excel spreadsheet along with daily mean flow data from the reference streams candidates (Gabilan Creek, Corrilitos Creek, and Clear Creek). The Excel “Correlation” data analysis tool was then run to determine "R", or the Pearson's correlation coefficient, which can be used as an indication of the strength of the correlation. In this analysis absolute values of the Pearson's coefficient between 0 to 0.5 were regarded as indicating a very weak correlation, 0.5 to 0.7 as moderate and 0.7 to 1 as a strong correlation.

Table 0-1 highlights the target and reference watershed drainage area, physiography (USDA Ecoregion), land use, and correlation coefficients. Gabilan Creek was selected as the reference stream based on proximity, similar land use, similar drainage area size, and the highest correlation coefficient with El Toro Creek.

Table 0-1. Reference Stream Correlations with El Toro Creek.

	Watershed	USGS Gage	Drainage Area (mi^2)	USDA Ecoregion	Area Ratio	Land Use	Correlation Coefficient
Target Watershed	**El Toro Creek**	Partial Record 11153540	31.9	CCC	-		**-**
Potential Reference Streams	**Gabilan Creek**	11152600	36.7	CCC	1.15		**0.705**
	Corralitos Creek	11159200	27.8	CCC	0.87		**0.499**
	Clear Creek	11154700	14.1	CVCR	0.44		**0.612**

CCC=Calif. Central Coast Ecoregion
CVCR=Central Valley Coast Ranges Ecoregion



The flow regression for El Toro Creek and Gabilan Creek is shown in Figure 0-1. To complete the El Toro Creek flow record, daily flows from Gabilan Creek from October 2001 to December 2006 were adjusted by the regression equation in Figure 0-1, and added to the flow record gap in the partial El Toro Creek flow record. This effectively creates a complete flow record for the Toro Creek gage during the period in which all the monitoring data in the project area has been collected.

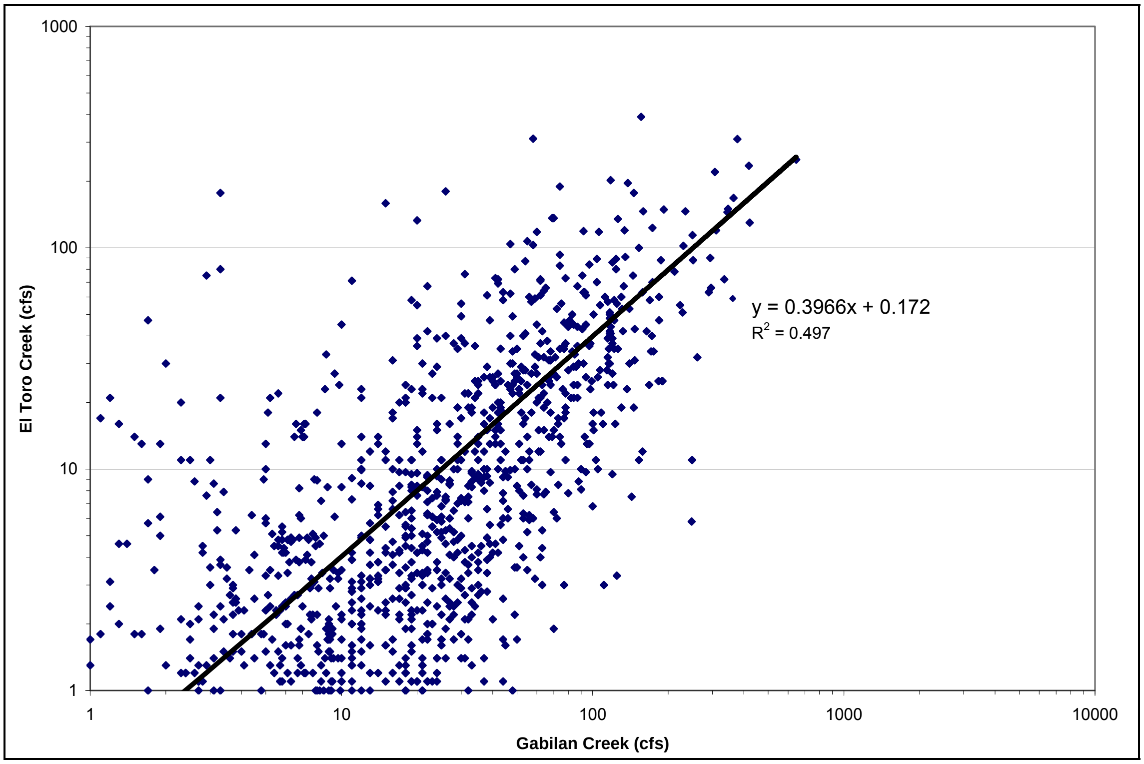


Figure 0-1 Flow Regression for El Toro Creek flow vs. Gabilan Creek flow.

Estimating Flow at Ungaged Streams

<u>Flow Estimation using USGS Stream Gages</u>

As noted previously, not all watersheds in the project area have gaging stations or flow data available to develop flow duration curves and load duration curves. In such cases flow estimation techniques are needed. A simple and widely used analytical method to develop a flow record for ungaged watersheds, is the drainage area ratio method (DAR). The DAR method is a simple, widely used analytical approach for developing discharge for ungaged watersheds/sites using discharge data from gaged watersheds. DAR is recognized by USEPA as a standard flow estimation method for ungaged sites (USEPA, 2007(a) and 2007(b)). The DAR method is most reliable when land use characteristics of the ungaged and gaged watersheds are similar, and when the size ratio between the drainage areas of the ungaged site and the gaged site is between 0.3 and 1.5 (USGS, 2000). DAR assumes that flow at the ungaged stream is proportional to the ratio of the drainage areas between the ungaged stream, and the gaged stream. The DAR flow transfer method is calculated as:

$$Flow_{ungaged} = Flow_{gaged} \times \frac{Area_{ungaged}}{Area_{gaged}}$$

Because DAR simply assumes that the streamflow at an ungaged site is the same per unit area as a nearby hydrologically similar stream gaged station, and the method does not account for spatial variations in precipitation and runoff, the DAR method is generally best used for transferring flows between sites within the same drainage basin.

To minimize uncertainty in flow estimates in this project report, a modified version of the State Water Resources Control Board DAR method (SWRCB, 2002) was used, making corrections for spatial variation in precipitation and in surface runoff characteristics. Unlike the standard DAR method, which simply transfers flows between gaged and ungaged sites by making a correction based on the drainage area ratio (i.e., ratio of ungaged watershed size to the gaged watershed size), the SWRCB DAR method incorporates a correction factor for spatial precipitation variations. The SWRCB method can be used to transfer flow statistics from one drainage basin to another basin (personal communication, Bill Cowen, SWRCB). The DAR equation used by the SWRCB to estimate streamflow statistics is:

$$Q_{ug} = Q_g \times \frac{A_{ug}}{A_g} \times \frac{I_{ug}}{I_g} \quad \text{(equation 1)}$$

Where

Q_{ug} is the mean daily flow (cfs) at ungaged location.
Q_g is the mean daily flow (cfs) at gaged location.
A_{ug} is the watershed drainage area above the ungaged site (acres).
A_g is the watershed drainage area above the gaged site (acres).
I_{ug} is mean annual precipitation in the ungaged watershed.
I_g is mean annual precipitation in the gaged watershed.

The SWRCB DAR method however, does not account for spatial variations in surface runoff characteristics. In an effort to further reduce uncertainty in the flow estimates, a correction factor was added to the SWRCB DAR equation. The correction factor accounts for spatial differences in land runoff characteristics by using area-weighted runoff coefficients for the various watersheds (a method used for example, in the State of Michigan Ecorse Creek *E. coli* TMDL, 2008). An area-weighted runoff coefficient is used where a drainage area is composed of subareas each having different runoff coefficients. The area-weighted runoff coefficient is in effect a composite coefficient for the total drainage area based on the percentage of different types of land surface in the drainage area. The area-weighted runoff coefficient is computed by dividing the summation of the products of the size of the subareas and their runoff coefficients, by the total area.

Therefore, the SWRCB DAR equation shown in Equation (1), was modified with a correction factor which accounts for differences surface runoff characteristics between the gaged and ungaged drainages, as below:

$$Q_{ug} = Q_g \times \frac{A_{ug}}{A_g} \times \frac{I_{ug}}{I_g} \times \frac{R_{ug}}{R_g} \qquad \text{(equation 2)}$$

Where:

R_{ug} is the area-weighted runoff coefficient in the ungaged watershed.
R_g is area-weighted runoff coefficient in the gaged watershed.

To use the modified SWRCB DAR method, two USGS reference flow gaged streams were used to estimate flows in ungaged streams in the project area. Reference stream gages are Reclamation Canal (USGS 11152650) and El Toro Creek (USGS 11153540). The ungaged streams in the project area were compared and grouped with gaged streams based on similar land use and topography.

USGS 11152650 (Reclamation Canal) was used as a reference gage for Santa Rita Creek, Blanco Drain, and Alisal Slough (remnant). These subwatersheds are low-gradient valley floor waterbodies characterized by predominantly agricultural and urban land uses.

USGS 11153540 (El Toro Creek) was used as a reference gage for Alisal Creek, Natividad Creek, Quail Creek, and Chualar Creek. These streams are all characterized by flat to hilly topography (with significant proportions of the watersheds draining head water reaches in mountainous terrain), and are characterized predominantly by forest, grassland, or rangeland land use categories.

Daily Flow Estimation from Instantaneous Flow Measurements

Tembladero Slough is not gaged but instantaneous flow data was collected by Harris et al. (2007) at Haro Road in Castroville, the same location as monitoring site 309TEH. Harris et al. used this data to estimate mean daily flow on Tembladero Slough by regressing their instantaneous flow measurements of the slough's discharge against mean daily discharge values reported at USGS 11152650 (Reclamation Canal). Therefore, in this project report, mean daily flow for Tembladero Slough was estimated using the flow regression analysis given by Harris et al. (2007).

Flow Estimation for Coastal Confluence Water Bodies

It is not possible to estimate mean daily flow data for coastal confluence water bodies in the project area (Salinas River Lagoon; Old Salinas River). These are receiving waterbodies and are not typically characterized by measurable unidirectional flow, and flows are also complicated by tidal influences. However, available literature data is used here to estimate the mean annual and monthly water budget for these coastal waterbodies. Mean annual inflow to the Salinas River Lagoon is estimated from reporting by Monterey County Water Resources Agency (MCWRA, 2001). MCWRA (2001) estimates inflow into the Salinas Lagoon based on discharge measurements upgradient of the lagoon at USGS 11152500 (Salinas River at Spreckles). This method does not explicitly account for changes in water volume within the lagoon, but by basing the total fecal coliform load only upon the inflow into the Salinas River Lagoon, the estimated allowable load is conservatively calculated.

Outflow from the Old Salinas River is estimated from a water budget analysis of Watsonville Slough (Hager et al., 2004). Watsonville Slough is a nearby coastal confluence waterbody in Santa Cruz County. Watsonville Slough is similar to the Old Salinas River in landuse, size, and hydrologic characteristics. As such, outflow estimates from Watsonville Slough can be transferred to the Old Salinas River by proportionally adjusting outflows in accordance with the modified SWRCB DAR method described above. As a result, annual and monthly mean outflow for the Old Salinas River were estimated from the Watsonville Slough estimates, using the modified SWRCB DAR method (Equation 2), and the flow correction values.

Area-Weighted Runoff Coefficients

Flow statistics for ungaged sites were derived from a modified version of the SWRCB DAR method (Equation 2), utilizing spatial differences in runoff characteristics of the various watersheds. Table 0-2 shows the area-weighted runoff coefficients (RC) for the various watersheds in the project area. Both gaged and ungaged watersheds are evaluated in Table 0-2, so that an RC correction factor can be developed to transfer flow data from gaged sites to ungaged sites. Land use-specific runoff coefficients in Table 0-2 come from the Oregon Dept. of Transportation, Hydraulics Manual (2005). The Oregon Dept. of Transportation provides average runoff coefficients for various land uses, and associated topographies (flat, rolling, hilly) which are shown in Table 0-2.

Table 0-2. Area-Weighted Runoff Coefficients.

			Landuse (acres)						
	Topography	**Waterbody**	**Developed**	**Agriculture**	**Forest Shrub**	**Grassland Pasture**	**Barren Rock**	**Wetland**	**Area-weighted Runoff Coefficient**
Gaged Reference Watersheds	Coastal Confluence	**Watsonville Slough**	1601.2	4183.5	5713.1	1450.5	27.2	145.8	**0.262**
		Runoff Coefficient	0.5	0.4	0.1	0.25	0.85	0.5	
	Flat	**Reclamation Canal***	4608.9	15301	8721.8	6915.6	585.2	0	**0.319**
		Runoff Coefficient	0.5	0.4	0.1	0.25	0.85	0.05	
	Rolling	**El Toro Creek**	387.9	25.9	12517.7	12828.0	1.0	0.0	**0.231**
		Runoff Coefficient	0.55	0.45	0.15	0.3	0.85	0.05	
Project Area Ungaged Watersheds	Coastal Confluence	**Old Salinas River**	62.9	1195.3	144.8	10.2	39.5	10.2	**0.383**
		Runoff Coefficient	0.5	0.4	0.1	0.25	0.85	0.05	
		Salinas Lagoon	103.9	2158.2	210.9	125.3	305.7	146.7	**0.405**
		Runoff Coefficient	0.5	0.4	0.1	0.25	0.85	0.05	
	Flat	**Tembladero Slough**	2041.9	5322.4	4903.9	4033.6	217.6	200.8	**0.290**
		Runoff Coefficient	0.5	0.4	0.1	0.25	0.85	0.05	
		Espinosa Slough / Santa Rita Creek	674.3	7002.5	147.0	596.5	129.7	86.5	**0.396**
		Runoff Coefficient	0.5	0.4	0.1	0.25	0.85	0.05	
		Blanco Drain	390.1	7701.5	49.8	66.4	83.0	0	**0.406**
		Runoff Coefficient	0.5	0.4	0.1	0.25	0.85	0.05	
		Alisal Slough (Remnant)	125.9	3515.1	3.7	7.4	0	0	**0.403**
		Runoff Coefficient	0.5	0.4	0.1	0.25	0.85	0.05	
	Rolling	**Alisal Creek**	2338.4	11632.8	8584	6541.6	473.6	0	**0.344**
		Runoff Coefficient	0.55	0.45	0.15	0.3	0.85	0.05	
		Natividad Creek	281.4	3583.5	1517.8	1917.6	59.2	14.8	**0.355**
		Runoff Coefficient	0.55	0.45	0.15	0.3	0.85	0.05	
		Quail Creek	191.0	2427.2	6348.9	1842.9	415.8	0.0	**0.272**
		Runoff Coefficient	0.55	0.45	0.15	0.3	0.85	0.05	
		Chualar Creek	149.5	7953.4	11391.9	10046.4	358.8	0	**0.291**
		Runoff Coefficient	0.55	0.45	0.15	0.3	0.85	0.05	

The area-weighted runoff coefficients derived Table 0-2 were then used to adjust the SWRCB DAR equation to account for differences in runoff characteristics. For example, the Quail Creek flow values were increased by a factor of 1.18 (0.272/0.231), relative to the El Toro Creek reference gage flow record, due to the ratio in area-weighted runoff coefficients (see Table 0-3).

Precipitation, Drainage Area Ratios, and Flow Correction Factors

Mean annual precipitation estimates for project area watersheds were taken from Oregon State University's PRISM (Parameter-elevation Regressions on Independent Slopes Model) Climate Data Explorer (http://prism.oregonstate.edu/). PRISM provides searchable gridded precipitation data sets, which allow one to analyze time series and summary statistics for single spatial grid-points. Latitude-longitudes for project area monitoring points, and their associated subwatersheds, were entered into PRISM to obtain mean annual precipitation for each subwatershed. It was assumed that mean annual precipitation of the PRISM grid point in the subwatershed was representative of mean annual precipitation throughout the subwatershed.

With spatial differences in precipitation and surface runoff characteristics tabulated, the modified SWRCB DAR equation (Equation 2) can be used in conjunction with drainage area ratios, to transfer flow statistics from gaged watersheds to ungaged watersheds. Table 0-3 summarizes the drainage area ratios, precipitation ratios, and runoff coefficient correction factors used to estimate the flow at ungaged locations. Ungaged watersheds are grouped with their reference gaged watersheds based on similar landuse and topography. In most cases, the upstream drainage area of the ungaged stream is estimated relative to a monitoring point located at or near the lowest drainage point of the watershed.

Table 0-3. Drainage Areas, Drainage Area Ratios (DAR), Precipitation, and Landuse Correction Factors used to develop Discharge Data at Ungaged Locations.

Topography	Location	Drainage Area (sq. mi.)	DAR A_{ug}/A_g	Precipitation (inches)	Precipitation Ratio I_{ug}/I_g	Area Weighted Runoff Coef.	Runoff Coef. Ratio R_{ug}/R_g	Final Flow Adjustment Ratio
Coastal Confluence	Watsonville Slough[A]	20.5	-	21.6	-	0.262	-	-
	Old Salinas River*	41.7	2.03*	17.1	0.79	0.332	1.16	**2.04**
	Salinas Lagoon**	-	X	16.12	X	X	X	**N.A.**
Flat	Reclamation Canal @ USGS 11152650	56	-	15.44	-	0.319	-	**-**
	Tembladero Slough[B]	26.1	X	X	X	X	X	N.A.
	Espinosa Slough \ Santa Rita Creek***	9	0.16	16.39	1.06	0.396	1.24	**0.21**
	Blanco Drain	13	0.23	14.58	0.94	0.406	1.27	**0.28**
	Alisal Slough (Remnant)	5.7	0.10	14.58	0.94	0.403	1.26	**0.12**
Rolling	El Toro Creek @ USGS 11153540	31.9	-	17.1	-	0.231	-	**-**
	Alisal Creek	46	1.44	13.59	0.79	0.344	1.49	**1.71**
	Natividad Creek	11.5	0.36	16.28	0.95	0.355	1.54	**0.53**
	Quail Creek	17.5	0.55	14.59	0.85	0.272	1.18	**0.55**
	Chualar Creek	47	1.47	12.86	0.75	0.291	1.26	**1.40**

= Gaged Reference stream

A: No flow gage, outflow was estimated from Watsonville Slough Water Budget analysis by Questa Engineering (1995).
B. Mean daily flow was estimated from flow regression equation provided in Hager et al. (2007)

*Includes upgradient tributaries Reclamation Canal subwatershed (3a) and Tembladero Slough subwatershed. Runoff coefficient is composite area weighted runoff coefficient of all three subwatersheds
**Inflow values estimated from discharge measurements at upstream USGS 11152500, as reported in MCWRA (2001).
***Includes Espinosa Lake, Espinosa Slough, and Santa Rita Creek drainage area upstream of monitoring site 309ESP

Using the ratios and correction factors from Table 0-3 in conjunction with Equation 2, a final flow adjustment ratio was calculated in the right hand column of Table 0-3. Estimated flow records for ungaged streams were then derived from their respective reference stream gage records using this flow adjustment ratio. For example, the mean daily El Toro Creek flow record was adjusted by a factor of 1.71, to derive an estimated flow record for Alisal Creek. Likewise, the mean daily Reclamation Canal flow record was adjusted by a factor of 0.21 to derive an estimated flow record for Santa Rita Creek. Flow duration curves were constructed using the estimated flow records of ungaged streams using a spreadsheet tool developed by Bruce Cleland, USEPA.

Additionally, daily flow records for steams with instantaneous flow data (Tembladero Slough) were estimated as previously described.

Lastly, outflow for coastal confluence waterbodies were estimated, as previously described. Figure 0-2 shows the estimated outflows from the Old Salinas River as derived from the Watsonville Slough outflow water budget reported in Hager et al. (2004), by adjusting the Watsonville Slough flows by the correction factor shown in Table 0-3. Figure 0-3 shows estimated inflow into the Salinas River Lagoon based on discharge data at upstream USGS 11152500.

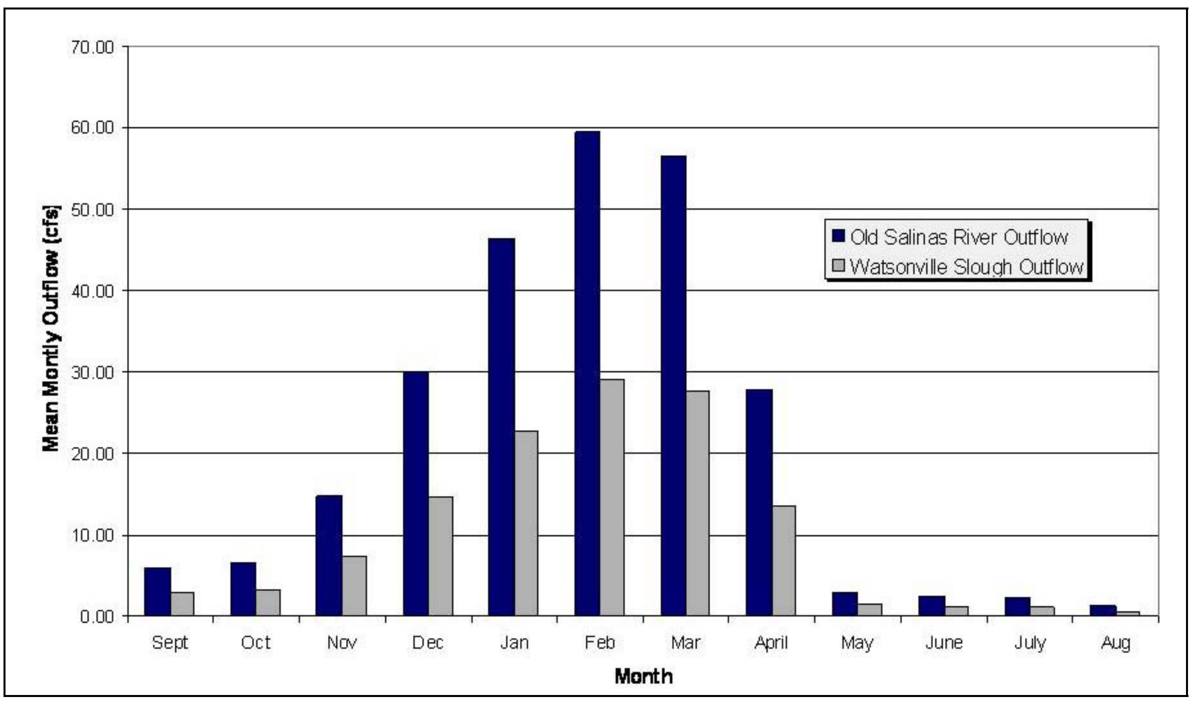


Figure 0-2. Estimated Outflow from Old Salinas River.

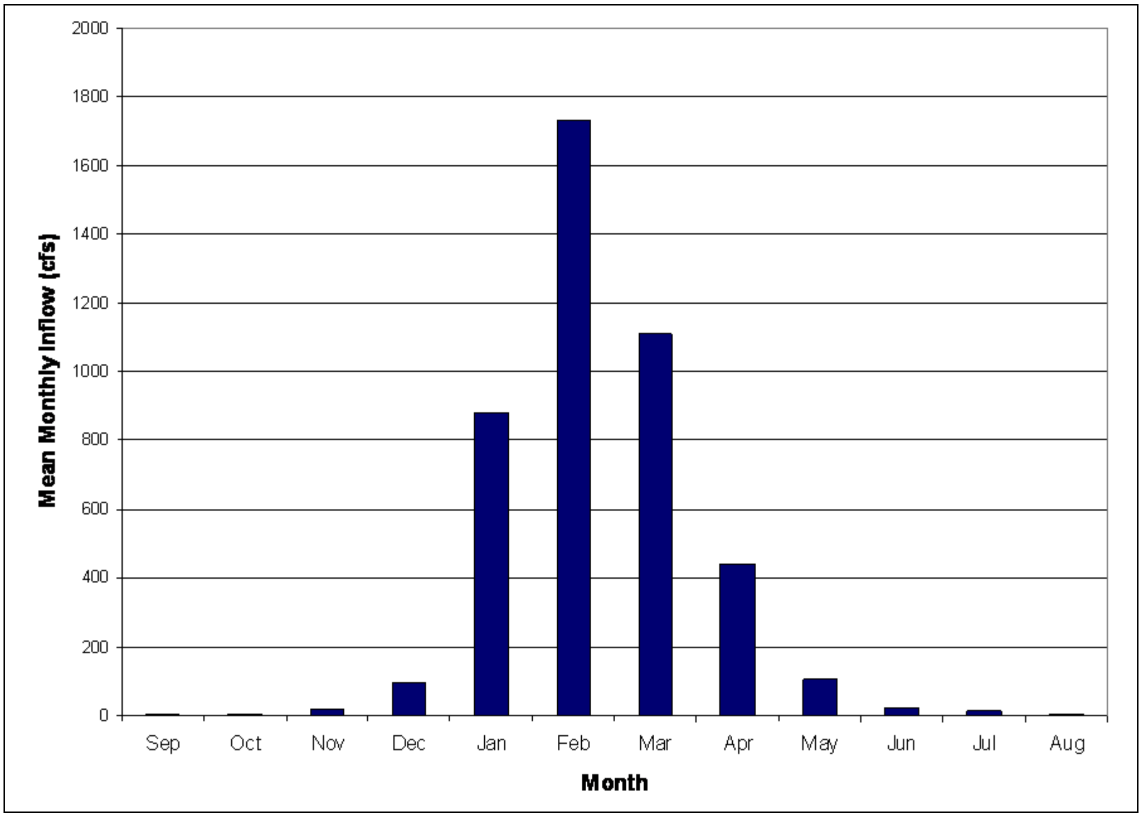


Figure 0-3. Estimated Salinas River Lagoon Inflow.

Validation of Estimated Flow Estimates

Finally, flow estimates derived in this Project Report were checked for reasonableness and consistency against historical discharge estimates from other published sources, and against instantaneous flow monitoring data and other metrics staff could identify.

In 1978, the Monterey County Water Resources Agency (MWRCA) estimated that the mean annual discharge from the Blanco Drain was 2,200 acre feet per year (reported in MCWRA, 2001). By comparison, flow estimates derived in this Project Report indicate that the mean annual discharge from Blanco Drain is 2,150 acre-feet/year (based on an estimated mean annual flow of 2.97 cfs). The Blanco Drain discharge estimate from data derived in this Project Report is therefore virtually identical to the MCWRA Blanco Drain discharge estimate.

Instantaneous flow field measurements for Natividad Creek have been reported by the Water Board (2008). These field data were collected monthly between January 2005 and December 2007 at monitoring site 309NAD. Staff assessed how the estimated flow for Natividad Creek derived in this Project Report compared to the reported field measurements of instantaneous flow. Using the Excel spreadsheet correlation tool, Staff calculated a correlation coefficient of 0.841 for the log normalized estimated flow record and the instantaneous flow field measurements. The coefficient of determination

(R^2), using the Excel trend analysis tool, ranges from 0.71 to 0.79 as shown in Figure 0-4. Therefore, it appears that the Natividad Creek estimated flow record comports reasonably well with instantaneous flow field measurements.

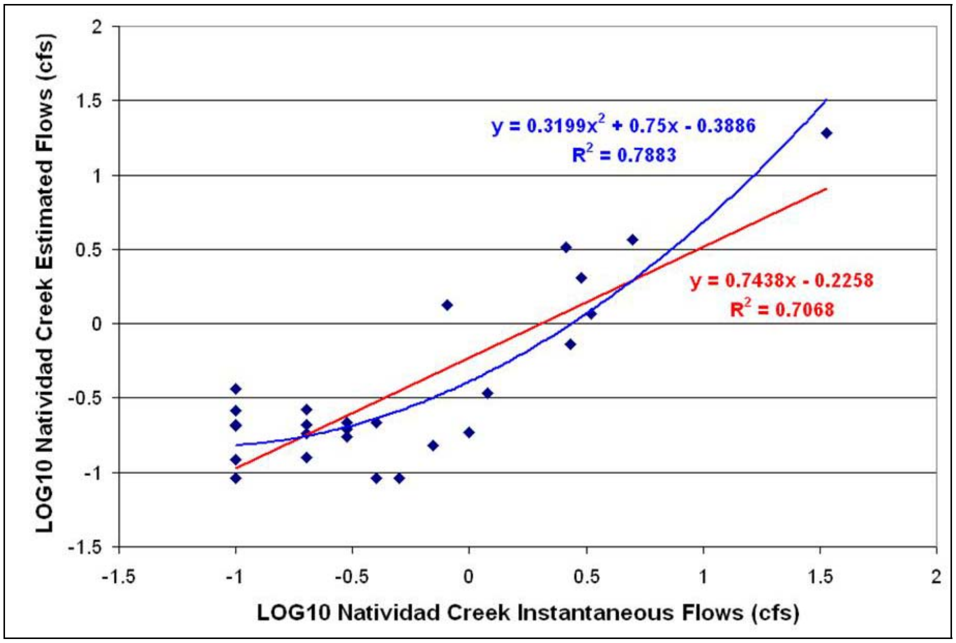


Figure 0-4. Natividad Creek, Estimated Flows versus Instantaneous Flow Field Measurements.

Modeled discharge data for the Old Salinas River near its confluence with Moss Landing Harbor has been reported by Flow Science Inc. (2005). The modeled discharge data was calibrated to match temperature data. Modeled flow was calculated only over ebbing tidal periods, during which time the Old Salinas River discharges into Moss Landing Harbor, ultimately discharging through Elkhorn into Monterey Bay. As a result, Flow Science Inc. reported an ebb tidal discharge from the Old Salinas River as10 m^3/sec (353 cfs) over the period April 16-April 22, 2003.

It is important to recognize that ebb tides only occur for several hours a day, Broenkow and Breaker (2005) reported that Elkhorn Slough is an ebb tidal current dominated system, with flood tides lasting almost twice as long as ebb tides. Tidal current measurements of the semidiurnal cycle, as shown in Broenkow and Breaker (2005), indicate that ebb tide cycles appear to occur for about a total of 4 hours during a 24 hour cycle (Figure 5). During ebb tides, the Old Salinas River discharges into the southern end of Moss Landing Harbor (Chapin et al., 2004). During slack tides, or flood tides there should be little to no discharge from the Old Salinas River to Moss Landing Harbor.

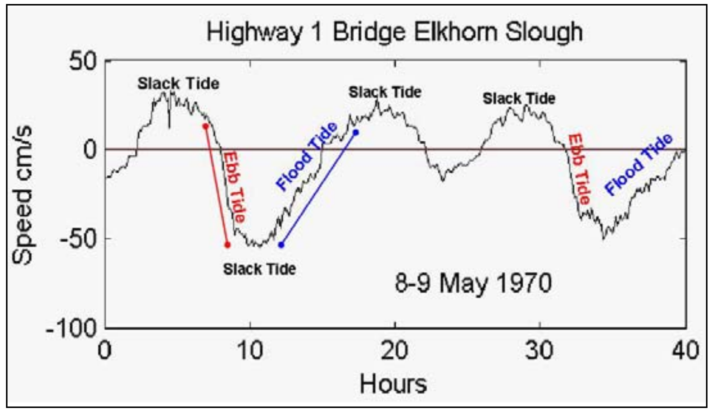


Figure 0-5. Elkhorn Slough Tidal Current Velocity and Cycle (modified from Broenkow and Breaker, 2005).

As such, the reported Old Salinas River ebb tide discharges reported by Flow Science Inc, translated to a mean *daily* basis, should be in the range of 59 cfs mean daily outflow, assuming a temporal duration of 4 hours of ebb tide per day. In contrast, flow record estimates derived in this Project Report indicate that the mean April discharge from the Old Salinas River at OLS-MON is 28 cfs. This is significantly less that the estimated 59 cfs estimate derived from ebb tide flows modeled by Flow Science Incorporated. However, a review of precipitation records indicates that rainfall in April 2003 (the period the Flow Science Inc. ebb tide discharge was modeled) was between 118% to 137% above normal (NOAA Salinas #2 COOP, and CIMS Castroville #19 weathers stations, respectively). All other things being equal, and increasing the Project Report estimated mean April monthly flow by 118 to 137% in accordance with the precipitation correction factor as used in equation (2), the April 2003 monthly discharge for the Old Salinas River would be expected to be around 61 to 66 cfs. These values appear to comport reasonably well with the Flow Science Inc. modeled mean daily discharge estimate of ~59 cfs.

Lastly, the potential affects of water rights diversions to the estimated flows were evaluated. Flow transfer statistics using drainage area ratio methods do not explicitly account for water diversions due to anthropomorphic activities in the ungaged streams. If the magnitude of water diversions are large or significant in an ungaged stream, it may introduce significant uncertainty or error to the transferred flow statistics from a nearby gaged stream.

The State Water Resources Control Board (SWRCB) evaluated the impact of water diversions on the SWRCB DAR flow estimation method in the North Coast region of the state. SWRCB concluded that the magnitude of diversions were too small to introduce any significant error to transferred flow statistics from gaged streams to ungaged streams (personal communication, Bill Cowen, SWRCB). Simply put, trying to quantify and remove the flow diversions from the DAR estimated flow statistics was deemed to be not worth the effort by SWRCB, because the effect of diversions on seasonal flow were so small.

In an effort to evaluate if this was likewise the case in the Lower Salinas Valley, water rights diversion data for the project area was obtained from the SWRCB's web-based GIS water rights mapping system- eWRIMS (waterrightsmaps.waterboards.ca.gov/ewrims). Table 4 shows the magnitude of water rights diversions on project area streams, as identified from eWRIMS. The magnitude of flow diversions appears to be insignificant and small enough relative to annual discharges, that the impact of flow diversions relative to the estimated stream flow statistics is presumed to be inconsequential.

Table 0-4. Project Area Water Diversions.

	Water Rights Diversions (annual acre feet)	Ave. Annual Flow (cfs)	Ave. Annual Discharge acre feet/year	**% of flow diverted annually**
Gabilan Creek @ USGS 11152600	129.1	4.86	3518.5	**3.67%**
Alisal Creek (estimated flow record)	42	4.22	3055.2	**1.37%**
Natividad Creek (estimated flow record)	8.7	1.31	948.4	**0.92%**

In summary, the flow estimates derived in this project report appear to be reasonable and consistent with respect to discharge estimates from other published sources, with continuous flow monitoring data, and with water rights stream flow diversion information.

Flow Duration Curves

Figure 0-6 and Figure 0-7 depict flow duration curves for the Salinas Reclamation Canal and Salinas River near Spreckles that were developed for this project report. The horizontal axis is essentially a flow frequency distribution, depicting the percentage of times a certain flow is exceeded on a daily basis. As such, highest flows are represented on the extreme left side of the horizontal axis, lowest flows recorded are represented the extreme right side of the axis.

For perennial streams, with sustained and broad flow conditions, the flow frequency is often split into five flow regimes, from highest to lowest flows. Central Coast streams in contrast, tend to be flashy, or have intermittent flows, with short durations of high flows following precipitation events, followed by long, extended periods of low or no flows. Because of the lack of sustained and broadly varying flow conditions, the flow frequencies developed for project area streams were limited to three flow regimes: high, moderate, and low (see Table 0-5. Hydrologic Flow Regime Classes).

Table 0-5. Hydrologic Flow Regime Classes

Flow Duration Interval	Hydrologic Flow Regime Class
0-10%	High Flows
10-40%	Moderate Flows
40-100%	Low Flows (or Dry)

Duration curves provide the benefit of considering the full range of flow conditions. Development of a flow duration curve is based on daily average stream discharge data and typically run from high flows to low flows along the x-axis, as illustrated in Figure 0-6 for the Salinas Reclamation Ditch. Figure 0-7 depicts the flow duration curve for Salinas River at Sprekles. Note that for the Salinas Reclamation Ditch the flow duration interval of forty is associated with a stream discharge of 3.4 cfs (i.e., forty percent of all observed stream discharge values equal or exceed 3.4 cfs).

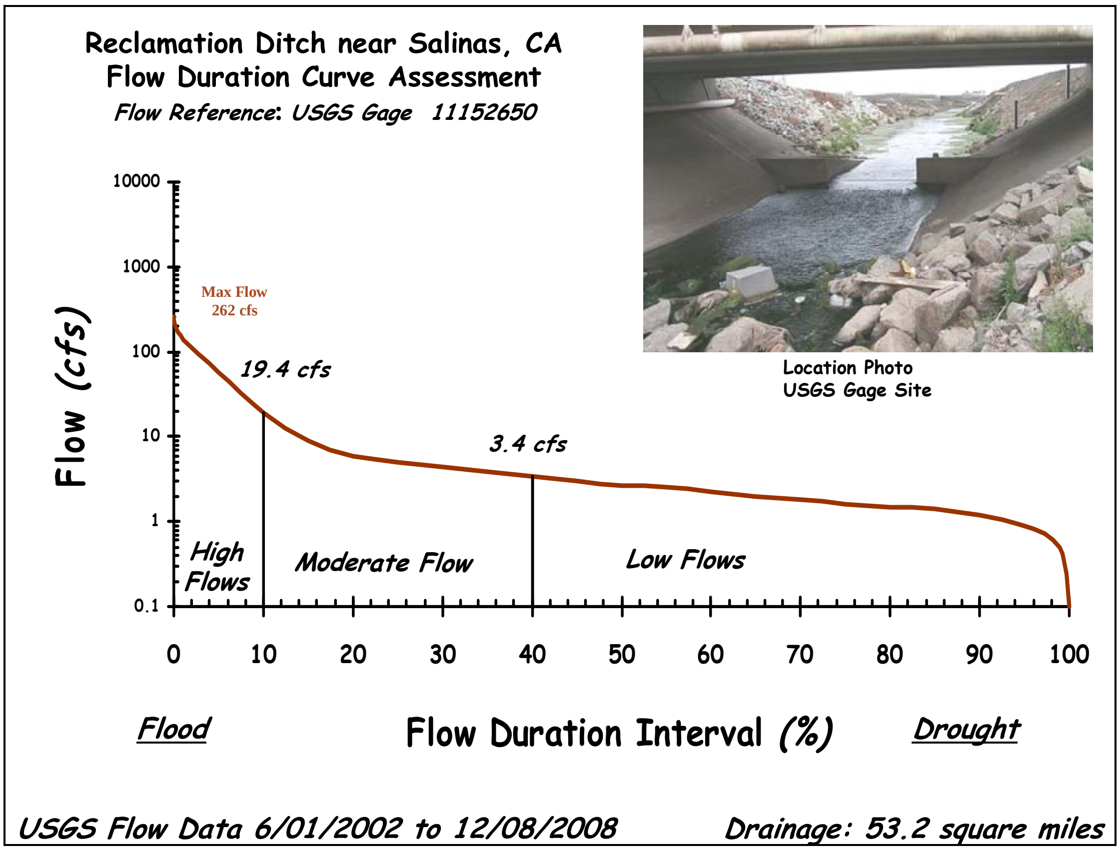


Figure 0-6. Flow duration curve for Salinas Reclamation Ditch.

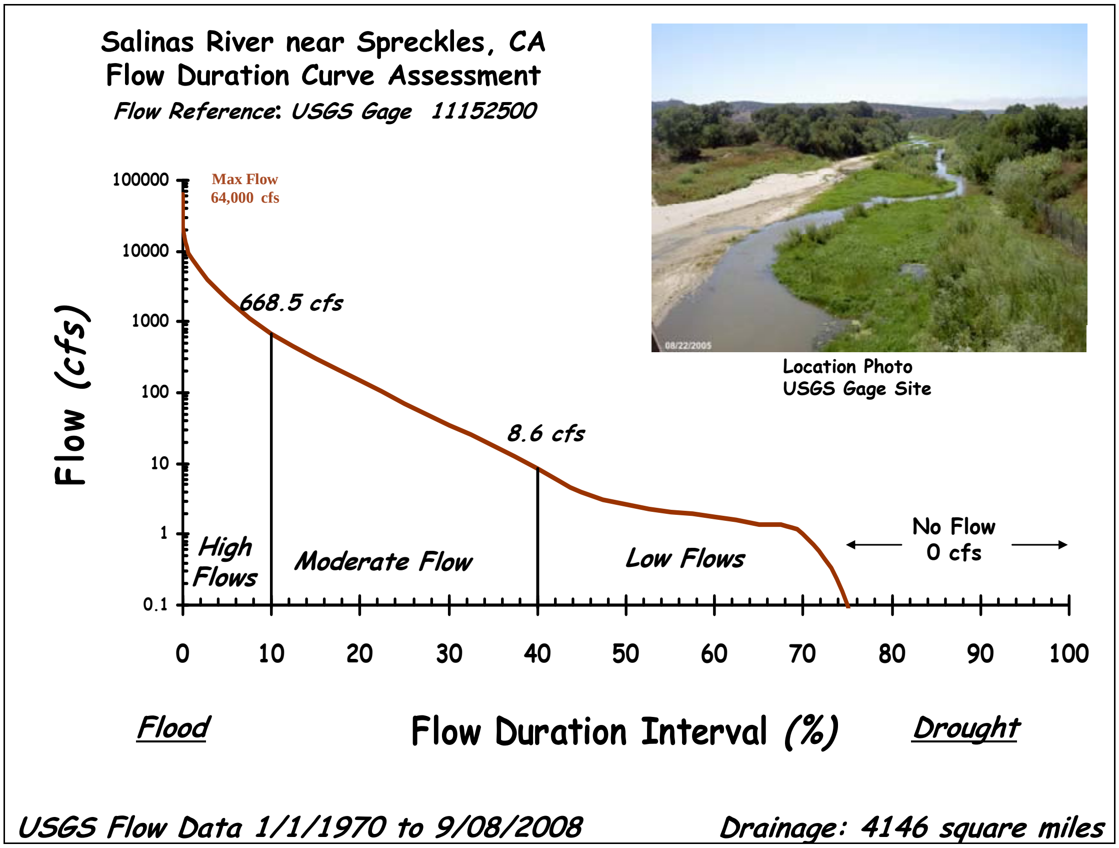


Figure 0-7. Flow duration curve for Salinas River near Spreckes.

The remainder of the flow duration curves developed for waterbodies in the project area are presented in later portions of this Appendix.

Load Duration Curves

A load duration curve is the allowable loading capacity of a pollutant, as a function of flow. The flow duration curve is transformed into a load duration curve by multiplying the flow by the water quality objective and a conversion factor. The water quality objective that staff selected to calculate the load duration curves was the guidance criteria of 0.025 µg/L for chlorpyrifos and 0.160 µg/L for diazinon (CDFG, 2000; CDFG, 2004). The load duration curves are thereby calculated by multiplying the flow at the given flow exceedance percentile, by the instantaneous chlorpyrifos or diazinon criterion times unit conversion factors; therefore the loading capacity for chlorpyrifos is:

Loading capacity (grams/day) = 0.025 µg/L (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 normal flows can be attributed to a combination of runoff and direct deposition.

The load duration curve is derived from the flow duration curves, water quality criteria, and water quality monitoring data. Points plotting above the curve represent exceedances of the water quality objective (e.g., allowable load, loading capacity). Those plotting below the curve represent compliance with standards and represent loads below the maximum loading capacity.

Salinas Reclamation Ditch load duration curves for chlorpyrifos and diazinon are shown in Figure 0-8 and Figure 0-9, respectively. Observed daily load values are computed using water quality data from the monitoring station located at Jon Road (309JON) and USGS observed flow for the day in which the water quality data was obtained. Water quality data collected between June 2002 and December 2008 were used to derive the observed daily load values (plotted as blue diamonds on the graph). The curve (brown line) represents the loading capacity in grams per day. For example, the chlorpyrifos loading capacity at a flow rate of 19.4 cubic feet per second is 1.2 grams of chlorpyrifos per day. Points above the curve on the left side of the figure are indicative of load exceedances during wet weather conditions (higher flows) and when data points plot above the curve to the right side it indicates load exceedances during dry weather conditions (lower flows). For the Reclamation Ditch the assimilative capacity for both chlorpyrifos and diazinon is exceeded under all flow conditions.

For the Salinas Reclamation Ditch, storm water management would be a logical activity to target for development of management strategies that address high flow water quality criteria exceedances. In addition, due to fairly constant high load across the moderate and low flow condittions, irrigation tailwater management and dry-season urban runoff reduction would be a logical management stategy.

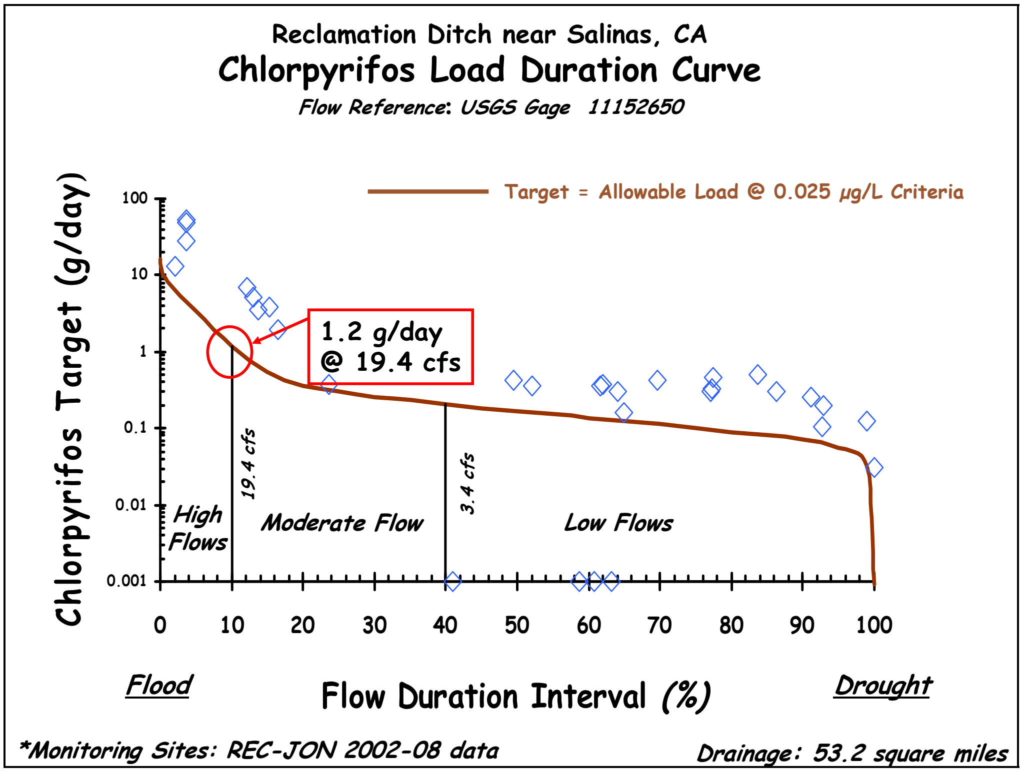


Figure 0-8. Chlorpyrifos load duration curve for Salinas Reclamation Ditch.

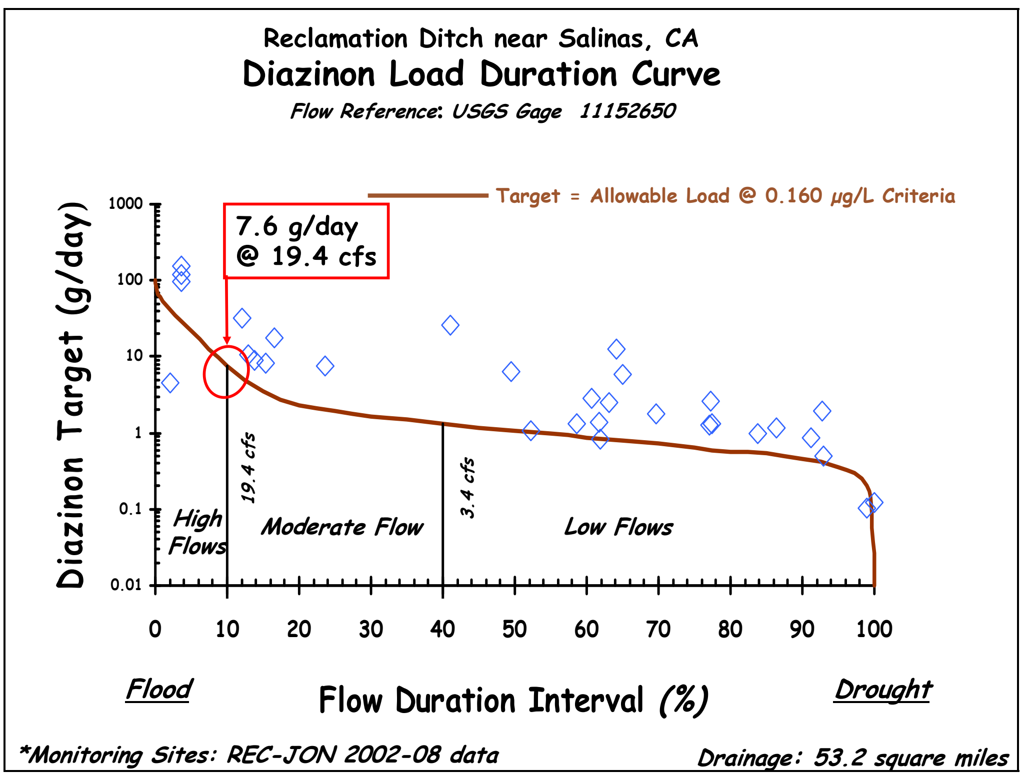


Figure 0-9. Diazinon load duration curve for Salinas Reclamation Ditch.

Figure 0-10 and Figure 0-11 show chlorpyrifos and diazinon load duration curves for Salinas River near Sprecks, respectively. As mentioned earlier in the flow duration section, no flow may be observed at this station. Staff used water quality data from from a site located near the USGS gage (CCWQP-SSP) and from at a monitoring site located at Davis Road (309DAV), approximately 1.5 miles downstream of the USGS gage. As shown on the graph, some samples were obtained from the downstream monitoring station when there was no flow at the Spreckles gage upstream. This segment of the Salinas River receives irrigation return flows resulting in flows that may be sampled at the 309DAV location even though no flow is observed at the USGS gage station. Under these conditions the flow duration curve indicates no load, due to no flow. However, five of seven samples exceeded the chlorpyrifos criteria and one of seven samples exceeded the diazinon criteria.

Chlorpyrifos loading capacity is generally exceeded in moderate to low flow conditions.

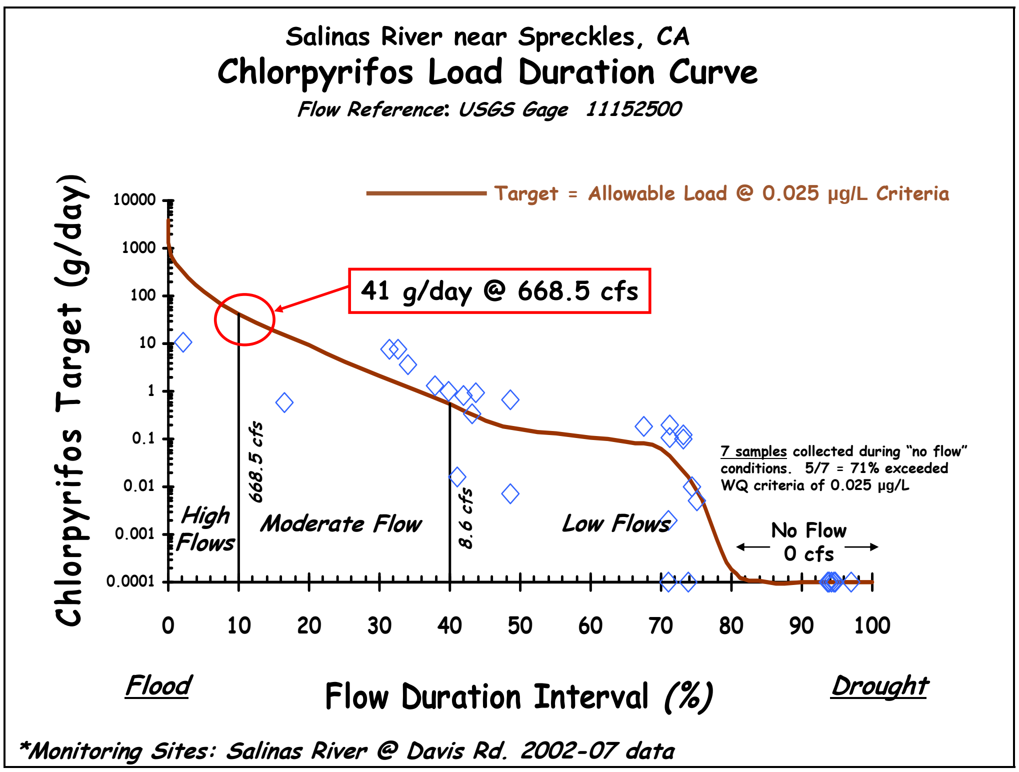


Figure 0-10. Chlorpyrifos load duration curve for Salinas River near Spreckles.

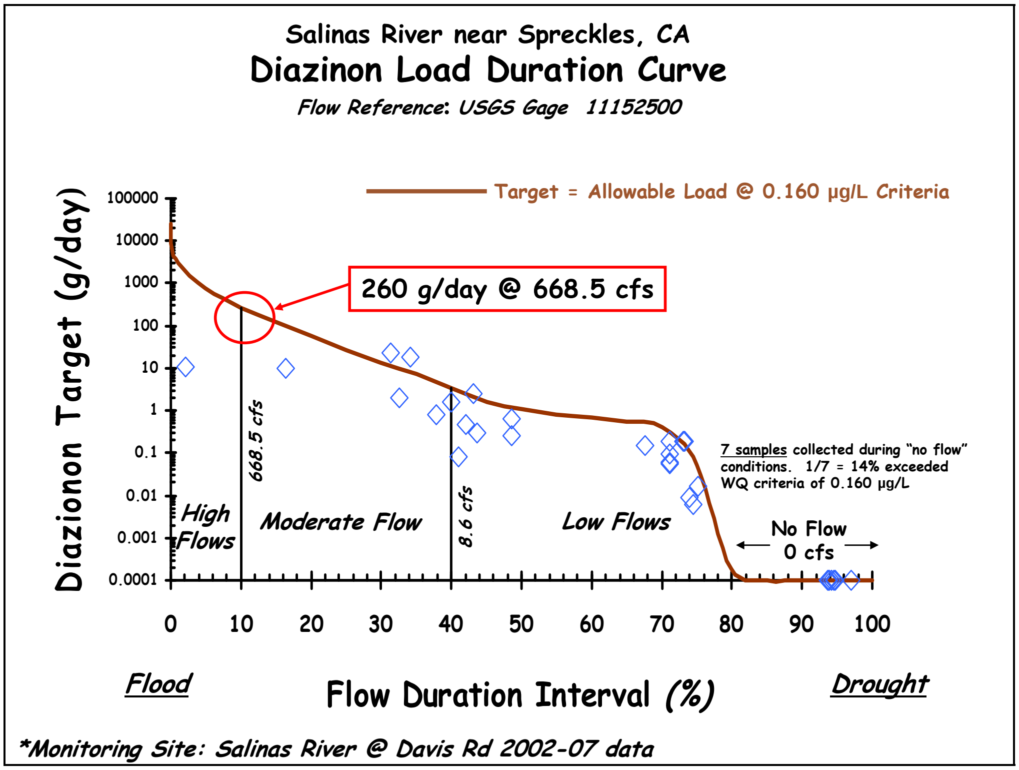


Figure 0-11. Diazinon load duration curve for Salinas River near Spreckles.

The diazinon loading capacity is ocassionally exceeded at moderate and low flow conditions. Water quality samples obtained when no flow was recorded at the USGS Spreckles gage resulted in one out of seven exceedances of the diazinon criteria.

The remainder of the load duration curves developed for waterbodies in the project area are presented in later portions of this Appendix.

Load Duration Curves and Potential Contributing Sources

A load duration curve (LDC) considers how flow conditions relate to a variety of pollutant sources, and therefore load duration curves can be useful in differentiating between loading from point and nonpoint sources (see Table 0-6). For example, excursions above the water quality objective at high to moderate flows suggest that non-point sources and stormwater flows are potential sources. Under low flow conditions excursions may be due to direct discharges or irrigation return flows.

Table 0-6. Potential Relationship Between Load Duration Curve and Contributing Sources

Contributing Source	Flow Regime-Load Duration Curve		
	High Flow	Moderate Flow	Low Flow
Direct Point Sources (pipe discharge, etc)			*H*
Direct Delivery (irrigation return flows, spills)		*M*	*H*
Sediment Resuspension	*H*	*M*	
Stormwater: Agricultureal runoff	*H*	*H*	

-Note: Color Shading = Potential relative importance of source area to contribute loads under given hydrologic condition **(H=High; M=Medium)**
-Figure adapted from USEPA, Bruce Cleland, and Oregon Dept. of Environmental Quality

The load duration curve itself can be established as the TMDL. The TMDL would be dynamic and based on flow. Essentially, the loading capacity is the load corresponding to the flow selected along the curve. Alternatively, a static TMDL can be established based on the area beneath the TMDL curve, representing the loading capacity of the stream. The difference between this area and the area representing current loading conditions is the load that must be reduced to meet water quality standards.

Percent Reduction Goals

This section presents the methods that staff used to derive existing loads, allowable loads (loading capacity), and percent reduction goals for the Salinas Reclamation Ditch and the Salinas River. As part of the load duration analysis, staff calculated "percent reduction goals" for informational purposes for responsible parties and to illustrate the difference between existing conditions and the loading capacity at the time the streams were sampled.

A TMDL provides a foundation for identifying, planning, and implementing water quality-based controls to reduce both point and nonpoint source pollution. The data provided in this appendix provides a representation of existing chlorpyrifos and diazinon loads in the waterbodies over a range of hydrologic conditions. Therefore, the percent reduction *should not be viewed as the TMDL* but rather a goal to work towards in the implementation phase of the TMDL process with the ultimate goal being the restoration and maintenance of in-stream water quality so that beneficial uses are met. The percent reduction can be calculated as:

Percent reduction = [(existing load) - (allowable load)/(existing load)] *100

Determination of Loading Capacity and Existing Load

This section presents the methods used to derive load duration curves and presents estimates of existing loading for the Reclamation Canal and for the Salinas River impaired waterbodies in the project area. Additional waterbodies are included in later portions of this appendix.

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 and diazinon concentrations under each hydrologic flow regime class multiplied by the flow at the middle of the flow exceedance percentile. The 90 percentile of measure loads is a more conservative estimate than using the median. For example, in calculating the existing loading under high flow conditions (flow exceedance percentiles = 0-10% percent), the 5th percentile exceedance flow is multiplied by the 90th percentile of pesticide concentrations measured within the 0-10th percentile flow class. Similarly, the middle percentile (25%) of the moderate flow regime was used, to assess existing loads at moderate flow (10-40th percentile flow class). Low flows were handled a little differently. Many project area streams are ephemeral, and flow is not observed 100% of the time. In addition, water quality data is rarely available for the 80 to 100th percentile flows, which correspond either to dry stream bed conditions, or extremely limited flows. Therefore, the existing loading at low flow conditions is multiplied by the flow at the 60th percentile flow.

For a graphical example of how existing loads and flow-based assimilative capacities (TMDLs) are determined, refer to Figure 0-12.

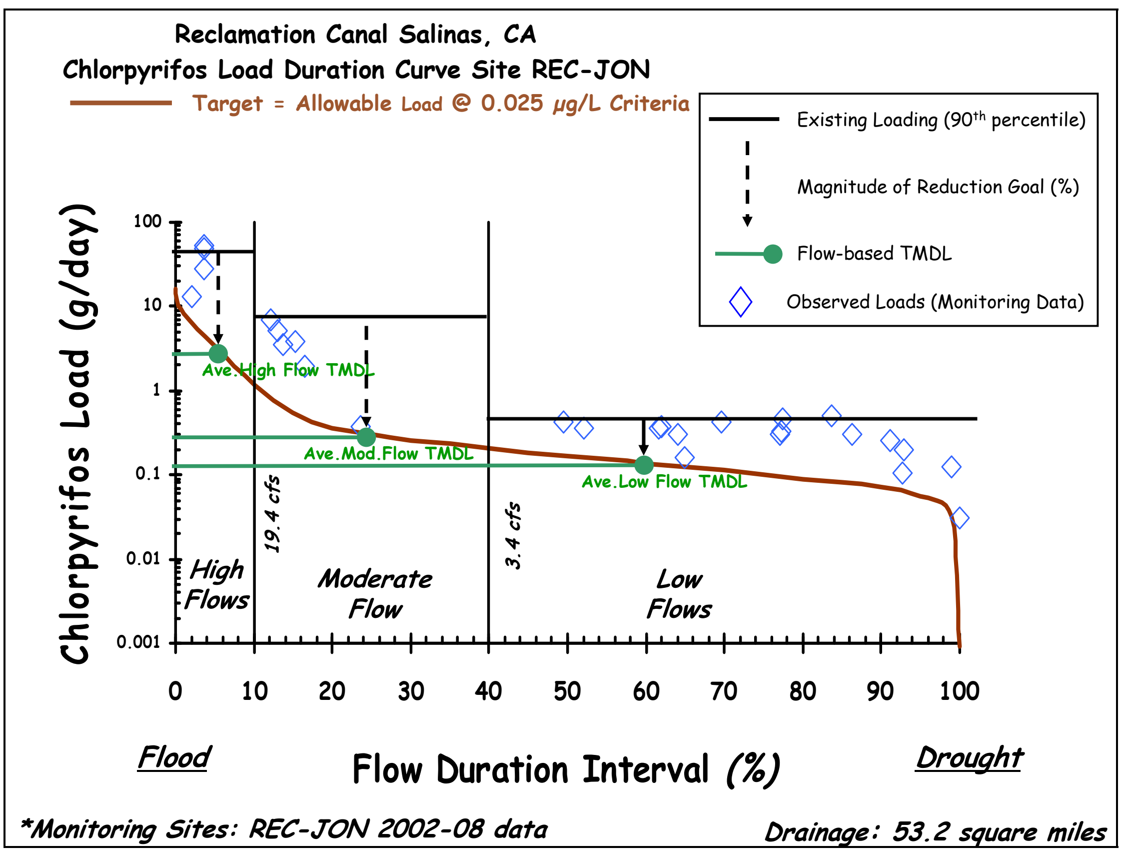


Figure 0-12. Derivation of existing load, flow-based assimilative capacity, and percent reduction goals.

Staff used the load duration curve methodology to derive estimated existing loading, allowable load, and percent reductions necessary for achieving the TMDLs for the Salinas Reclamation Ditch and Salinas River as presented in Table 0-7 and Table 0-8, respectively.

Table 0-7. Estimated existing loads, allowable loads, and % load reduction goals for Salinas Reclamation Ditch at Jon Road.

Reference flow (exceedance % in flow regime)	Existing Load: 90th percentile of loads within flow range (grams/day)	Allowable load for the reference flow percentile (grams/day)	% Load reduction goal
Chlorpyrifos			
5 %	51.45	3.44	93
25 %	6.09	0.30	95
60 %	0.43	0.14	68
Diazinon			
5 %	143.20	21.99	85
25 %	25.03	1.94	92
60 %	6.34	0.87	86

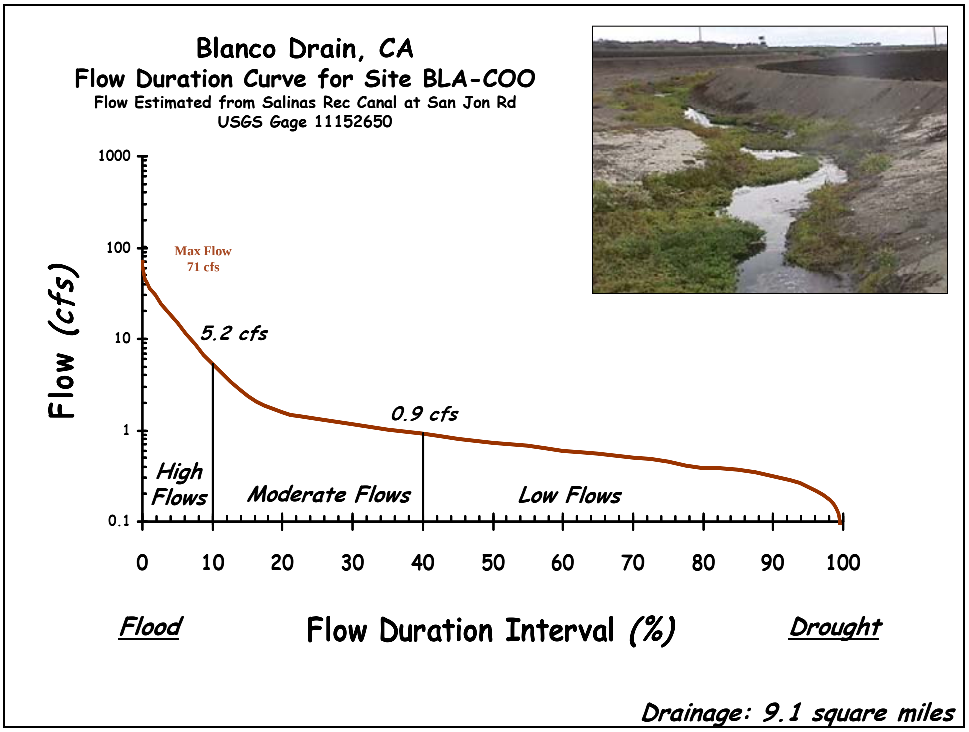
Table 0-8. Estimated existing loading, allowable load, and % reduction for Salinas River near Spreckles

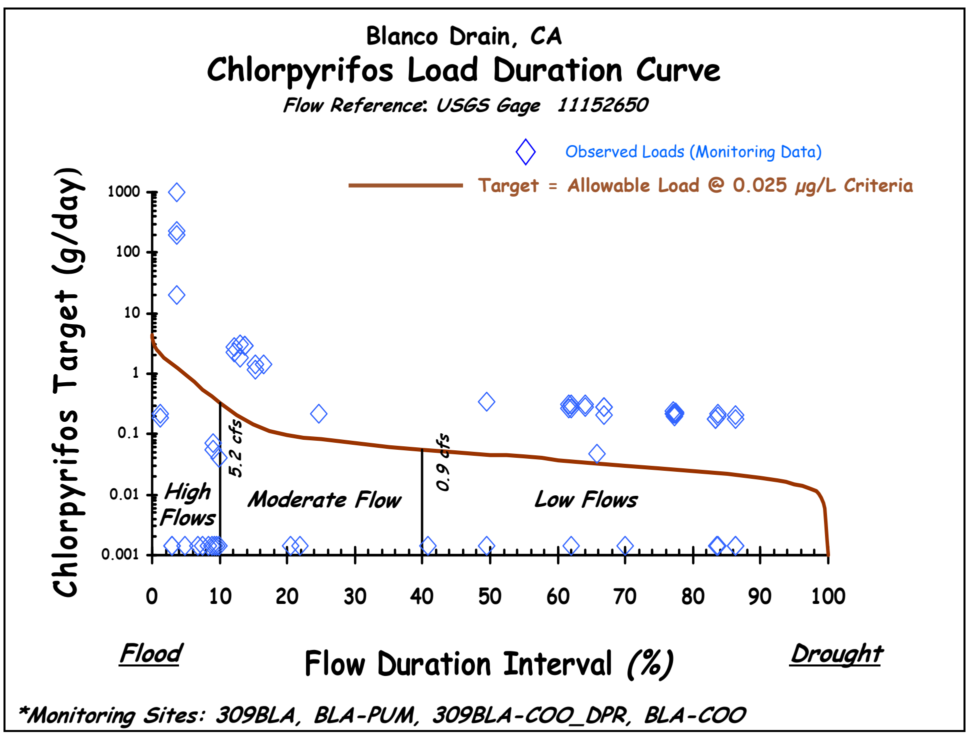
Reference flow (exceedance % in flow regime)	Existing Load: 90th percentile of loads within flow range (grams/day)	Allowable load for the reference flow percentile (grams/day)	% Load reduction goal
Chlorpyrifos			
5 %	10.89	123.20	N/A[a]
25 %	7.84	4.28	45
60 %	0.74	0.11	85
Diazinon			
5 %	10.89	788.50	N/A[a]
25 %	20.29	27.40	N/A[b]
60 %	0.55	0.70	N/A[b]

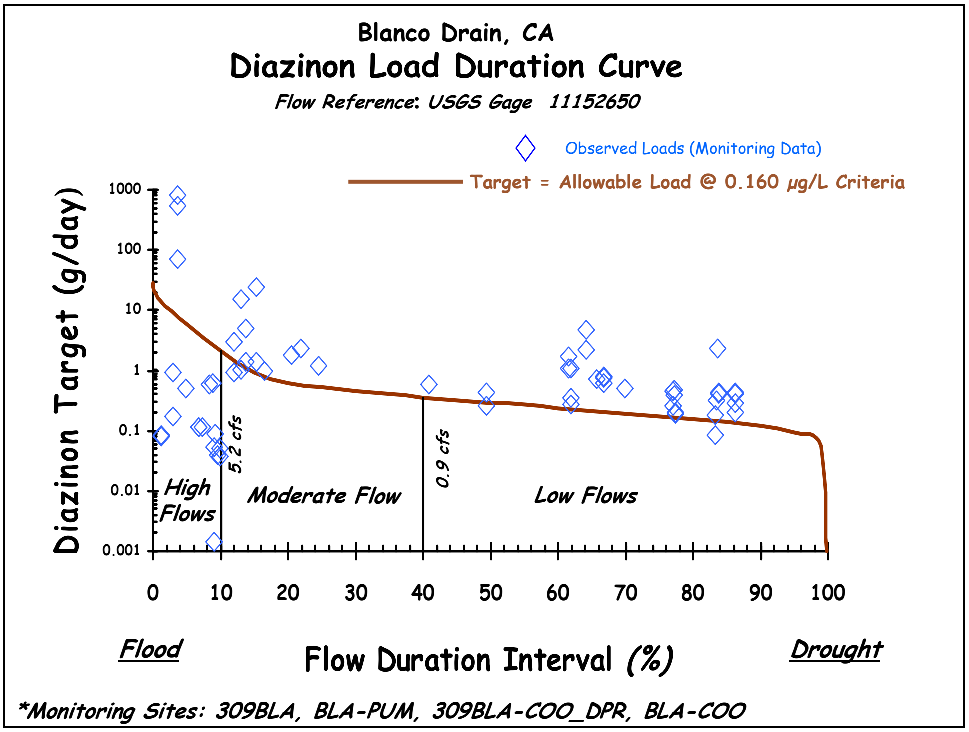
[a] Not applicable. Only one sample obtained for load estimation within reference flow regime.
[b] Not applicable. Existing estimated load below allowable load for reference flow regime.

For coastal confluence waterbodies where daily flow information is not available and cannot be estimated (Salinas River Lagoon, and Old Salinas River), a temporal/seasonal-based TMDL is provided, rather than a flow-based load expression.

Load duration curves, allowable load, and percent reductions for the remaining waterbodies in the project area are presented below.

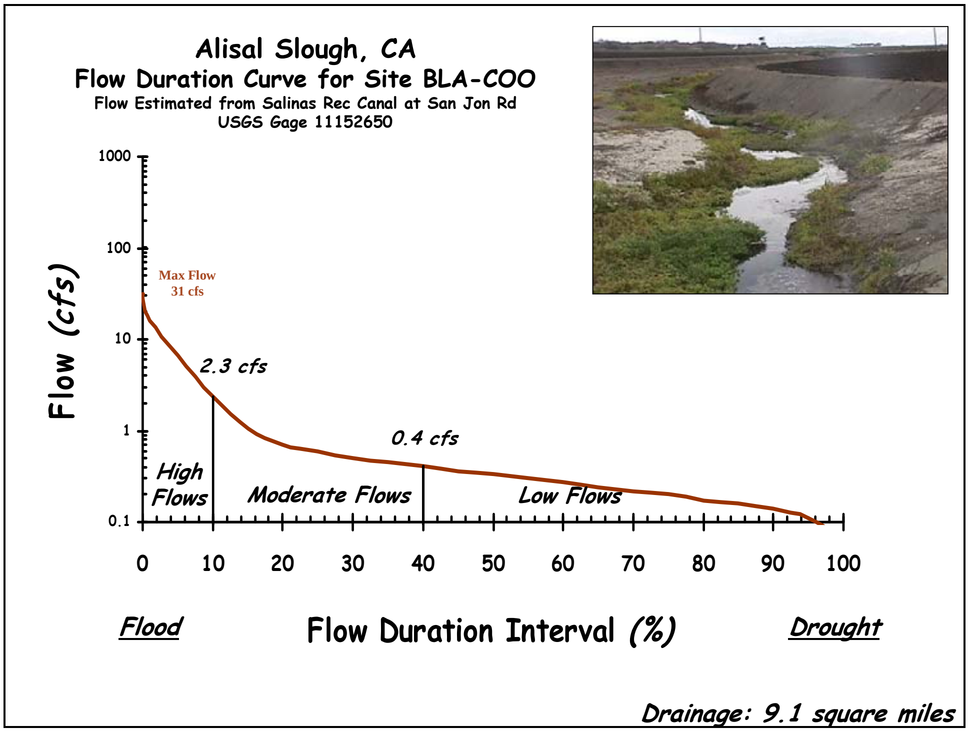

Blanco Drain, CA
Flow Duration Curve for Site BLA-COO
Flow Estimated from Salinas Rec Canal at San Jon Rd
USGS Gage 11152650
Flow (cfs)
1000
100
10
1
0.1
Max Flow
71 cfs
5.2 cfs
0.9 cfs
High Flows
Moderate Flows
Low Flows
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
Drainage: 9.1 square miles

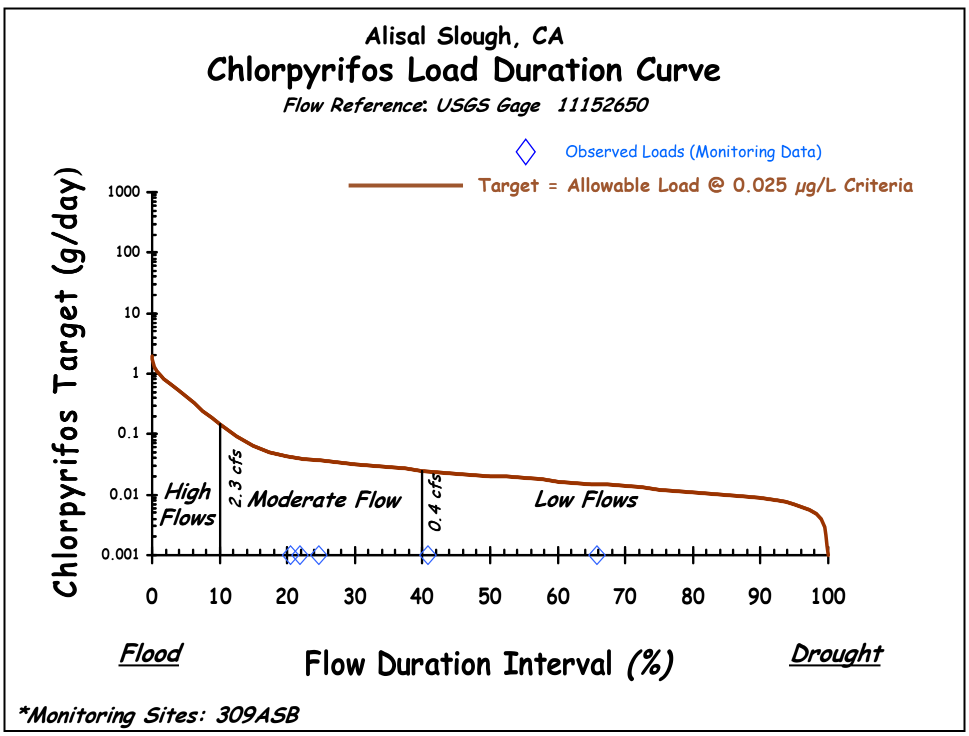

Blanco Drain, CA
Chlorpyrifos Load Duration Curve
Flow Reference: USGS Gage 11152650
Observed Loads (Monitoring Data)
Target = Allowable Load @ 0.025 µg/L Criteria
Chlorpyrifos Target (g/day)
1000
100
10
1
0.1
0.01
0.001
5.2 cfs
0.9 cfs
High Flows
Moderate Flow
Low Flows
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
*Monitoring Sites: 309BLA, BLA-PUM, 309BLA-COO_DPR, BLA-COO

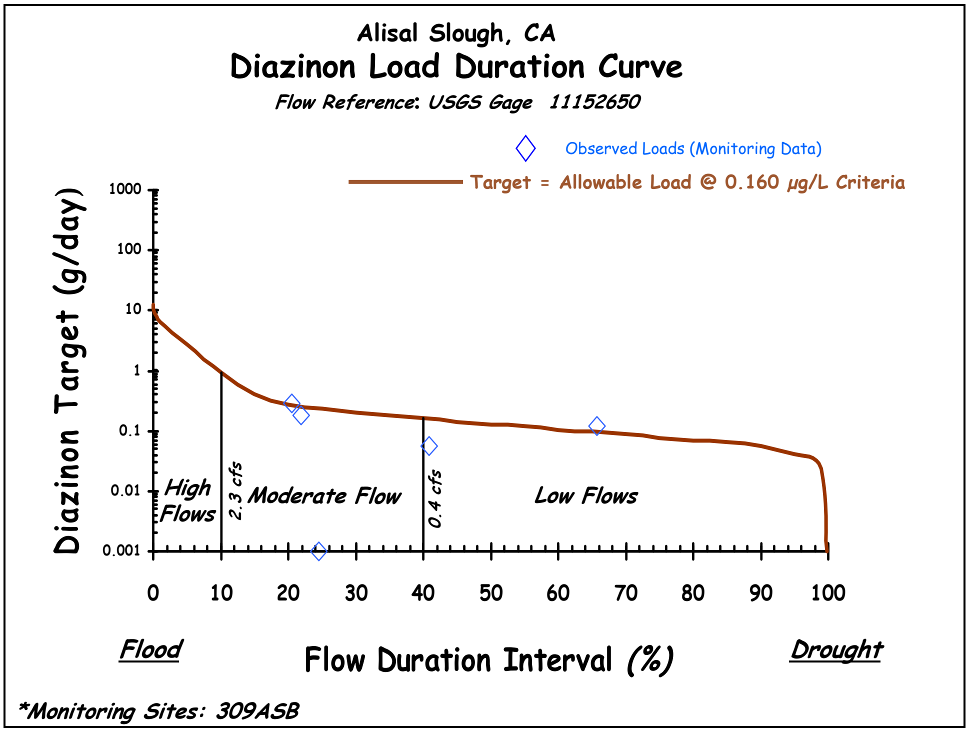


Blanco Drain

Reference flow (exceedance % in flow regime)	Existing Load for Chlorpyrifos: 90th percentile of Chlorpyrifos loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Chlorpyrifos
5 %	202.8719	0.9276	99.54
25 %	2.9195	0.0817	97.20
60 %	0.3035	0.0368	87.86
Reference flow (exceedance % in flow regime)	Existing Load for Diazinon: 90th percentile of Diazinon loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Diazinon
5 %	168.3626	5.9369	96.47
25 %	14.5341	0.5229	96.40
60 %	1.7441	0.2358	86.48

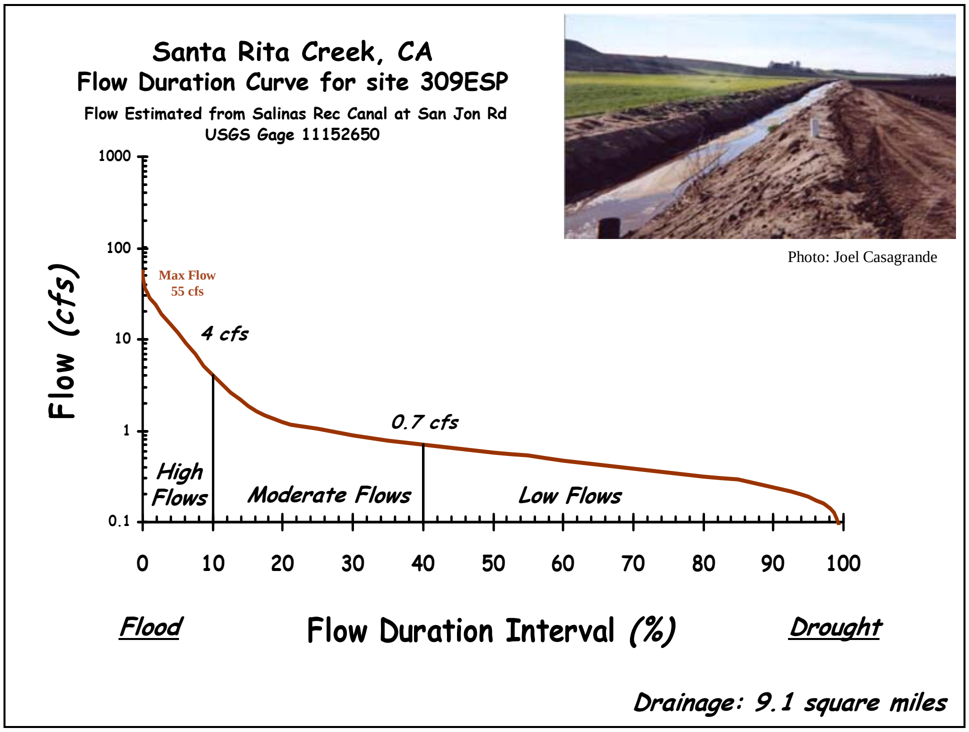

Alisal Slough, CA
Flow Duration Curve for Site BLA-COO
Flow Estimated from Salinas Rec Canal at San Jon Rd
USGS Gage 11152650
Flow (cfs)
Max Flow
31 cfs
2.3 cfs
0.4 cfs
High Flows
Moderate Flows
Low Flows
Flood
Flow Duration Interval (%)
Drought
Drainage: 9.1 square miles

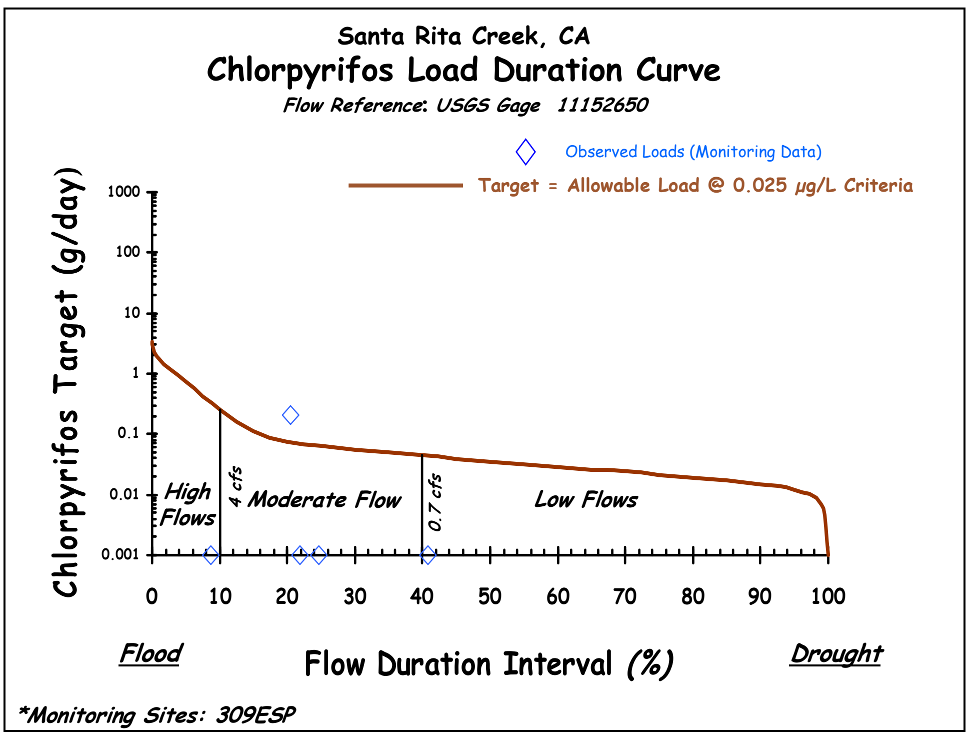

Alisal Slough, CA
Chlorpyrifos Load Duration Curve
Flow Reference: USGS Gage 11152650
Observed Loads (Monitoring Data)
Target = Allowable Load @ 0.025 µg/L Criteria
Chlorpyrifos Target (g/day)
2.3 cfs
0.4 cfs
High Flows
Moderate Flow
Low Flows
Flood
Flow Duration Interval (%)
Drought
*Monitoring Sites: 309ASB

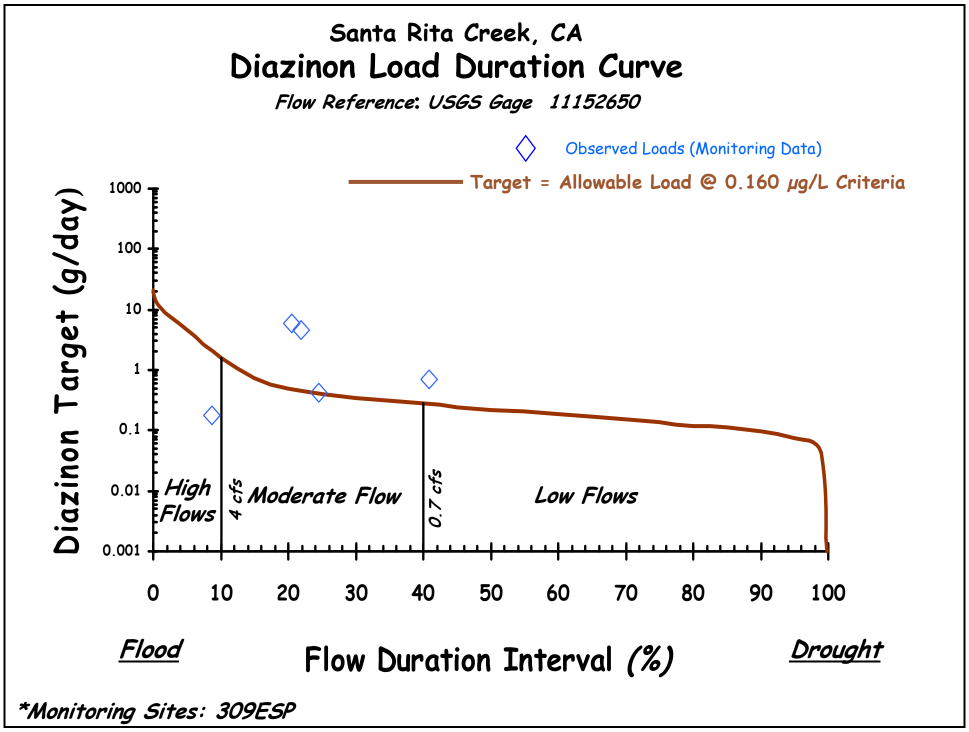


Alisal Slough

Reference flow (exceedance % in flow regime)	Existing Load for Chlorpyrifos: 90th percentile of Chlorpyrifos loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Chlorpyrifos
5 %	N/A	0.4123	N/A
25 %	0.0002	0.0363	N/A
60 %	0.0001	0.0164	N/A
Reference flow (exceedance % in flow regime)	**Existing Load for Diazinon: 90th percentile of Diazinon loads within flow range (grams/day)**	**Allowable load for the Reference flow percentile (grams/day)**	**% Load Reduction Diazinon**
5 %	N/A	2.6386	N/A
25 %	0.2608	0.2324	10.89
60 %	0.1154	0.1048	9.14

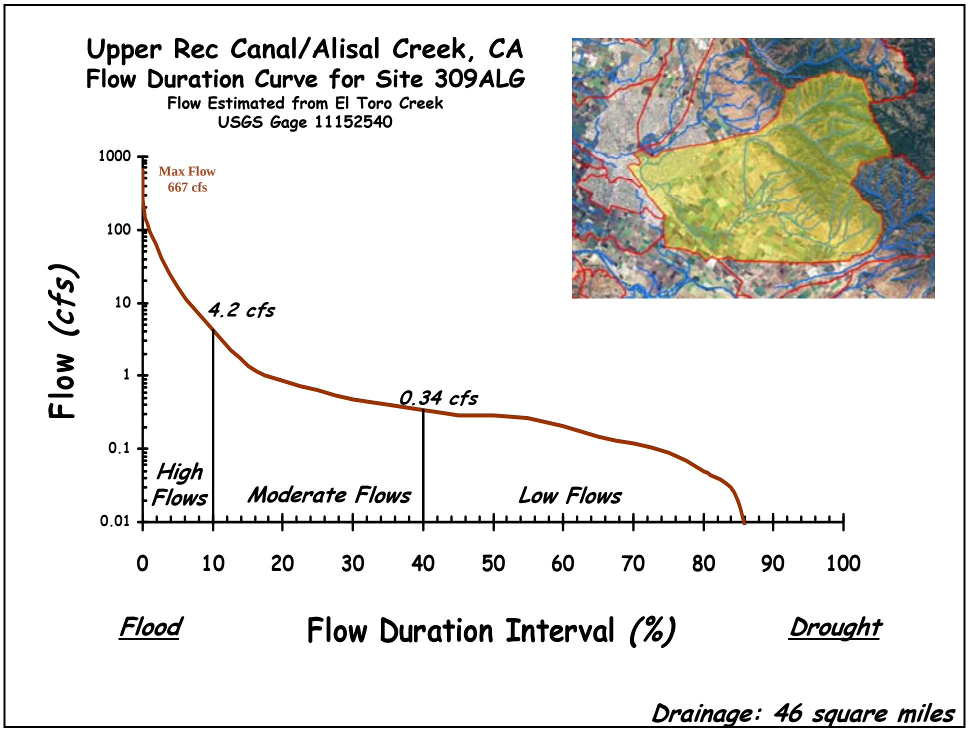

Santa Rita Creek, CA
Flow Duration Curve for site 309ESP
Flow Estimated from Salinas Rec Canal at San Jon Rd
USGS Gage 11152650
Photo: Joel Casagrande
Flow (cfs)
1000
100
10
1
0.1
Max Flow
55 cfs
4 cfs
0.7 cfs
High Flows
Moderate Flows
Low Flows
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
Drainage: 9.1 square miles

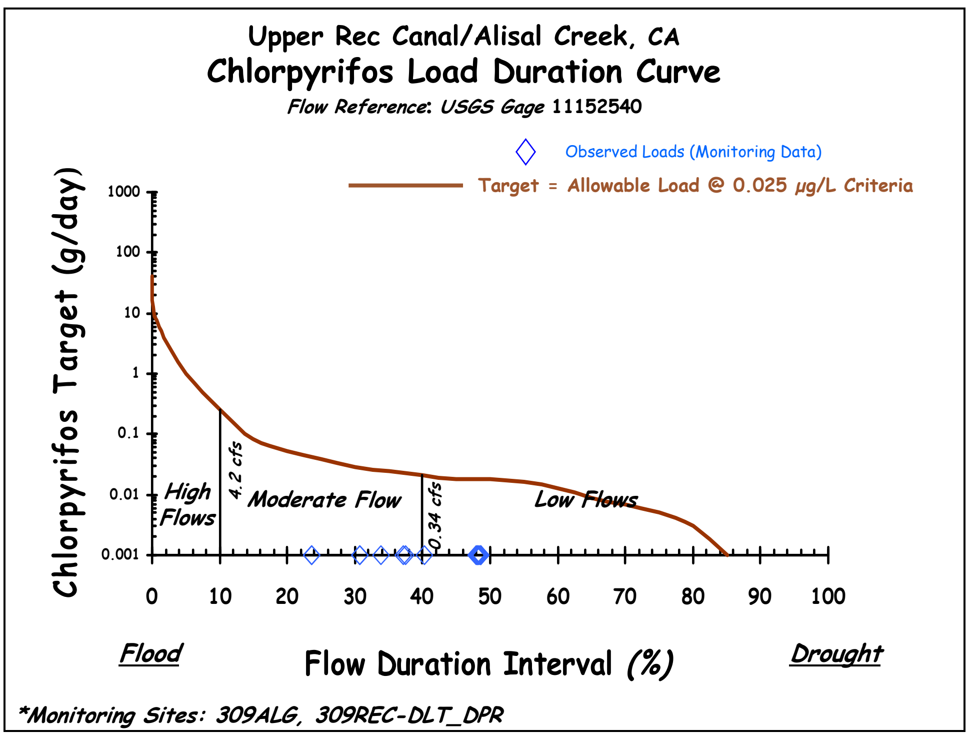

Santa Rita Creek, CA
Chlorpyrifos Load Duration Curve
Flow Reference: USGS Gage 11152650
Observed Loads (Monitoring Data)
Target = Allowable Load @ 0.025 µg/L Criteria
Chlorpyrifos Target (g/day)
1000
100
10
1
0.1
0.01
0.001
High Flows
4 cfs
Moderate Flow
0.7 cfs
Low Flows
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
*Monitoring Sites: 309ESP

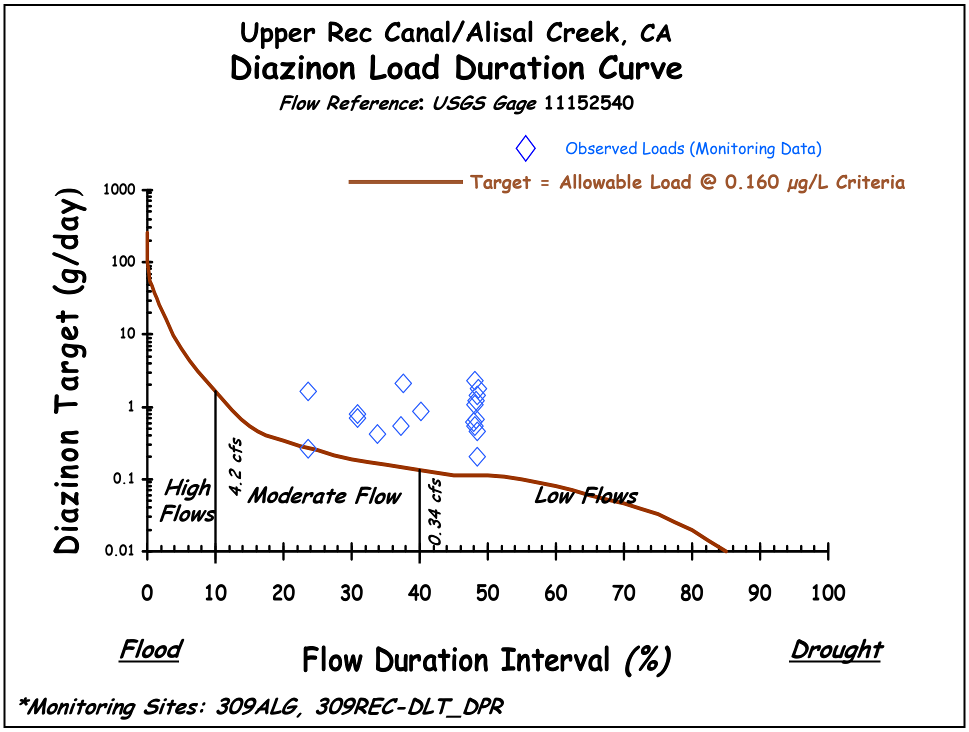


Santa Rita Creek

Reference flow (exceedance % in flow regime)	Existing Load for Chlorpyrifos: 90th percentile of Chlorpyrifos loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Chlorpyrifos
5 %	0.0001	0.7215	N/A
25 %	0.1662	0.0636	61.76
60 %	0.00017	0.0287	N/A
Reference flow (exceedance % in flow regime)	**Existing Load for Diazinon: 90th percentile of Diazinon loads within flow range (grams/day)**	**Allowable load for the Reference flow percentile (grams/day)**	**% Load Reduction Diazinon**
5 %	0.1735	4.6176	N/A
25 %	5.6790	0.4067	92.84
60 %	0.7016	0.1834	73.86


Upper Rec Canal/Alisal Creek, CA
Flow Duration Curve for Site 309ALG
Flow Estimated from El Toro Creek
USGS Gage 11152540
Max Flow
667 cfs
4.2 cfs
0.34 cfs
High Flows
Moderate Flows
Low Flows
Flow (cfs)
1000
100
10
1
0.1
0.01
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
Drainage: 46 square miles

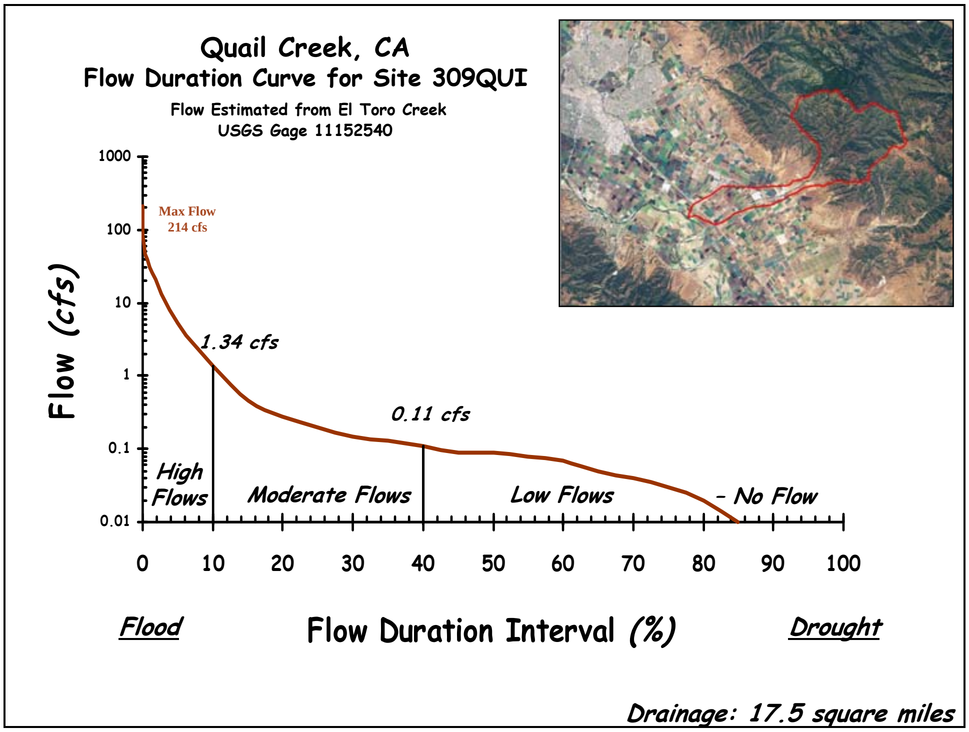

Upper Rec Canal/Alisal Creek, CA
Chlorpyrifos Load Duration Curve
Flow Reference: USGS Gage 11152540
Observed Loads (Monitoring Data)
Target = Allowable Load @ 0.025 µg/L Criteria
Chlorpyrifos Target (g/day)
1000
100
10
1
0.1
0.01
0.001
High Flows
4.2 cfs
Moderate Flow
0.34 cfs
Low Flows
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
*Monitoring Sites: 309ALG, 309REC-DLT_DPR

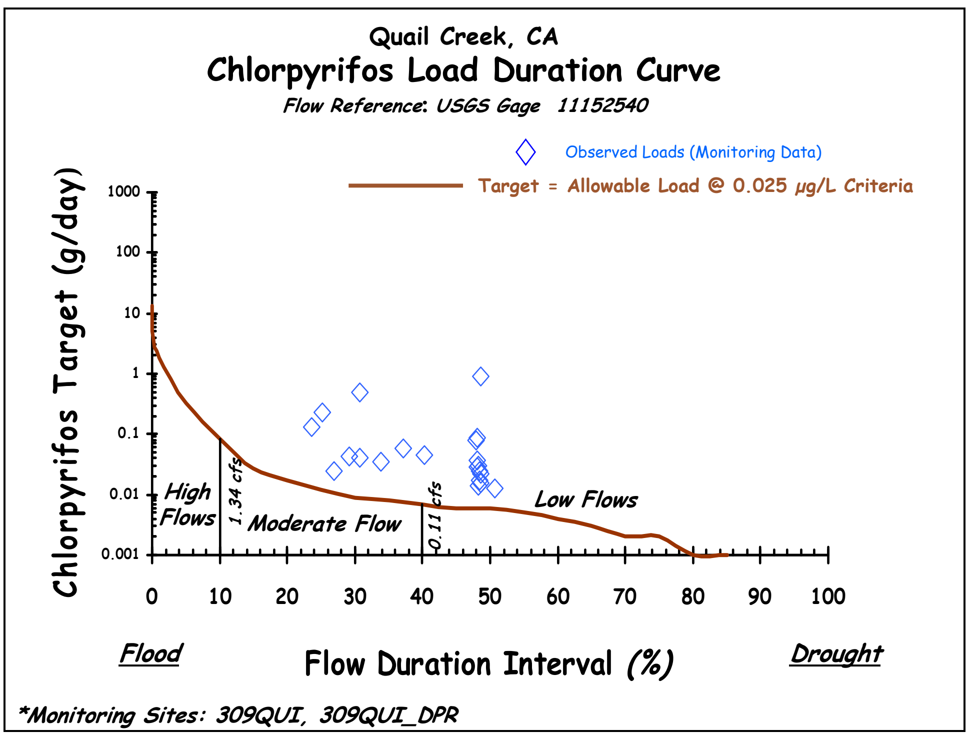


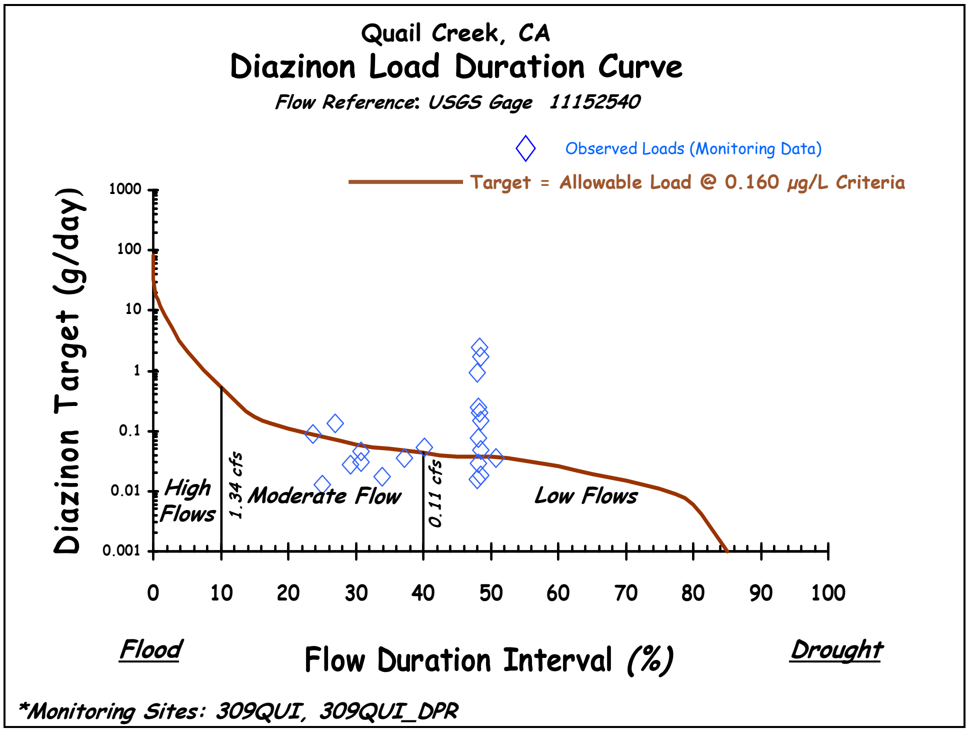
Upper Rec Canal/Alisal Creek

Reference flow (exceedance % in flow regime)	Existing Load for Chlorpyrifos: 90th percentile of Chlorpyrifos loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Chlorpyrifos
5 %	N/A	1.0137	N/A
25 %	0.0002	0.0387	N/A
60 %	0.0001	0.0126	N/A

Reference flow (exceedance % in flow regime)	Existing Load for Diazinon: 90th percentile of Diazinon loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Diazinon
5 %	N/A	6.4876	N/A
25 %	1.8390	0.2477	86.53
60 %	1.7848	0.0803	95.50

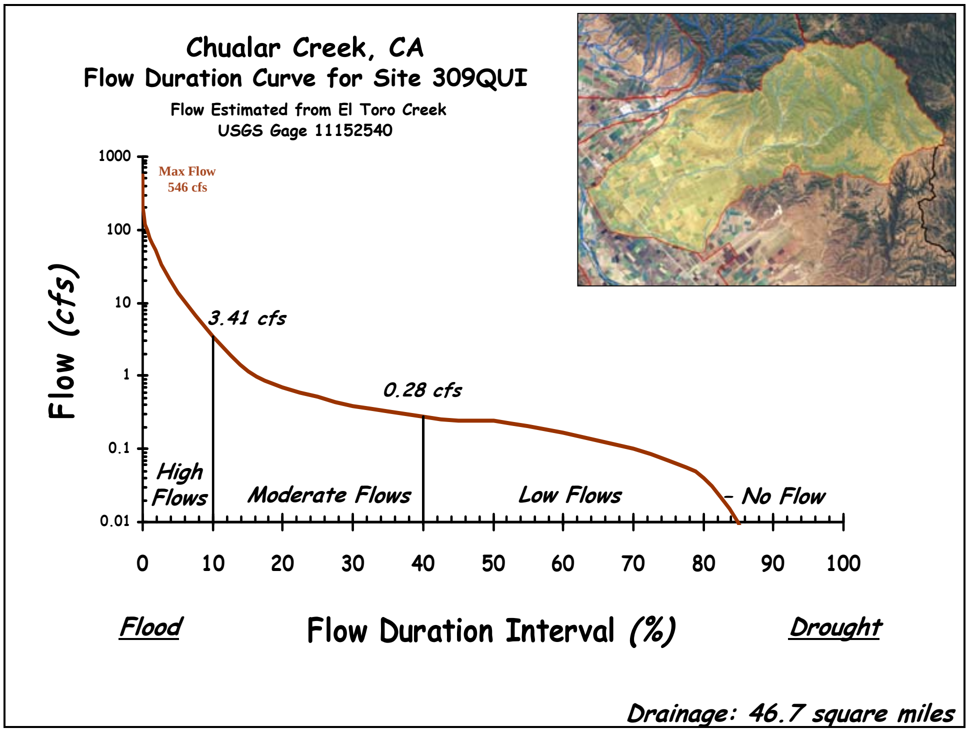

Quail Creek, CA
Flow Duration Curve for Site 309QUI
Flow Estimated from El Toro Creek
USGS Gage 11152540
Max Flow
214 cfs
1.34 cfs
0.11 cfs
High Flows
Moderate Flows
Low Flows
No Flow
Flow (cfs)
Flood
Flow Duration Interval (%)
Drought
Drainage: 17.5 square miles

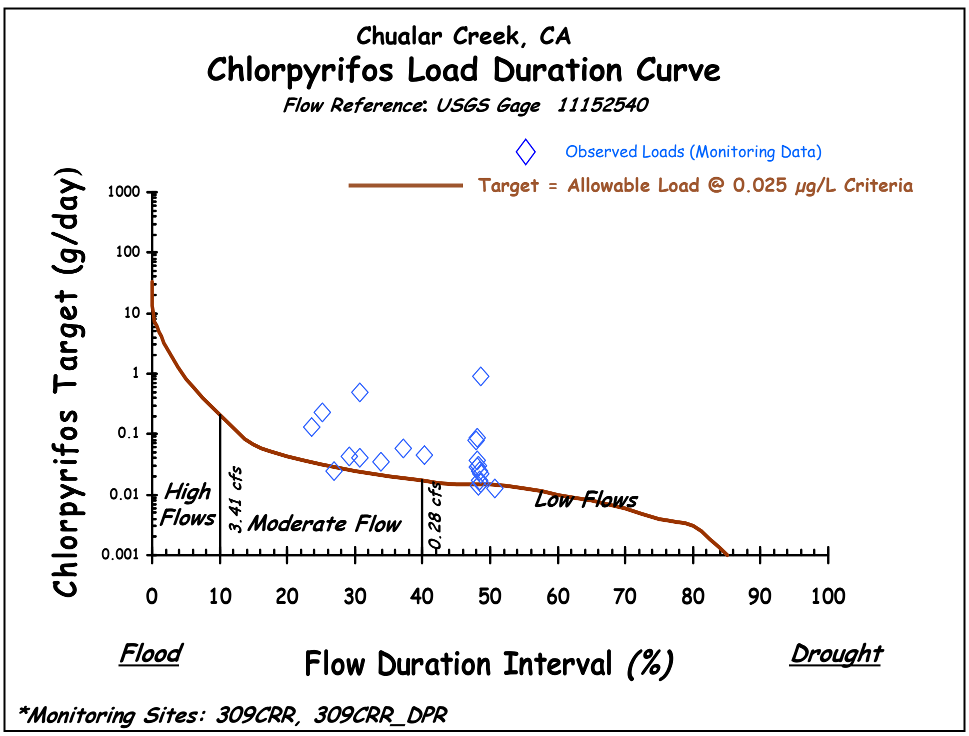

Quail Creek, CA
Chlorpyrifos Load Duration Curve
Flow Reference: USGS Gage 11152540
Observed Loads (Monitoring Data)
Target = Allowable Load @ 0.025 µg/L Criteria
Chlorpyrifos Target (g/day)
High Flows
1.34 cfs
Moderate Flow
0.11 cfs
Low Flows
Flood
Flow Duration Interval (%)
Drought
*Monitoring Sites: 309QUI, 309QUI_DPR

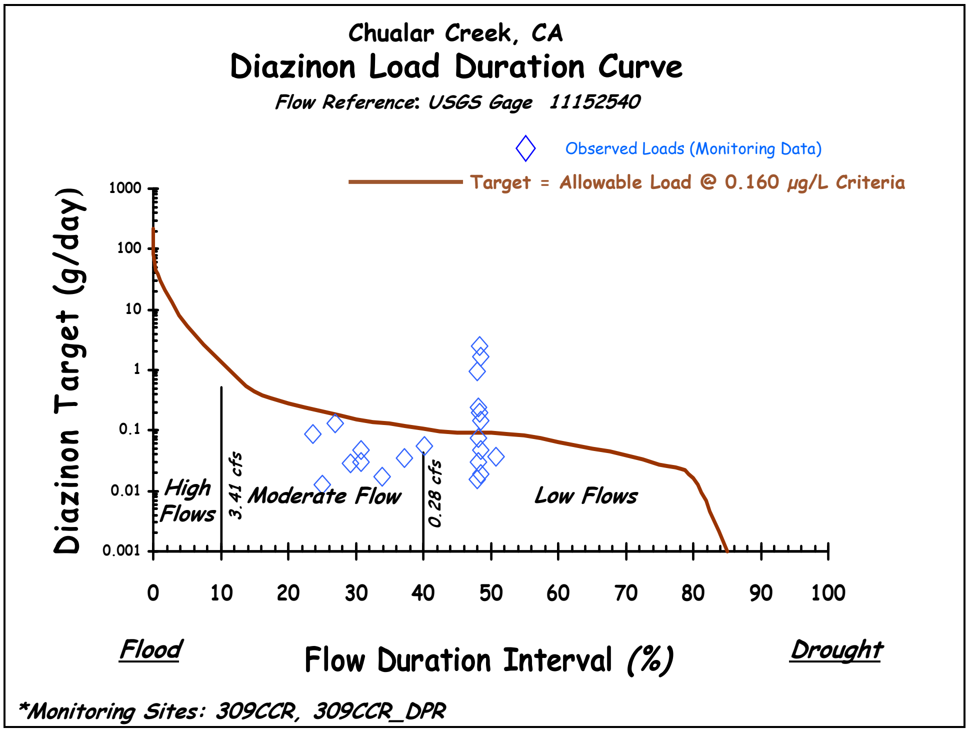


Quail Creeek

Reference flow (exceedance % in flow regime)	Existing Load for Chlorpyrifos: 90th percentile of Chlorpyrifos loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Chlorpyrifos
5 %	N/A	0.3260	N/A
25 %	0.3066	0.0124	95.94
60 %	0.0846	0.0040	95.23
Reference flow (exceedance % in flow regime)	**Existing Load for Diazinon: 90th percentile of Diazinon loads within flow range (grams/day)**	**Allowable load for the Reference flow percentile (grams/day)**	**% Load Reduction Diazinon**
5 %	N/A	2.0866	N/A
25 %	0.0900	0.0797	11.45
60 %	1.4588	0.0258	98.23

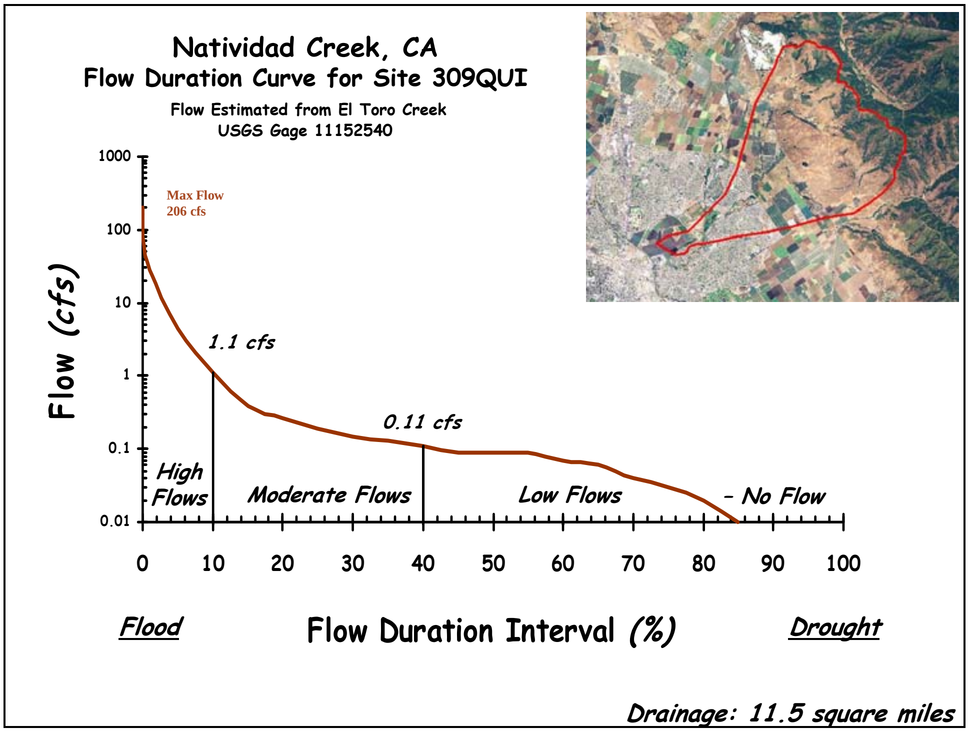

Chualar Creek, CA
Flow Duration Curve for Site 309QUI
Flow Estimated from El Toro Creek
USGS Gage 11152540
Max Flow
546 cfs
Flow (cfs)
1000
100
10
1
0.1
0.01
3.41 cfs
0.28 cfs
High Flows
Moderate Flows
Low Flows
No Flow
0 10 20 30 40 50 60 70 80 90 100
Flood
Flow Duration Interval (%)
Drought
Drainage: 46.7 square miles

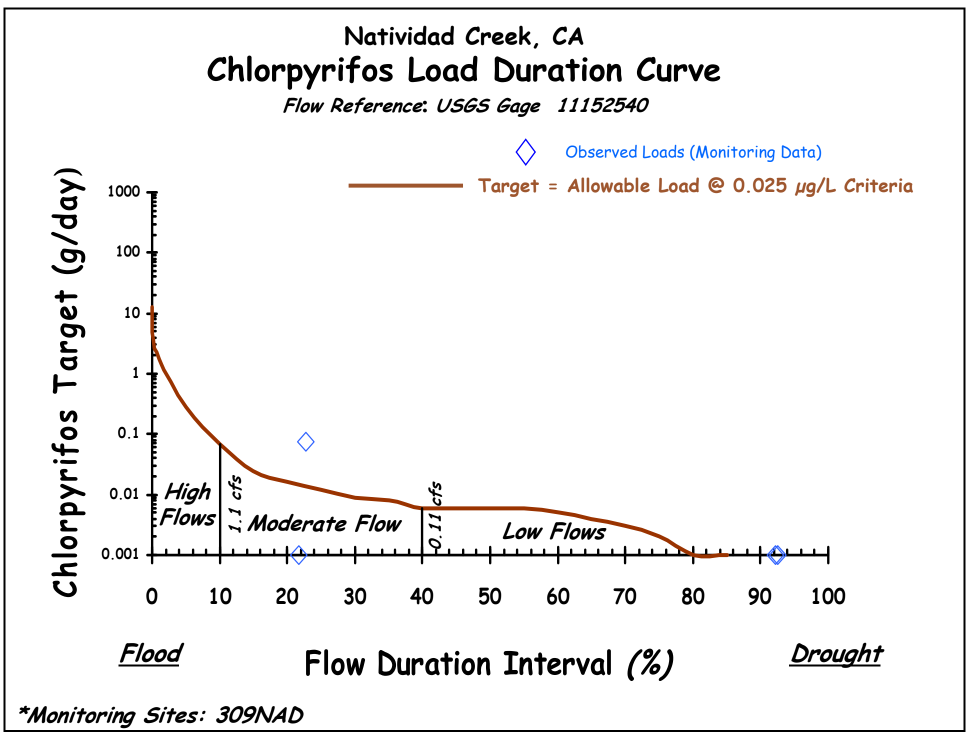

Chualar Creek, CA
Chlorpyrifos Load Duration Curve
Flow Reference: USGS Gage 11152540
Observed Loads (Monitoring Data)
Target = Allowable Load @ 0.025 µg/L Criteria
Chlorpyrifos Target (g/day)
1000
100
10
1
0.1
0.01
0.001
High Flows
3.41 cfs
Moderate Flow
0.28 cfs
Low Flows
0 10 20 30 40 50 60 70 80 90 100
Flood
Flow Duration Interval (%)
Drought
*Monitoring Sites: 309CRR, 309CRR_DPR

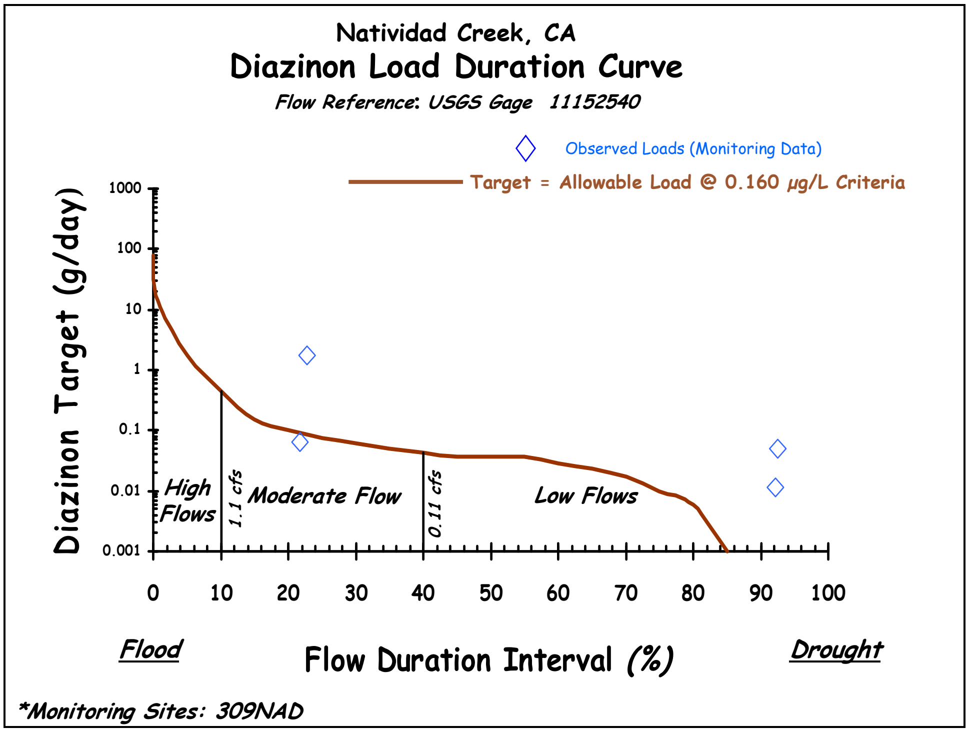


Chualar Creek

Reference flow (exceedance % in flow regime)	Existing Load for Chlorpyrifos: 90th percentile of Chlorpyrifos loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Chlorpyrifos
5 %	N/A	0.208	N/A
25 %	0.2049	0.017	91.65
60 %	0.1413	0.010	92.73
Reference flow (exceedance % in flow regime)	**Existing Load for Diazinon: 90th percentile of Diazinon loads within flow range (grams/day)**	**Allowable load for the Reference flow percentile (grams/day)**	**% Load Reduction Diazinon**
5 %	N/A	1.333	N/A
25 %	0.1966	0.109	44.31
60 %	0.4771	0.066	86.21

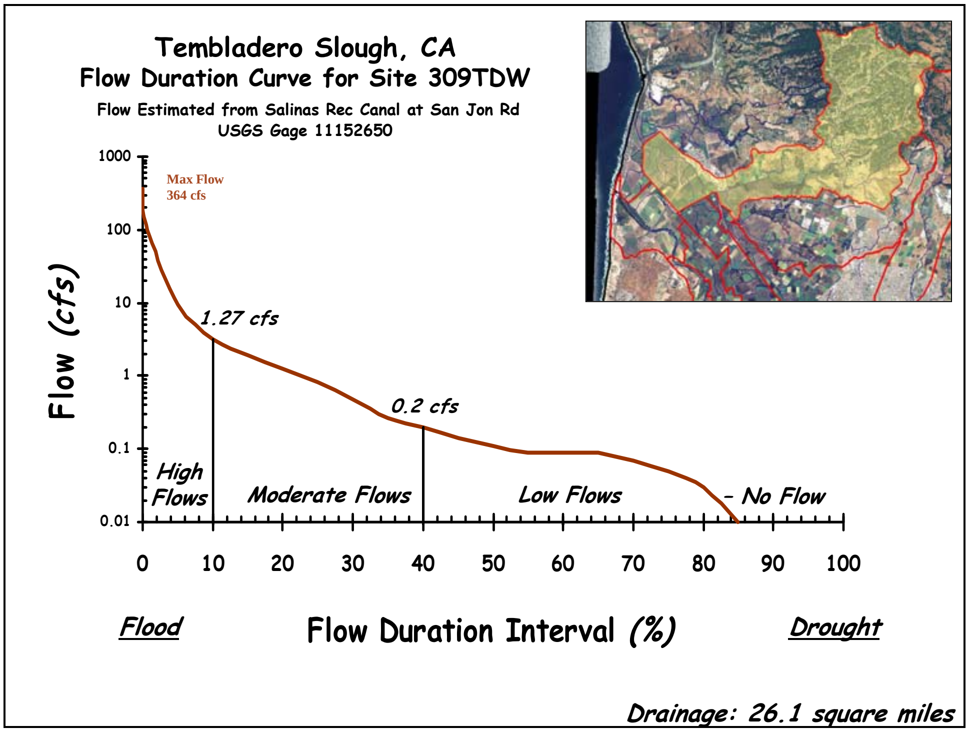

Natividad Creek, CA
Flow Duration Curve for Site 309QUI
Flow Estimated from El Toro Creek
USGS Gage 11152540
Max Flow
206 cfs
Flow (cfs)
1000
100
10
1
0.1
0.01
1.1 cfs
0.11 cfs
High Flows
Moderate Flows
Low Flows
- No Flow
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
Drainage: 11.5 square miles

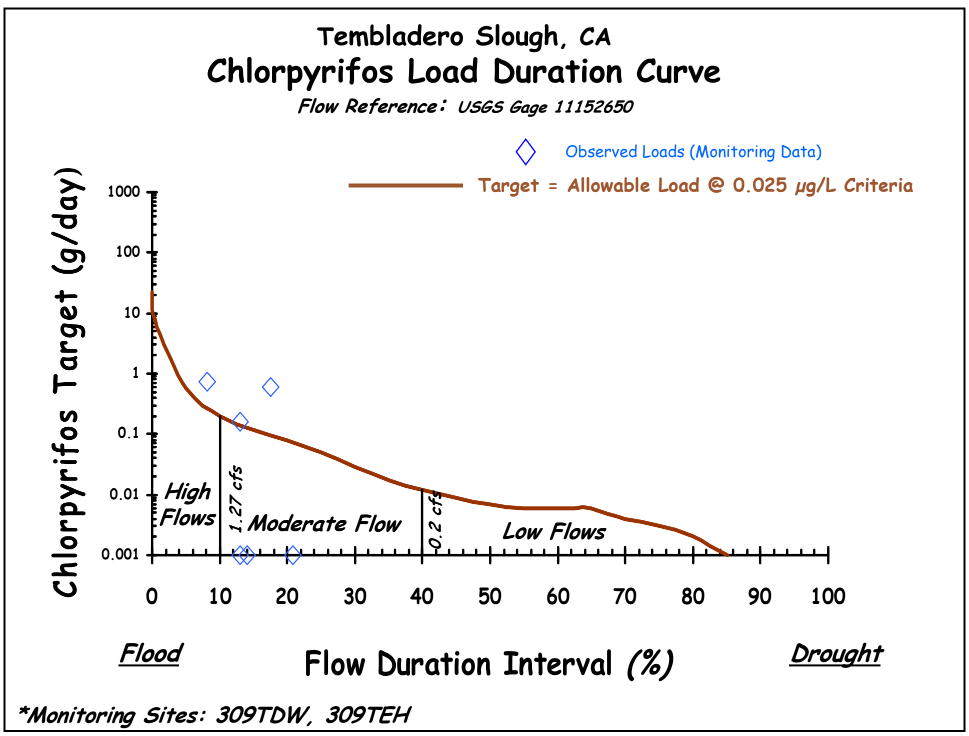

Natividad Creek, CA
Chlorpyrifos Load Duration Curve
Flow Reference: USGS Gage 11152540
Observed Loads (Monitoring Data)
Target = Allowable Load @ 0.025 µg/L Criteria
Chlorpyrifos Target (g/day)
1000
100
10
1
0.1
0.01
0.001
High Flows
1.1 cfs
Moderate Flow
0.11 cfs
Low Flows
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
*Monitoring Sites: 309NAD

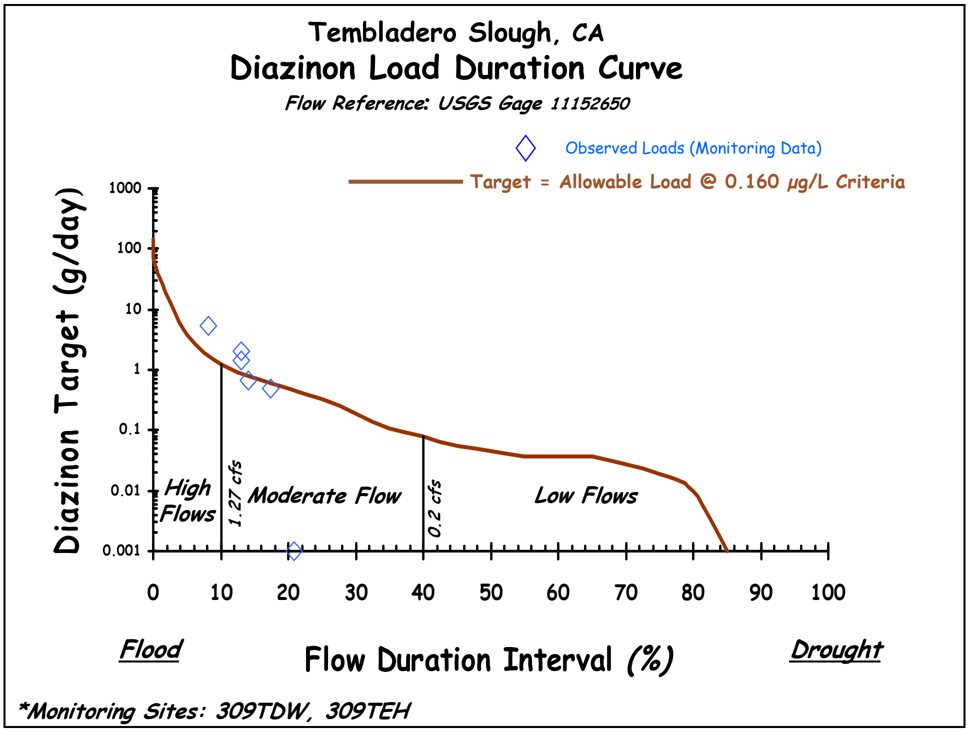


Natividad Creek

Reference flow (exceedance % in flow regime)	Existing Load for Chlorpyrifos: 90th percentile of Chlorpyrifos loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Chlorpyrifos
5 %	N/A	0.276	N/A
25 %	0.0670	0.012	82.27
60 %	0.0001	0.005	N/A
Reference flow (exceedance % in flow regime)	**Existing Load for Diazinon: 90th percentile of Diazinon loads within flow range (grams/day)**	**Allowable load for the Reference flow percentile (grams/day)**	**% Load Reduction Diazinon**
5 %	N/A	1.764	N/A
25 %	1.5409	0.050	96.77
60 %	0.0466	0.029	37.70

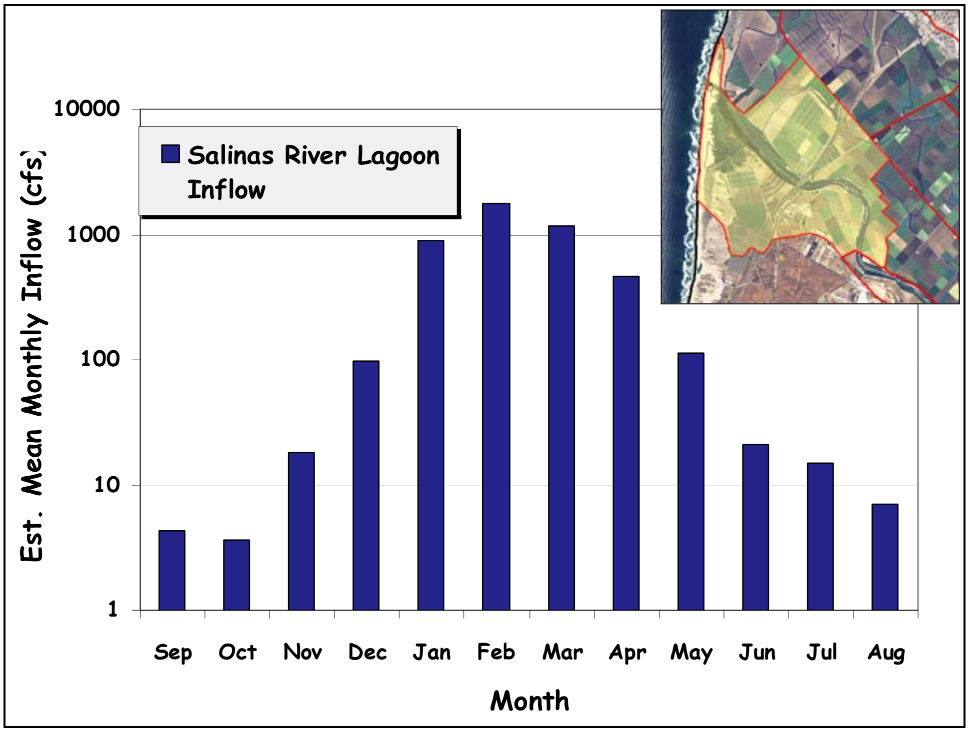

Tembladero Slough, CA
Flow Duration Curve for Site 309TDW
Flow Estimated from Salinas Rec Canal at San Jon Rd
USGS Gage 11152650
Max Flow
364 cfs
1.27 cfs
0.2 cfs
High Flows
Moderate Flows
Low Flows
No Flow
Flow (cfs)
1000
100
10
1
0.1
0.01
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
Drainage: 26.1 square miles


Tembladero Slough, CA
Chlorpyrifos Load Duration Curve
Flow Reference: USGS Gage 11152650
Observed Loads (Monitoring Data)
Target = Allowable Load @ 0.025 µg/L Criteria
Chlorpyrifos Target (g/day)
1000
100
10
1
0.1
0.01
0.001
High Flows
1.27 cfs
Moderate Flow
0.2 cfs
Low Flows
0
10
20
30
40
50
60
70
80
90
100
Flood
Flow Duration Interval (%)
Drought
*Monitoring Sites: 309TDW, 309TEH



Tembladero Slough

Reference flow (exceedance % in flow regime)	Existing Load for Chlorpyrifos: 90th percentile of Chlorpyrifos loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Chlorpyrifos
5 %	0.7243	0.571	21.12
25 %	0.4193	0.051	87.94
60 %	N/A	0.006	N/A
Reference flow (exceedance % in flow regime)	Existing Load for Diazinon: 90th percentile of Diazinon loads within flow range (grams/day)	Allowable load for the Reference flow percentile (grams/day)	% Load Reduction Diazinon
5 %	5.3208	1.764	66.85
25 %	1.8190	0.050	97.26
60 %	N/A	0.029	N/A

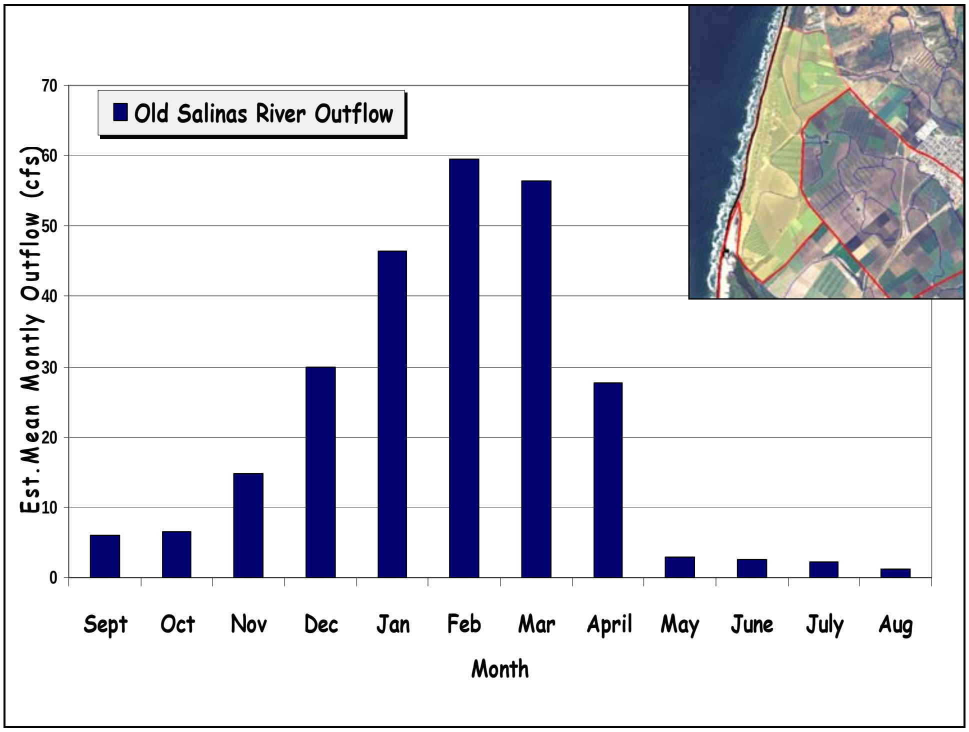


Estimated Existing Chlorpyrifos Loading for Salinas River Lagoon

Season	Number of Samples	Sample Mean Concentration (µg/L)	90th Percentile Concentration (µg/L)	Allowable Concentration (µg/L)	Percent Reduction Goal
Wet (Nov through Apr)	8	0.0647	0.0930	0.025	73%
Dry (May through Oct)	14	0.0441	0.0657	0.025	62%

Estimated Existing Diazinon Loading for Salinas River Lagoon

Season	Number of Samples	Sample Mean Concentration (µg/L)	90th Percentile Concentration (µg/L)	Allowable Concentration (µg/L)	Percent Reduction Goal
Wet (Nov through Apr)	8	0.0203	0.0404	0.160	N/A
Dry (May through Oct)	14	0.0452	0.1023	0.160	N/A



Estimated Existing Chlorpyrifos Loading for Old Salinas River Estuary

Season	Number of Samples	Sample Mean Concentration (µg/L)	90th Percentile Concentration (µg/L)	Allowable Concentration (µg/L)	Percent Reduction Goal
Wet (Nov through Apr)	14	0.0886	0.1241	0.025	80%
Dry (May through Oct)	17	0.0508	0.0932	0.025	73%

Estimated Existing Diazinon Loading for Old Salinas River Estuary

Season	Number of Samples	Sample Mean Concentration (µg/L)	90th Percentile Concentration (µg/L)	Allowable Concentration (µg/L)	Percent Reduction Goal
Wet (Nov through Apr)	14	0.2156	0.4025	0.160	60%
Dry (May through Oct)	17	0.1286	0.3136	0.160	49%