



CENTRAL VALLEY REGIONAL  
WATER QUALITY CONTROL BOARD

AMENDMENTS TO THE WATER QUALITY CONTROL  
PLAN FOR THE SACRAMENTO AND  
SAN JOAQUIN RIVER BASINS

FOR

THE CONTROL OF DIAZINON AND CHLORPYRIFOS  
DISCHARGES

FINAL STAFF REPORT  
*MARCH 2014*

***APPENDIX B***

**COST CALCULATIONS**

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This appendix contains additional tables showing calculations used to determine the potential cost of implementing the proposed Basin Plan Amendment, including implementation of management practices and monitoring and planning alternatives. The overall description of cost calculations is contained in section 9. Unless otherwise specified, costs are expressed as 2010 dollars.

**Table B-1 Total Estimated Cost for Agriculture**

	<b>Low Cost (\$/yr.)</b>	<b>High Cost (\$/yr.)</b>
Dormant Season Practices (see Table 9.10)	(217,120)	5,291,728
Irrigation Season Practices (See Table 9.9)	5,187,900	16,326,618
Total Management Practice Cost	4,970,780	21,618,346
Monitoring, Planning and Reporting Cost (see Table B-2)	1,625,162	6,006,000
Total Estimated Cost to Agriculture	<b>6,595,942</b>	<b>27,624,346</b>

**Table B-2 Agricultural Monitoring and Planning Costs – Watershed Groups**

Number of Diazinon and Chlorpyrifos Samples (See table D-5)	882
Total # of samples including 30% QA/QC Samples	1,147
Cost per Sample	\$ 200
Total Analytical Costs for Diazinon and Chlorpyrifos	\$ 229,320
Number of Toxicity Samples	96
Total Cost of Toxicity Analyses (assumes \$1,000 per sample average cost)	\$ 96,000
Number of Full Pesticide Scan Samples	96
Total Cost of Full Pesticide Scan Samples (assumes \$1,000 per sample average cost)	\$ 96,000
Number of Sediment Toxicity and Pesticide Samples	45
Total Cost of Sediment Toxicity and Pesticide Samples (assumes \$1500 per sample)	\$ 67,500
Total Cost of Additional Analysis for Toxicity and Potential Replacement Pesticides	\$ 259,500
Number of Person-days for sample collection. Assumes 2 person crew can cover 6 sites.	294
Sample collection preparation as a percent of Person-days for sampling.	25%
Total Person-days for Sample Collection & Preparation	368
Cost per Person-day (Assumes 8 hours @ \$65 per hour)	\$ 520
Sampling personnel cost	\$ 191,360
Travel Costs (assumes each person day involves 300 miles of driving at \$0.51 per mile)	\$ 44,982
Equipment/Supplies	\$ 20,000
Monitoring Plan & Quality Assurance Plan (Assumes 1 person month @ \$10,000 per person month)	\$ 10,000
Monitoring Program Coordination (Assumes 1 year at 50% time at \$10,000 per person month)	\$ 60,000
Annual Monitoring Reports	\$ 30,000
Monitoring Planning, Coordination and Reporting Cost Per Coalition Area	\$ 100,000
Number of Coalitions	4
Total Monitoring Planning, Coordination and Reporting	\$ 400,000
<b>Total Monitoring Cost</b>	<b>\$ 1,145,162</b>
<b>Planning and Evaluation Cost</b>	
Implementation Plan (Assumes 3 person months @ \$10,000 per person month)	\$ 30,000
Implementation Plan Coordination, Delta Watershed - Wide (assumes 12 months at 50% time at \$10,000 per person month)	\$ 60,000
Annual Implementation Report, Including Practices Effectiveness Evaluation (Assumes 3 months at \$10,000 per person month)	\$ 30,000
Total Planning and Evaluation Cost per Coalition Area	\$ 120,000
<b>Total Planning and Evaluation Cost</b>	<b>\$ 480,000</b>
<b>Total Cost for Monitoring, Planning, and Evaluation</b>	<b>\$ 1,625,162</b>
Approx. Number of Growers Applying Diazinon or Chlorpyrifos	2400
Approx. Cost per Grower	\$ 677

**Table B-3 Agricultural Monitoring and Planning Costs – Individual Discharger**

Number of Tailwater Samples Collected Per Pesticide Application Site	1
% QA/QC Samples	30%
Total # of samples per site	2
Cost per Sample	\$200
Total analytical costs	\$400
Cost for sampling collection and flow estimate (incl preparation and shipping). Assumes 2 hrs per sample @ \$ 65 /hr.	\$130
Travel Costs (50 mi per trip/ \$0.51 per mile.)	\$26
Bottles and Supplies (\$5/sample)	\$10
Cost Per Water Quality Monitoring Event per pesticide application site	<b>\$566</b>
<b>Water Quality Monitoring Planning and Reporting Costs</b>	
Monitoring and Quality Assurance Plan. Assumes 8 hours time @ \$65/hr.	\$520
Annual Monitoring Report (assume 8 hrs. time @ \$65/hr.)	\$520
Total Water Quality Monitoring Planning and Reporting	<b>\$1,040</b>
<b>Planning and Evaluation Cost</b>	
Implementation Plan (Assumes 4 hours @ \$65 per person hour)	\$260
Annual Implementation Plan Report Including Effectiveness Evaluation (Assumes 4 hours @ \$65 per person hour )	\$260
Total Planning and Evaluation Cost	<b>\$520</b>
<b>Total annual cost for basin-wide monitoring, planning, and evaluation</b>	
Costs Totaled Per Grower (total water quality monitoring planning and reporting, and total planning and evaluation costs, does not include monitoring cost)	\$1,560
Number of Growers	2400
Total Costs for planning and reporting (per grower cost*number of growers)	<b>\$3,744,000</b>
Cost Per Water Quality Monitoring Event	\$566
Number of Water Quality Monitoring Events (assumes 1 per pesticide application for approximately half of the ~8000 applications per year)	4000
Total Water Quality Monitoring Cost	<b>\$2,262,000</b>
<b>Basin-wide Cost (total sampling cost + Total planning and reporting cost)</b>	<b>\$6,006,000</b>
<b>Total Monitoring and Planning Cost Per Grower</b>	<b>\$2,503</b>

**Table B-4 Monitoring and Planning Costs  
Hybrid - Watershed Approach with Individual Discharge Monitoring**

Number of Tailwater Samples Collected (assumes 1 per pesticide application for approximately half of the ~8000 applications per year)	4000
% QA/QC Samples	30%
Total # of samples	5200
Cost per Sample	\$ 200
Total analytical costs for Diazinon and Chlorpyrifos	<b>\$ 1,040,000</b>
Total Cost of Additional Analysis for Toxicity and Potential Replacement Pesticides (from Watershed Monitoring Table D-2)	<b>\$259,500</b>
Cost for sampling collection and flow estimate (incl preparation and shipping). Assumes 2 hrs. per sample @ \$65/hr.	<b>\$ 520,000</b>
Travel Costs (50 mi per trip/ \$0.51 per mile.)	<b>\$102,000</b>
Bottles and Supplies (\$5/sample)	<b>\$ 26,000</b>
Monitoring Plan & Quality Assurance Plan (Assumes 1 person month @ \$10,000 per person month)	\$ 10,000
Monitoring Program Coordination (Assumes 1 year at 50% time at \$10,000 per person month)	\$ 60,000
Annual Monitoring Reports	\$ 30,000
Total Monitoring planning cost per coalition area	\$ 100,000
Number of Coalitions	4
Total monitoring planning cost	<b>400,000</b>
Total Monitoring Cost	<b>\$2,347,500</b>
<b>Planning and Evaluation Cost</b>	
Implementation Plan (Assumes 3 person months @ \$10,000 per person month)	\$ 30,000
Implementation Plan Coordination, Watershed - Wide (assumes 12 mos. at 50% time at \$10,000 per person month)	\$ 60,000
Annual Implementation Report, Including Practices Effectiveness Evaluation (Assumes 3 months at \$10,000 per person month)	\$ 30,000
Total planning cost per coalition area	<b>\$ 120,000</b>
Number of Coalition Areas	<b>4</b>
Total Planning and Evaluation Cost	<b>\$ 480,000</b>
<b>Total annual cost for basin-wide monitoring, planning, and evaluation</b>	
<b>Total Cost (total monitoring cost + total planning and evaluation cost)</b>	<b>\$2,827,500</b>
Total Number of Growers	2400
Cost per grower	<b>\$1,178</b>

**Table B- 5 Estimation of Annual Number of Samples for Watershed-Based Compliance Monitoring**

Waterbody Segment	Storm samples			Irrigation season samples			Total number of water samples			Sediment
	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scan	Diazinon and Chlorpyrifos	toxicity	Full Pesticide Scan	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scans	Toxicity and pesticide scan
<b>San Joaquin River Watershed</b>										
Ash Slough (Madera County)	0	0	0	10			10	0	0	0
Berenda Creek	0	0	0	10			10	0	0	0
Berenda Slough	0	0	0	10			10	0	0	0
Deadman Creek (Merced County)	0	0	0	10			10	0	0	0
Del Puerto Creek at Vineyard Road	2	0	0	10	0	0	12	0	0	0
Dry Creek (tributary to Tuolumne River at Modesto, E Stanislaus County)	4	2	2	10	3	3	14	5	5	3
Duck Creek (San Joaquin County)	0	0	0	10			10	0	0	0

Waterbody Segment	Storm samples			Irrigation season samples			Total number of water samples			Sediment
	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scan	Diazinon and Chlorpyrifos	toxicity	Full Pesticide Scan	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scans	Toxicity and pesticide scan
Duck Slough (Merced County)	0	0	0	10			10	0	0	0
Harding Drain	0	0	0	10			10	0	0	0
Highline Canal	0	0	0	10			10	0	0	0
Ingram Creek downstream of confluence with hospital creek	4	0	0	10	3	3	14	3	3	3
Merced River	8	2	2	10	3	3	18	5	5	3
Mustang Creek (Merced County)	4	0	0	10			14	0	0	0
Newman Wasteway	0	0	0	10			10	0	0	0
Orestimba Creek	4	2	2	10	3	3	14	5	5	3
Salt Slough	4	2	2	10	3	3	14	5	5	3
San Joaquin River (Bear Creek to Mud Slough)	12	0	0	10			22	0	0	0



Waterbody Segment	Storm samples			Irrigation season samples			Total number of water samples			Sediment
	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scan	Diazinon and Chlorpyrifos	toxicity	Full Pesticide Scan	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scans	Toxicity and pesticide scan
San Joaquin River (Mendota Pool to Bear Creek)	12	0	0	10			22	0	0	0
San Joaquin River (Merced River to Tuolumne River)	12	0	0	10			22	0	0	0
San Joaquin River (Mud Slough to Merced River)	8	0	0	10			18	0	0	0
San Joaquin River (Stanislaus River to Delta)	12	3	3	10	3	3	22	6	6	3
San Joaquin River (Tuolumne River to Stanislaus River)	12	3	3	10	3	3	22	6	6	3
Stanislaus River	8	0	0	10	0	0	18	0	0	0
Tuolumne River	8	2	2	10	3	3	18	5	5	3

Waterbody Segment	Storm samples			Irrigation season samples			Total number of water samples			Sediment
	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scan	Diazinon and Chlorpyrifos	toxicity	Full Pesticide Scan	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scans	Toxicity and pesticide scan
Westley Wasteway (Stanislaus County)	4	0	0	10			14	0	0	0
<b>Sacramento River Watershed</b>										
Bear River, Lower (below Camp Far West Reservoir)	4	0	0	10			14	0	0	0
Butte Slough	4	0	0	10			14	0	0	0
Colusa Basin Drain	6	3	3	0	3	3	6	6	6	3
Coon Creek, Lower (Sutter County)	0	0	0	10			10	0	0	0
Feather River nr. Verona (or Nicolaus during high flows)	0	0	0	10	3	3	10	3	3	3
Gilsizer Slough	4	0	0	0			4	0	0	0
Jack Slough	4	0	0	0			4	0	0	0

Waterbody Segment	Storm samples			Irrigation season samples			Total number of water samples			Sediment
	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scan	Diazinon and Chlorpyrifos	toxicity	Full Pesticide Scan	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scans	Toxicity and pesticide scan
Live Oak Slough	4	0	0	0			4	0	0	0
Main Drainage Canal (Butte County)	4	0	0	0			4	0	0	0
Morrison Slough	6	0	0	0			6	0	0	0
Sacramento Slough near Karnak	0	0	0	10			10	0	0	0
Spring Creek (Colusa County)	6	0	0	10			16	0	0	0
Stony Creek	0	0	0	10			10	0	0	0
Wadsworth Canal	6	0	0	10			16	0	0	0
Yankee Slough (Placer and Sutter Counties)	0	0	0	10			10	0	0	0
<b>Delta Watershed</b>										
Bear Creek (San Joaquin and Calaveras Counties)	6	0	0				6	0	0	0

Waterbody Segment	Storm samples			Irrigation season samples			Total number of water samples			Sediment
	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scan	Diazinon and Chlorpyrifos	toxicity	Full Pesticide Scan	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scans	Toxicity and pesticide scan
Cache Slough	12	3	3	10	3	3	22	6	6	3
Calaveras River (downstream of Stockton Diverting Canal)	6	0	0	10			16	0	0	0
Delta Island Drains (6 drains)	18	0	0	60	3	3	78	3	3	0
Duck Slough	0	0	0	10		0	10	0	0	0
Five Mile Slough	6	0	0				6	0	0	0
French Camp Slough	6	0	0	10	3	3	16	3	3	3
Grant Line Canal	6	3	3	10	3	3	16	6	6	3

Waterbody Segment	Storm samples			Irrigation season samples			Total number of water samples			Sediment
	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scan	Diazinon and Chlorpyrifos	toxicity	Full Pesticide Scan	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scans	Toxicity and pesticide scan
Lone Tree Creek	0	0	0	10	3	3	10	3	3	0
Marsh Creek	6	0	0	10			16	0	0	0
Mokelumne River (Camanche Reservoir to Delta)	6	0	0	10	3	3	16	3	3	0
Mormon Slough (from Stockton Diverting Canal to Bellota Weir – Calaveras River)	0	0	0	10			10	0	0	0
Mosher Slough	6	0	0				6	0	0	0
Old River (SJR to Delta Mendota Canal)	12	0	0				12	0	0	0
Paradise Cut	12	3	3	10	3	3	22	6	6	3
Pixley Slough (San Joaquin County)	6	0	0	10			16	0	0	0

Waterbody Segment	Storm samples			Irrigation season samples			Total number of water samples			Sediment
	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scan	Diazinon and Chlorpyrifos	toxicity	Full Pesticide Scan	Diazinon and Chlorpyrifos	Toxicity	Full pesticide scans	Toxicity and pesticide scan
Sacramento River at Rio Vista	12	3	3	10	3	3	22	6	6	0
San Joaquin River at Jersey Point	8	2	2	10	3	3	18	5	5	0
Sand Creek (tributary to Marsh Creek, Contra Costa County)	0	0	0	10			10	0	0	0
Ulatis Creek	12	3	3	10	3	3	22	6	6	3
Walthall Slough @ Woodward Ave	0	0	0				0	0	0	0
Winters Canal (Yolo County)	4	0	0	0			4	0	0	0
Yolo bypass (toe drain)	12	0	0	10	0	0	22	0	0	0
<b>Grand Total</b>							<b>882</b>	<b>96</b>	<b>96</b>	<b>45</b>

**Table B-6 Compliance Costs for Municipal and Domestic Wastewater Dischargers**

Number of Diazinon and Chlorpyrifos Samples	4
Total # of samples including 20% QA/QC Samples	5
Cost per Sample	\$ 200
Total Analytical Costs for Diazinon and Chlorpyrifos	\$ 1,000
Number of Toxicity Samples	0
Total Cost of Toxicity Analyses (assumes \$1,000 per sample average cost)	\$ -
Number of Full Pesticide Scan Samples	5
Total Cost of Full Pesticide Scan Samples (assumes \$1,000 per sample average cost)	\$ 5,000
Number of Sediment Toxicity and Pesticide Samples	2
Total Cost of Sediment Toxicity and Pesticide Samples (assumes \$1500 per sample)	\$ 3,000
Total Cost of Additional Analysis for Toxicity and Potential Replacement Pesticides	\$ 8,000
Number of Person-days for sample collection. Assumes 2 person crew can collect necessary samples in 2 hours, 4 times per year. .	2
Sample collection preparation as a percent of Person-days for sampling.	25%
Total Person-days for Sample Collection & Preparation	2
Cost per Person-day (8hours at \$65 per hour)	\$ 520
Sampling personnel cost	\$ 1,560
Travel Costs (assumes each person day involves 300 miles of driving at \$0.51 per mile)	\$ 300
Equipment/Supplies	\$ 500
Monitoring Plan & Quality Assurance Plan (Assumes 0.5 person month @ \$10,000 per person month)	\$ 5,000
Monitoring Reports (Assumes 0.5 person month @ 10,000 per person month)	\$ 5,000
Monitoring Planning, Coordination and Reporting Cost Per MS4	\$ 10,000
<b>Total Monitoring Cost for each 5-Yearr Permit Cycle</b>	<b>\$ 21,360</b>
<b>Annual Monitoring Cost per wastewater treatment plant</b>	<b>\$ 4,272</b>

**Table B-7 Compliance Costs for Municipal Storm Water Dischargers –  
Individual Compliance Approach**

Number of Diazinon and Chlorpyrifos Samples	4
Total # of samples including 20% QA/QC Samples	5
Cost per Sample	\$ 200
Total Analytical Costs for Diazinon and Chlorpyrifos	\$ 1,000
Number of Toxicity Samples	5
Total Cost of Toxicity Analyses (assumes \$1,000 per sample average cost)	\$ 5,000
Number of Full Pesticide Scan Samples	5
Total Cost of Full Pesticide Scan Samples (assumes \$1,000 per sample average cost)	\$ 5,000
Number of Sediment Toxicity and Pesticide Samples	2
Total Cost of Sediment Toxicity and Pesticide Samples (assumes \$1500 per sample)	\$ 3,000
Number of Person-days for sample collection. Assumes 2 person crew can cover 6 sites.	8
Sample collection preparation as a percent of Person-days for sampling.	25%
Total Person-days for Sample Collection & Preparation	10
Cost per Person-day (8 hours @ \$65 per hour)	\$ 520
Sampling personnel cost	\$ 5,200
Travel Costs (assumes each person day involves 300 miles of driving at \$0.50 per mile)	\$ 1,200
Equipment/Supplies	\$ 500
Monitoring Plan & Quality Assurance Plan (Assumes 0.5 person month @ \$10,000 per person month)	\$ 5,000
Monitoring Reports (Assumes 0.5 person month @ 10,000 per person month)	\$ 5,000
Monitoring Planning, Coordination and Reporting Cost Per MS4	\$ 10,000
<b>Total Monitoring Cost for each 5-Yearr Permit Cycle</b>	<b>\$ 30,900</b>
<b>Annual Monitoring Cost per MS4</b>	<b>\$ 6,180</b>



**Table B-8 Compliance Costs for Municipal Storm Water Dischargers –  
Collective Compliance Program Approach**

<b>Number of Samples per MS4</b>	4
<b>Number of Sites</b>	8
Number of Diazinon and Chlorpyrifos Samples	32
Total # of samples including 20% QA/QC Samples	38
Cost per Sample	\$ 200
Total Analytical Costs for Diazinon and Chlorpyrifos	\$ 7,680
Number of Toxicity Samples	32
Total Cost of Toxicity Analyses (assumes \$1,000 per sample average cost)	\$ 32,000
Number of Full Pesticide Scan Samples	32
Total Cost of Full Pesticide Scan Samples (assumes \$1,000 per sample average cost)	\$ 32,000
Number of Sediment Toxicity and Pesticide Samples	16
Total Cost of Sediment Toxicity and Pesticide Samples (assumes \$1500 per sample)	\$ 24,000
Total Cost of Additional Analysis for Toxicity and Potential Replacement Pesticides	\$ 88,000
Number of Person-days for sample collection. Assumes 2 person crew can cover 6 sites.	11
Sample collection preparation as a percent of Person-days for sampling.	25%
Total Person-days for Sample Collection & Preparation	13
Cost per Person-day ( 8 hours at \$65 per hour)	\$ 520
Sampling personnel cost	\$ 6,760
Travel Costs (assumes each person day involves 300 miles of driving at \$0.50 per mile)	\$ 1,600
Equipment/Supplies	\$ 500
Monitoring Plan & Quality Assurance Plan (Assumes 0.5 person month @ \$10,000 per person month)	\$ 5,000
Monitoring Reports (Assumes 0.5 person month @ 10,000 per person month)	\$ 5,000
Monitoring Planning, Coordination and Reporting Cost Per MS4	\$ 10,000
<b>Total Annual Monitoring for 50 MS4s in the project area.</b>	<b>\$ 114,540</b>
<b>Annual Monitoring Cost per MS4</b>	<b>\$ 2,291</b>