CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

CENTRAL VALLEY REGION

ATTACHMENT A TO ORDER NO. R5-2014-XXXX

INFORMATION SHEET

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER

FOR

SACRAMENTO VALLEY RICE GROWERS

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I. Overview

This attachment to Waste Discharge Requirements General Order for Rice Growers in the Sacramento Valley, Order No. R5-2014-XXXX (referred to as the "Order") is intended to provide information regarding the rationale for the Order; background information on the California Rice Commission (CRC) and rice farming operations; general information on surface and groundwater monitoring that has been conducted; and a discussion of the Order's elements that meet required state policy. More detailed information; including rice farming system and farming environment descriptions, as well as data presentation, and analysis are provided in the Groundwater Quality Assessment Report (GAR), as well as other documents previously submitted by CRC that are part of the administrative record.

II. Introduction

The Central Valley Regional Water Quality Control Board Irrigated Lands Regulatory Program (ILRP) was initiated in 2003 with the adoption of a conditional waiver of WDRs for discharges from irrigated lands. The 2003 conditional waiver was renewed in 2006. The conditional waiver's requirements are designed to reduce wastes discharged from irrigated agricultural sites (e.g., tailwater, runoff from fields, subsurface drains) to Central Valley surface waters (Central Valley Water Board 2006).

In addition to providing conditions, or requirements, for discharge of waste from irrigated agricultural lands to surface waters, the Central Valley Water Board's conditional waiver included direction to board staff to develop an environmental impact report for a long-term ILRP that would protect waters of the state (groundwater and surface water) from discharges of waste from irrigated lands. Although the requirements of the conditional waiver are aimed to protect surface water bodies, the directive to develop a long-term ILRP and environmental impact report is not as limited, as waters of the State include ground and surface waters within the State of California (CWC, Section 13050[e]).

The Central Valley Water Board completed an Existing Conditions Report (ECR) for Central Valley irrigated agricultural operations in December 2008. The ECR was developed to establish baseline conditions for estimating potential environmental and economic effects of long-term ILRP alternatives in a program environmental impact report (PEIR) and other associated analyses.

In fall 2008, the Central Valley Water Board convened the Long-Term ILRP Stakeholder Advisory Workgroup (Workgroup). The Workgroup included a range of stakeholder interests representing local government, industry, agricultural coalitions, and environmental/environmental justice groups throughout the Central Valley. The main goal of the Workgroup was to provide Central Valley Water Board staff with input on the development of the long-term ILRP. Central Valley Water Board staff and the Workgroup developed long-term program goals and objectives and a range of proposed alternatives for consideration in a programmatic environmental impact report (PEIR) and corresponding economic analysis. In August 2009 the Workgroup generally approved the goals, objectives, and range of proposed alternatives for the long-term ILRP. The Workgroup did not come to consensus on a preferred alternative.

The Central Valley Water Board's contractor, ICF International, developed the Program Environmental Impact Report (PEIR)[1] and Economics Report[2] for consideration by the board. The PEIR analyzed the range of proposed alternatives developed by the Workgroup. The Draft PEIR was released in July 2010, and the Final PEIR was certified by the board in April 2011 (referred to throughout as "PEIR"). In June 2011, the board directed staff to begin developing waste discharge requirements (orders) that would

[1] ICF International, 2011. Irrigated Lands Regulatory Program, Program Environmental Impact Report. Draft and Final. March. (ICF 05508.05.) Sacramento, CA. Prepared for Central Valley Regional Water Quality Control Board, Sacramento, CA.

[2] ICF International, 2010. Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program) (Economics Report).

implement the long-term ILRP to protect surface and groundwater quality. During 2011, the board reconvened the Stakeholder Advisory Workgroup to provide additional input in the development of the orders. Also, during the same time, the board worked with a Groundwater Monitoring Advisory Workgroup to develop an approach for groundwater monitoring in the ILRP.

The board's intent is to develop seven geographic and one commodity-specific general waste discharge requirements (general orders) within the Central Valley region for irrigated lands owners/operators that are part of a third-party group. In addition, the board intends to develop a general order for irrigated lands owners/operators that are not part of a third-party group.

The geographic/commodity-based orders will allow for tailoring of implementation requirements based on the specific conditions within each geographic area, or specific to a commodity. At the same time, and to the extent appropriate, the board intends to maintain consistency in the general regulatory approach across the orders.

This Order is the only general order that is commodity-specific. Since rice in the Sacramento Valley is grown under generally similar conditions, using similar farming methods and rice lands are generally contiguous, the regulatory framework used for geographic specific Orders is generally applicable, but has been altered to reflect the unique circumstances associated with rice farming and a commodity-specific order.

III. Goals and Objectives of the Irrigated Lands Regulatory Program

The goals and objectives of this Order, which implements the long term ILRP for rice growers in the Sacramento Valley are described below. These are the goals described in the PEIR for the ILRP.[3]

> *"Understanding that irrigated agriculture in the Central Valley provides valuable food and fiber products to communities worldwide, the overall goals of the ILRP are to (1) restore and/or maintain the highest reasonable quality of state waters considering all the demands being placed on the water; (2) minimize waste discharge from irrigated agricultural lands that could degrade the quality of state waters; (3) maintain the economic viability of agriculture in California's Central Valley; and (4) ensure that irrigated agricultural discharges do not impair access by Central Valley communities and residents to safe and reliable drinking water. In accordance with these goals, the objectives of the ILRP are to:*
>
> - *Restore and/or maintain appropriate beneficial uses established in Central Valley Water Board water quality control plans by ensuring that all state waters meet applicable water quality objectives.*
> - *Encourage implementation of management practices that improve water quality in keeping with the first objective, without jeopardizing the economic viability for all sizes of irrigated agricultural operations in the Central Valley or placing an undue burden on rural communities to provide safe drinking water.*
> - *Provide incentives for agricultural operations to minimize waste discharge to state waters from their operations.*
> - *Coordinate with other Central Valley Water Board programs, such as the Grasslands Bypass Project WDRs for agricultural lands total maximum daily load development, CV - SALTS, and WDRs for dairies.*
> - *Promote coordination with other regulatory and non - regulatory programs associated with agricultural operations (e.g., DPR, the California Department of Public Health [DPH] Drinking*

[3] ICF International, 2011. Irrigated Lands Regulatory Program, Program Environmental Impact Report. Draft and Final. March. (ICF 05508.05.) Sacramento, CA. Prepared for Central Valley Regional Water Quality Control Board, Sacramento, CA., page 2-6

Water Program, the California Air Resources Board [ARB], the California Department of Food and Agriculture, Resource Conservation Districts [RCDs], the University of California Extension, the Natural Resources Conservation Service [NRCS], the USDA National Organic Program, CACs, State Water Board Groundwater Ambient Monitoring and Assessment Program, the U.S. Geological Survey [USGS], and local groundwater programs [SB 1938, Assembly Bill [AB] 3030, and Integrated Regional Water Management Plans]) to minimize duplicative regulatory oversight while ensuring program effectiveness."

IV. Rice Production in California

A. Rice Lands in the Sacramento Valley[4]

The Sacramento Valley is surrounded by the Coast, Cascade, and Sierra Nevada mountain ranges which have weathered and eroded to fill the valley bottom with alluvial material. Within these alluvial plains are a relatively wide variety of soils and soil conditions. Rice is generally grown in three landforms, alluvial plains (including terrace soils), floodplains, and flood basins.

Alluvial plains include **terrace** soils that are formed on the valley margins from mixed alluvium and are among the oldest in the valley. Terrace soils have a loam or clay loam surface horizons of 10 to 35% clay and a dense clay layer below. Over time, periodic flooding allows coarser materials to travel farther down the stream, where they may be buried by subsequent deposition of fine-grained materials. A cementation or consolidation process of this alluvial material may occur after being deposited and buried at considerable depth. With cementation and consolidation, pore spaces are reduced, lowering the ability of the materials to hold and transport water vertically. Erosion of the surface may subsequently bring these cemented and consolidated layers closer to the surface. Significant rice acreage is planted on this landform on the east side of the Sacramento Valley.

Floodplains occur when natural stream channel flows overtop banks due to intense precipitation and/or elevated streamflow from upstream precipitation and/or snowmelt. Sediments suspended in the floodwaters deposit along the channel banks, with coarse sediments near the streams, and finer sediments settling in the bottom of broad basins known as **flood basins**. The Sutter, Butte, Colusa, and Natomas basins are examples of these flood basin landforms, which contain most of California's rice fields.

Soils in the flood basin landforms generally have high proportions of clay and silt-sized particles and poor internal drainage. Soil surface horizons typically have 30 to 60 percent clay and have high shrink and swell capacity with changes in soil moisture. It is estimated that 75% of the rice on the west side of the Sacramento Valley and 60% on the east side is grown on basin soils, with fewer acres on floodplains, alluvial plains, and terraces.

Fine-textured soils of the Sacramento Valley are expected to have relatively high cation exchange capacity, allowing positively charged ions such as ammonium, potassium, sodium and calcium to be adsorbed on the clay/soil surface. Negatively charged ions, such as nitrate, would be more readily transported in solution through the soil profile.

B. Rice Farming in the Sacramento Valley

California rice is an annual crop, with only one harvest per year. About 90% of the rice grown in the state is medium grain cultivars, Over 95% of all rice production in the Sacramento Valley is in nine counties – Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Tehama, Yolo and Yuba (Figure 1).[5] All rice producing

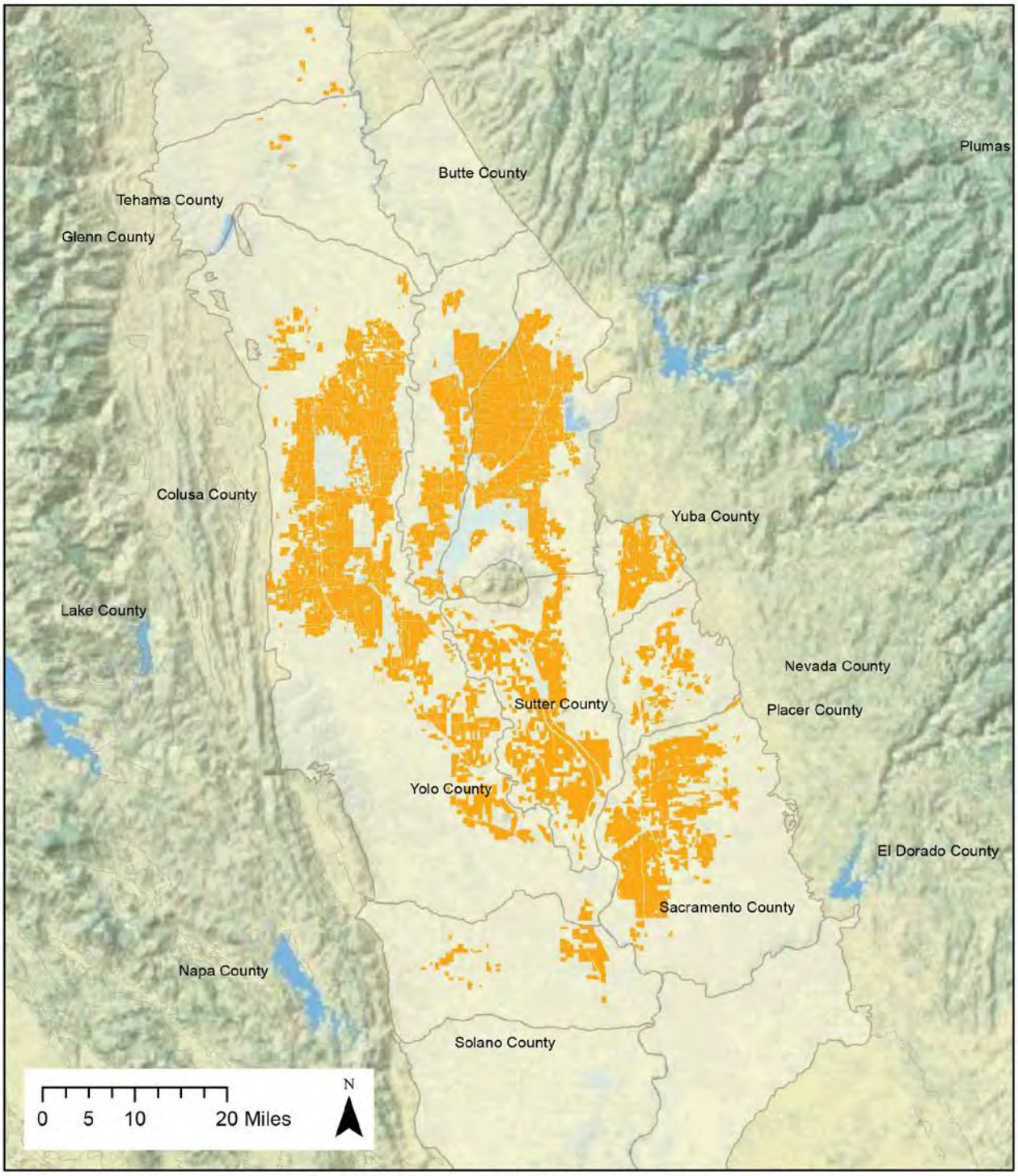
[4] Most of the information in this section is taken from *Rice Nutrient Management in California,* John F. Williams, UC Agriculture and Natural Resources Publication 3516.

[5] The figure is from the CRC Groundwater Assessment Report (GAR). The rice lands shown are based on integrating California Department of Water Resources (DWR) maps showing crops grown in each county.

areas in those counties are contained within the Sacramento Valley. According to the California Department of Food and Agriculture (CDFA) California Agricultural Statistics, the nine counties harvested about 540,510 acres of rice for the 2011 growing season.[6]

[6] From 2002 to 2010, the rice acreage harvested in the nine counties varied from 500,048 to 573,235 acres based on County Crop Reports.

Figure 1: Rice Land (DWR), showing lands where rice is normally grown



Data Sources: Groundwater Basins, Rice Crop (California DWR 2010); Basemap, County (ESRI 2011). Datum is NAD83.

Legend
- County Boundary
- Groundwater Basins
- Rice Lands (DWR)

Note: Figure from the Rice-Specific Groundwater Assessment Report, Map 2-3.

California Rice

Areas where rice is grown require a specific type of soil physically suited to rice production. The soil must have restricted drainage caused by high clay content or a hardpan/claypan layer that facilitates season-long ponding without excessive percolation of irrigation water (Figure 2).[7] Rice-only soils, historically farmed only to rice, have very poor internal drainage due to high clay content or hardpan at less than 3 feet deep making them unsuitable for most other crops. These rice-only soils tend to have poor yields and high input costs when rotated to other crops. For this reason, many rice fields are designed to optimize rice production with permanent levees and low-grade slopes, further limiting their utility for crop rotation. Some soils with expandable clay minerals (vertisols) and hardpans greater than 3 feet deep are suitable for rice and non-rice crops, allowing for crop rotation. Rotations can be used to improve weed and disease management and soil fertility, but are not essential for conventional rice production.

C. Water Management in Rice Fields

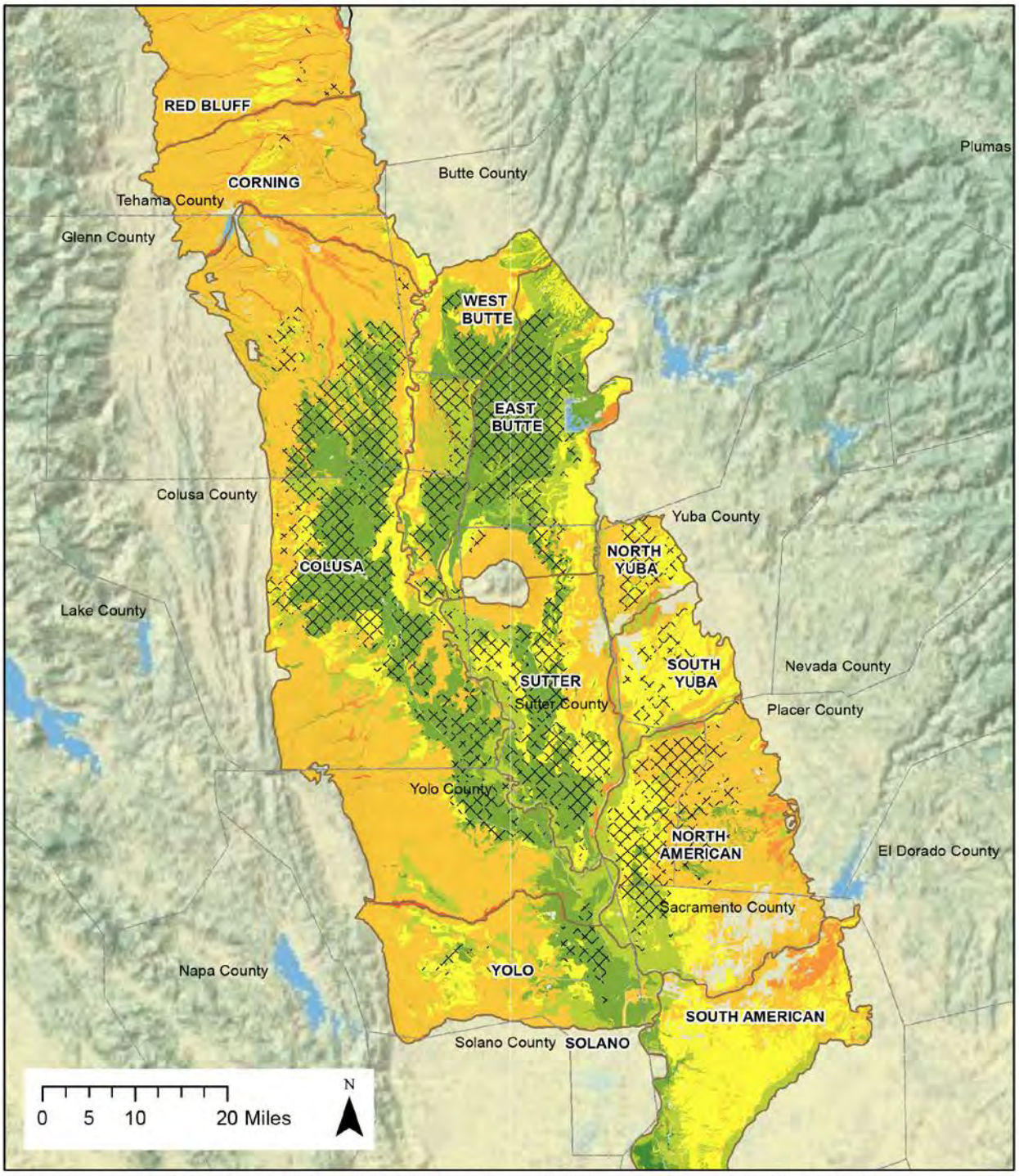
Rice is farmed in standing water. Medium grain rice varieties were specifically bred for California conditions. This breeding program decreased the stalk height, reducing the desired standing water depth. Breeding has also shortened the growing season to about 120 days during which rice is irrigated.

Water is managed in rice fields to minimize wasted water, nutrients, and pesticides. Rice is grown in standing water contained by small levees. Fields are generally laser-leveled (slope less than 0.1%, or 0.1 feet per 100 feet) to allow for a slow flow rate through the fields and to control the rate of water released. Due to these irrigation management controls, sediment loads in irrigation runoff are low, and particle-coagulant additives are not required or used for sediment control. Further information on water management systems and practices can be found the University of California Cooperative Extension (UCCE) Rice Project website.[8]

In a normal season, field preparation generally starts in mid-February to March, before rice seeding. Rice seed is generally sown by airplane into a flooded field, although Growers may elect to plant in a dry field (drill-seed). Seeding typically takes place from mid-April to the end of May. Water management after seeding depends on the pesticides to be applied. Pesticide application can occur in April, but most typically happens in the May through June period. During this period and into early July, water may be released from the field to expose small aquatic weeds for control. From mid-July to mid-August (after herbicide application), water is held on the fields to allow herbicides to degrade. Water is added as needed to maintain a constant water level and a favorable water temperature range for growth.

[7] From GAR showing rice lands overlay on NRCS soil drainage classifications.
[8] http://www.plantsciences.ucdavis.edu/uccerice/rice_production/planting_water_mgmt.htm

Figure 2: Rice Land and Soil Drainage



Data Sources: Groundwater Basins, Rice Crop (California DWR 2010); Drainage Class (NRCS 2012); Basemap, County (ESRI 2011). Datum is NAD83.

Legend

NRCS Soil Drainage Class
- Very poorly drained
- Poorly drained
- Somewhat poorly drained
- Moderately well drained
- Well drained
- Somewhat excessively drained
- Excessively drained

- County Boundary
- Groundwater Basins
- Rice Lands (DWR)

Note: Figure from the Rice-Specific Groundwater Assessment Report, Map 2-7.

California Rice

All California rice is flooded during growth and grain formation. A top-dressing (mid-season application) of nitrogen may be made during the water hold period, if needed. Rice field drainage before harvest typically occurs from mid-August through September. Drainage and drying is necessary to allow harvester and truck access to fields. Timing of harvest is based on the moisture content of the rice kernel so as to optimize the quality and yield of head rice.[9] After harvest, rice fields are generally flooded to facilitate decomposition of rice straw and to provide waterfowl habitat. No application of fertilizers or pesticides occurs on rice fields during the winter, until the fields are once again drained in mid-February or March. Field preparation for the next season may include applications of fertilizers before seeding. Factors such as weather conditions may affect planting and pesticide application. A summary of the rice farming calendar and approximate dates are shown in Table 1.

Table 1: Summary of Rice Farming Calendar

Rice Farming Calendar		Month*
Winter drainage	Fields drained for planting; pre-plant activities	mid-February thru March
Irrigation season	Peak pesticide use season	April thru May; June thru July
	Rice development; fields flooded	July thru August
Fall drainage	Fields drained and allowed to dry for harvesting	mid-August thru September
Winter flood	Fields flooded for rice straw decomposition and waterfowl habitat	October thru mid- February

- * Start of the rice growing season depends on factors such as weather conditions, rice variety being grown (length of growing season), and planting method. The months listed are approximate.
- Most pesticide applications take place in May and June. Only occasional use can occur in early July.

D. Nitrogen Management for Rice Fields

Rice primarily absorbs nitrogen in the form of ammonium,[10] which is the most common form of inorganic nitrogen in flooded soils. Nitrogen is generally applied below the soil surface as aqua ammonia (NH_3 in water) or urea ($CO(NH_2)_2$).[11] Fields are immediately flooded creating an anaerobic soil condition that minimizes volatilization and nitrification[12] of ammonium. Some nitrogen loss occurs by ammonium diffusion from the anaerobic layer to the aerobic layer and subsequent nitrification to the nitrate (NO_3^-) form. Nitrate can also form in soil zones that temporarily become aerobic when fields are drained for foliar-active herbicides[13]. When the field is re-flooded and the soil again becomes anaerobic, microbes convert residual nitrate into nitrogen gas (N_2), with the ammonium-nitrogen again remaining in a stable state. Vertical leaching of nitrates is minimal due to the general predominance of ammonium in the soil (and general absence of nitrate-nitrogen forms), and to the generally low permeability of rice soils. After herbicide applications, fields remain flooded until the drainage before harvest. After drainage, nitrification may again occur in aerobic soil zones, but most rice fields are flooded during the winter for rice straw

[9] Head rice yield is the portion of kernels greater than 75% of intact length after milling. Head rice commands a higher price than broken kernels.

[10] Williams, J.F. (editor), *Rice Nutrient Management in California*. 2010. University of California: Agriculture and Natural Resources. Publication 3516.

[11] More information on subsurface and surface application can be found in Linquist, B.A., Hill, J.E., Mutters, R.G., Greer, C.A., Hartley, C., Ruark, M.D., and van Kessel, C,. 2009. Assessing the Necessity of Surface-Applied Preplant Nitrogen Fertilizer in Rice Systems, *Agronomy Journal* 101-9006-915.

[12] Nitrification refers to oxidation or addition of oxygen to form nitrates (NO_3^-); denitrification refers to the reduction or the loss of oxygen to form nitrogen gas (N_2).

[13] Foliar-active herbicides require adequate leaf surface area for absorption by the plant of the herbicide. If application is by ground, the surface has to be dry enough to support application equipment. Drainage can last up to three weeks, depending on the soil type, climate conditions, and the herbicide to be applied.

decomposition and for waterfowl habitat. Where nitrate is formed, denitrification will occur.[14,15]

E. Pesticide Application and Management for Rice

Herbicides (pesticides applied to control weeds) and copper sulfate used by both organic and conventional rice constitute most of the pesticide load applied to the crop.[16] The decision for dry or wet (flooded) planting of rice seed may be based on disrupting prevalent types of weeds in a rice field.

Several rice pesticides have mandatory field hold times derived from the scientific data review required for registration. The resulting water holds are included as the mandatory label requirements. The water holds were developed to provide for in-field degradation of pesticides before the release of the field water to drains and other surface waters. Water holds have become industry standard practice in California to address aquatic toxicity, taste complaints, environmental fate, and pesticide efficacy. The original water holds were developed in cooperation with technical resources such as the University of California Cooperative Extension, Rice Research Board and pesticide registrants. Rice-specific permit conditions were developed to require additional conditions of the registered use of those products. In conjunction with the water holds, the California Department of Pesticide Regulations (DPR) requires seepage controls for all rice pesticides having mandatory water-holding requirements.[17]

Pesticides that can be applied to rice are limited. Figure 3 shows when pesticides are normally applied. Applications are made in accordance with the label specifications[18] and to optimize effectiveness and minimize damage to the crop. Timing for herbicide application is critical, with a set window for effectiveness and prevention of crop damage.

[14] Linquist, B.A., Koffler, K., Hill, J.E. and van Kessel, C., 2011. Rice field drainage affects nitrogen dynamics and management. *California Agriculture* 65:80-84.

[15] Reddy, K.R., 1982. Nitrogen cycling in a flooded-soil ecosystem planted to rice (*Oryza sativa* L.), Plant and Soil 67:209-220.

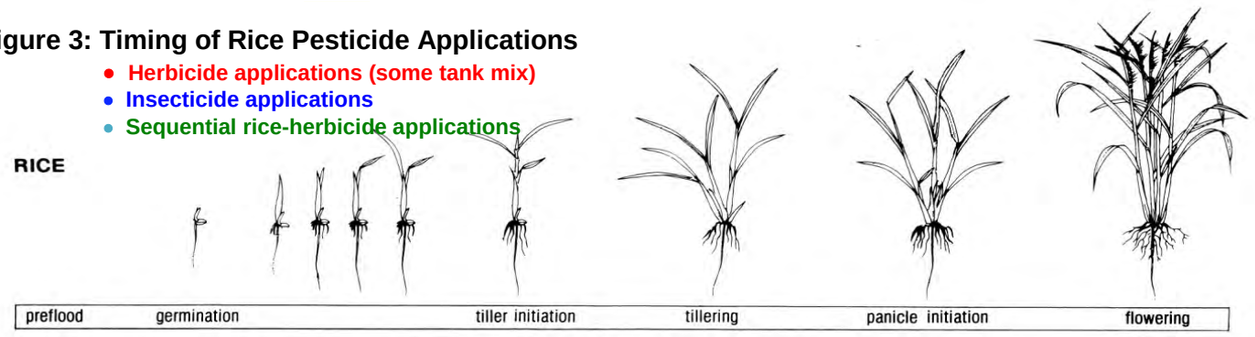
[16] Copper sulfate is used as an algaecide, fungicide and insecticide. It is applied to a flooded field and the copper appears to be bound to organic matter in the soil.

[17] Pesticide Use Enforcement Program Standards Compendium, Volume 3, *Restricted Materials and Permitting* Appendix C, Subsection C.2.2, General Water-Holding.

[18] Growers are required to follow label specifications which are approved by the US Environmental Protection Agency (EPA). Labels may be specific for certain states due to additional requirements within that state.

Figure 3: Timing of Rice Pesticide Applications

- **Herbicide applications (some tank mix)**
- **Insecticide applications**
- **Sequential rice-herbicide applications**



Early Season (March–April)		Mid Season (May–June)		Late Season (June–July)	
Pre-Flood	**Germination**	**Tiller Initiation**	**Tillering**	**Panicle Initiation**	**Flowering**
	Bensulfuron-methyl Permanent flood	**Bensulfuron-methyl** Pinpoint flood **Bispyribac-sodium** Pinpoint flood			
	Carfentrazone-ethyl Permanent flood 5-day static; 30-day release				
	Clomazone Permanent flood 14-day water hold		**Cyhalofop-butyl** Pinpoint flood 7-day water hold		
		Propanil Pinpoint flood			
	Thiobencarb (Bolero and Abolish) Permanent flood		**Triclopyr TEA** Pinpoint flood 20-day water hold		
		Bispyribac- sodium/ Thiobencarb (Abolish) Pinpoint flood 30-day water hold **Propanil/Thiobencarb** (Abolish) Permanent flood 30-day water hold			
	Lambda Cyhalothrin Border treatment 7-day water hold **(s)-Cypermethrin** Border treatment 7-day water hold				**Lambda Cyhalothrin** Border treatment 7-day water hold **(s)-Cypermethrin** Border treatment 7-day water hold
	Bispyribac-sodium, Thiobencarb (Bolero) 30-day water hold Permanent Flood		**Bispyribac-sodium, Propanil** Pinpoint flood		
	Clomazone, Bensulfuron-methyl 14-day water old Permanent flood				
	Clomazone, Bispyribac-sodium 14-day water hold Permanent flood				
	Clomazone, Carfentrazone-ethyl up to 30-day water hold Permanent flood				
	Clomazone, Propanil 14-day water hold Permanent flood				
	Clomazone, Propanil/Triclopyr TEA 20-day water hold				
		Cyhalofop-butyl, Bensulfuron-methyl 7-day water hold Pinpoint flood			
		Cyhalofop-butyl, Bispyribac-sodium 7-day water hold Pinpoint flood			
		Cyhalofop-butyl, Propanil 7-day water hold Pinpoint flood			
		Propanil, Cyhalofop-butyl 7-day water hold Pinpoint flood			
	Carfentrazone-ethyl, Cyhalofop-butyl 30-day water hold, 7-day water hold Pinpoint flood				

V. California Rice Commission

The California Rice Commission (CRC) is a state statutory organization established by California Food and Agriculture Code[19] to represent all producers and handlers[20] of rough (paddy) or milled rice[21] (*Oryza sativa*) from any source within the State of California. The CRC does not represent growers that produce rice seed or wild rice.[22]

The CRC submitted a Notice of Intent in October 2003 and received a Notice of Applicability (NOA) from the Executive Officer in June 2004. The NOA approved the CRC to operate as the lead entity for rice growers in the Sacramento Valley under the previous Coalition Group Conditional Waiver. Similar to the Coalition Group Conditional Waiver, this Order has been written for the CRC to provide a lead role in conducting monitoring, educating rice growers, developing and implementing water quality management plans, and interacting with the Central Valley Water Board on behalf of its rice growers. Under the Conditional Waiver, the CRC conducted surface water quality monitoring and submitted annual reports according to requirements described in CRC-specific Monitoring and Reporting Program Orders. Management plans were developed, implemented, and completed. The CRC routinely provides rice growers with water quality information during mandatory grower meetings and through the CRC website and newsletter.

Since its inception in 1983, the Rice Pesticides Program (RPP) has monitored rice pesticides and required implementation of management practices by rice growers to address significant water quality concerns that arose related to fish toxicity and drinking water taste complaints. The RPP was originally administered by the California Department of Fish and Game, Department of Pesticide Regulation, and Central Valley Water Board. In 2003, the CRC assumed responsibility for overseeing and documenting compliance with the RPP. The RPP is a separate program from the ILRP, currently under Resolution No. R5-2010-9001, which specifies approved management practices for five rice pesticides to meet Basin Plan performance goals. Currently, only one of the five rice pesticides (thiobencarb) is applied by rice in significant quantities and requires RPP monitoring. As part of the RPP, the CRC provides monitoring at four primary sites for the pesticides and has initiated management practices and outreach to ensure compliance with the performance goals. Management practices initiated by the RPP include water-holding requirements; drift minimization, water management including reporting of emergency releases, seepage mitigation measures, and mandatory stewardship training for permit applicants.

The CRC, under Food & Agricultural Code, cannot release information regarding its producers or handlers.[23] In Food & Agricultural Code, § 71079, the CRC "may present facts to, and negotiate with, local, state, federal, and foreign agencies on matters that affect the rice industry." This Order authorizes the CRC to represent all Sacramento Valley producers and, by extension, landowners of land used by a producer of rice (hereafter referred to as Growers[24]) to comply with specified aspects of the Order. Discharges governed by this Order include discharges of waste from rice land only within the counties of Sacramento, Sutter, Yuba, Butte, Glenn, Colusa, Yolo, Placer, and Tehama.

[19] Food & Agricultural Code, Division 22, Chapter 9.5, Article 1, section 71000.

[20] Producer is defined as any person who produces or causes to be produced, rice. Handler is any person in the business of marketing rice and handles 100,000 hundredweight (10,000,000 pounds) or more of rough rice or the equivalent amount of milled rice during a marketing season.

[21] Rough or paddy rice is rice that comes from the field after harvest with the hull or husk still covering the rice kernel. Milling removes the outer hull (brown rice) and may be continued to remove the entire hull and the germ to produce white rice.

[22] Wild rice is technically a species of grasses forming the genus *Zizania*.

[23] Food & Agricultural Code, Division 22, Chapter 9.5, § 71089(a) states "[t]he Commission and the secretary shall keep confidential and shall not disclose, except when required by court order after a hearing in a judicial proceeding, all lists in their possession of persons subject to this chapter."

[24] For the purposes of this Order, Grower(s) is defined to mean a producer of rice as defined in Food & Agricultural Code § 71032, or a landowner that leases, rents, or otherwise owns land that is used by a producer of rice.

As required by the Order, the CRC will identify the locations of Sacramento Valley rice growing operations in a manner that does not violate Food & Agricultural Code § 71089(a). The CRC will map, likely with satellite images and/or aerial surveys, land planted to rice in the Sacramento Valley. The CRC will then submit a Geographic Information System (GIS) shapefile with enough detail to overlay assessor's parcel number (APN) data. The Order requires Growers to perform a Farm Evaluation that identifies water quality management practices used by the Grower. The evaluation will be updated annually by Growers, unless the Executive Officer otherwise determines that annual updates are unnecessary. The Monitoring and Reporting Program (MRP) of this Order requires that the CRC identify use of the management practices in GIS at a township level. To update the information, the CRC may either provide updates of the shapefile or submit APNs every three years with the Farm Evaluation update. If rice acreage varies by more than 20% from the last update, an update of the shapefile is required for that year. The updates are required because some rice areas may rotate a crop occasionally, even though rice acreage is generally not suitable for other crops.[25]

VI. Surface Water Monitoring

A. Surface Water Monitoring Sites

The CRC has monitored rice discharges at four primary sites and five secondary sites under the ILRP (Table 2). The four primary sites, shown in Figure 4, were established under the Rice Pesticides Program[26] (RPP) and found to be representative of rice field discharges for those pesticides. The CRC also submitted a report, *Basis for Water Quality Monitoring Program,* in October 2004 that contained an assessment and evaluation of the four primary sites as being representative of rice field discharges.[27] The report concluded that the primary sites -- CBD5, BS1, CBD1, and SSB – capture the majority of rice field discharges. Because there is dilution from other inputs (both agricultural and non-agricultural) at these sites, monitoring for the ILRP is also conducted at three upstream secondary sites.

Since 2004, the primary sites have been monitored every year of the ILRP. MRP Order R5-2010-0805[28] requires secondary sites upstream of the primary sites to be monitored on a rotating basis to ensure the primary sites remain representative of rice field discharges and also to help identify the location of any exceedances of water quality objectives.

[25] A Grower's rotation to another crop will not be considered grounds for termination of coverage from this Order if the Grower intends to rotate the operation in question back to rice. However, if the Grower intends to rotate to another crop besides rice, then the Grower will need to obtain additional coverage for the non-rice crop for those years in question.

[26] The Rice Pesticides Program is a separate program from the Irrigated Lands Regulatory Program and has its own monitoring and reporting requirements.

[27] The report, *Basis for Water Quality Monitoring Program* includes a detailed description of the watersheds, the rice acreage in each watershed, and the drainages that transfer rice field discharges into the watershed. The monitoring data from the Rice Pesticides Program, which initially monitored approximately sixty sampling sites between Redding and the Delta, were analyzed with additional DPR monitoring data from locations in the study area. Detections of the rice pesticides were graphed by date (year) and concentration for each sampling site. Detections were examined for timing and location. The four primary sites showed detections when material was present in the watershed system and were considered representative of rice fields in the watershed.

[28] MRP Order R5-2010-0805 was in effect from the 2010 to 2012 rice growing seasons. An extension of the Order thru the 2013 growing season was approved by the Executive Officer on 29 December 2012.

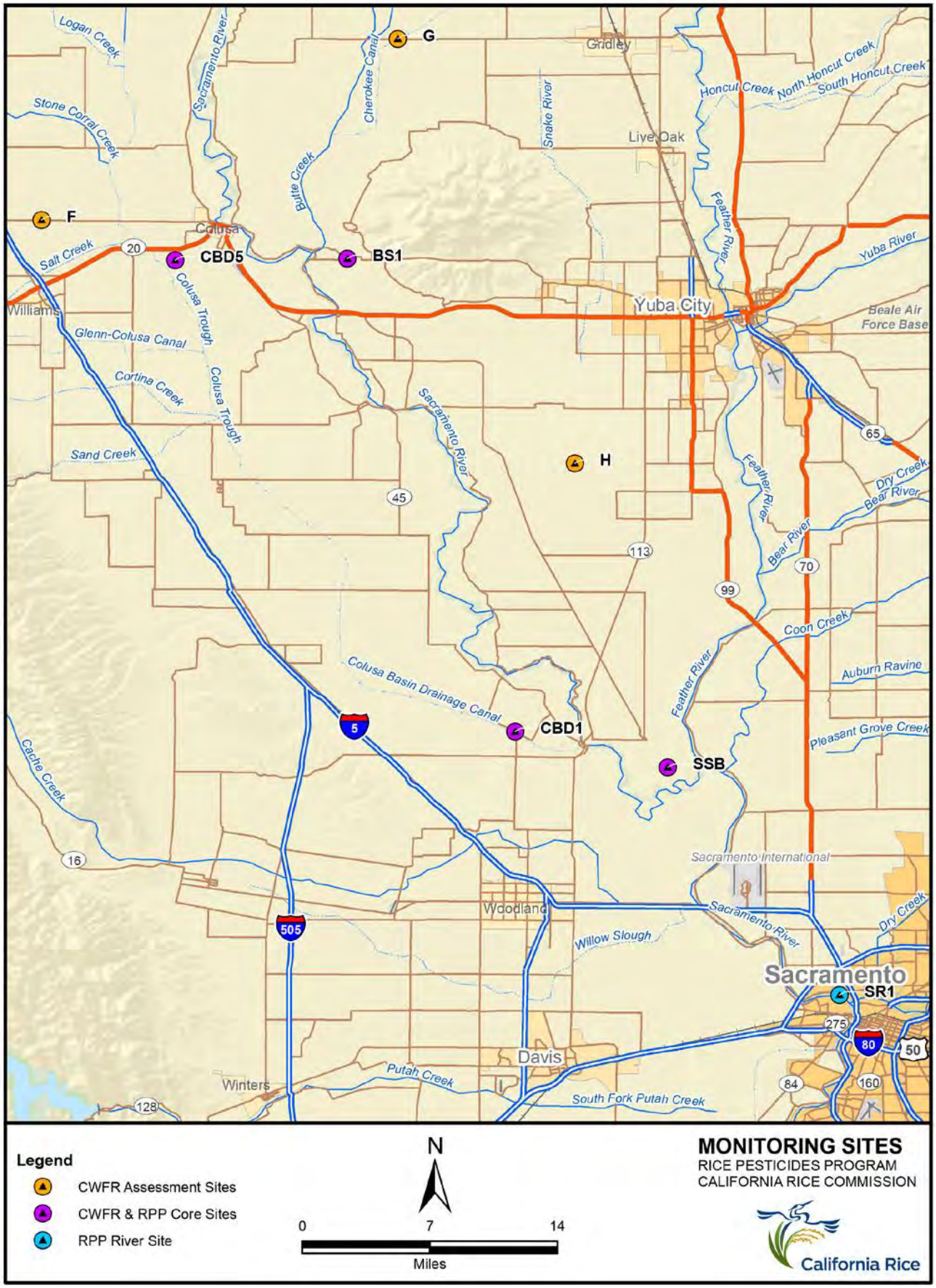
Table 2: CRC Surface Water Monitoring Sites

Site Type	Site Code	Site Name	Latitude	Longitude
Primary	520XCBDWR	Colusa Basin Drain #5 (CBD5)	39.1833 N	-122.0500 W
Primary	520CRCBS1	Butte Slough at Lower Pass Rd (BS1)	39.1875 N	-121.9000 W
Primary	520XCBDKL	Colusa Basin Drain above Knights Landing (CBD1)	38.8125 N	-121.7731 W
Primary	520CRCSSB	Sacramento Slough Bridge near Karnak (SSB)	38.7850 N	-121.6533 W
Secondary	520CRCLCF	Lurline Creek; upstream site for CBD5 (F)*	39.2184 N	-122.1511 W
Secondary	520CRCCCG	Cherokee Canal, upstream site for BS1*(G)*	39.3611 N	-121.8675 W
Secondary	520CRCOOH	Obanion Outfall at DWR PP on Obanion Rd, upstream site for SSB (H)*	39.0258N	-121.7272 W
Secondary	515CRCJSS	Jack Slough (JS)**	39.1804	-121.571100
Secondary	519CRCLCC	Lower Coon Creek (LCC)**	38.8715	-121.580800

* Monitoring was initiated in 2009 for sites F, G, and H.

** JS and LCC were removed as monitoring sites in 2008 and 2007, respectively, due to low or stagnant flow during the monitoring season.

Figure 4: CRC Surface Water Monitoring Sites



B. Past Surface Water Monitoring Results

In May 2012, the CRC submitted to the Central Valley Water Board a draft Surface Water Assessment Report (SAR) that summarizes and assesses all readily available water quality information[29] associated with rice growing operations in the Sacramento Valley. The SAR included recommendations for surface water monitoring parameters and schedules for this Order.

Although it may vary from year to year, the timing for the start of rice field operations and the type of operations are fairly consistent for the year. Start of field operations may vary about a month from north to south in the Sacramento Valley. The application of a specific pesticide generally occurs within a period of a few weeks for the majority of users. As such, monitoring for specific pesticides during application and release provides a good indicator of whether growers in that representative drainage are meeting applicable requirements.

Table 3 lists all constituents monitored to date. Table 4 contains a partial list of the constituents monitored from 2009 to 2012. Pursuant to the ILRP's MRP, the CRC monitored for pesticides used by Growers and general parameters including pH, flow, temperature, dissolved oxygen (DO), total dissolved solids (TDS), electrical conductivity (EC), and turbidity. Metals[30] were monitored in 2006 and generally found not to be a problem. Copper and hardness have been analyzed since 2006 at specific sites due to the amount of copper applied and as part of the Management Plan for toxicity to *Selenastrum capricornutum* (algae). Nutrient analyses were conducted in 2009 and 2012. Aquatic toxicity testing[31] for *Selenastrum capricornutum*, *Ceriodaphnia dubia* and *Pimephales promelas* were conducted from 2004 to 2009 and in 2012. Sediment toxicity tests with *Hyalella azteca* were performed at least once per season during pre-harvest drainage from 2005 to 2007, and in 2009 and 2012.

[29] Readily available information includes, but is not limited to, published monitoring data, reports and studies from the US Geological Surveys, University of California Cooperative Extension, the Rice Research Board, and State Water Resources Control Board, as well as previous monitoring data performed for the ILRP.

[30] Metals analyzed included cadmium, copper, lead, nickel, zinc, selenium, arsenic and boron. Hardness was measured with metals.

[31] Short-term chronic toxicity testing was performed for *Selenastrum*, and acute toxicity testing was performed for *Ceriodaphnia* and *Pimephales*.

Table 3: Constituents Monitored in Surface Water (previous MRPs)

Constituent	
General physical parameter	
Flow	Hardness
pH	Total dissolved solids
Electrical conductivity	Turbidity
Dissolved oxygen	Total organic carbon (TOC)
Temperature	
Nutrient Analysis	Unionized ammonia (calculated)
Total Kjeldahl nitrogen	Total phosphorous as P
Nitrate – nitrite, as N	Soluble orthophosphate
Total ammonia	
Water column toxicity	
Selenastrum capricornutum	
Ceriodaphnia dubia	
Pimephales promelas	
Photo monitoring (digital)	
Metals	
Arsenic	Lead
Boron	Nickel
Cadmium	Selenium
Copper	Zinc
Pesticides[32]	
Sediment toxicity	
Hyalella azteca	
Sediment TOC	
Pesticides in sediment[33]	
Lambda cyhalothrin	
S-cypermethrin	

[32] The following pesticides were sampled: lambda cyhalothrin and (s) cypermethrin (2005 season); carfentrazone ethyl and bispyribac sodium (2006 season); cyhalofop butyl, azoxystrobin, and propiconazole/trifloxystrobin (2007 season); clomazone and triclopyr (2012 season).

[33] To be analyzed only if sediment toxicity found.

Table 4: Monitoring Result Summary for ILRP Monitoring from 2009 to 2012[a]

	# of results for each parameter				
	2009 (6 events, 7 sites)	**2010** (4 events, 7 sites)	**2011** (4 events, 4 sites)	**2012** (5 events, 4 sites)	**Total # of results**
General Parameters					
pH (units) (# of exceedances[b]/range)	45 (0/7.22-8.05)	23 (0/7.44-8.03)	18 (1/4.5-8.13)	20 (0/7.37-8.31)	106
Electrical conductivity (µmhos/cm) (range)	45 (128-667)	23 (171-768)	18 (152-761)	20 (233-695)	106
Dissolved oxygen (mg/L) (# of exceedances[c]/range)	45 (5/2.82-10.10)	23 (1/3.44-9.14)	18 (1/4.55-9.34)	20 (3/3.16-8.14)	106
Total dissolved solids (mg/L) (range)		15 (87-356)	16 (110-470)	20 (130-420)	51
Turbidity (NTU) (range)	42 (2.15-133.3)	21 (6.98-75.38)	18 (7.5-76.6)	20 (9.4-81.7)	101
Total organic carbon (mg/L) (range)		22 (1.9-10.0)	16 (3.9-19)	24 (2.7-11.0)	65
Nutrients					
Total Kjeldahl Nitrogen(TKN) (mg/L) (range)				8 (0.32-0.94)	8
Nitrate-nitrite as N (mg/L) (range)				8 (0.098-0.350)	8
Ammonia as N (mg/L) range)				8 ((0.14-0.35)	8
Phosphorus as P (mg/L) (range)				8 (<0.15-0.28)	8
Toxicity					
(# samples/# significant toxicity[d]					
Selenastrum	30/0			16/0	46
Ceriodaphnia	18/0			16/0	34
Pimephales	18/0			16/0	34
Hyalella	3/0			4/0	7
Metals					
Copper[e], dissolved ((µg/L) (# of exceedances[f]/range)	42[g] (3/1.6-35)	14 (0/ND-9.0)	9 (0/1.0-5.0)	8 (0/1.4-7.0)	73
Pesticides[h, i]					
Carfentrazone-ethyl (µg/L) (# of detections/range)	43 (0/ND)				43
Clomazone (µg/L) (# of detections/range)	43 (17/ND-4.0)			16 (9/ND-5.6)	59
Glyphosate (µg/L) (# of detections/range)	43 (0/ND)				43
Pendimethalin (µg/L) (# of detections/range)	43 (0/ND)				43
Penoxsulam (µg/L) (# of detections/range)	44 (0/ND)				44
Propanil[j] (µg/L) (# of detections/range)	38 (21/ND-27)	40 (15/ND-4.4)	40 (13/ND-6.5)		118
Triclopyr (µg/L) (# of detections/range)	9 (1/ND-0.71)			16 (6/ND-6.4)	25

[a] The number of sampling results may not match due to duplicate samples and/or a reading was not taken due to dry conditions for field parameters. An exceedance (shown in parentheses) is based on the numerical water quality objectives for the parameter/constituent.

[b] Defined as pH<6.5 or pH>8.5.

c Defined as warm water objective, DO<5 mg/L
d Toxicity is based on statistically significant reduction in population or survival compared to controls.
e Hardness measured with copper analyses
f Exceedance based on California Toxics Rule when copper is adjusted for hardness.
g Total copper was analyzed rather than dissolved. Dissolved copper was analyzed in 2010 to 2012.
h ND = Not detected based on lab's reporting limit for the pesticide. ND varied from 0.05 µg/L to 5.0 µg/L.
i Pesticides monitored as part of the Algae Management Plan included clomazone, propanil, and triclopyr in 2009. The management plan was closed April 2010.
j The voluntary Propanil Management Plan was triggered by the high result in 2009. Sampling under the management plan continued until closed February 2012.

Other than a high result for propanil, pesticides monitored to date have been found in concentrations below the level of concern based on relevant aquatic toxicity data and drinking water standards. The CRC voluntarily initiated a propanil management plan as discussed in Section VI.E. Management plans for *Selenastrum capricornutum* toxicity and DO and pH, initiated by two or exceedances in a three year period, are also discussed in Section VI.E.

C. Surface Water Monitoring Strategy

The surface water monitoring program is designed to assess whether materials applied to rice cause or contribute to identified surface water quality problems. This is assessed by measuring concentrations at times that materials would be expected to be present (shortly after application), and by measuring the toxicity to representative organisms of waters and sediments that might be affected by these materials.

The basic questions to be answered by the updated surface water quality monitoring program are similar to those established under the previous MRP Order (R5-2010-0805):

1. Are receiving waters to which rice lands discharge meeting applicable water quality objectives and Basin Plan provisions?
2. Are rice operations causing or contributing to identified water quality problems?[34] If so, what are the specific factors or practices causing or contributing to the identified problems?
3. Are water quality conditions changing over time (e.g., degrading or improving as new management practices are implemented)?
4. Are rice operations of Growers in compliance with the provisions of the Order?
5. Are implemented management practices effective in meeting applicable receiving water limitations?
6. Are the applicable surface water quality management plans effective in addressing identified water quality problems?

The questions are addressed through the following monitoring and information gathering approaches:

1. The monitoring sites cover representative sections of the rice lands in the Sacramento Valley. The requirement to evaluate materials applied to rice or constituents mobilized by rice operations will result in monitoring of those constituents in receiving waters.
2. The monitoring and evaluation approach required as part of the surface water quality monitoring and management plan development and implementation will address this question (see below and the requirements associated with surface water quality management plans).
3. Both "special project" monitoring associated with management plans and the monitoring conducted at monitoring sites should be sufficient to allow for the evaluation of trends. The requirements to gather information on management practices will provide additional information to help estimate whether any changes in trends may be associated with the implementation of practices.

[34] Water quality problem" is defined in Attachment E.

4. The surface water monitoring required should allow for a determination as to whether discharges from rice lands are protective of beneficial uses and meeting water quality objectives. Other provisions in the MRP should result in the gathering of information that will allow the board to evaluate overall compliance with the Order.
5. The monitoring conducted as part of the implementation of a management plan, in addition to any special project monitoring required by the Executive Officer, should allow the board to determine whether management practices representative of those implemented by rice growers are effective. In addition, information developed through studies outside of these requirements can be used to evaluate effectiveness.
6. The "special project" monitoring associated with management plans will be tailored to the specific constituents of concern and the time period when they are impacting water quality. Therefore, the water quality data gathered, together with management practice information, should be sufficient to determine whether the management plans are effective.

The surface water monitoring required by this Order's Monitoring and Reporting Program R5-2014-XXXX (MRP) has been developed using the CRC's 2010 MRP as a foundation. However, a number of changes were made to improve the cost-effectiveness of the surface water monitoring effort and ensure the data collected are the most appropriate for answering the monitoring questions.

The monitoring approach in this Order is based on three types of monitoring (Assessment, Modified Assessment, and Core Monitoring) performed on a five year rotation. Primary and secondary sites will be evaluated during Year 1 (Assessment Monitoring) and Year 2 (Modified Assessment Monitoring). Primary sites will be evaluated during Years 3-5 (Core Monitoring).

Assessment monitoring requires full comprehensive monitoring at the primary and secondary sites of the parameters listed in Table 3 of this Order's MRP. For metals, only dissolved copper will be analyzed, since it is used in large quantities on rice fields as an algaecide and insecticide. No other metals have been detected from past monitoring, nor are they applied in any quantity on rice fields.

Based on past monitoring results (see above), rice pesticides pose a low risk of causing surface water quality problems. Therefore, this Order's MRP requires monitoring of two pesticides in any given year to verify compliance with receiving water limitations. During the Assessment year, the Executive Officer may require monitoring of more than two pesticides if the Executive Officer determines that insufficient information is available to assess the potential threat to water quality of the pesticide or that available information suggests there could be a water quality threat associated with the pesticide[35]. The two pesticides to be monitored during any given year will be based on the pesticide evaluation performed by the CRC and Central Valley Water Board staff. The pesticide monitoring schedule will be based on the time of application and release, the most vulnerable times for release to surface water, with two monitoring events per month required during the growing season. A minimum of two months (during and following peak application) of monitoring for each pesticide is required during Assessment and Modified Assessment years; one month (two sampling events within the month) of pesticide monitoring for each pesticide during peak application for those pesticides is required during Core years[36].

Past monitoring results also indicate there is a low risk of aquatic toxicity from rice operations. Therefore, toxicity tests are required during Assessment year monitoring only. Water column toxicity tests (*Selenastrum, Ceriodaphnia and Pimephales*) will be performed during the months when pesticides are monitored. Samples for sediment toxicity will be taken during the pre-harvest drainage period.

[35] For example, a change in use patterns or practices make it more likely that the pesticide could be above water quality objectives or concentrations of the pesticide in surface waters could be increasing (a trend of degradation).

[36] For example, during a given Core year, pesticide X may have peak application during May and pesticide Y may have peak application in June. Two sampling events for pesticide X would occur in May and two sampling events for pesticide Y would occur in June.

Core monitoring occurs at the primary sites, which have proven to be representative of rice discharges. Monitoring is twice a month for two "indicator" pesticides. Monitoring occurs during each indicator pesticides' peak use period. The "indicator" pesticides will be determined by its wide use in rice fields. This monitoring will be used as an indicator that management practices, such as drift minimization, water-holding-times, and levee compaction, are implemented and protective of water quality.

The Executive Officer may require the CRC to conduct additional monitoring to address exceedances of a parameter(s) and may revise MRP Order R5-2014-XXXX as necessary to address water quality problems with potential contributions from rice operations.

D. Rice Pesticides Evaluation

The 2004 *Basis for Water Quality Monitoring Program* included a Rice Pesticides Matrix to assess and identify pesticides for monitoring based on usage, acreage applied and physical/chemical properties of the pesticides when released into the environment.[37] This assessment process has continued in the ILRP using updated DPR data for the monitoring requirements in MRPs. Under the Order's MRP, monitoring for pesticides will be evaluated and assessed every 5-years to determine if modifications should be made due to changes such as, but not limited to, application method, pounds/acreage applied, or new products in the market.

Selection of pesticides to be monitored under this Order is based on an evaluation of previous years' monitoring results, changes in pesticide use and/or application, and assessment of the potential for affecting water quality using physical and chemical properties of the pesticides. A typical evaluation starts with a compilation of pesticides used in rice operations.

The evaluation for trends in pesticide use includes evaluation of reported use, or knowledge of potential drivers for change in use patterns. For example, clomazone and triclopyr were chosen for assessment monitoring in 2012 due to the expected increase in use from previous years with the reports of increased thiobencarb-resistance for sprangletop in rice fields.

The pesticides are then evaluated for chemical, physical, and use properties to determine risk to water quality. Published field dissipation and degradation rates are also taken into account for pesticides that have required hold times before release from the field. Another step in the evaluation examines the aquatic toxicity values for freshwater biota (ECOTOX data).

E. Previous Surface Water Management Plans

Under Conditional Waiver Order R5-2006-0053, surface water quality management plans (SQMPs) are required when there is an exceedance of a water quality objective or trigger limit[38] more than one time in a three year period. Only two SQMPs have been required (algae and dissolved oxygen/pH), with the CRC voluntarily submitting a third SQMP (propanil).

Algae Toxicity Management Plan

A management plan was triggered for *Selenastrum capricornutum* (algae) toxicity at the primary sites in 2006. The initial toxicity identification evaluations (TIEs) performed in 2006 indicated that the source of toxicity was a non-polar organic herbicide with a short half-life. Further tests performed for identification were inconclusive. The CRC submitted its Algae Toxicity Management Plan (AMP) in 2007 and proposed pesticides used by rice and non-rice crops be analyzed in conjunction with toxicity testing in an attempt to identify the toxicant and pinpoint the source. In addition, copper and hardness were analyzed with pesticide analyses to determine if the copper could be contributing to the toxicity.

[37] Evaluation of chemical and physical properties includes, but is not limited to, solubility in water; adsorption coefficient; degradation or dissipation rates in water, soil and field; and consideration of field hold times.

[38] Trigger limits are discussed below under "Water Quality Objectives."

In the 2008 season, surface water samples were collected for algae toxicity testing in March (Jack Slough [JS], a secondary site[39]), June (JS, CBD1, CBD5, BS1, and SSB), July (CBD1), and September (BS1, CBD1, and CBD5) and analyzed for the following pesticides: atrazine, bensulfuron-methyl, bispyribac-sodium, carfentrazone, clomazone, diuron, glyphosate, halosulfuron, molinate, pendimethalin, penoxsulam, propanil, simazine, thiobencarb, and triclopyr. As part of the ILRP, four pesticides also registered for use on rice, azoxystrobin, cyhalofop-butyl, propiconazole and trifloxystrobin, were also analyzed. *Selenastrum* toxicity (when compared to the control) was observed in April (JS, BS1, CBD5, CBD1, and SSB), at all sites in May, at JS in June and September, and CBD5 in June. However, no apparent relationship between pesticide presence and algae toxicity was observed.

In the 2009 season, the ILRP required the following pesticides to be analyzed at primary and secondary sites (F, G, and H): carfentrazone-ethyl, clomazone, glyphosate, pendimethalin and penoxsulam. The AMP required monitoring of propanil, clomazone and triclopyr at the primary sites. *Selenastrum* toxicity was observed in April (G) and in May (CBD1 and SSB). Again, no apparent relationship between pesticide presence and algae toxicity was observed. In fact, when algae toxicity was observed, detected pesticide concentrations were lower than on days with higher algae growth.

In accordance with the AMP, resampling at the site was required for any *Selenastrum* toxicity test with an observed toxicity reduction of 50% or more. Resampling, when triggered, showed no persistent toxicity.

During this time period an additional complicating factor in the *Selenastrum* toxicity test procedure being used by the toxicity laboratories throughout the ILRP was identified by staff. This led to a requirement in MRP Order R5-2010-0805, Attachment C, prohibiting the use of ethylenediaminetetraacetic acid (EDTA) in the *Selenastrum* toxicity tests. This prohibition ensured *Selenastrum* toxicity testing was performed consistently by all labs[40].

In April 2010, the Algae Toxicity Management Plan was deemed complete and closed after two years of monitoring could not identify the toxicant or confirm that the source was from rice field discharges. Water column toxicity testing in 2012 for *Selenastrum* showed no significant reduction in growth.

<u>DO and pH Management Plan</u>

In addition to algae toxicity, management plans were triggered for dissolved oxygen (DO) and pH. The DO and pH Management Plan was submitted to the Central Valley Water Board staff in December 2007, but deemed a low priority. DO and pH are affected by many physical and chemical factors, including flow, nutrient levels, water temperature, and weather. Central Valley Water Board staff will work with the Technical Issues Committee and CRC to identify next steps to address any continuing exceedances of the applicable DO and pH objectives.

<u>Propanil Management Plan</u>

In the 2008 Annual Monitoring Report, the CRC reported propanil monitoring by the registrant at CRC monitoring sites from 2006 to 2008. In 2009, a propanil concentration of 47 µg/L was found at Lurline Creek; exceeding the trigger limit of 19-26 µg/L.[41] This exceedance did not trigger a management plan, which requires two exceedances in a three year period. The CRC voluntarily submitted a Propanil Management Plan for the 2010 season that included monitoring at the primary sites and Lurline Creek during periods when propanil would be applied and released from rice fields. The Propanil Management Plan included the following actions to implement additional outreach, education and communication to propanil stakeholders:

[39] Jack Slough was later dropped as a monitoring site due to inadequate flow.

[40] The EPA guidance for *Selenastrum* toxicity testing allows the test to be performed with or without the addition of EDTA. EDTA is a chelating agent used to remove metals from the sample water.

[41] The range for the trigger limit is based on toxicity reduction of population growth for different species of algae.

- coordinate with the registrants on a combined meeting with the California Association of Pest Control Advisors (CAPCA), the California Agricultural Aircraft Association (CAAA), Pest Control Operators of California (PCOC) and county agricultural commissioners (CACs)
- provide propanil use information in the CRC newsletter and grower letter
- include links to regulation and permit conditions on the CRC website
- coordination with the registrants on the development of a brochure mailed to all CRC coalition members – the brochure is brought to the front page of the CRC website during the propanil use season

For the 2010 season, the highest propanil concentration detected was 10 µg/L at Lurline Creek, with all other sites reporting results less than 5 µg/L. The highest propanil concentration observed for the 2011 season was 6.5 µg/L, thereby indicating that the CRC's efforts were successful in ensuring that propanil did not exceed applicable trigger limits.

On 3 February 2012, the CRC requested termination of the Propanil Management Plan, stating the outreach efforts initiated under the plan would continue. The Executive Officer gave approval to terminate on 9 March 2012.

1. Surface Water Quality Management Plans
   Similar to the previous Order (Coalition Group Conditional Waiver), this Order requires the CRC to develop a surface water quality management plan (SQMP) for areas where there is more than one exceedance of a water quality objective or trigger limit within a three-year period. SQMPs may also be required where there is a trend of degradation that threatens a beneficial use. SQMPs will only be required for wastes that may be discharged by some or all rice lands in the area. SQMPs are the key mechanism under the Order to help ensure that waste discharges from rice lands are meeting Surface Water Limitation III.A.1. The limitations apply immediately unless the Grower is implementing the SQMP in accordance with the approved time schedule. The SQMP will include a schedule and milestones for the implementation of management practices (see Appendix MRP-1). The schedule must identify the time needed to identify new management practices necessary to meet the receiving water limitations, as well as a timetable for implementation of identified management practices. The SQMP will include a schedule for implementing practices that are known to be effective in partially or fully protecting surface water quality. The SQMP must also identify an approach for determining the effectiveness of the implemented management practices in protecting surface water quality.

   The main elements of SQMPs are to A) investigate potential rice sources of waste discharge to surface water, B) review physical setting information for the plan area such as existing water quality data, C) considering elements A and B, develop a strategy with schedule and milestones to implement practices to ensure discharge from rice discharges are meeting Surface Water Limitation III.A.1, D) develop a monitoring strategy to provide feedback on SQMP progress, E) develop methods to evaluate data collected under the SQMP, and F) provide reports to the Central Valley Water Board on SQMP progress.

   Elements A – F are necessary to establish a process by which the CRC and Central Valley Water Board are able to investigate waste sources and the important physical factors in the plan area that may impact management decisions (elements A and B), implement a process to ensure effective practices are adopted by Growers (element C), ensure that adequate feedback monitoring is conducted to allow for evaluation of SQMP effectiveness (elements D and E), and facilitate efficient Central Valley Water Board review of data collected on the progress of the SQMP (element F).

   The SQMPs required by this Order require the CRC to include the above elements. SQMPs will be reviewed and approved by the Executive Officer. Also, because SQMPs may cover broad areas potentially impacting multiple surface water users in the plan area, these plans will be circulated for public review. Prior to plan approval, the Central Valley Water Board Executive Officer will consider public comments on proposed SQMPs.

The burden of requiring SQMPs where there are exceedances of water quality objectives and/or trigger limits, including costs, is reasonable. To protect water quality and enforce the provisions of the Order, the Central Valley Water Board must be informed of the efforts being undertaken by the CRC and its Growers to address identified surface water quality problems. In addition, should a SQMP(s) be triggered, a regional (i.e., watershed or subwatershed) SQMP is a reasonable first step to address identified surface water quality problems that may be caused by rice farming, since the monitoring and planning costs are significantly lower when undertaken by the CRC rather than requiring individual Growers to undertake similar monitoring and planning efforts. However, if the regional SQMP does not result in the necessary improvements to water quality, the Executive Office may require individual monitoring pursuant to Water Code Section 13267. In such cases, the Central Valley Water Board finds that the burden, including costs, of requiring individual Growers in the impacted area to conduct individual monitoring, describe their plans for addressing the identified problems, and evaluate their practices, is a reasonable subsequent step. The benefits and necessity of such individual reporting, when regional efforts fail, include, but are not limited to: 1) the need of the board to evaluate the compliance of regulated growers with applicable orders; 2) the need of the board to understand the effectiveness of practices being implemented by regulated growers; and 3) the benefits to all users of that surface water of improved water quality.

VII. Groundwater Quality

A. Groundwater Monitoring Advisory Workgroup

The Central Valley Water Board staff formed a Groundwater Monitoring Advisory Workgroup (GMAW), which consisted of groundwater experts representing state agencies, the United States Environmental Protection Agency (USEPA), the United States Geological Survey (USGS), academia, and private consultants. The following questions were identified by the GMAW and Central Valley Water Board staff as critical questions to be answered by groundwater monitoring conducted to comply with the ILRP.

1. What are irrigated agriculture's impacts to the beneficial uses of groundwater and where has groundwater been degraded or polluted by irrigated agricultural operations (horizontal and vertical extent)?

2. Which irrigated agricultural management practices are protective of groundwater quality and to what extent is that determination affected by site conditions (e.g., depth to groundwater, soil type, and recharge)?

3. To what extent can irrigated agriculture's impact on groundwater quality be differentiated from other potential sources of impact (e.g., nutrients from septic tanks or dairies)?

4. What are the trends in groundwater quality beneath irrigated agricultural areas (getting better or worse) and how can we differentiate between ongoing impact, residual impact (vadose zone) or legacy contamination?

5. What properties (soil type, depth to groundwater, infiltration/recharge rate, denitrification/ nitrification, fertilizer and pesticide application rates, preferential pathways through the vadose zone [including well seals, abandoned or standby wells], contaminant partitioning and mobility [solubility constants]) are the most important factors resulting in degradation of groundwater quality due to irrigated agricultural operations?

6. What are the transport mechanisms by which irrigated agricultural operations impact deeper groundwater systems? At what rate is this impact occurring and are there measures that can be taken to limit or prevent further degradation of deeper groundwater while we're identifying management practices that are protective of groundwater?

7. How can we confirm that management practices implemented to improve groundwater quality are effective?

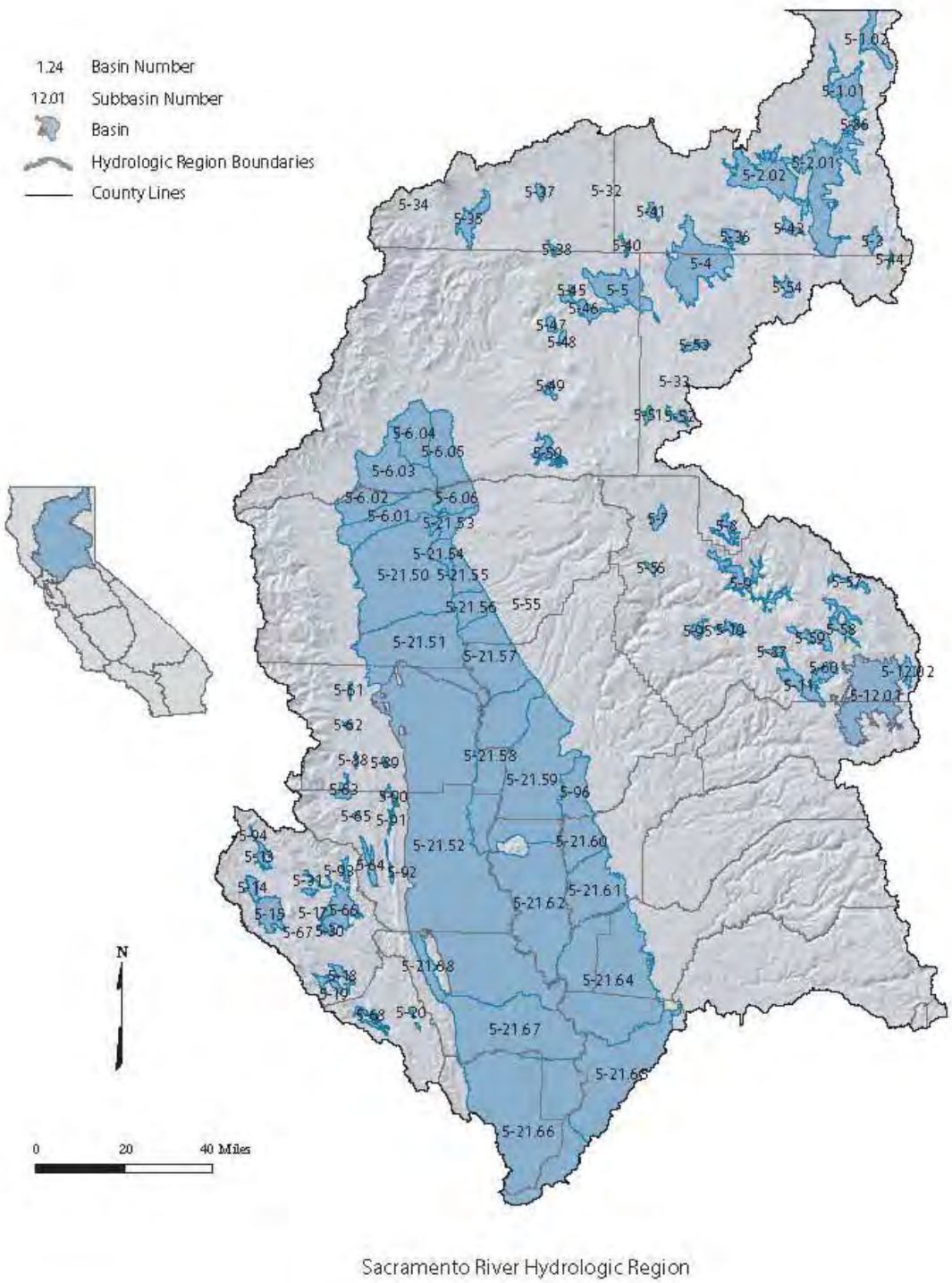
The workgroup members reached consensus that the most important constituents of concern related to agriculture's impacts to the beneficial uses of groundwater are nitrate (NO_3-N) and salinity. In addition to addressing the widespread nitrate problems, the presence of nitrates in groundwater at elevated levels would serve as an indicator of other potential problems associated with irrigated agricultural practices. Central Valley Water Board staff utilized the recommended salinity and nitrate parameters and added general water quality parameters contained within a majority of the groundwater monitoring programs administered by the board (commonly measured in the field) and some general minerals that may be mobilized by agricultural operations (general minerals to be analyzed once every five years in Trend wells). The general water quality parameters will help in the interpretation of results and ensure that representative samples are collected. The Central Valley Water Board staff considered the above questions in developing the Order's groundwater quality monitoring and management practices assessment and evaluation requirements.

B. Description of Sacramento Valley Groundwater Basins

The California Department of Water Resources (DWR) has defined the groundwater basins and major hydrologic features within the Sacramento Valley (Figure 5). The Sacramento Valley groundwater basin is further divided into the north, the middle and the southern Sacramento study units under the joint State Water Resources Control Board (State Water Board) and USGS Groundwater Ambient Monitoring Assessment (GAMA) Program (Figure 6). Rice lands are contained in the middle and southern sections of the Sacramento Valley groundwater basin, with the majority of rice planted in the middle section.

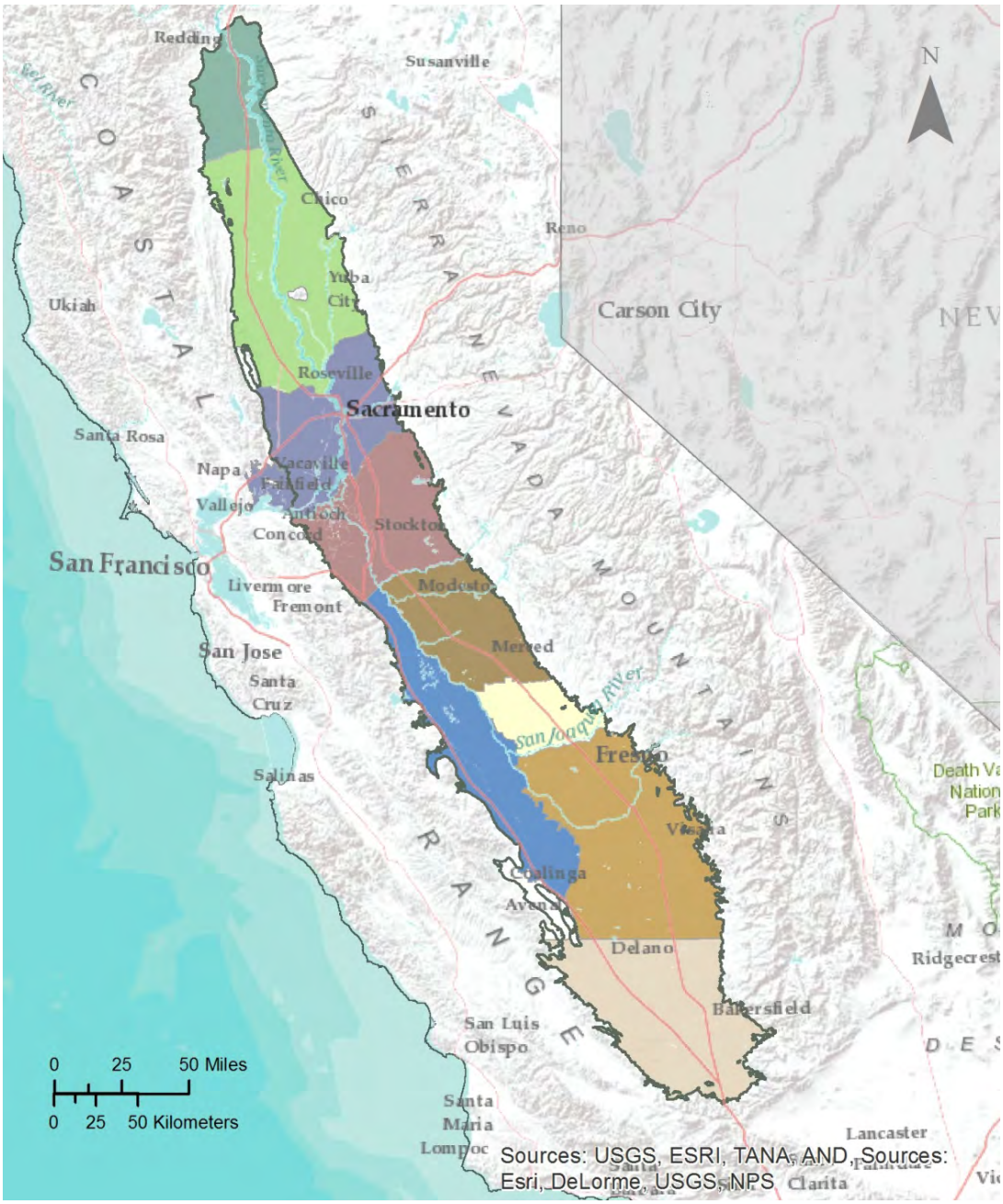
The Sacramento Valley overlies one of the largest groundwater basins in the state, providing high quality water for irrigation, municipal, industrial and domestic uses. DWR divides the Sacramento Valley groundwater basin into 17 subdivisions based on ground water characteristics, surface water features, and political boundaries. The Sacramento River and its tributaries do not act as barriers to groundwater flow. The individual groundwater sub-basins have a high degree of hydraulic interconnection and are not discrete isolated groundwater sub-basins.

Figure 5: Sacramento Valley Groundwater Basin[42]



[42] From DWR website, map of Sacramento River Groundwater Sub-basin
http://www.water.ca.gov/groundwater/bulletin118/gwbasin_maps_descriptions.cfm

Figure 6: Sacramento Valley and San Joaquin Valley GAMA Study Units[43]



The Central Valley Province consists of the following basins or study areas:

- Northern Sacramento Valley
- Central Sacramento Valley
- Southern Sacramento Valley
- Northern San Joaquin Basin
- Western San Joaquin Basin
- Central Eastside San Joaquin Valley
- Madera-Chowchilla
- Southeast San Joaquin Valley
- Kern

[43] Figure and captions from website http://ca.water.usgs.gov/gama/Provs/CenVly.htm

Groundwater generally flows from the edges of the basin toward the Sacramento River, then in a southerly direction parallel to the river. Depth to groundwater throughout most of the Sacramento Valley is 30 feet below ground surface (bgs), with shallower depths along the Sacramento River and greater depths along the basin margins. Seasonal fluctuations occur due to recharge through precipitation and snowmelt runoff, associated fluctuations in river stages, and the pumping of groundwater to supply agricultural, municipal and domestic demands.

In the past, Sacramento Valley surface water supplies have been abundant and groundwater was used as a supplement for agricultural irrigation. With the changes in environmental requirements and the lack of precipitation in the area, greater reliance on groundwater and conjunctive management of both surface and groundwater supplies is occurring to a greater extent throughout the Sacramento Valley. Many valley towns and cities rely on groundwater for a portion or all of their municipal supply needs. Domestic use of groundwater varies, but rural unincorporated areas generally rely completely on groundwater.

More detailed information on geology, soils, hydrogeology and groundwater can be found in the GAR.

C. Groundwater Assessment Report for Rice Fields in the Sacramento Valley

In April 2012, the CRC submitted a draft *Rice-Specific Groundwater Assessment Report* (GAR) for rice growing areas in the Sacramento Valley. A final GAR was submitted 2 August 2013 based on staff comments and is available to the public as part of this Order.

The analysis presented in the GAR integrates information and data, including soils, hydrogeology, irrigation practices, and groundwater monitoring data, to evaluate rice areas that may have, or have the potential, to impact groundwater quality. Figure 7 shows the data assimilation process for this analysis. The data was ultimately used to develop a rice-specific Conceptual Site Model (CSM) that describes and helps with the interpretation of the physical processes in rice growing systems (see Figure 8). The CSM is a framework for analyzing data related to subsurface hydrology and pollutant transport. The CSM helps describe the connections of rice fields to the broader environment. Independent lines of evidence were developed to assess risk of groundwater quality degradation by rice farming.

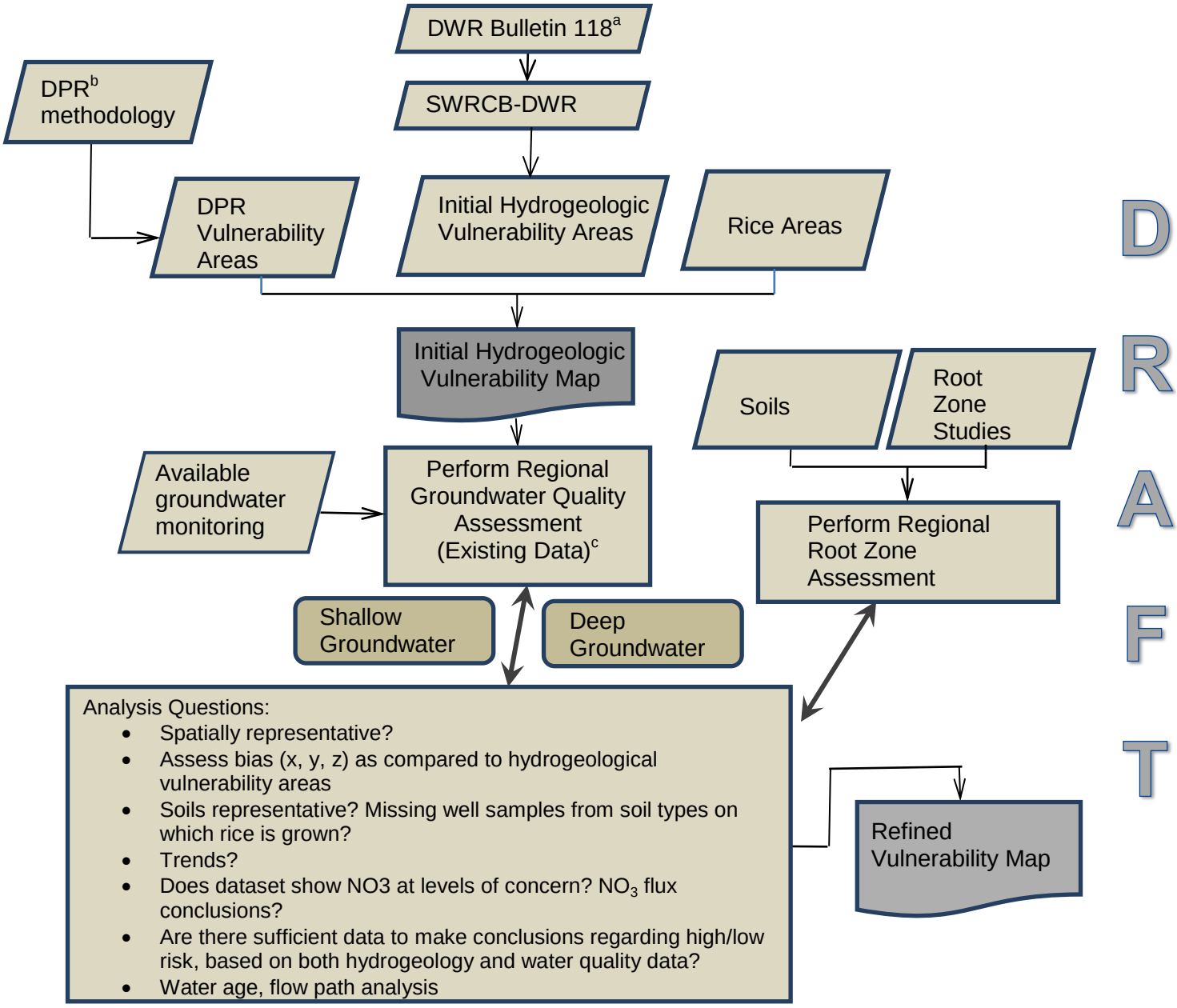
Figure 9 shows the State Water Board's initial high vulnerability areas[44] (HVAs) and the DPR Groundwater Protection Areas[45] (GPA), and rice lands within the HVAs and GPAs, respectively. A GIS analysis was used to calculate the acres of rice lands located in the initial HVAs and the GPAs (Figure 10). Using rice land use data, the CRC estimated that about 48,200 acres of rice lands are located in the initial HVAs. It was also estimated that about 1,900 acres of rice lands are located in DPR leaching areas and 56 acres in DPR leaching or runoff GPAs.

Due to the types of soil in rice fields (high clay and loam content with low permeability), the closely managed method of nitrogen application (liquid injection into the soil and immediate flooding), and the dynamics of nitrogen in flooded soils, the GAR found that groundwater in the rice region is generally of low vulnerability to contamination from rice farming. In regions farmed continuously to rice for decades, shallow groundwater is generally of high quality, showing low levels of nitrate and salinity. Soil conditions in rice fields do not favor transport of nitrate to groundwater, and irrigation and drainage water are generally less saline than in other areas of the Central Valley. Rice farming has thus been shown to be a weak source of groundwater contaminants, and there are no known high vulnerability areas (to shallow groundwater pollution from rice farming) in the CRC Coalition area.

[44] The initial HVA map was created in 2000 by the State Water Board in GIS format to support groundwater vulnerability assessment. The initial HVA map is based on hydrogeologic information.

[45] DPR GPAs identifies leaching, runoff, and leaching or runoff conditions based on soil types.

Figure 7: Data Assimilation and Interpretation Process



[a] California Department of Water Resources. *California's Groundwater*, 1978. Bulletin 118. Latest update 2003.

[b] Troiano, J, B. Johnson, S. Powell, and S. Schoenig, 1992. Profiling Areas Vulnerable to Ground Water Contamination by Pesticides in California, EH 92-09.

[c] Available groundwater monitoring data include studies such as the US Geological Survey (USGS) National Water Quality Assessment (NAWQA) Program; DPR Sampling for Pesticide Residues in California Well Water; and the California Groundwater Ambient Monitoring and Assessment (GAMA) Program sponsored by the California State Water Resources Control Board and the USGS.

Figure 8: Conceptual Site Model in Sacramento Valley Rice Fields

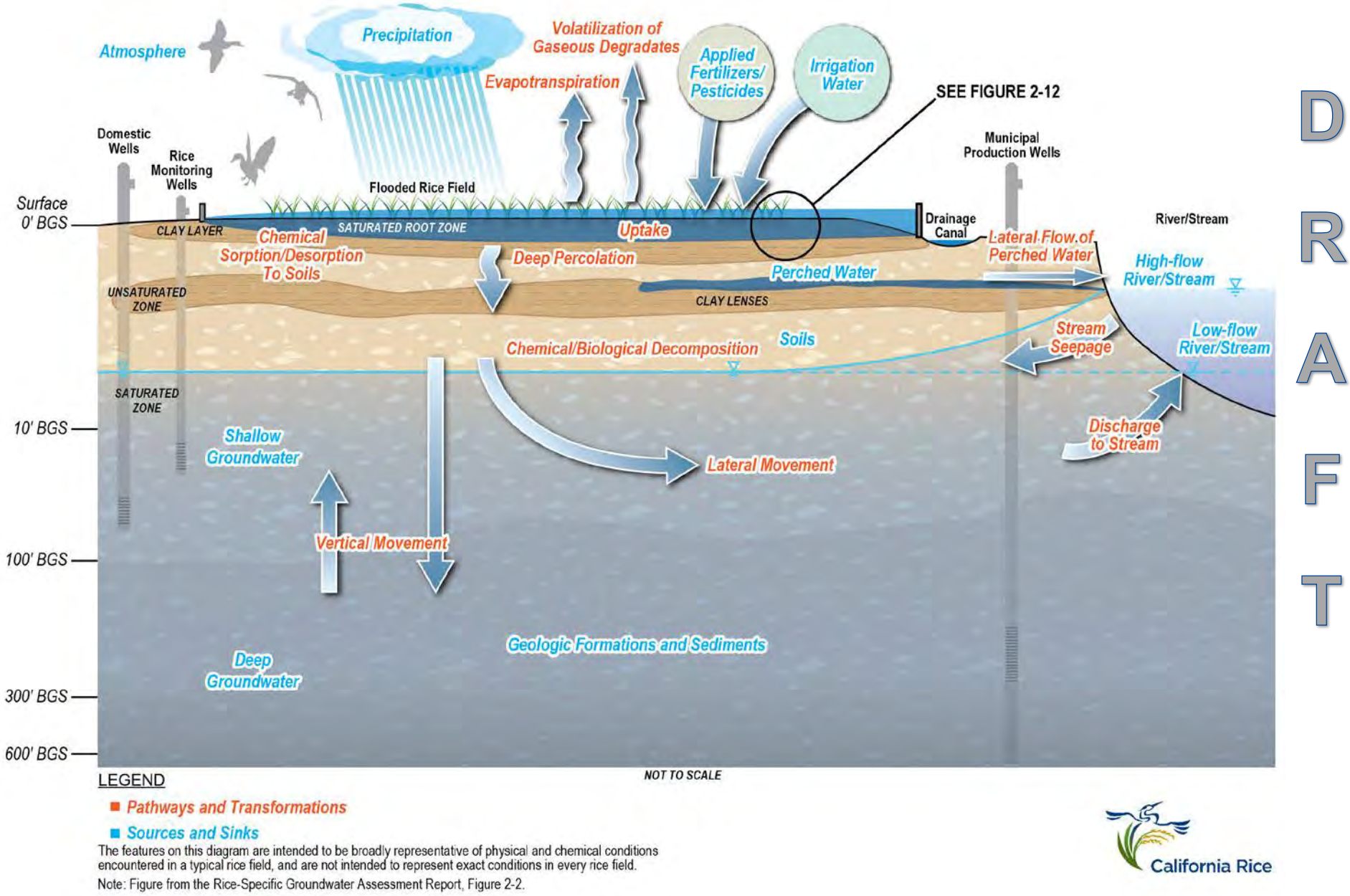
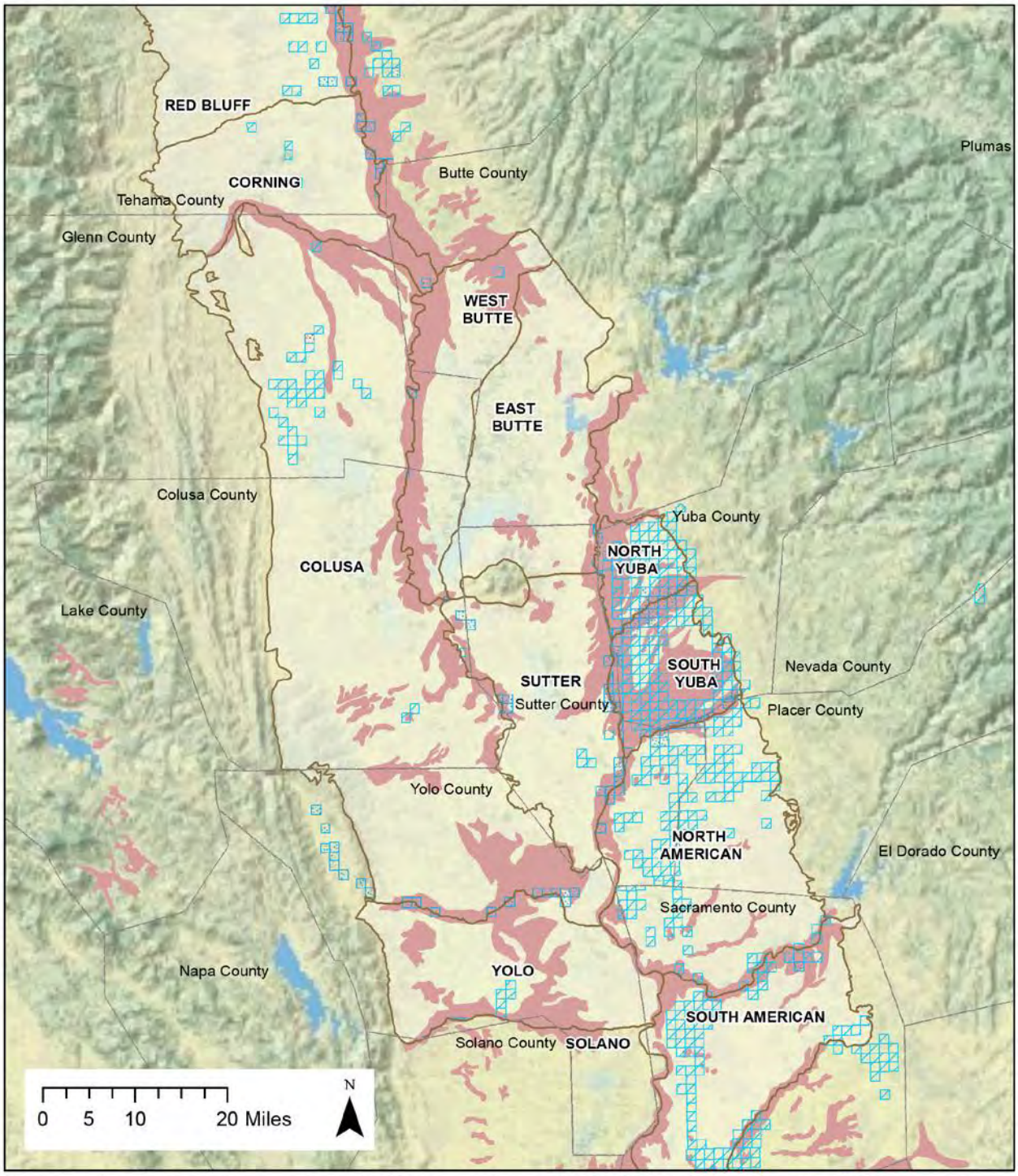


Figure 9: State Water Board's HVAs and DPR GPAs



Data Sources: Groundwater Basins, Rice Crop (California DWR 2010); Basemap, County (ESRI 2011); SWRCB (2000); DPR (2004). Datum is NAD83.

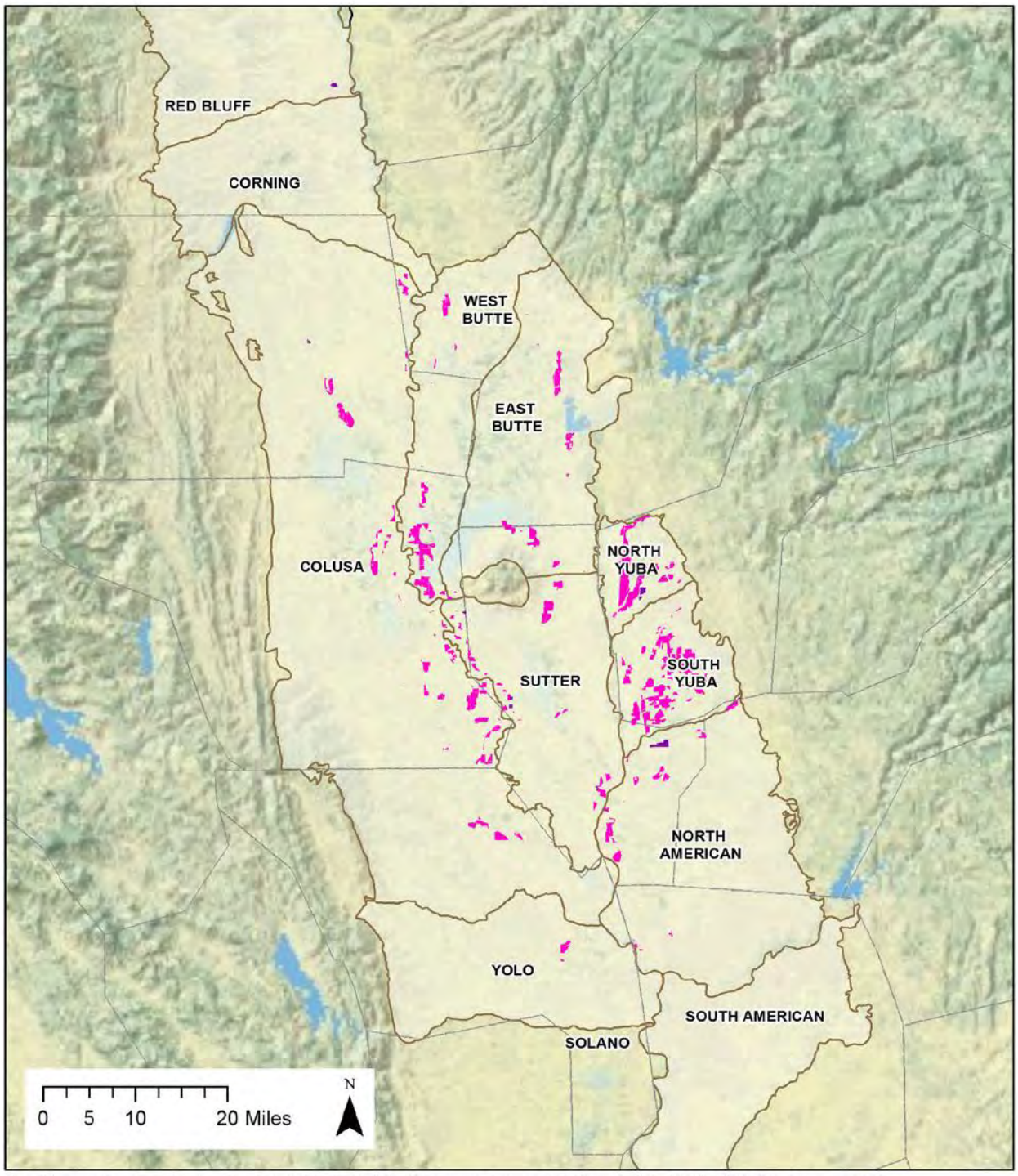
Legend

- SWRCB Initial HVA
- County Boundary
- **DPR GPAs**
- Groundwater Basins
- Leaching
- Runoff
- Runoff or Leaching

Note: Figure from the Rice-Specific Groundwater Assessment Report, Map 2-15.

California Rice

Figure 10: Rice lands in State Water Board's HVAs and DPR GPAs



Data Sources: Groundwater Basins, Rice Crop (California DWR 2010); Basemap, County (ESRI 2011); SWRCB (2000); DPR (2004). Datum is NAD83.

Legend

- Rice within Initial SWRCB HVA
- Rice within DPR Leaching and Leaching or Runoff GPA
- County Boundary
- Groundwater Basins

Note: Figure from the Rice-Specific Groundwater Assessment Report, Map 2-16.

California Rice

The GAR identified an area, North Yuba and South Yuba groundwater sub-basins in Yuba County, with no or limited groundwater monitoring data from the reviewed datasets. Also, smaller areas comprised of varying soil classes were not represented by shallow wells, including northern Glenn County and Placer County. In these limited rice growing regions where available data were sparse, CRC will undertake additional data gap analysis and potential monitoring to better characterize the environment, and to confirm or potentially change the vulnerability findings in the GAR.

D. Past Groundwater Monitoring Results

In the GAR, the CRC examined monitoring data from the following well networks and programs:

1. USGS Groundwater Ambient Monitoring and Assessment (GAMA) Program
   In 2005, the USGS started monitoring in the Sacramento Valley as part of the California Groundwater Ambient Monitoring and Assessment (GAMA) Program in cooperation with the State Water Board. The Sacramento Valley was divided into the Northern, Middle and Southern sub-regions, with the Middle and Southern sub-regions encompassing rice lands. Monitoring initially occurred in June-September 2006 for the Middle Sacramento Valley, and in March-June 2005 for the Southern Sacramento Valley. The GAMA Program continues to monitor certain wells from the original studies under the GAMA Priority Basin Project.[46]

2. California Department of Pesticide Regulation – Groundwater Protection Program
   The California Department of Pesticide Regulation (DPR), as part of its regulatory requirements under the Pesticide Contamination Prevention Act (PCPA), is required to maintain a statewide database of wells sampled for pesticide active ingredients. In consultation with the California Department of Public Health (CDPH) and the State Water Resources Control Board (State Water Board)[47], DPR annually reports the data and the actions taken to prevent pesticides contamination. DPR submits the reports to the Legislature and other State agencies.

   DPR also initiated the Groundwater Protection Program, which focuses on evaluating the potential for pesticides to move to groundwater, improving contaminant transport modeling tools, and outreach/training programs for pesticide users. As part of the Groundwater Protection Program, DPR has delineated areas where groundwater is vulnerable to contamination due to soil conditions that may allow leaching of pesticides or runoff to unprotected wellheads or other conduits to groundwater. More detailed information on rice land soils found in this area is contained in the GAR (and Figure 10).

   DPR evaluates and lists pesticides that have the potential to move to groundwater based on guidelines established in the Food & Agricultural Code § 13145(d). DPR will add restrictions to the use of the pesticides identified as known groundwater contaminants, and defined in the Food & Agricultural Code § 13149. Monitoring of pesticides both as known and potential groundwater contaminants can lead to mitigation with additional management practices either through permit conditions, or regulation. These pesticides are listed under Title 3 California Code of Regulation (CCR), Division 6, § 6800(b) (DPR's Ground Water Protection List or GWPL) indicating they have the potential to become contaminants based on their mobility, persistence and legal uses, which include certain characteristics as defined in the Food & Agricultural Code, § 13145(d). Pesticides currently applied to rice that are listed in § 6800(b) include azoxystrobin, bensulfuron methyl, bispyribac-sodium, carbaryl, clomazone, 2,4-D dimethylamine salt, halosulfuron-methyl, penoxsulam, propanil, thiobencarb, and triclopyr triethylamine salt. Of these pesticides, only bensulfuron methyl, clomazone, propanil and thiobencarb are used exclusively on rice.[48]

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[46] Bennett, G.L., Fram, M.S, and Belitz, K., 2011. Status of Groundwater Quality in the Southern, Middle, and Northern Sacramento Valley Study Units, 2005-2008: California GAMA Priority Basin Project, U.S. Geological Survey Scientific Investigations Report 2011-5002, 120 p.

[47] The State Water Board sampling results are from the GAMA Program with USGS.

[48] Date pesticide registered for use on rice: bensulfuron methyl (1989); clomazone (2003); propanil (1996); and thiobencarb (1983)

The DPR 2012 Update of the Well Inventory Database,[49] lists results from sampling reported by DPR from 1984 through 2011. Detections of rice pesticides listed in the Groundwater protection List (GWPL) are shown in Table 6.

Table 5: GWPL Rice Pesticides Detected from 1984 to 2011 for All Reporting Agencies

	Counties Sampled/Positive Counties	Wells Sampled/Positive Wells	Historical Min-Max Concentration (ppb)	Years Monitored
Registered Pesticides and Degradates				
Azoxystrobin acid[a]	11/1	124/3	0.101-0.268	2010
Propanil[b]	29/2	736/2	0.006 – 0.097	2011
Thiobencarb	56/6	8,047/9	0.006-8.7	1985-1986, 1989, 1992-1993, 2002-2011
Triclopyr	36/1	806/1	0.12	2011
Inactive Pesticides				
Molinate[c]	55/9	8,160/19	.002-29	1984-1986, 1989-1991, 1993, 2003, 2005-2011

[a] Azoxystrobin acid, is a degradation product of azoxystrobin, a fungicide registered on multiple crops. DPR did not enter this degradation product into the PDRP because DPR determined that the detected concentrations did not pose a threat to public health. DPR Sampling for Pesticide Residues in California Well Water, March 2013.

[b] A degradate, 3,4-dichloroanaline (DCA), was detected at several wells. 3,4-DCA is also a degradate of linuron, and diuron, pesticides not registered for rice.

[c] Molinate registration was cancelled in 2008 with no use permitted after the 2009 growing season.

3. USGS Water-Resources Investigations Report 01-4000 USGS National Water-Quality Assessment (NAWQA) Program – Land Use Study[50]

   The USGS installed 28 shallow monitoring wells in the Sacramento rice-growing areas in 1997 as part of the 1997 National Water Quality Assessment (NAWQA) Program. Of these wells, 23 wells are currently monitored annually for water levels. A subset of 5 wells is sampled every 2 years for water quality.

   These wells were specifically located to be surrounded by at least 75% rice farmland within 500 meters at the time of installation. Because of crop rotation, some of the wells are surrounded by less than 50% rice land in some years. Seven wells are located in right-of-way areas next to rice fields; the rest are located adjacent to the rice fields along field roads or rice equipment areas, or in farm or home yards surrounded by rice fields. Well depth varies from 8.8 m to 15.2 m (29 to 50 feet) bgs.

   Wells were initially sampled from August to October 1997. Results showed that eleven pesticides and one pesticide degradate were detected in groundwater samples. Four of the detected pesticides are or have been used on rice crops in the Sacramento Valley (bentazon, carbofuran, molinate, and

[49] Updated with sampling results from 2011, dated March 2013.

[50] Milby Dawson, B,J, 2001. *Shallow Ground-Water Quality Beneath Rice Areas in the Sacramento Valley, California, 1997.* USGS Water-Sources Investigations Report 01-4000, National Water-Quality Assessment Program, Water-Resources Investigations Report, 04-4000.

thiobencarb). All pesticide concentrations, rice and non-rice, were below state and federal 2000 drinking water standards.[51] Results from further sampling performed since 1997 is described in detail in the GAR.

4. USGS National Water-Quality Assessment (NAWQA) Program – Sacramento Subunit Area[52]
The NAWQA Sacramento subunit area, which comprises about 1,700 square miles and includes intense agricultural and urban development, was chosen for the program because it had the largest amount of groundwater use in the Sacramento Valley Groundwater Basin (SVGB). The objective of a study-unit survey was to assess the overall water quality in the aquifers that supply the highest amount of drinking water within the study basin. For this study, 29 shallow domestic and 2 monitoring wells were sampled. The data from this network provide additional information on groundwater quality in shallow groundwater in and around rice land use areas. These wells were sampled twice by the NAWQA program: once in 1996 and again in 2008. Results of these sampling events are found in the GAR.

5. Nitrates in Groundwater
The GAR examined three USGS studies for nitrate beneath rice lands: 1) the USGS study on shallow rice wells; 2) the USGS study under the NAWQA Program for 31 shallow domestic wells with nitrate data from 1996 and 2008; and 3) the USGS GAMA data for deep wells that has monitoring data from 1996 to 2008. The GAR summarized the data for each of these studies and located the wells that had nitrate (generally defined in the studies as nitrate + nitrite as N) concentrations above the MCL (10 mg/L) and 0.5 MCL (between 5 mg/L and 10 mg/L).

USGS Shallow Rice Wells
USGS currently samples the remaining network wells annually for water levels. A subset of 5 wells is sampled every 2 years for water quality. No wells showed nitrate concentrations above 10 mg/L for sampling performed from 1996 to 2011. During the same period, two wells had results over the 0.5 MCL.

The initial study analyzed for tritium, a radioactive isotope of hydrogen that can be used to estimate recharge rate for the groundwater. In 1997, the tritium analyses indicate that all but one of the USGS rice wells yield groundwater that was at least partially recharged since 1950. Based on the fact that rice acreage tripled from 1940 to 1950[53], these shallow groundwater samples can be considered representative of rice growing practices in the Sacramento Valley after the development and spread of irrigated rice cultivation in the Sacramento Valley.

USGS NAWQA Shallow Domestic Wells
The NAWQA study of shallow domestic wells has data from 1996 and 2008 for thirty wells. The 1996 sampling showed one well with nitrate detected greater than the MCL. Follow-up sampling at the same wells in May and July 2008 showed two wells with nitrate values over 10 mg/L, including the well previously found in 1996. These two wells are located in northeastern Sutter County, near Yuba City. These wells may capture some rice field discharges to groundwater, but other sources, non-rice agriculture and non-agriculture, are also likely contributing.

[51] Pesticides detected were atrazine, bromacil, carbofuran, desethyl atrazine, dichlorprop, diuron, azinphos-methyl, molinate, simazine, tebuthiuron, and thiobencarb. Bentazon had a maximum detection level (estimated) at 7.8 µg/L. All of the other pesticides had maximum detection levels below 1 µg/L.

[52] Dawson, B.J.M., 2001. *Ground-Water Quality in the Southeastern Sacramento Valley Aquifer, California, 1996*. U.S. Geological Survey Water-Resources Investigations Report 01-4125, 24 p.

[53] Rice acreage in California increased from about 100,000 acres in 1940 to over 300,000 acres in 1950 (US Census of Agriculture).

USGS GAMA Study

The USGS GAMA study used grid wells to statistically represent the study unit conditions and flow-path wells.[54] These wells were generally production wells with well depths ranging from 48 ft to 870 ft bls. The 2006 results for these deep wells showed 2 of 60 deep wells with nitrate concentration above the MCL and 6 wells with nitrate concentrations between half the MCL and the MCL. The two wells above the MCL were located in Yolo County (outside of rice-growing areas) and in southern Butte County. The latter well is upgradient of the North Yuba groundwater basin and in an area where higher nitrate concentrations have been repeatedly observed.

The six wells with nitrate concentration between 0.5 MCL and the MCL were located in Glenn County (3 wells), Sutter County (1 well), and Colusa County (2 wells). One well in Glenn County is located in a wide area of non-rice land use and one well in Colusa is at the edge of rice land use. The remaining four wells may capture some rice field discharges to groundwater, but other sources, non-rice agriculture and non-agriculture, are also contributing.

A detailed analysis of the above nitrate results in each of the three USGS well networks is provided in the GAR. In summary, nitrate was not detected in any USGS Rice Well at a level exceeding the applicable drinking water standard (i.e., primary maximum contaminant level (MCL)), and the large majority showed concentrations below the level indicative of anthropogenic impacts. The quality of this shallow groundwater suggests that despite the short distance from the root zone to shallow groundwater observed beneath rice fields, there is no evidence of nitrate contamination degradation to groundwater from rice lands monitored by these wells. This further suggests that rice cultivation is not a source of nitrate contamination throughout areas of rice land use. These results are consistent with geochemical understanding of rice root zone properties and are validated by the other USGS datasets reviewed.

The lines of evidence support the hypothesis that under typical rice growing conditions in the Sacramento Valley, rice operations are not likely to cause or contribute to water quality problems associated with nitrate in groundwater. Low permeability soils combined with saturated conditions contribute to a redox and transport environment that favors the conversion of nitrate to nitrite and volatile gases (denitrification), and that could only very slowly transport nitrogen present in any form to groundwater. As would be expected based on the known behavior of nitrogen in the rice root-zone environment, shallow groundwater in USGS Rice Wells representative of rice land use has low levels of nitrate relative to drinking water quality standards. Further, deep groundwater near rice fields (monitored by USGS GAMA Wells) also contains low nitrate concentrations.

The available evidence indicates that Sacramento Valley groundwater is not vulnerable to nitrate contamination by rice farming. However, data gaps were identified and these general conclusions may be modified for specific areas based on the results of studies or information gathered to fill those data gaps.

E. Groundwater Quality Monitoring and Management Practice Assessment, and Evaluation Requirements

The groundwater quality monitoring, assessment, and evaluation requirements have been developed in consideration of the critical questions developed by the Groundwater Monitoring Advisory Workgroup (listed above). The CRC must collect sufficient data to describe impacts on groundwater quality from rice operations and to determine whether existing or newly implemented management practices comply with the groundwater receiving water limitations of the Order.

As discussed above, the CRC GAR does not indicate that high vulnerability groundwater areas are associated with rice farming operations. The GAR's assessment of typical rice farming conditions

[54] The USGS rice wells were included in this study, but the monitoring results have been reported in the USGS shallow rice section.

indicates that rice farming operations are not expected to cause or contribute to groundwater quality problems. Since there are no identified high vulnerability areas, the Rice GAR suggests that current management practices associated with rice operations are protective of groundwater quality. The lack of identified high vulnerability areas means the Management Practices Evaluation Program does not need to be initiated with the adoption of the Order. The provisions associated with the Management Practices Evaluation Program (MPEP) will only be triggered if high vulnerability areas associated with rice operations are identified.

The general ILRP strategy for evaluating groundwater quality and protection consists of: 1) a Groundwater Quality Assessment Report (GAR), 2) a Management Practices Evaluation Program, and 3) a Groundwater Quality Trend Monitoring Program.

The purpose of the Groundwater Quality Assessment Report was to analyze existing monitoring data and provide the foundation for designing a Management Practices Evaluation Program, if needed, and the Groundwater Quality Trend Monitoring Program, as well as identifying high vulnerability groundwater areas where a groundwater quality management plan must be developed and implemented.

For the CRC, should a Groundwater Quality Management Plan (GQMP) be required, a Management Practices Evaluation Program Workplan as described in Section IV.D of the MRP would be developed. The MPEP requirements may be addressed through an equivalent evaluation program described in the applicable GQMP.

Should a MPEP be triggered, the purpose of the MPEP is to identify whether existing site-specific and/or rice-specific agricultural management practices are protective of groundwater quality in the high vulnerability areas and to assess the effectiveness of any newly implemented management practices instituted to improve groundwater quality. If the MPEP requirements are triggered, the CRC is required to develop a workplan that describes the tools or methods to be used to associate management practice activities on the land surface with the effect of those activities on underlying groundwater quality. The MPEP would need to be designed to answer GMAW questions 2, 5, 6, and 7. Where applicable, management practices identified as protective of groundwater quality through the MPEP (or equivalent practices) would need to be implemented by Growers, whether the Grower is in a high or low vulnerability area.

The trend monitoring and GAR updates will ensure that the Growers efforts continue to protect water quality. If groundwater quality trends indicate a trend of increasing degradation is occurring in low vulnerability areas, then a Groundwater Quality Management Plan must be developed and implemented.

The Order's MRP requires monitoring for general trends in groundwater quality under rice growing lands. Trend monitoring[55] has been developed to try to answer GMAW questions 1 and 4. Existing shallow wells, such as the USGS rice wells (see section D above), will be used for the trend monitoring under the Order. Groundwater monitoring to evaluate the effects of rice growing practices on groundwater quality is also required under the MRP when a GQMP is triggered. If the GQMP is triggered, studies and monitoring to evaluate the effect, if any, of rice operations on first encountered groundwater would answer GMAW questions 2, 5, 6, and 7. Monitoring as outlined in a GQMP will be required in rice areas where water quality problems in the groundwater have been identified with rice operations as a known or possible contributor.

GMAW question 3, which seeks to differentiate sources of existing impact, cannot be easily answered by traditional groundwater monitoring. Trend monitoring will help to answer this question, but other methods such as isotope tracing and groundwater age determination may also be necessary to fully differentiate

[55] Trend monitoring requires yearly monitoring at the same time each year for electrical conductivity, pH, temperature, alkalinity, nitrate + nitrite, as nitrogen, and total Kjeldahl nitrogen. Every five years total dissolved solids, and general minerals (cations and anions).

sources. The MRP does not require these advanced source methods because they are not necessary to determine compliance with the Order.

F. Groundwater Quality Management Plans

Under this Order, groundwater quality management plans (GQMPs) will be required where there are exceedances of water quality objectives, where there is a trend of degradation[56] that threatens a beneficial use, as well as for high vulnerability groundwater areas if such areas are identified in the future. GQMPs will only be required if rice operations may cause or contribute to the groundwater quality problem. GQMPs are the key mechanism under this Order to help ensure that waste discharges from rice operations are meeting Groundwater Receiving Water Limitation III.B. The limitations apply immediately unless the Grower is implementing the GQMP in accordance with the approved time schedule. The GQMP will include a schedule and milestones for the implementation of management practices (see Appendix MRP-1). The schedule must identify the time needed to identify new management practices necessary to meet the receiving water limitations, as well as a timetable for implementation of identified management practices. The MPEP will be the process used to identify the effectiveness of management practices, where there is uncertainty regarding practice effectiveness under different site conditions. However, the GQMP will also be expected to include a schedule for implementing practices that are known to be effective in partially or fully protecting groundwater quality.

The main elements of GQMPs are to A) investigate potential rice sources of waste discharge to groundwater, B) review physical setting information for the plan area such as geologic factors and existing water quality data, C) considering elements A and B, develop a strategy with schedule and milestones to implement practices to ensure discharge from rice discharges are meeting Groundwater Limitation III.B.1, D) develop a monitoring strategy to provide feedback on GQMP progress, E) develop methods to evaluate data collected under the GQMP, and F) provide reports to the Central Valley Water Board on progress (annual).

Elements A – F are necessary to establish a process by which the CRC and Central Valley Water Board are able to investigate waste sources and the important physical factors in the plan area that may impact management decisions (elements A and B), implement a process to ensure effective practices are adopted by Growers (element C), ensure that adequate feedback monitoring is conducted to allow for evaluation of GQMP effectiveness (elements D and E), and facilitate efficient Central Valley Water Board review of data collected on the progress of the GQMP (element F).

Under the Order, the CRC will be required to develop GQMPs that include the above elements. GQMPs will be reviewed and approved by the Executive Officer. Also, because GQMPs may cover broad areas potentially impacting multiple groundwater users in the plan area, these plans will be posted for public review. Prior to plan approval, the Central Valley Water Board Executive Officer will consider public comments on proposed GQMPs.

In accordance with Water Code section 13267, the burden of the GQMP, including costs, is reasonable. The Central Valley Water Board must be informed of the efforts being undertaken by Growers to address identified groundwater quality problems. In addition, a GQMP for multiple or specified areas where rice is grown is a reasonable first step to address identified groundwater quality problems, since the monitoring and planning costs are significantly lower when undertaken collectively by the CRC rather than requiring individual Growers to undertake similar monitoring and planning efforts. However, if the collective GQMP does not result in the necessary improvements to water quality, the burden, including costs, of requiring individual Growers in the impacted area to conduct monitoring, describe their plans for addressing the identified problems, and evaluate their practices is a reasonable subsequent step. The benefits and necessity of such individual reporting, if collective efforts fail, include, but are not limited to: 1) the need of the board to evaluate the compliance of regulated Growers with applicable orders; 2) the need of the

[56] A trend in degradation could be identified through the required trend monitoring or through the periodic updates of the Groundwater Quality Assessment Report.

board to understand the effectiveness of practices being implemented by Growers; and 3) the benefits of improved groundwater quality to all users.

VIII. Farm Evaluations

The Order requires that all Growers complete a farm evaluation describing management practices implemented to protect surface and groundwater quality. The evaluation also includes information such as location of the farm, surface water discharge points, and whether wellhead protection practices have been implemented.

The Order requires all Growers to complete the Farm Evaluation and submit it to the California Rice Commission by 1 March 2015. Growers must update the Farm Evaluation and submit it to the California Rice Commission by 1 March 2016 and annually thereafter, unless a reduced frequency is approved by the Executive Officer after 1 March 2017.

The farm evaluation is intended to provide the CRC and the Central Valley Water Board with information regarding Grower implementation of the Order's requirements. Without this information, the board would rely solely on representative surface and groundwater monitoring to determine compliance with the Order. Farm evaluations will provide assurance that Growers are implementing management practices to protect groundwater quality while trend data are collected, and to evaluate implementation of any applicable Groundwater Quality Management Plan.

Further, the reporting of practices identified in the farm evaluation will allow the CRC and the Central Valley Water Board to effectively implement an MPEP, should one be triggered. Evaluating management practices at representative sites (in lieu of farm-specific monitoring) is effective if the results of the monitored sites can be extrapolated to non-monitored sites. One of the key methods for extrapolating such results is to have an understanding of which rice farming operations have practices similar to the site that is monitored. The reporting of practices will also allow the Central Valley Water Board to evaluate if the GQMP is being implemented by Growers according to the approved schedule. It is understood that rice farming operations and practices do not vary significantly for Growers represented by the CRC.

In addition, reporting of practices will allow the CRC and board to evaluate changes in surface water quality relative to changes in practices. The SQMP (should one be triggered) will include a schedule and milestones for the implementation of practices to address identified surface water quality problems (e.g., identified through monitoring at sites). The reporting of practices will allow the board to determine whether the SQMP is being implemented by Growers according to the approved schedule. Absent information on practices being implemented by Growers, the board would not be able to determine whether individual Growers are complying with the Order.

The Executive Officer is given the discretion to reduce the reporting frequency for, if there are minimal year to year changes in the practices reported. This discretion is provided, since the reporting burden would be difficult to justify given the costs if there were minimal year to year changes in the information provided.

IX. Nitrogen Management Plans

The Order requires Growers to prepare and implement a rice-specific nitrogen management plan by 1 March 2016, and update by 1 March annually thereafter. The Grower must use the rice-specific Nitrogen Management Plan template approved by the Executive Officer. The Nitrogen Management Plan shall be maintained or be available electronically at the Grower's farming operations headquarters or primary place of business. A copy of the plan must be made available for inspection, upon request, to Central Valley Water Board staff.

The Nitrogen Management Plan requirements are part of the MRP Order for all Growers. Growers in an area where nitrates in groundwater have triggered the need for a GQMP must, as part of GQMP implementation, have their Nitrogen Management Plan certified by a Central Valley Water Board approved third-party and prepare a Nitrogen Management Summary Report.

X. Spatial Resolution of Farm Evaluation Information

The Order requires reporting to the Central Valley Water Board of management practices identified through the farm evaluation. These data are required to be reported at a township scale (36 square mile area) where the farm is located. The spatial resolution by township provides a common unit that should facilitate analysis of data and comparisons between different areas.

Although the data collected by the CRC from individual Growers will be reported to the board, those data will only be associated with the township where the enrolled parcel is located and will not be associated with the Grower or their enrolled parcel. For example, the CRC may have information submitted for 180 different parcels in a given township. The board would receive 180 individual data records for that township, but the individual data records would not be associated with a specific parcel or Grower

In order to determine whether Growers in a given township are implementing practices necessary to meet the Order's requirements, the CRC will need to assess the data and evaluate trends. The CRC's assessment and evaluation will be provided in the CRC's annual monitoring report. Since a report on management practice implementation will be provided annually, the board will be able to determine whether trends are positive.

XI. Special study reports

Additional technical reports may include field specific special or source identification studies at the direction of the Executive Officer, or as requested by the CRC and approved by the Executive Officer. The Executive Officer may require special studies where regional monitoring is ineffective in determining potential sources of water quality problems, to identify whether management practices are effective, or to determine whether individual Grower parcels are causing exceedances of water quality objectives. Special studies help ensure that the potential information gaps described above under the Order's regional monitoring may be filled through targeted technical reports, instead of more costly individual monitoring programs.

XII. Technical Reports

The surface water and trend groundwater quality monitoring programs under the Order are representative in nature instead of individual field discharge monitoring and provide representation of receiving water quality. The benefits of such monitoring include the ability to determine whether receiving waters accepting discharges from rice lands are meeting water quality objectives. Representative monitoring also allows the Central Valley Water Board to determine whether practices are protective of water quality. There are limitations to such receiving water monitoring when trying to determine possible sources of water quality problems.

Therefore, if Surface Water Quality Management Plans and Groundwater Quality Management Plans are triggered, such plans must evaluate the effectiveness of management practices in protecting water quality. Thus, through the evaluations and studies conducted by the CRC, the reporting of practices by the Growers on the Farm Evaluations, and the board's compliance and enforcement activities, the Central Valley Water Board will be able to determine whether a Grower is complying with the Order and meeting the established farm management performance standards.

Although an effective method of determining compliance with water quality objectives may be water quality monitoring at the individual level, the costs of individual monitoring would be much higher than representative surface and groundwater quality monitoring required under the Order. This is because

representative monitoring site selection may be based on a group or category of represented waste discharges, assessing compliance for represented Growers, reducing the number of samples needed to evaluate compliance with the requirements of this Order. The CRC is tasked with ensuring that selected monitoring sites are representative of waste discharges from all rice operations within the Order's boundaries.

This Order requires the CRC to provide technical reports. These reports may include special studies at the direction of the Executive Officer. The Executive Officer may require special studies where representative monitoring is ineffective in determining potential sources of water quality problems or to identify whether management practices are effective. Special studies help ensure that the potential information gaps described above under the Order's representative monitoring requirements may be filled through targeted technical reports, instead of more costly individual monitoring programs.

XIII. Approach to Implementation and Compliance and Enforcement

The board has been implementing the Irrigated Lands Regulatory Program since 2003. The implementation of the program has included compliance and enforcement activities to ensure growers have the proper regulatory coverage and are in compliance with the applicable board orders. The following section describes the state-wide policy followed by the board, as well as how the board intends to implement and enforce the Order.

The State Water Board's Water Quality Enforcement Policy (Enforcement Policy) defines an enforcement process that addresses water quality in an efficient, effective, and consistent manner[18]. A variety of enforcement tools are available in response to noncompliance. The Enforcement Policy endorses the progressive enforcement approach which includes an escalating series of actions from informal to formal enforcement. Informal enforcement actions are any enforcement taken by staff that is not defined in statute or regulation, such as oral, written, or electronic communication concerning violations. The purpose of informal enforcement is to quickly bring an actual, threatened, or potential violation to the discharger's attention and to give the discharger an opportunity to return to compliance as soon as possible. Formal enforcement includes statutorily based actions that may be taken in place of, or in addition to, informal enforcement. Formal enforcement is recommended as a first response to more significant violations, such as the highest priority violations, chronic violations, and/or threatened violations. There are multiple options for formal enforcement, including Administrative Civil Liabilities (ACLs) imposed by a Regional Water Board or the State Water Board. A 30-day public comment period is required prior to the settlement or imposition of any ACL and prior to settlement of any judicial civil liabilities.

A. Compliance/Enforcement Related to Water Quality Violations

The board intends to respond promptly to complaints and conduct field inspections on a routine basis to identify potential water quality violations. Complaints will generally result from local residents contacting the board based on their observations of sediment plumes, fish kills, or odor problems. The board will generally contact and coordinate with the third-party, the California Department of Fish and Wildlife, and the local county agricultural commissioner depending on the nature of the problem.

In addition, the board staff will conduct field inspections of individual grower's operations to determine whether practices protective of groundwater are in place. Such practices include backflow prevention devices; well head protection; and those practices found protective through the Management Practices Evaluation Program. The field inspections will also include a review of whether implemented practices are protective of surface water, and may include sampling of runoff. The informal and formal enforcement process described above will be used should any violations of the Order be identified through field inspections.

B. Compliance/Enforcement Related to Information Collected

As a part of field inspections, and with the consent of the Growers, owner or authorized representative as required by applicable laws, staff may also review information and farm plans prepared by Growers. The

Executive Officer will request information, as necessary, from Growers and the CRC to audit the quality and accuracy of information being submitted. The Executive Officer will regularly report to the board on the results of any audits of the information reported by the third-party, the outcome of any field verification inspections of information submitted by the Growers, and make recommendations regarding changes to the reporting requirements and the information submittal process, if needed.

The findings of this Order provide a further description of the enforcement priorities and process for addressing violations.

XIV. Reports and Plans

This Order is structured such that the Executive Officer is to make determinations regarding the adequacy of reports and information provided by the Growers and allows the Executive Officer to approve such reports. All plans and reports required for approval by the Executive Officer will be posted on the board's website upon approval. In addition, this Order identifies specific reports and Executive Officer's decisions that must be posted for public comment and review. It is the right of any interested person to request the Central Valley Water Board to review any of the aforementioned Executive Officer decisions.

XV. Water Quality Objectives

Surface water and groundwater limitations in section III of the Order specify that waste discharged from rice lands shall not cause or contribute to an exceedance of water quality objectives in surface water or underlying groundwater, unreasonably affect beneficial uses, or cause a condition of pollution or nuisance. The surface water and groundwater limitations are effective immediately except in areas where Growers are implementing an approved SQMP or GQMP.

Water quality objectives that apply to surface water are described in the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan). Applicable water quality objectives include, but are not limited to, (1) the numeric objectives, including the bacteria objective, the chemical constituents objective (includes listed chemicals and state drinking water standards, i.e., maximum contaminant levels (MCLs) promulgated in Title 22 California Code of Regulations (CCR) Division 4, Chapter 15 sections 64431 and 64444 that are applicable through the Basin Plan to waters designated as municipal and domestic supply), dissolved oxygen objectives, pH objectives, and the turbidity objectives, and (2) the narrative objectives, including the biostimulatory substances objective, the chemical constituents objective, and the toxicity objective. The Basin Plan also contains numeric water quality objectives that apply to specifically identified water bodies, such as specific temperature and salinity objectives. Federal water quality criteria that apply to surface water are contained in federal regulations referred to as the California Toxics Rule and the National Toxics Rule. CFR, sections 131.36 and 131.38.

Water quality objectives that apply to groundwater include, but are not limited to, (1) numeric objectives, including the bacteria objective and the chemical constituents objective (includes state MCLs promulgated in Title 22 CCR Division 4, Chapter 15, sections 64431 and 64444 and are applicable through the Basin Plan to municipal and domestic supply), and (2) narrative objectives including the chemical constituents, taste and odor, and toxicity objectives.

The requirements that waste discharge not unreasonably affect beneficial uses or cause a condition of pollution or nuisance are prescribed pursuant to sections 13263 of the California Water Code. Section 13263 of the California Water Code requires Regional Water Boards, when establishing waste discharge requirements, to consider the need to prevent nuisance and the provisions in section 13241 of the California Water Code. Section 13241 requires Regional Water Boards to consider several factors when establishing water quality objectives including prevention of nuisance and reasonable protection of beneficial uses.

A. Implementation of Water Quality Objectives

The Basin Plan includes numeric and narrative water quality objectives. The narrative toxicity objective states: *"All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life."* The Basin Plan states that material and relevant information, including numeric criteria, and recommendations from other agencies and scientific literature will be utilized in evaluating compliance with the narrative toxicity objective. The narrative chemical constituent objective states that waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. At a minimum, "…*water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs)"* in Title 22 of CCR. The Basin Plan further states that, to protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs. The narrative tastes and odors objective states: *"Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses."*

The Sacramento-San Joaquin Basin Plan, starting at page IV-16.00, contains an implementation policy, "Policy for Application of Water Quality Objectives", that specifies how the Central Valley Water Board will evaluate compliance with narrative water quality objectives.

For constituents where there are no adopted numeric water quality objectives, the Central Valley Water Board staff will develop trigger limits in consultation with the Department of Pesticide Regulation (for pesticides), CRC, and other agencies as appropriate. Central Valley Water Board staff will provide interested parties, including the CRC, with an opportunity to review and comment on the trigger limits. The Executive Officer will then provide the trigger limits to the CRC. Those trigger limits will be used to address applicable narrative objectives. In locations where trigger limits are exceeded, water quality management plans must be developed that will form the basis for reporting which steps have been taken by Growers to achieve compliance with numeric and narrative water quality objectives.

B. Nonpoint Source Program (NPS)

The Order regulates waste discharges from rice lands to state waters as an NPS program. Accordingly, these waste discharge requirements must implement the provisions of the State Water Board's *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Policy). Under the NPS Policy, the Regional Water Board must find that the program will promote attainment of water quality objectives. The nonpoint-source program also includes five key structural elements. These elements include (1) the purpose of the program must be stated and the program must address NPS pollution in a manner that achieves and maintains water quality objectives and beneficial uses, including any applicable antidegradation requirements; (2) describe the practices to be implemented and processes to be used to select and verify proper implementation of practices; (3) where it is necessary to allow time to achieve water quality requirements, include a specific time schedule, and corresponding quantifiable milestones designed to measure progress toward reaching specified requirements; (4) feedback mechanisms to determine whether the program is achieving its purpose; and (5) the consequences of failure to achieve the stated purpose.

The Order addresses each of the five key elements, as described below.

(1) The purpose of the long-term irrigated lands regulatory program, of which the Order is an implementing mechanism for rice lands in the Sacramento Valley, is stated above under the section titled "Goals and Objectives of the Irrigated Lands Regulatory Program."[57] The program goals and objectives include meeting water quality objectives. The requirements of the Order

[57] ICF International. 2010. *Irrigated Lands Regulatory Program - Program Environmental Impact Report*. Draft. July. (ICF 05508.05.) Sacramento, CA. Prepared for Central Valley Regional Water Quality Control Board, Sacramento, CA.

include requirements to meet applicable water quality objectives and requirements of State Water Board Resolution 68-16 (antidegradation requirements). Further discussion of this Order's implementation of the antidegradation policy is given below under the section titled "State Water Board Resolution 68-16."

(2) The board is prevented by Water Code section 13360 from prescribing specific management practices to be implemented. However, it may set forth performance standards and require dischargers to report on what practices they have or will implement to meet those standards. Examples of the types of practices that irrigated agricultural operations may implement to meet program goals and objectives have been described in the Economics Report[58] and evaluated in the Program Environmental Impact Report (PEIR)[59] for the long-term ILRP. This Order requires each individual rice operation to develop a farm evaluation that will describe and evaluate their management practices in place to protect surface water and groundwater quality. This Order also requires the development of surface/groundwater quality management plans (SQMPs/GQMPs) in areas where there are exceedances of water quality objectives. The requirements for SQMPs and GQMPs include that the CRC needs to identify management practices and develop a process for evaluating the effectiveness of such practices. The requirements of the Order are consistent with Key Element 2.

(3) This Order requires the development of SQMPs/GQMPs in areas where water quality objectives are not met. SQMPs/GQMPs must include time schedules for implementing the plans and meeting the surface and groundwater limitations (section III of the Order) as soon as practicable, but within a maximum of 10 years for surface and groundwater. The time schedules must be consistent with the requirements for time schedules set forth in this Order. The time schedules must include quantifiable milestones that will be reviewed by the Executive Officer and the public prior to approval. The time schedule requirements in the Order are consistent with Key Element 3.

(4) To provide feedback on whether program goals are being achieved, this Order requires surface and groundwater quality monitoring, tracking of management practices, and evaluation of the effectiveness of implemented practices. The Monitoring and Reporting Program (Attachment B) implements this element by: a) tracking, monitoring, assessing and reporting program activities; b) ensuring consistent and accurate reporting of monitoring activities; c) targeting NPS Program activities at the watershed level, d) coordinating with public and private partners; and e) tracking the implementation of management practices to improve water quality and protect existing beneficial uses. This feedback will allow iterative implementation of practices to ensure that program goals are achieved. The feedback mechanisms required by the Order are consistent with Key Element 4.

(5) This Order establishes the following consequences where requirements are not met:

(a) The CRC or Growers will be required, in an iterative process, to conduct additional monitoring and/or implement management practices where water quality objectives are not being met;

(b) Appropriate Central Valley Water Board enforcement action will be taken where the iterative management practices process is unsuccessful, program requirements are not met, or time schedules are not met;

(c) Central Valley Water Board will require noncompliant Growers of all rice lands where the CRC fails to meet the requirements of this Order, to submit of a report of waste discharge to obtain

[58] ICF International. 2010. *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program.* July. (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA.

[59] ICF International. 2011. *Irrigated Lands Regulatory Program - Program Environmental Impact Report*. Final and Draft. March. (ICF 05508.05.) Sacramento, CA. Prepared for Central Valley Regional Water Quality Control Board, Sacramento, CA.

individual waste discharge requirements from the Central Valley Water Board (i.e., revoke coverage under this Order).

The Order describes consequences for failure to meet requirements and is consistent with Key Element 5.

C. California Environmental Quality Act (CEQA)

For the purposes of adoption of the Order, the Central Valley Water Board is the lead agency pursuant to CEQA (Public Resources Code sections 21100 et seq.). The Central Valley Water Board has prepared a Final Program Environmental Impact Report (PEIR)[60] that analyzes the potential environmental impacts of six alternatives for a long term ILRP. As described more fully in Attachment D, this Order relies upon the PEIR for CEQA compliance. The requirements of the Order include regulatory elements that are also contained in the six alternatives analyzed in the PEIR. Therefore, the actions by Growers to protect water quality in response to the requirements of this Order are expected to be similar to those described for Alternatives 2-6 of the PEIR (Alternative 1 does not include groundwater protection).

The PEIR describes that potential environmental impacts of all six alternatives are associated with implementation of water quality management practices, construction of monitoring wells, and impacts to agriculture resources (e.g., loss of production of prime farmland) due to increased regulatory costs. Under the Order, Growers will be required to implement water quality management practices to address water quality concerns. The PEIR describes and evaluates potential impacts of practices likely to be implemented to meet water quality and other management goals on irrigated lands. These water quality management practices include:

- Nutrient management
- Improved water management
- Tailwater recovery system
- Pressurized irrigation
- Sediment trap, hedgerow, or buffer,
- Cover cropping or conservation tillage
- Wellhead protection

These practices are examples of the types of practices that would be broadly applied by irrigated agricultural operations throughout the Central Valley and are considered representative of the types of practices that would have potential environmental impacts. It is important to note that the evaluated practices are not required; operators will have the flexibility to select practices to meet water quality goals. The Order represents one order in a series of orders that will be developed, based on the alternatives evaluated in the PEIR for all irrigated agriculture within the Central Valley.

Because Sacramento Valley rice lands represent a single commodity, instead of all commodities within the Central Valley, it is possible to further narrow the types of practices that may be implemented in response to the requirements in the order. Of the types of management practices evaluated in the PEIR, only the following may be implemented by Growers:

- Nutrient management
- Buffer zones for nearby sensitive crops
- Wellhead protection

Pressurized irrigation systems are not used on Sacramento Valley rice fields since most fields are leveled to control surface irrigation flow, so that they can be efficiently flooded for extended periods of time. For this same reason, cover crops are seldom planted by Growers. The flooded fields essentially

[60] ICF International. 2011. *Irrigated Lands Regulatory Program Final Program Environmental Impact Report.* Final. March. (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA

function as sediment basins and tailwater return systems. This is reflected in the economic evaluation[61] for the long-term program (hereafter referred to as the Economics Report), indicating that 100 percent of rice operations have capabilities equivalent to a tailwater recovery system, i.e., the infrastructure is in place to hold water in a field without additional construction practices. The Economics Report also describes that 100 percent of rice operations already have irrigation water management practices in place that can regulate the flow on and off the rice field.[62] Therefore, these practices are already implemented on all rice fields and would not be implemented as a result of the Order. Consequently, many of the significant effects identified in the PEIR do not apply when considering implementation of the Order.

The requirements of the Order would lead to implementation of the above, rice-specific practices to a similar degree as is described for Alternatives 2-6 analyzed in the PEIR. Also, the Order may require installation of monitoring wells (depending on the adequacy of existing wells for water quality monitoring). Because the basis for evaluation of the Order's potential impacts is the PEIR, which applies to all irrigated agricultural operations within the Central Valley, Attachment D, Findings of Fact and Statement of Overriding Considerations, of this Order provides impact findings described in the PEIR that are applicable to the Order.

1. Mitigation Measures

The impacts described above, except for agriculture resources, cumulative climate change and cumulative vegetation and wildlife, can be reduced to a less than significant level through the employment of alternate practices or by choosing a location that avoids sensitive areas (e.g., installing a monitoring well in a developed area rather than in an area that provides riparian habitat). Where no alternate practice or less sensitive location for a practice exists, the Order requires the CRC and Growers choosing to employ these practices to avoid impacts to sensitive resources by implementing the mitigation measures described in Attachment D. A CEQA Mitigation Monitoring and Reporting Program is included in Attachment B of this Order, Monitoring and Reporting Program R5-2014-XXXX.

D. Statement of policy with respect to maintaining high quality waters in California (State Water Board Resolution 68-16)

This section of the Information Sheet first provides background on State Water Board Resolution 68-16 *Statement of Policy with Respect to Maintaining High Quality of Waters in California* (Resolution 68-16). Following the background discussion, the Information Sheet describes how the various provisions in the WDR and MRP collectively implement Resolution 68-16. In summary, the requirements of Resolution 68-16 are met through a combination of upfront planning and implementation at the farm level; representative monitoring and assessments to determine whether trends in degradation are occurring; and regional planning and on-farm implementation when degradation trends are identified.

Initially, all Growers will need to conduct an on-farm evaluation to determine whether their practices are protective of water quality and whether they are meeting the established farm management performance standards. Through the process of becoming aware of effective management practices; evaluating their practices; and implementing improved practices; Growers are expected to meet the farm management performance measures and, thereby, achieve best practicable treatment or control (BPTC), where applicable. All Growers must prepare and implement a farm-specific nitrogen management plan.

[61] ICF International. 2010. *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program.* July. (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA.

[62] Irrigation water management practices are designed to optimize the use of irrigation water for crop production by matching the timing and uniformity of irrigation to the soil water depletion. Examples include proper timing of irrigation to reduce crop stress and susceptibility to disease and pest infestation; reduction of runoff due to overwatering and thus the likelihood that nutrients or pesticides will be transported off site.

Monitoring of surface water and groundwater together with periodic assessments of available surface water and groundwater information is required to determine compliance with water quality objectives and determine whether any trends in water quality improvement or degradation are occurring. If trends in such degradation are identified that could result in impacts to beneficial uses, a surface (or groundwater) quality management plan must be prepared by CRC. The plan must include the identification of practices that will be implemented to address the trend in degradation and an evaluation of the effectiveness of those practices in addressing the degradation. The CRC must report on the implementation of practices by their Growers. Failure to implement practices or address the degradation by individual Growers will result in further direct regulation by the board, including, but not limited to, requiring individual farm water quality management plans; regulating the individual grower directly through WDRs for individual farmers; or taking other enforcement action.

As discussed further below, the combination of these requirements fulfill the requirements of Resolution 68-16 for any degradation of high quality waters authorized by this Order.

1. Background

Basin Plan water quality objectives are developed to ensure that ground and surface water beneficial uses are protected. The quality of some state ground and surface waters is higher than established Basin Plan water quality objectives. For example, nutrient levels in good, or "high quality" waters may be very low, or not detectable, while existing water quality standards for nutrients may be much higher. In such waters, some degradation of water quality may occur without compromising protection of beneficial uses. State Water Board Resolution 68-16 *Statement of Policy with Respect to Maintaining High Quality of Waters in California* (Resolution 68-16) was adopted in October of 1968 to address high quality waters in the state. Title 40 of the Code of Federal Regulations, Section 131.12—Antidegradation Policy (40 CFR 131.12) was developed in 1975 to ensure water quality necessary to protect existing uses in waters of the United States. Resolution 68-16 applies to discharges to all high quality waters of the state, including groundwater and surface water (Water Code section 13050[e]); 40 CFR 131.12 applies only to surface waters.

The requirement to implement the Antidegradation Policy is contained in Resolution 68-16 (provision 2 presented below) and in the Basin Plan. The Basin Plan states that the Central Valley Water Board actions must conform with State Water Board plans and policies and among these policies is Resolution 68-16, which requires that:

1. *"Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies."*
2. *"Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."*

For discharges to surface waters only, the Federal Antidegradation Policy (Section 131.12, Title 40, CFR) requires:

1. *"Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.*
2. *Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing*

lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.

3. *When high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.*
4. *In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act."*

The State Water Board has interpreted Resolution 68-16 to incorporate the Federal Antidegradation Policy in situations where the policy is applicable. (SWRCB Order WQ 86-17.). The application of the Federal Antidegradation Policy to nonpoint source discharges (including discharges from irrigated agriculture) is limited.[63]

Administrative Procedures Update 90-004, Antidegradation Policy Implementation for NPDES Permitting, provides guidance for the Regional Water Boards in implementing Resolution 68-16 and 40 CFR 131.12, as these provisions apply to NPDES permitting. APU 90-004 is not applicable in the context of this Order because nonpoint discharges from agriculture are exempt from NPDES permitting.

A number of key terms are relevant to application of Resolution 68-16 and 40 CFR 131.12 to this Order. These terms are described below.

High Quality Waters: Resolution 68-16 applies whenever "existing quality of water is better than quality established in policies as of the date such policies become effective,"[64] and 40 CFR 131.12 refers to "quality of waters [that] exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation." Such waters are "high quality waters" under the state and federal antidegradation policies. In other words, high quality waters are waters with a background quality of better quality than that necessary to protect beneficial uses.[65] The Water Code directs the State Water Board and the Regional Water Boards to establish water quality objectives for the reasonable protection of beneficial uses. Therefore, where water bodies contain levels of water quality constituents or characteristics that are better than the established water quality objectives, such waters are considered high quality waters.

[63] 40 CFR 131.12(a)(2) requires that the "State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and *all cost-effective and reasonable best management practices for nonpoint source control.*" The EPA Handbook, Chapter 4, clarifies this as follows: "Section 131.12(a)(2) does not mandate that States establish controls on nonpoint sources. The Act leaves it to the States to determine what, if any, controls on nonpoint sources are needed to provide attainment of State water quality standards (See CWA Section 319). States may adopt enforceable requirements, or voluntary programs to address nonpoint source pollution. Section 40 CFR 131.12(a)(2) does not require that States adopt or implement best management practices for nonpoint sources prior to allowing point source degradation of a high quality water. However, States that have adopted nonpoint source controls must assure that such controls are properly implemented before authorization is granted to allow point source degradation of water quality." Accordingly, in the context of nonpoint discharges, the BPTC standard established by state law controls

[64] Such policies would include policies such as State Water Board Resolution 88-63, Sources of Drinking Water Policy, establishing beneficial uses, and water quality control plans.

[65] USEPA Water Quality Handbook, Chapter 4 Antidegradation (40 CFR 131.12) , defines "high quality waters" as "those whose quality exceeds that necessary to protect the section 101(a)(2) goals of the Act [Clean Water Act], regardless of use designation."

Both state and federal guidance indicate that the definition of high quality waters is established by constituent or parameter [State Water Board Order WQ 91-10; USEPA Water Quality Handbook, Chapter 4 Antidegradation (40 CFR 131.12) ("EPA Handbook")]. Waters can be of high quality for some constituents but not for others. With respect to degraded groundwater, a portion of the aquifer may be degraded with waste while another portion of the same aquifer may not be degraded with waste. The portion not degraded is high quality water within the meaning of Resolution 68-16. See State Water Board Order WQ 91-10.

In order to determine whether a water body is a high quality water with regard to a given constituent, the background quality of the water body unaffected by the discharge must be compared to the water quality objectives. If the quality of a water body has declined since the adoption of the relevant policies and that subsequent lowering was not a result of regulatory action consistent with the state antidegradation policy, a baseline representing the historically higher water quality may be an appropriate representation of background.[66] However, if the decline in water quality was permitted consistent with state and federal antidegradation policies, the most recent water quality resulting from permitted action constitutes the relevant baseline for determination of whether the water body is high quality. See, e.g., SWRCB Order WQ 2009-0007 at 12. Additionally, if water quality conditions have improved historically, the current higher water quality would again be the point of comparison for determining the status of the water body as a high quality water.

Best Practicable Treatment or Control: Resolution 68-16 requires that, where degradation of high quality waters is permitted, best practicable treatment or control (BPTC) limits the amount of degradation that may occur. Neither the Water Code nor Resolution 68-16 defines the term "best practicable treatment or control."

Despite the lack of a BPTC definition, certain State Water Board water quality orders and other documents provide direction on the interpretation of BPTC. The State Water Board has stated: "one factor to be considered in determining BPTC would be the water quality achieved by other similarly situated dischargers, and the methods used to achieve that water quality." (See Order WQ 2000-07, at pp. 10-11). In a "Questions and Answers" document for Resolution 68-16 (the Questions and Answers Document), BPTC is interpreted to additionally include a comparison of the proposed method to existing proven technology; evaluation of performance data (through treatability studies); comparison of alternative methods of treatment or control, and consideration of methods currently used by the discharger or similarly situated dischargers.[67] The costs of the treatment or control should also be considered. Many of the above considerations are made under the "best efforts" approach described later in this section. In fact, the State Water Board has not distinguished between the level of treatment and control required under BPTC and what can be achieved through "best efforts."

The Regional Water Board may not "specify the design, location, type of construction, or particular manner in which compliance may be had with [a] requirement, order, or decree" (Water Code 13360). However, the Regional Water Board still must require the discharger to demonstrate that the proposed manner of compliance constitutes BPTC (SWRCB Order WQ 2000-7). The requirement of BPTC is discussed in greater detail below.

Maximum Benefit to People of the State: Resolution 68-16 requires that where degradation of water quality is permitted, such degradation must be consistent with the "maximum benefit to people of the state." Only after "intergovernmental coordination and public participation" and a determination that "allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located" does 40 CFR 131.12 allow for degradation.

[66] The state antidegradation policy was adopted in 1968, therefore water quality as far back as 1968 may be relevant to an antidegradation analysis but it will vary depending on the effective date of the policy (e.g.., water quality objective). For purposes of application of the federal antidegradation policy only, the relevant year would be 1975.

[67] See Questions and Answers, State Water Resources Control Board, Resolution 68-16 (February 16, 1995).

As described in the Question and Answers Document, factors considered in determining whether degradation of water quality is consistent with maximum benefit to people of the State include economic and social costs, tangible and intangible, of the proposed discharge, as well as the environmental aspects of the proposed discharge, including benefits to be achieved by enhanced pollution controls. Closely related to the BPTC requirement, consideration must be given to alternative treatment and control methods and whether lower water quality can be abated or avoided through reasonable means, and the implementation of feasible alternative treatment or control methods should be considered.

USEPA guidance clarifies that the federal antidegradation provision "is not a 'no growth' rule and was never designed or intended to be such. It is a policy that allows public decisions to be made on important environmental actions. Where the state intends to provide for development, it may decide under this section, after satisfying the requirements for intergovernmental coordination and public participation, that some lowering of water quality in "high quality waters" is necessary to accommodate important economic or social development" (EPA Handbook for Developing Watershed Plans to Restore and Protect Our Waters, Chapter 4). Similarly, under Resolution 68-16, degradation is permitted where maximum benefit to the people of the state is demonstrated.

Water Quality Objectives and Beneficial Uses: As described above, Resolution 68-16 and Section 40 CFR 131.12 are both site-specific evaluations that are not easily employed to address large areas or broad implementation for classes of discharges. However, as a floor, any degradation permitted under the antidegradation policies must not cause an exceedance of water quality objectives or a pollution or nuisance. Furthermore, the NPS Policy establishes a floor for all water bodies in that implementation programs must address NPS pollution in a manner that achieves and maintains water quality objectives and beneficial uses.

***Waters that are Not High Quality: The "Best Efforts" Approach*:** Where a water body is at or exceeding water quality objectives and has not attained the objective since 1968, it is not a high quality water for that constituent and is not subject to the requirements of the antidegradation policy.

Where a water body is not high quality and the antidegradation policies are accordingly not triggered, the Central Valley Water Board should, under State Water Board precedent, set limitations more stringent than the objectives set forth in the Basin Plan. The State Water Board has directed that, "where the constituent in a groundwater basin is already at or exceeding the water quality objective... the Regional Water Board should set limitations more stringent than the Basin Plan objectives if it can be shown that those limitations can be met using 'best efforts.'" SWRCB Order WQ 81-5; *see also* SWRCB Orders Nos. WQ 79-14, WQ 82-5, WQ 2000-07. Finally, the NPS Policy establishes standards for management practices.

The "best efforts" approach involves the Regional Water Board establishing limitations expected to be achieved using reasonable control measures. Factors which should be analyzed under the "best efforts" approach include the effluent quality achieved by other similarly situated dischargers, the good faith efforts of the discharger to limit the discharge of the constituent, and the measures necessary to achieve compliance. SWRCB Order WQ 81-5, at p. 7. The State Water Board has applied the "best efforts" factors in interpreting BPTC. (See SWRCB Order Nos. WQ 79-14, and WQ 2000-07).

In summary, the board may set discharge limitations more stringent than water quality objectives even outside the context of the antidegradation policies. The "best efforts" approach must be taken where a water body is not "high quality" and the antidegradation policies are accordingly not triggered.

2. Application of Resolution 68-16 Requirements to this Order

The determination of high quality water within the meaning of the antidegradation policies is water body and constituent-specific. Very little guidance has been provided in state or federal law with respect to applying the antidegradation policy to a program or general permit where multiple water bodies are affected by various discharges, some of which may be high quality waters and some of which may, by contrast, have constituents at levels that already exceed water quality objectives. Given

these limitations, the board has used readily available information regarding the water quality status of surface and ground waters in the Sacramento Valley to construct provisions in this Order to meet the substantive requirements of Resolution 68-16.

This Order regulates discharges from thousands of individual fields to a very large number of water bodies within the Sacramento Valley. There is no comprehensive, waste constituent–specific information available for all surface waters and groundwater aquifers accepting wastes discharged from rice lands that allow site-specific assessment of current conditions. Likewise, there is no comprehensive historic data. However, available information and analysis that should be representative of discharges from rice operations do not indicate that such discharges are causing or contributing to exceedances of water quality objectives or increasing trends of degradation.

Given the significant variation in conditions over the broad areas covered by this Order, any application of the antidegradation requirements must account for the fact that at least some of the waters into which agricultural discharges will occur are high quality waters (for some constituents). Further, the Order provisions should also account for the fact that even where a water body is not high quality (such that discharge into that water body is not subject to the antidegradation policy), the board should, under State Water Board precedent, impose limitations more stringent than the objectives set forth in the Basin Plan, if those limits can be met by "best efforts."

3. Consistency with BPTC and the "Best Efforts" Approach

Rice, as a single commodity grown with similar management practices in similar soils, is unique in that BPTC or "best efforts" can be identified and implemented for the majority of Growers. For example, the effectiveness of the Rice Pesticides Program (RPP) in using management practices to achieve water quality performance goals is consistent with the "best efforts" approach. The uniformity of management practices for Growers and the use of the conceptual site model allows for the use of available data to determine the general effect of rice operations on surface water and groundwater.

In general, growers need the flexibility to choose management practices that best achieve a management measure's performance expectations given their own unique circumstances. Management practices developed for agriculture are to be used as an overall system of measures to address nonpoint-source pollution sources on any given site. In most cases, not all of the practices will be needed to address the nonpoint sources at a specific site. Operations may have more than one constituent of concern to address and may need to employ two or more of the practices to address the multiple sources. Where more than one source exists, the application of the practices should be coordinated to produce an overall system that adequately addresses all sources for the site in a cost-effective manner.

There is no specific set of technologies, practices, or treatment devices that can be said to achieve BPTC/best efforts universally in the watershed. This Order, therefore, establishes a set of performance standards that must be achieved and an iterative planning approach that will lead to implementation of BPTC/best efforts. The iterative planning approach will be implemented as two distinct processes, 1) establishment of a baseline set of universal farm water quality management standards combined with upfront evaluation, planning and implementation of management practices to attain those goals, and 2) additional planning and implementation measures where degradation trends are observed that threaten to impair a beneficial use or where beneficial uses are impaired (i.e., water quality objectives are not being met). Taken together, these processes are considered BPTC/best efforts. The planning and implementation processes that growers must follow on their farms should lead to the on-the-ground implementation of the optimal practices and control measures to address waste discharge from irrigated agriculture.

1. Farm Management Performance Standards

This Order establishes on farm standards for implementation of management practices that all Growers must achieve. The selection of appropriate management practices must include analysis of site-specific conditions, waste types, discharge mechanisms, and crop types. Considering this,

as well as the Water Code 13360 mandate that the Regional Water Board not specify the manner of compliance with its requirements, selection must be done at the farm level. Following are the performance standards that all Growers must achieve:

a. minimize waste discharge offsite in surface water,
b. minimize or eliminate the discharge of sediment above background levels,
c. minimize percolation of waste to groundwater,
d. minimize excess nutrient application relative to crop need,
e. prevent pollution and nuisance,
f. achieve and maintain water quality objectives and beneficial uses,
g. protect wellheads from surface water intrusion.

BPTC is not defined in Resolution 68-16. However, the State Water Board describes in their 1995 Questions and Answers, Resolution 68-16: "To evaluate the best practicable treatment or control method, the discharger should compare the proposed method to existing proven technology; evaluate performance data, e.g., through treatability studies; compare alternative methods of treatment or control; and/or consider the method currently used by the discharger or similarly situated dischargers." Available state and federal guidance on management practices may serve as a measure of the types of water quality management goals for irrigated agriculture recommended throughout the state and country (e.g., water quality management goals for similarly situated dischargers). This will provide a measure of whether implementation of the above performance standards will lead to implementation of BPTC/best efforts.

- As part of California's Nonpoint Source Pollution Control Program, the State Water Board, California Coastal Commission, and other state agencies have identified seven management measures to address agricultural nonpoint sources of pollution that affect state waters (*California's Management Measures for Polluted Runoff*, referred to below as "Agriculture Management Measures").[68] The agricultural management measures include practices and plans installed under various NPS programs in California, including systems of practices commonly used and recommended by the USDA as components of resource management systems, water quality management plans, and agricultural waste management systems.

- USEPA's National Management Measures to Control Nonpoint Source Pollution from Agriculture (EPA 841-B-03-004, July 2003;),[69] "*is a technical guidance and reference document for use by State, local, and tribal managers in the implementation of nonpoint source pollution management programs. It contains information on the best available, economically achievable means of reducing pollution of surface and ground water from agriculture."*

Both of the above guidance documents describe a series of management measures, similar to the farm management performance standards and related requirements of the Order. The agricultural management measures described in the state and USEPA reference documents generally include: 1) erosion and sediment control, 2) facility wastewater and runoff from confined animal facilities, 3) nutrient management, 4) pesticide management, 5) grazing management, 6) irrigation water management, and 7) education and outreach. A comparison of the recommendations with the Order's requirements is provided below.

Management measure 1 is not applicable, as discharges from rice fields are controlled releases and are not expected to cause erosion or excess sediments from the fields.

Management measure 2 is not applicable, as this Order does not address waste discharges from confined animal facilities.

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68 *California's Management Measures for Polluted Runoff* (<http://www.waterboards.ca.gov/water_issues/programs/nps/docs/cammpr/info.pdf>)

69 (<http://water.epa.gov/polwaste/nps/agriculture/agmm_index.cfm>)

Management measure 3, nutrient management. As described in the State's Agricultural Management Measures document, *"this measure addresses the development and implementation of comprehensive nutrient management plans for areas where nutrient runoff is a problem affecting coastal waters and/or water bodies listed as impaired by nutrients."* Nutrient management practices implemented to meet performance standard d are consistent with this measure. The Order also requires nitrogen management plans to be developed by Growers. Nitrogen management plans require Growers to document how their fertilizer use management practices meet performance standard d. Finally, where nutrients are causing exceedances of water quality objectives in surface waters, this Order would require development of a detailed SQMP which would address sources of nutrients and require implementation of practices to manage nutrients. Collectively, these requirements work together in a manner consistent with management measure 3.

Management measure 4, pesticide management. As described in the State's Agricultural Management Measures document, this measure *"is intended to reduce contamination of surface water and groundwater from pesticides."* Performance standards a, c, e, f, and g are consistent with this management measure, requiring Growers to implement practices that minimize waste discharge to surface and groundwater (such as pesticides), prevent pollution and nuisance, achieve and maintain water quality objectives, and implement wellhead protection measures.

Management measure 5 is not applicable, as this Order only applies to rice fields in the Sacramento Valley.

Management measure 6, irrigation water management. As described in the state Agricultural Management Measures document, this measure "*promotes effective irrigation while reducing pollutant delivery to surface and ground waters.*" Performance standards a and c, requiring Growers to minimize waste discharge to surface and groundwater will lead to practices that will also achieve this management measure. For example, a Grower may choose to change to drill-seed planting, delaying flood irrigation and the use of certain pesticides

Management measure 7, education and outreach. The Order requires that CRC conduct education and outreach activities to inform Growers of program requirements and water quality problems.

Implementation of practices to achieve the Order's water quality requirements described above is consistent with the state and federal guidance for management measures. Because these measures are recommended for similarly situated dischargers (e.g., rice), compliance with the requirements of the Order will lead to implementation of BPTC/best efforts by all Growers.

2. Additional Planning and Implementation Measures (SQMP/GQMPs)

This Order requires development of water quality management plans (surface or groundwater) where degradation trends are observed that threaten to impair a beneficial use or where beneficial uses are impaired (i.e., water quality objectives are not being met). SQMPs/GQMPs include requirements to investigate sources, develop strategies to implement practices to ensure waste discharges are meeting the Orders surface and groundwater receiving water limitations, and develop a monitoring strategy to provide feedback on the effectiveness of the management plan. In addition, the SQMPs/GQMPs must include actions to "Identify, validate, and implement management practices to reduce loading of COC's [constituents of concern] to surface water or groundwater, as applicable, thereby improving water quality" (see Appendix MRP-1). Under these plans, additional management practices will be implemented in an iterative manner, to ensure that the management practices represent BPTC/best efforts and that degradation does not threaten beneficial uses. The SQMPs/GQMPs need to meet the performance standards set forth in this Order. The SQMPs/GQMPs are also reviewed periodically to determine whether adequate progress is being made to address the degradation trend or impairment. If adequate progress is not being made, then the Executive Officer can require field monitoring studies, on-site verification of implementation of

practices, or the board may revoke the coverage under this Order and regulate the discharger through an individual WDR.

In cases where effectiveness of practices in protecting water quality is not known, the data and information gathered through the SQMP/GQMP will result in the identification of management practices that meet the performance standards and represent BPTC/best efforts. Since the performance standards also apply to areas with high quality waters, those data and information will help inform the Growers and the Central Valley Water Board of the types of practices that meet performance standard requirements.

It is also important to note that in some cases, other agencies may establish performance standards that are equivalent to BPTC and may be relied upon as part of a SQMP or GQMP. For example, the Department of Pesticide Regulation (DPR) has established Groundwater Protection Areas (GPAs) within the Sacramento Valley Watershed that require growers to implement specific groundwater quality protection requirements for certain pesticides. However, based on the analysis in the GAR, there are no vulnerable areas under rice fields in those GPAs. The practices required under DPR's Groundwater Protection Program are considered BPTC for those pesticides requiring permits in groundwater protection areas, since the practices are designed to prevent those pesticides from reaching groundwater and they apply uniformly to similarly situated dischargers in the area.

The State Water Board indicates in its Questions and Answers, Resolution 68-16: "To evaluate the best practicable treatment or control method, the discharger should…evaluate performance data, e.g., through treatability studies..." Water quality management plans, referred to as SQMPs/GQMPs above, institute an iterative process whereby the effectiveness of any set of practices in minimizing degradation will be periodically reevaluated as necessary and/or as more recent and detailed water quality data become available. This process of reviewing data and instituting additional practices where necessary will continue to assure that BPTC/best efforts are implemented and will facilitate the collection of information necessary to demonstrate the performance of the practices. This iterative process will also ensure that the highest water quality consistent with maximum benefit to the people of the state will be maintained.

Resolution 68-16 does not require Growers to use technology that is better than necessary to prevent degradation. As such, the board presumes that the performance standards required by this Order are sufficiently achieving BPTC where water quality conditions and management practice implementation are already preventing degradation. Further, since BPTC determinations are informed by the consideration of costs, it is important that discharges in these areas not be subject to the more stringent and expensive requirements associated with SQMPs/GQMPs (e.g., developing plans, conducting additional monitoring, conducting additional studies). Therefore, though Growers in "low vulnerability" areas must still meet the farm management performance standards described above, they do not need to incur additional costs associated with SQMPs/GQMPs where there is no evidence of their contributing to degradation of high quality waters.

3. Management Practices Evaluation Program (MPEP) and Other Reporting and Planning Requirements

In addition to the SQMPs/GQMPs, the Order includes a comprehensive suite of reporting requirements that should provide the board with the information it needs to determine whether the necessary actions are being taken to achieve BPTC and protect water quality, where applicable. If a GQMP is triggered, the CRC must develop and implement a Management Practices Evaluation Program (MPEP), or provide equivalent information. At this time, and based on the CRC's GAR, no GQMP's have been triggered and thus a MPEP is not required. However, an MPEP (or equivalent) may be required if new information indicates rice operations may cause or contribute to a groundwater quality problem. The MPEP will include evaluation studies of management practices to determine whether those practices are protective of groundwater quality (e.g., that will not cause or contribute to exceedances of water quality objectives) for identified constituents of concern under a

variety of site conditions. If the management practices are not protective, new practices must be developed, implemented, and evaluated. Any management practices that are identified as being protective of water quality, or those that are equally effective, must be implemented by Growers who farm under similar conditions (e.g., crop type, soil conditions) (see provision IV.B.21 of the Order).

Farm management performance standards are applicable in all areas. The Order requires implementation of actions that achieve BPTC and best efforts for both high and low quality waters, respectively.

To determine whether a degradation trend is occurring, the Order requires surface water monitoring of specific monitoring sites on a regular basis. The data gathered from the surface water monitoring effort will allow the board to determine whether there is a trend in degradation of water quality related to discharges from rice lands. For groundwater, a trend monitoring program is required. The trend monitoring is required to help the board determine whether any trend in degradation of groundwater quality is occurring. For pesticides in groundwater, the board will initially rely on the information gathered through the Department of Pesticide Regulation's (DPR) monitoring efforts to determine whether any degradation related to pesticides is occurring. If the available groundwater quality data (e.g., nitrates, pesticides) in a low vulnerability area suggests that degradation is occurring that could threaten to impair beneficial uses, then a GQMP will be required.

The CRC has submitted a Groundwater Quality Assessment Report (GAR) and will update that report every five years. The GAR includes a process to identify high vulnerability and low vulnerability areas, and concluded that, with known information, rice fields were not located in high vulnerability areas. The GAR includes a compilation of water quality data, which was used to assess rice field operations effect on groundwater quality. Areas with insufficient information, including soils, hydrogeology, and groundwater monitoring data, were identified and will be examined in the Groundwater Quality Trend Monitoring Workplan. The periodic updates to the GAR will require the consideration of data collected by the CRC, as well as other organizations, and will also allow the board and CRC to evaluate trends. The GAR provides a reporting vehicle for the board to periodically evaluate water quality trends to determine whether degradation is occurring. If the degradation triggers the requirement for a GQMP, then the area in which the GQMP is required would be considered "high vulnerability". If the degradation is for nitrates then Growers in the "high vulnerability" area will be required to prepare and implement a certified Nitrogen Management Plan, and submit a Nitrogen Management Plan Summary Report to the CRC.

All Growers will also need to report on their management practices through the farm evaluation process. In addition, all Growers will need to prepare nitrogen management plans prepared in accordance with the rice-specific nitrogen management plan template approved by the Executive Officer. The plans require Growers to document how their fertilizer use management practices minimize excess nutrient application relative to crop need. Through the farm evaluation, the Grower must identify "…on-farm management practices implemented to achieve the Order's farm management performance standards." (see Attachment B, section V.E). In addition, the nitrogen management plan summary reports required in high vulnerability areas, if any are identified, will include, at a minimum, information on the ratio of total nitrogen available for crop uptake to the estimated crop consumption of nitrogen. Nitrogen management plans and nitrogen management plan summary reports provide indicators as to whether the Grower is meeting the performance standard to minimize excess nutrient application relative to crop need for nitrogen.

4. Summary

Growers are required to implement practices to meet the above goals and periodically review the effectiveness of implemented practices and make improvements where necessary. Growers will identify the practices they are implementing to achieve water quality protection goals as part of farm evaluations and nitrogen management plans. If high vulnerability areas are subsequently identified,

Growers will have additional requirements associated with the SQMPs/GQMPs, which may include a MPEP.

Also, the Order requires water quality monitoring and assessments aimed to identify trends, evaluate effectiveness of management practices, and detect exceedances of water quality objectives. The process of periodic review of SQMPs/GQMPs provides a mechanism for the board to better ensure that Growers are meeting the requirements of the Order, if the CRC led efforts are not effective in ensuring BPTC is achieved, where applicable.

Requirements for individual farm evaluations, nitrogen management plans, management practices tracking, and water quality monitoring and reporting are designed to ensure that degradation is minimized and that management practices are protective of water quality. These requirements are aimed to ensure that all irrigated lands are implementing management practices that minimize degradation, the effectiveness of such practices is evaluated, and feedback monitoring is conducted to ensure that degradation is limited. Even in low vulnerability areas where there is no information indicating degradation of a high quality water, the farm management performance standards act as a preventative requirement to ensure degradation does not occur. The farm evaluations and nitrogen management plan requirements for all areas are indicators as to whether Growers are meeting applicable performance standards. The required monitoring and periodic reassessment of vulnerability designations will allow the board to determine whether degradation is occurring and whether the status of a low vulnerability area should be changed to high vulnerability.

The Order is designed to achieve site-specific antidegradation and antidegradation-related requirements through implementation of BPTC/best efforts as appropriate and monitoring, evaluation, and reporting to confirm the effectiveness of the BPTC/best efforts measures in achieving their goals. The Order relies on implementation of practices and treatment technologies that constitute BPTC/best efforts, based to the extent possible on existing data, and requires monitoring of water quality and evaluation studies to ensure that the selected practices in fact constitute BPTC where degradation of high quality waters is or may be occurring, and best efforts where waters are already degraded. Because the State Water Board has not distinguished between the level of treatment and control required under BPTC and what can be achieved through best efforts, the requirements of this Order for BPTC/best efforts apply equally to high quality waters and already degraded waters.

This Order allows degradation of existing high quality waters. This degradation is consistent with maximum benefit to the people of the state for the following reasons:

- At a minimum, this Order requires that rice operations achieve and maintain compliance with water quality objectives and beneficial uses;
- The requirements implementing the Order will result in use of BPTC where rice operations waste discharges may cause degradation of high quality waters; where waters are already degraded, the requirements will result in the pollution controls that reflect the “best efforts” approach. Because BPTC will be implemented, any lowering of water quality will be accompanied by implementation of the most appropriate treatment or control technology;
- Central Valley communities depend on irrigated agriculture for employment, for example the California rice industry annually contributes $1.8 billion dollars and 25,000 jobs to the state's economy[70]. (PEIR, Appendix A);
- The state and nation depend on Central Valley agriculture for food (PEIR, Appendix A);
- Consistent with the Order’s and PEIR’s stated goal of ensuring that irrigated agricultural discharges do not impair access to safe and reliable drinking water, the Order protects high

[70] Economic Contributions of the U.S. Rice Industry to the U.S. Economy. Agricultural & Food Poly Center, Department of Agricultural Economics, Texas AgriLife Research and Extension Service, Texas A&M University, August 2010/

quality waters relied on by local communities from degradation of their water supplies by current practices on rice lands. The Order is designed to prevent rice operation discharges from causing or contributing to exceedances of water quality objectives, which include maximum contaminant levels for drinking water. The Order also is designed to detect and address exceedances of water quality objectives, if they occur, in accordance with the compliance time schedules provided therein,

- The Order prohibits degradation above a water quality objective and establishes representative surface water monitoring and groundwater monitoring programs to determine whether rice operation waste discharges are in compliance with the Order's receiving water limitations. Local communities should, therefore, not incur any additional treatment costs associated with the degradation authorized by this Order; and
- The Order requires Growers to achieve water quality management practice performance standards and includes farm management practices monitoring to ensure practices are implemented to achieve these standards. The iterative process whereby Growers implement practices to achieve farm management performance standards, coupled with representative surface and groundwater monitoring feedback to assess whether practices are effective, will prevent degradation of surface and groundwater quality above water quality objectives.

The requirements of the Order and the degradation that would be allowed are consistent with State Water Board Resolution 68-16. The requirements of the Order will result in the implementation of BPTC necessary to assure the highest water quality consistent with the maximum benefit to the people of the state. The receiving water limitations in section III of the Order, the compliance schedules in section XII, and the Monitoring and Reporting Program's requirements to track compliance with the Order, are designed to ensure that the authorized degradation will not cause or contribute to exceedances of water quality objectives, unreasonably affect beneficial uses, or cause a condition of pollution or nuisance. Finally, the iterative process of reviewing data and instituting additional management practices where necessary will ensure that the highest water quality consistent with the maximum benefit to the people of the state will be maintained.

XVI. California Water Code 13141 and 13241

The total estimated annual cost of compliance with this Order, e.g., summation of costs for administration, monitoring, reporting, tracking, implementation of management practices, is expected to be approximately $2.49 per acre greater than the cost associated with the protection of surface water only under the Coalition Group Conditional Waiver. The total estimated cost of compliance associated with continuation of the previous Coalition Group Conditional Waiver within the Sacramento Valley for Growers is expected to be approximately 587,000 dollars per year ($1.12 per acre annually). The total estimated cost of this Order is 1.8 million dollars per year ($3.60 per acre annually).

For the above estimates, no costs were assumed to be associated with the implementation of new water quality management practices for Growers. Rice cultivation requires water management for optimum growth and yield of the crop. In addition, several of the rice pesticides require mandatory hold times before release off the field to allow for degradation of the active ingredient. Education and outreach costs were eliminated because a communication system between Growers and the CRC is established. Growers attend board meetings as Growers and receive newsletters that contain information relevant to rice operation, regulation and marketing. The costs for groundwater monitoring in Tier 3 areas (Alternative 4) was eliminated from the cost estimates since very few rice lands are expected to be located in high vulnerability areas due to the physical soil conditions necessary for rice cultivation. The cost estimates include an increase in assessments assuming that the CRC is able to increase assessments based on the statutory approval process required for approval under the Food & Agricultural Code requirements. Such costs in any assessment increase may include costs to prepare the required reports and conduct the required monitoring, as well as annual State Water Board permit fees that are charged to permitted dischargers for permit coverage. In accordance with the State Water

Board's Fee Regulations, the current annual permit fee charged to Growers covered by this Order is $0.56/acre.

This Order, which implements the long-term ILRP for Growers within Sacramento Valley is based mainly on Alternatives 2 and 4 of the PEIR, but does include elements from Alternatives 2-5. The Order contains the third-party lead entity structure, regional surface and groundwater management plans, and regional surface water quality monitoring approach similar to Alternative 2 of the PEIR; farm planning, management practices tracking, nitrogen tracking, and regional groundwater monitoring similar to Alternative 4 of the PEIR; prioritized installation of groundwater monitoring wells similar to Alternative 5; and a prioritization system based on systems described by Alternatives 2 and 4. Therefore, potential costs of the Order are estimated using the costs for these components of Alternatives 2-5 given in Tables 2-19, 2-20, 2-21, and 2-22 of the *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program* (Economics Report).[71] Estimated costs of management practices are based on costs for Alternatives 2 and 4. Table 6 summarizes the major regulatory elements of the Order and provides reference to the PEIR alternative basis.

Table 6: Summary of regulatory elements

Order elements	Equivalent element from Alternatives 2-5
CRC administration	Alternative 2
Farm evaluation	Alternative 4: farm water quality management plan and certified nutrient management plan
Surface and groundwater management plans	Alternative 2 surface and groundwater management plans
Regional surface water monitoring	Alternative 2 regional surface water monitoring
Regional trend groundwater monitoring	Alternative 4 regional groundwater monitoring
Management practices evaluation program	Alternative 4 regional groundwater monitoring, targeted site-specific studies to evaluate the effects of changes in management practices on groundwater quality and Alternative 5 installation of groundwater monitoring wells at prioritized sites
Management practice reporting	Alternative 4 tracking of practices

The administrative costs of the Order are estimated to be similar to the costs shown for Alternative 2 in Table 2-19 of the Economics Report. The farm evaluation (farm plans) costs are estimated to be similar to the costs shown for Alternative 4 for farm planning (Table 2-21, Economics Report). Total surface water monitoring and reporting costs are estimated to be similar to the costs shown for Alternative 2 – essentially a continuation of the current regional surface water monitoring approach. Total regional groundwater monitoring and reporting costs are estimated to be similar to the costs shown for Alternative 4 in Table 2-21 of the Economics Report minus the "Tier 3 individual monitoring." Costs for installation of groundwater monitoring wells are estimated to be similar to the costs shown for Alternative 5 in Table 2-22 of the Economics Report. Tracking costs of management practices and nitrogen management plan information are estimated to be similar to the costs shown for Alternative 4 in Table 2-21 of the economics report – under "tracking." Estimated average annualized costs per acre of the Order relative to full implementation of the current waiver program for Growers in the Sacramento Valley (per acre costs based on 525,000 rice acres in the Sacramento Valley irrigated agricultural lands of 2,286,395 acres) are summarized below in Table 7.

[71] ICF International. 2010. *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program.* Draft. July. (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA

Table 7: Estimated annual average per acre cost of the Order relative to full implementation of the current program (PEIR Alternative 1) for Rice Growers in the Sacramento Valley

	Order	Current program	Change
Administration	0.58	0.45	0.13
Farm plans	0.73	--	0.73
Monitoring/reporting/tracking	2.29	0.67	1.62
Management practices	--	--	--
Total	3.60	1.12	2.49

* Totals may not sum due to rounding. Estimated cost figures are from Tables 2-18, 2-19, 2-20, 2-21, and 2-22 of the Economics Report for the Sacramento Valley. Per acre costs have been developed using a ratio between the estimated rice (est. 525,000) in the Sacramento Valley (est. 2,286,395, Table 3-3, Economics Report).

** These costs are an estimate of *potential*, not required costs of implementing specific practices.

The Sacramento and San Joaquin River Basin Plan includes an estimate of potential costs and sources of financing for the long-term irrigated lands program. The estimated costs were derived by analyzing the alternatives evaluated in the PEIR using the cost figures provided in the Economics Report. The Basin Plan cost estimate is provided as a range applicable to implementation of the program throughout the Central Valley. The Basin Plan's estimated total annualized cost of the irrigated lands program is $216 million to $1.3 billion, or $27 to $168 per acre.[72] The estimated total annual cost of this Order of $99 million dollars ($118.55 per acre) falls within the estimated cost range for the irrigated lands program as described in the Sacramento and San Joaquin River Basin Plan when considering per acre costs ($27-$168 per acre).

The Order, based substantially on Alternative 4, has lower estimated costs than described in the Economics Report. Rice growers have implemented water quality management practices as part of their operations, such as leveling of fields to control water flow, mandatory pesticide hold times to allow for degradation, compaction of surrounding levees to minimize water seepage, and water management practices to ensure optimum crop growth and yield. Implementation of additional management practices will be minimized or non-existent. Because nitrogen fertilizers, in the form of ammonium sulfate or liquid ammonia, are generally injected into the soil and immediately flooded, nitrogen management is not expected to be a major water quality problem. If added as a top dressing, nitrogen is not expected to leave the flooded fields nor leach through the low permeability soil typically found in rice fields.

XVII. California Water Code Section 13263

California Water Code section 13263 requires that the Central Valley Water Board consider the following factors, found in section 13241, when considering adoption of waste discharge requirements.

(a) Past, present, and probable future beneficial uses of water

The Central Valley Water Board's Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan) identifies applicable beneficial uses of surface and groundwater within the Sacramento River Basin. The Order protects the beneficial used identified in the Basin Plan. Applicable past, present, and probable future beneficial uses of Sacramento River Basin waters were considered by the Central Valley Water Board as part of the Basin Planning process and are reflected in the Basin Plans themselves. The Order is a general order applicable to a wide geographic area. Therefore, it is appropriate to consider beneficial uses as identified in the Basin Plan and applicable policies, rather than a site specific evaluation that might be appropriate for WDRs applicable to a single discharger.

(b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto

[72] Per acre average cost calculated using an estimate for total irrigated agricultural acres in the Central Valley (7.9 million acres, Table 3-3, Economics Report).

Environmental characteristics of the Sacramento Valley have been considered in the development of irrigated lands program requirements as part of the Central Valley Water Board's 2008 *Irrigated Lands Regulatory Program Existing Conditions Report* and the PEIR. In addition, the GAR includes a discussion of the environmental conditions associated with rice operations in the Sacramento Valley. In these reports, existing water quality and other environmental conditions throughout the Central Valley have been considered in the evaluation of six program alternatives for regulating waste discharge from irrigated lands. The Order's requirements are based on the alternatives evaluated in the PEIR.

(c) *Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area*

The Order provides a process to review these factors during implementation of water quality management plans (SQMPs/GQMPs). The Order requires that discharges of waste from rice lands to surface water and groundwater do not cause receiving waters to exceed applicable water quality objectives. SQMPs and GQMPs are required in areas where water quality objectives are not being met. GQMPs are also required in high vulnerability groundwater areas. Under these plans, sources of waste must be estimated along with background water quality to determine what options exist for reducing waste discharge to ensure that rice lands are not causing or contributing to the water quality problem. The SQMPs and GQMPs must be designed to ensure that waste discharges from rice lands do not cause or contribute to an exceedance of a water quality objective and meet other applicable requirements of the Order, including, but not limited to, section III.

(d) *Economic considerations*

The PEIR was supported by the *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program* (Economics Report). An extensive economic analysis was presented in this report to estimate the cost and broader economic impact on irrigated agricultural operations, including irrigated rice operations, associated with the five alternatives for the irrigated lands program. Staff was also able to use that analysis to estimate costs of a sixth alternative, since the sixth alternative fell within the range of the five alternatives. This cost estimate is found in Appendix A of the PEIR. The Order is based on the alternatives evaluated in the PEIR, which is part of the administrative record. Therefore, potential economic considerations related to the Order have been considered as part of the overall economic analysis for implementation of the long-term irrigated lands program. The Order is a single action in a series of actions to implement the ILRP in the Central Valley region. Because the Order has been developed from the alternatives evaluated in the PEIR, economic effects will be within the range of those described for the alternatives.

One measure considered in the Economics Report is the potential loss of productive farmland due to increased costs. This information has been used in the context of the Order to estimate potential loss of productive rice lands. As described in Attachment D of the Order, it is estimated that there will not be any loss of productive rice lands due to the costs imposed by the Order (see section IV.A of Attachment D).

(e) *The need for developing housing within the region*

The Order establishes waste discharge requirements for rice lands in the Sacramento Valley. The order is not intended to establish requirements for any facilities that accept wastewater from residences or stormwater runoff from residential areas, nor is it expected to result in any loss to productive rice land acreage due to costs imposed by the Order. The Order will not affect the development of housing within the region.

(f) *The need to develop and use recycled water*

The Order does not establish any requirements for the use or purveyance of recycled wastewater. Where a rice operation may have access to recycled wastewater of appropriate quality for application to rice fields, the operation would need to obtain appropriate waste discharge requirements from the Central Valley Water Board prior to initiating use. This need to obtain additional waste discharge requirements in order to use recycle wastewater on rice fields instead of

providing requirements under the Order may complicate potential use of recycled wastewater on rice fields. However, the location of rice fields in rural areas generally limits access to large volumes of appropriately treated recycled wastewater. As such, it is not anticipated that there is a need to develop general waste discharge requirements for application of recycled wastewater on rice fields in the Sacramento Valley.