Attachments to Letter BN: Abby Taylor-Silva et al, Grower-Shipper Association of Central California et al (June 22, 2020)

Exhibit 2. CEQA Arguments and Attachment 1 to CEQA Arguments

36817 Foothill Road Soledad, CA 93960 Phone (831) 678-0799 Fax (831) 678-3551

June 3, 2020

Central Coast Regional Water Quality Control Board
Chair and Members of the Board
AgNOI@waterboards.ca.gov

Subject: Comments on Draft Ag Order

Dear Jean-Pierre Wolf and Members of the Board:

Please find attached a letter written to Monterey County Water Resources Agency regarding the Salinas River Stream Maintenance Program (SRMP) Draft Environmental Impact Report (DEIR) on May 28, 2013. Contained in this letter are many facts regarding the Salinas River and Costa operations.

Although this letter was submitted for the SRMP DEIR in 2013, all facts regarding Costa's location on the river, background, flooding history and costs resulting from flooding and reparation continue to be accurate. Many of the concerns expressed regarding the SRMP apply to the Irrigated Lands Regulatory Program (ILRP) 4.0 Draft Riparian Habitat Requirements.

Thank you for your consideration of this letter and the information that it contains.

Sincerely,

David Costa

David Costa
President

May 26, 2013

Brent Buche, Assistant General Manager
Monterey County Water Resources Agency
893 Blanco Circle
Salinas CA 93901

RE: Comments on Salinas River Stream Maintenance Program Draft EIR

Dear Brent:

I am writing to you regarding the Salinas River Stream Maintenance Program (SMP) Draft Environmental Impact Report. In general, I am supportive of a Stream Maintenance Program. I recognize the need for coordinated management of potential flood risks as all of the Costa Growing Areas have unique flooding hazards. In the past, the ability to manage land that abuts the Salinas River was necessary to protect farming areas found within the Program Area.

Background on Costa Growing Areas Most Affected by the SMP

Soledad The Costa Soledad Growing Area is adjacent to the Salinas and Arroyo Seco Rivers. It contains agricultural soils that are globally esteemed for their productivity. It is well populated. It is home to an important California archaeological landmark, the Mission Nuestra Senora de la Soledad, as well as the unique Monterey County historical district, the Fort Romie Colony. It is located on the west side of the Salinas River and transportation to the upper Salinas Valley is dependent on crossing two bridges over the both the Salinas and Arroyo Seco Rivers. Consequently, the majority of my concerns regarding the Stream Maintenance Program (SMP) focus on how it will (or will not) protect valuable soils, human life, buildings, public infrastructure, and cultural resources.

The Costa Soledad Growing Area is comprised of about 2,000 acres of row crops. All farmland in this area is either classified as Prime Farmland, Farmlands of Statewide Importance or Unique Farmlands according to the USDA Soil Conservation Service Important Farmlands Inventory System. The majority of soils in this area are in the Mollisols taxonomic order. These soils have dark, high-organic matter topsoil that is typically between 60-80 cm deep. Globally, this soil order represents approximately 7% of the ice-free soils. Mollisols are considered the world's most agriculturally productive soils and are thought to be one of the most economically important soil types.

The Dominant Suborder, Xerolls, is more-or-less freely drained in regions that have Mediterranean climates, such as California. The parent material is typically base-rich

1

and calcareous and may include limestone, loess, or wind-blown sand. They are found dominantly under annual grasslands and oak species in California. The main processes that lead to the formation of grassland Mollisols are decomposition, humification and proturbation. (NRCS) Most notably, these soils would not be associated with conditions that would naturally support most riparian (i.e. fully to partially hydrophilic) plant species.

The value of land in the Monterey County is predicated by its productivity. Definitely, these productive soils are an important resource to my farming operation and to the Salinas Valley's agricultural and economic base. Consequently, It is vital to all stakeholders to design and implement plans that protect these soils. In fact, it is my understanding that the CEQA process provides equal protection to agricultural soils as it does to any other natural resource. It is critical, at many levels, to sustain this resource at its full productive capacity. Risk from flooding-related soil scouring and cutting does not support this objective. Thus, one of my largest concerns about the SMP stems from the inequitable and preferential protections given to other environmental resources at the detriment of these productive soils.

This area floods! And it has historically flooded often. Below is a list of floods that occurred during the Spanish Mission epoch. The historical flood information was derived from a 1947 article by Achilles Alfred Tavernetti, University of California (System), Agricultural Extension. He complied this information from Spanish Mission and early colonists' records.

1770 - 1771
1771 - 1772
1773 - 1774
1775 - 1776
1779 - 1780
1810 - 1815
1820 - 1821
1824 - 1825
Note The Soledad Mission was flooded twice in 1824 and again in 1832. Flooding and an earthquake precipitated the eventual closure of the mission.
1841 - 1842
1849 - 1850
1851 - 1852
1852 - 1853
1859 - 1860
1861 - 1862

It should be noted that the flood of 1861-62 was considered an ARKstorm (aka Atmospheric River 1000 storm). According to the pre-historic geologic record, there have been four ARKstorms in California in the last 2000 years. This storm, combined with a sequential and intense two-year drought, precipitated the collapse of Mexican Rancho cattle industry.

It should be further emphasized that the floods listed above occurred prior to significant anthropomorphic channelization and hydromodification of the Salinas Valley.

The Soledad Mission was considered an arduous post during colonial times and most padres sent to mission soon complained of rheumatism and poor health. Records during the 1800's indicate that this area was sparsely vegetated. In 1849, J. Ross Browne of

2

Soledad wrote, "A more desolate place cannot well be imagined. The old church is partially in ruins, and the adobe huts built for the Indians are roofless, and the walls tumbled about in shapeless piles. *Not a tree or shrub* is to be seen anywhere in the vicinity. The ground is bare, like an open road..."
(http://missiontour.org/soledad/history.htm)

Early colonial pictographic records support the description above:

March 1850: H.M.T. Powell produced this drawing of the Mission published in "*Santa Fe Trail.*" This drawing was found in the Historic American Buildings survey housed at the Library of Congress.

1861: Oriana Day painting from the DeYoung Museum, San Francisco. This drawing was found in the Historic American Buildings survey housed at the Library of Congress.

1870s: Another depiction of the Mission from the 1870s by Vischer. This drawing was found in the Historic American Buildings survey housed at the Library of Congress.

1873: Another depiction of the Mission by Vischer. This drawing was found in the Historic American Buildings survey housed at the Library of Congress.

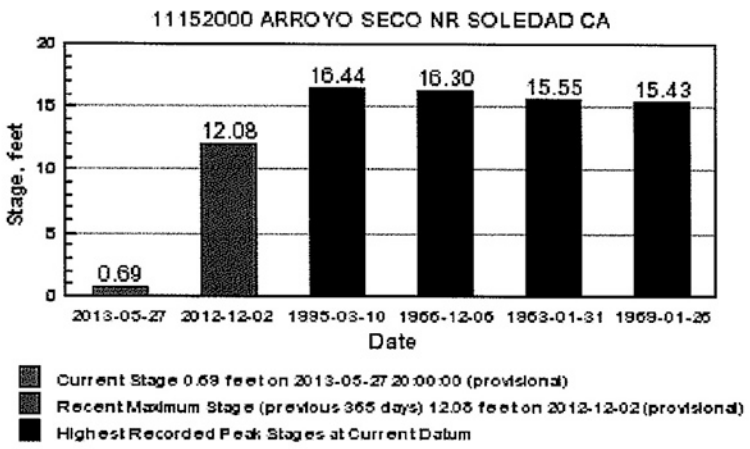
3

June 1873: Another Vischer depiction of the Mission from. This drawing was found in the Historic American Buildings survey housed at the Library of Congress.

1870s: An actual photo from this same period can be compared to the drawings above. This photo was found in the Historic American Buildings survey housed at the Library of Congress.

Not only the Salinas River, but also the Arroyo Seco River occasionally experiences heavy flows when intense winter storms suspend over steep upstream canyons and watersheds. Additionally, storms may stall over smaller watersheds on the east face of the Santa Lucia Mountains, sending torrents of water through the Soledad Growing Area to cause localized flooding on the farming operation and near and in the Salinas River.

In the early part of the 20th Century, the United State Geological Survey (USGS) installed a flow gage at the confluence of the Salinas and the Arroyo Seco Rivers. In the figure below, the highest peak flows since the early 1900s are reported:



Historical records from 1911 through 2005 indicate that flood conditions and flood damage occurred in: March 1911, January 1914, February 1922, November 1926, December 1931, February 1937, February 1938, March 1941, January 1943, February 1945, January 1952, December 1955, January 1956, April 1958, February 1962, December 1966, January and February 1969, February 1973, February 1978, March 1983, January and March 1995, and February 1998. (Monterey County, Multi-Jurisdictional Hazard Mitigation Plan, MJHMP, 2007).

It is worth mentioning that since the devastating flood in 1862, the Salinas River Watershed and surrounding areas have been subjected to major hydromodification that cannot be reversed. This system is highly managed and management issues can only be mitigated and ameliorated. I have concerns that any effort to return parts of system (i.e. the floodplain) to its original state while allowing other parts of the system to remain altered will likely lead to unpleasant, unforeseen and expensive consequences.

Nationwide, floods result in more deaths than any other natural hazard (FEMA). Safeguarding human life from flooding is of paramount importance. Costa's Soledad Growing Area is in Monterey County's Census tract for Soledad City CCD (this is an unincorporated area of Soledad). According to the 2010 Census, there are 5,188 persons in this area and 4,499 persons are of Latino or Hispanic descent. There are 1,426 housing units. Approximately 58% are rental units. It is unknown exactly how many people live on or near Costa's Soledad Growing Area, but because it encompasses the unincorporated Fort Romie Colony, it is a fairly densely populated area with many homes on small acreage parcels. On or adjacent to Costa operations, 1995 flooding affected 5-8 houses. Other houses in lower lying areas were nearly flooded.

Imbalanced or poorly coordinated vegetation and sediment management of the Salinas and Arroyo Seco floodways and floodplains could result in damage to existing public infrastructure. For example, the Soledad Growing Area is directly opposite the Soledad Wastewater Treatment Plant and I have concerns that improper or deferred channel

5

maintenance could allow flood waters to breach waste water treatment ponds, which, in turn, could direct human-pathogen-contaminated waters onto Costa's Soledad Growing Area as well as downstream onto other agricultural lands.

Likewise, The Soledad Growing area and the unincorporated Fort Romie area are dependent on two bridges: one over the Salinas River and one over the Arroyo Seco River. In the event that floods destroy or impair use of these bridges, this area could be potentially isolated with little to no expected assistance from local emergency services. The Monterey County General Plan's Safety Element states "The provision of [emergency] services shall be prioritized to give the highest priority to areas where the highest concentrations of people reside" and the Soledad Emergency plan is limited to areas within its City Limits.

Finally, today, this area is perceived by many to have intrinsic aesthetic value. Below are a few on-line comments by visitors to the Soledad Mission. They comment on the Mission's relationship to the surrounding agricultural area where Costa farms.

> "Set on a historic road close enough to highway 101 that it's convenient to access, but far away enough to gain a sense of calm, [The Mission] offers a nice respite for weary travelers. The agricultural fields and hills around it were inspiring." Paolo M., 6/4/11
>
> This mission is plainer than many of the other California missions, but it's surrounded by farmland and seems to belong to the land it is sitting on..." Terry T, 2/1/13
>
> "...I was prepared for disappointment because the original mission had all but disappeared by the time it was rebuilt in the 1950s...The grounds have the remnants of the original walls and foundations, there are trees and some nice landscaping...The museum has the simple remains of a simple place. It is all good, always interesting...and it serves a devout local community. The chapel is still used, there is the obligatory giant barbeque pit for hosted events, and there are people there who still care about the place over 200 years later. It is out in the middle of agricultural fields and that gives it a more authentic perspective than some of the more urban missions." Carlos B, 8/23/09
>
> "I've visited all but one of the California missions. This small structure, in ruins since 1874 then rebuilt in 1955, is one of my favorites. It doesn't compare architecturally to the grand missions elsewhere but I enjoy the humble simplicity of the Mission Nuestra Senora de la Soledad and the views of the surrounding area. Paul L., 9/5/11

Comments on the SMP

The river serves many functions. All beneficial uses, including agriculture, must be protected and I strongly favor the continued use of coordinated permits such as the Steam Maintenance Program to protect all beneficial uses. It is critical to have a long-term program that coordinates voluntary, reasonable, timely, and cost-effective channel maintenance activities so that landowners, agencies and other stakeholders may work to protect the natural, agricultural and economic resources of the Salinas Valley.

It is a matter of fact: the Salinas River will continue to flood. The extent of flood damage will escalate in direct proportion to the degree of unworkable plans and political

compromises. The question is not how to stop floods, but how to prevent and mitigate potential damage. A Stream Maintenance Program is critical. However, "The Devil is in the Details" and it is the specifics of that SMP that will ensure its success - or failure. If the SMP is so costly, bureaucratic or unreasonable that the disadvantages are not offset by derived benefits, then it will discourage participation. In the absence of an effective SMP, extensive flood damage will be inevitable and growers will be required to recoup damages through emergency compensation or legal action. And as will be discussed below, some damages may not be remediated or compensated.

No Stream Maintenance Program (Alternative 1: No Project Alternative)

The SMP DEIR would have been more meaningful if it had analyzed the "No SMP" alternative and compared that analysis to an analysis of the proposed SMP. The DEIR should have asked "In the absence of an SMP, what damages would be expected to occur to aesthetics, agricultural resources, air quality and greenhouse gasses, terrestrial biological resources, aquatic biological resources cultural resources, geology, soils and seismicity, hazardous materials, hydrology and water quality and land use and planning and noise?"

In spite of the lack of analysis, damages from past flooding events can be used as references to estimate future and anticipated damages and costs that will be incurred in the absence of an approved SMP. Costs from these past flood events can be extrapolated to estimate anticipated costs associated with future flood events.

The DEIR summarizes documented damages to farmland from every flood that occurred since March 1911. Particular attention is given to damages associated with the 1995 and 1998 floods. In 1994-1995 rainfall season, there was a total of 20.18 inches of rainfall. During January 1995, sustained precipitation fell throughout the region and two months later, another 5.31 inches fell on saturated soils. This rainfall "combined with poor channel maintenance [caused the river to overflow] onto farmland as far away as a mile from the river bed....Damage to farms near the river bottom was extensive where the river cut new channels, and in some cases, took out the topsoil and left nothing but sand. During the 1997-98 rainy season, a total of 30.09 inches of rain fell with over 15 inches of rain falling during the month of February." (Burton Anderson, 2000). In 1995 and 1998, Monterey County received federal disaster declarations for winter storms and floods.

Burton Anderson reviewed flood records since 1850 and summarized the conditions under which floods occur. Flooding will occur if there is more than 6 inches of rainfall in January, February, or March or if there is more than 25 inches of rain during any one rainy season.

In addition to lost agricultural land and infrastructure documented in the DEIR, an article in the Disaster Recovery Journal (The California Floods, by Kevin J. Kraff) further recorded the following 1995 flood related damages:

- There were $70 million in losses in lettuce crops alone.
- Floods washed out highways, slowing distribution of salvaged crops.
- Prices of California-grown artichokes, broccoli, cauliflower, celery, lettuce and strawberries rose substantially after the flooding... causing shoppers to experience sticker shock. For example, lettuce that normally sold for $0.50-$1.00 was selling for $2.00-$2.75 a head. Broccoli and spinach increased 40%. [Quality was compromised].
- Since California grows most of the nation's fresh produce, vegetable retailers

7

were left looking for alternative suppliers, such as Florida [or overseas] farmers, to keep shelves stocked and prices under control.

- As many of the 40,000 [Salinas Valley] men and women farmworkers had their livelihoods impacted.

In a Nov 4, in a 2005, letter to California lettuce growers, packers, processors, and shippers, the Center for Food Safety and Applied Nutrition (CFSAN) director, Robert Brackett, mentioned intermittent flooding from Salinas Valley creeks and rivers as a possible sources of contamination. He cited a 2005 report that identified O157:H7 *E coli* in the valley's watershed and stated that any ready-to-eat crop that comes in contact with floodwaters is not fit for human consumption. Subsequently, food safety harvest restrictions have been imposed on land and crops exposed to flood waters. Thus, today's financial losses from flooded vegetable ground would be much greater as crops would not be harvestable and flooded land would be subject to mandated fallow periods that are dictated by the California Leafy Green Marketing Agreement, the Food and Drug Administration's Food Safety and Modernization Act and produce marketing contractual requirements.

The 1995 flooding events necessitated major farmland restoration efforts for the Costa Soledad Growing Area. Generally, renovations involved substantial sand removal because large pockets of sand were deposited over topsoil. There was removal of heavy debris (e.g. trees, Arundo donax, brush, other vegetation, buried sprinkler pipe, etc.) Wells, irrigation equipment, underground plumbing and piping that were either lost or damaged had to be repaired or replaced. Electrical power was lost and power poles and power lines had to be repaired or replaced in order to restore power. Recovery efforts for flood affected ranches was estimated to be $20,000-$25,000 per year.

Farmland was eroded and topsoil was scoured. Farmland renovation consisted of "borrowing" precious topsoil from other fields to replace scours and to fill deep cuts. Topsoil spreading was followed by expensive deep plowing to mix remaining soil with any un-removable sand. The estimated costs of land renovation in 1995 and 1998 ranged from $1,000 to $5,000 per acre depending upon the extent of land damage. To add insult to injury, wind-blown sand from the post-flood river bottom continued to blow onto fields for months after the flood even affecting crop quality and marketability.

Additional expenses resulted when new weed seeds and diseases were dispersed through floodwaters so that additional pest management costs were incurred.

In order to estimate potential flood damages resulting from the lack of an SMP, there would have to be adjustments for cost of living increases, inflation and lost opportunities from restrictions imposed by today's food safety requirements. It would be difficult to estimate what land renovation costs would be today. However, I estimate it would be at least 50% greater since today's cost of running a piece of heavy equipment for 6 to 30 hours per acre at $250.00 per hour equals $1500-$7500 per acre.

There is one last important point: if future topsoil losses from flooding should continue unabated into the future, there will eventually come a time when there will not be sufficient topsoil to "borrow" from other fields in order to rebuild flood damaged farmland. This would be an irreplaceable loss of a valuable natural resource.

Costa's use of past Channel Maintenance Programs

8

After the 1995 floods, a Channel Maintenance Program (CMP) occurred under a coordinated permit administered by MCWRA. According to the SMP DEIR, virtually all levees along the Salinas River were lost during the 1995 storm. The Stream Maintenance Program allowed levee improvements on properties adjacent to the river. This included levee re-alignment to widen the Salinas River channel and increase flow. Costa provided assistance to upstream property owners consisting of machinery, labor, gravel, and financial support to help them rebuild their levees since we were in the downstream flood path when their levees broke.

It should be noted that the 1998 flood was categorized as a larger flood (100-year flood) than the 1995 event, yet the Soledad Growing Area did not suffer damages. I attribute this fact to Salinas River Channel Maintenance Program (CMP) operations that occurred between 1995 and 1998.

In the last few years of the permitted CMP, we performed light mowing and sandbar disking as allowed in alternate years. In retrospect, Costa spent more money on the required permits, engineering, and consultations than on the allowed work. Annually, Costa spent an estimated $7,500 to $10,000 on channel maintenance under the CMP permit for work that only took one to two days to complete in any given year.

Questions/Concerns/Suggested Improvements regarding the Proposed Stream Maintenance Program (SMP)

Please find below, a discussion of questions, concerns and suggested improvements with respect to the proposed Stream Maintenance Program and the Draft EIR.

Terms used to describe eligibility requirements are used interchangeably: 10-year flow, minimum flow capacity (10-year flow), estimated flow capacity in cfs, minimum flood flow, minimum flood flow capacity, 10-year flow below Maximum Safe Water Surface Elevation (MSWSE), which happens to be one foot below the lower top of bank, and discharge capacity. This is confusing. I suggest that the EIR clarify terminology and the processes by which the eligibility triggers are calculated and how a participant's eligibility is determined.

The use of the 10-year flow capacity does not factor in a margin of error. In an effort to provide maximum environmental protection, the SMP allows a flood level to within one foot of the top of levees. This does not account for other factors that may (cumulatively) contribute to localized flooding such such as levee strength/weakness, impacts of debris balls on levee stability, the continuously diminishing flow capacity in the flood channel created by ever-encroaching riparian habitat and/or potential changes in base channel elevations of the from previous sediment deposition.

The use of a minimum 10-year flow capacity (39,000 cfs) is very confusing. There is no rationale provided in the DEIR for this eligibility trigger. There is no explanation of why was this trigger was chosen to replace the former upstream 25-year flow capacity in the Channel Maintenance program. Such explanations would have been helpful in determining the reasonableness of proposed mitigations. Without this context, it is difficult to determine whether the prescribed work is excessive for the benefit derived or whether there is value in participating in the program. Without some introductory explanation of why this trigger was selected, this designation appears to be somewhat arbitrary.

9

The use of a minimum 10-year flow capacity and 39,000 cfs cannot be easily correlated with other common units of flood measurement such as flood frequency and stage feet. It would have been helpful to better understand what the 39,000 cfs means in terms of Stage feet in order to better predict potential flooding occurrences throughout the Salinas Valley. Please see USGS (Spreckels gage) flood predictors below that are based on stage feet at the gage location:

19.0 Feet Minor lowland flooding of agricultural land can be expected.

23.0 Feet A few residences will begin to flood near the Salinas River along the reach of the gage. River Road will begin to flood near Spreckels.

24.0 Feet Significant flooding of the lowest portions of agricultural land can be expected along the lower portions of the Salinas River. River Road and Spreckels Boulevard will begin to flood.

26.0 Feet Moderate flooding along lower portions of Soledad, Gonzales, Chualar, Spence, and Spreckels can be expected. At least 20,000 acres of farmland may become inundated in the Salinas Valley. Levees along the lower Salinas River will be in danger of breaching. Some primary and secondary roads along the Salinas River begin to flood. Highway 68 is forecast to become inundated.

27.0 Feet The lower portions of Castroville will begin to flood. Flooding can be expected to Foster Road, 1 mile south of Salinas. Highway 156 near Castroville will begin to flood. Many secondary roads will be inundated in the Salinas Valley. Major flood damage to agricultural land in the Salinas Valley.

28.0 Feet Major flooding is expected along lower portions of Soledad, Gonzales, Chualar, Spence, Spreckels, and Castroville. Major damage will occur to wide expanses of agricultural land in the Salinas Valley with at least 40,000 acres possibly inundated. Many secondary and some primary roads in the Salinas Valley will become flooded making travel difficult. Highway 156 and Highway 68 will become inundated and impassable. Water/Sewage treatment plants along the lower Salinas River will be in danger of becoming flooded.

29.0 Feet All roads just south and west of Spreckels will become inundated. US 101 is forecast to flood just north of Soledad. Highway 1 just south of Castroville near Nashua Road is forecast to become inundated. Major damage to roads, agricultural land, and homes in the Salinas Valley will be experienced.

30.0 Feet Disastrous flooding will occur within the lower Salinas Valley. The city of Salinas will be in danger of becoming inundated. Most of Castroville is expected to experience flooding. All roads near the Salinas River will be inundated, making travel impossible. Disastrous flooding will occur to wide expanses of agricultural land in the Salinas Valley with at least 90,000 acres possibly inundated.

Uniformly applying a volumetric flow measure in cfs across sites may build error in the model. Every river and every site on a river has a specific, and different, volumetric flood rate which is determined by many factors including gradient, depth, width, and so on. A high cfs measurement at one site might mean it is at flood stage, but at a different site,

10

that same cfs reading could mean the water is exceptionally low. Therefore, it is not logical to apply a single volumetric flow rate and equate it to a uniform flood level.

How can MCRWA and other agencies who participate in the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) reconcile that the SMP manages to a mere 10 year-flow capacity; while FEMA requires managing to a 100-year flood level in order for participating agencies to be eligible for National Flood Insurance Programs? According to FEMA, the magnitude of flood used as the standard for floodplain management in the United States is a flood having a probability of occurrence of 1 percent in any given year, also known as the 100- year flood or base flood. The most readily available source of information regarding the 100-year flood is the system of Flood Insurance Rate Maps (FIRMs) prepared by FEMA. These maps are used to support the National Flood Insurance Program (NFIP). The FIRMs show 100-year floodplain boundaries for identified flood hazards. These areas are also referred to as Special Flood Hazard Areas (SFHAs) and are the basis for flood insurance and floodplain management requirements. The FIRMs also show floodplain boundaries for the 500-year flood, which is the flood having a 0.2 percent chance of occurrence in any given year. FEMA has prepared a FIRM for Monterey County, dated January 1984. FEMA is currently in the process of preparing a countywide digital FIRM for Monterey County, which will incorporate the flood hazard information for both the incorporated and unincorporated areas of the County. □ Rivers and streams for which FEMA has prepared detailed engineering studies may also have designated floodways. The floodway is the channel of a watercourse and portion of the adjacent floodplain that is needed to convey the base or 100-year flood event without increasing flood levels by more than 1 foot and without significantly increasing flood velocities. The floodway must be kept free of development or other encroachments. FEMA has designated floodways within the Salinas River. □

Note: FEMA Flood Control Insurance does not apply to agricultural land or to crops. It does apply to buildings and structures and infrastructure that support agricultural activities.

The DEIR should consider the SMP impact on potential FEMA insurance recoveries. In the past, flood-related insurance and emergency claims potentially were disallowed by FEMA if it were found that inadequate vegetation removal in a floodway contributed to flood damages. This occurred in the 1995 floods when the Pajaro River levees were damaged by removal of flood generated debris balls, and this removal instigated levee failure. FEMA denied expense recovery because upstream vegetation had not been previously managed in the watershed prior to the flood.

Could the SMP's 10-year flood capacity limit cause a reduction in Monterey County's Community Rating System (CRS) rate since the SMP clearly does not support flood maintenance activities at a requisite 100-year flood level? Currently, MCWRA's CRS rating allows for a 15% discount on federally subsidized flood insurance policies. Is it possible that the proposed SMP could result in higher insurance premiums for those who are required to obtain flood insurance if MCWRA and participating agencies do not adhere to FEMA requirements? Further details regarding the Community Rating System point system is provided in the Monterey County Floodplain Management Plan.

What consequences (and remedies) are there for growers if MJHMP agencies have different flood control obligations that could potentially exacerbate flooding conditions for non-incorporated areas of the County? The County of Monterey and the cities of Carmel-by-the-Sea, Del Rey Oaks, Gonzales, Greenfield, King City, Marina, Monterey, Pacific

11

Grove, Salinas, Sand City, and Soledad (hereafter referred to as the participating jurisdictions) participate in the FEMA Multi-Jurisdictional Hazard Management Program that is adopted by resolution between FEMA and participating parties. Of particular interest, is the fact that The City of Soledad's General Plan requires the City to "Identify and carryout minor flood and stormwater management projects that would reduce damage to infrastructure and damage due to local flooding/inadequate drainage. These include the modification of existing culverts and bridges, upgrading capacity of storm drains, stabilization of streambank, and creation of debris or flood/stormwater retention basins in small watersheds. The identification and implementation of minor flood and stormwater management projects will reduce multi-asset (critical facility, critical infrastructure, and residential and nonresidential) losses due to flooding." Costa's Soledad Growing Area is directly opposite of the Soledad waste water treatment facility. There is concern that since the City of Soledad is required to stabilize streambanks to withstand a 100 year flood, it will consequently (albeit, inadvertently) divert and direct water onto Costa Properties, especially when Costa is not allowed to perform any stream maintenance activities in that reach of the river. The consequence may be that Costa's Soledad Growing areas will deluged by unabated floodwaters that will exacerbate erosion and increase the vulnerability of agriculture land, infrastructure and buildings.

Costa is concerned that vegetation recommendations are based upon guidelines originating in other types of ecosystems. This is an appropriate point to remind Stream Maintenance Program authors and other stakeholders that the Salinas River is the type of broad, alluvial watershed system that is only found in the Mediterranean ecosystems of Western U.S. It is not technically sound to superimpose design, vegetation, maintenance or other standards that originated in dissimilar watersheds. Thus, I have concerns that recommended requirements to eliminate bare alluvium/soil in the river channel or impose riparian habitat guidelines from outside the Central Coast could be biologically inappropriate.

The SMP does not take into account increased water demand by increased riparian habitat that could deplete surface and subsurface water availability for other beneficial uses such as community drinking water, aquatic habitat, recreation and irrigation water. There is a body of literature that examines the effects of increased riparian evapotranspiration demands on water balances in watersheds with diminishing water supplies in semi-arid environments. D.C Goodrich with the USDA-ARS, Southwest Watershed Research Center, pioneered this body of work. Since, to date, no research has been conducted on the impacts of enlarged stands of riparian vegetation on water availability on the Central Coast, this might be an ideal recommended activity under the SMP EIR.

Arundo donax removal allowance of 100 acres per year is insufficient. At the proposed SMP removal rates, it will take 18 years to address the current stands of Arundo donax. This does not take in account the rapid pace of stand expansion, especially following flood events that redistribute canes and roots that may populate formerly Arundo-free zones. I would support a more aggressive Arundo removal program based on fire hazard concerns. Generally, riparian species located in waterways are not considered to be a fire hazard, however, more attention is recently being given to the impact of Arundo infestations and their contributions to fire hazard.

The SMP Economic Analysis appears to be incomplete. In addition to the factors considered, the analysis should have also evaluated the costs associated with flood impacts to transportation, power outages, evacuations, wastewater treatment, water

12

supply, levee and dam structural stability, telecommunications, land remediation, insurance impacts, and other emergency related activities as well as the cost of operation and maintenance. And it does not take into account costs associated with increased fire threats from expanding Arundo donax stands.

Costa supports the following aspects of the SMP:

- *The flexibility built into the SMP through the use of eligibility criteria.* However, the work allocation process should also utilize grower anecdotal knowledge of weak points in the flood control system and those points should be factored into work prioritization schedules. Additionally, eligibility criteria should be more adaptive and reactive to ever-changing conditions in the floodway and river channel.
- *The SMP's proposed 10-year term.*
- *The use of maintenance zone buffers,*
- *The annual work limits on the number of acres*
- *The flexibility to use site-appropriate best management practices that will fit operational and site needs.*

Comments and questions specific to proposed mitigations are as follows:

- Will all educational and training materials, necessary for SMP participation, be provided in Spanish by the designated resource and/or enforcement agencies? At a minimum, materials would include relevant regulations, SMP guidelines, and descriptions of species habitat and life cycles and information about riparian vegetation.
- Terr-1, Mitigation Measures Terr-1, Terr-5. It would be helpful if time and frequency schedules had been proposed in order to determine the reasonableness of the proposed mitigations.
- Terr-1, Mitigation Terr-2, more detail should be provided in respect to compensatory mitigations. For example, are they limited to the Salinas mainstem or could they be applied to subtributaries where it is deemed that riparian habitat would be helpful to enhance watershed functions?
- Terr-2, Mitigation Measure Terr-4 and Terr-3, Mitigation Measure-5. It is assumed that the 250 ft exclusion fencing would be restricted to habitat that is desirable for bank swallow nesting and Red legged frog and California tiger Salamander habitats. If the nesting or habitat areas are adjacent to farmland, it is assumed the exclusion area would not extend into farmland.
- Terr-3, Mitigation Measure Terr-7. Are raptor nest and bat colony buffer sizes based upon the discretion of the biologist who conducts clearance surveys? If not, it would have been helpful if buffer sizes had been included in the mitigation measure.

In summary, Costa strongly supports the proposed Stream Maintenance Program. It is critical to protect and support a wide variety of natural resources, community assets, and human health.

The SMP provides growers with a workable, flexible, adaptive plan in which they may conduct vegetation and sediment removal in the Salinas floodplain. It negotiates a labyrinth of regulatory requirements, and functions despite opposing ideas about optimal land uses, and existing hydrological constraints that have evolved with 200 years of hydromodification.

13

It has been a number of years since channel maintenance has occurred in the Salinas River floodplain and the time for action is becoming short. Adoption needs to occur so that work may ensue prior to the next rainy season and potential flood damage.

One weakness in the DEIR is that it does not analyze the cost of NOT adopting an SMP.

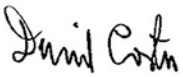
- There is potential environmental harm from doing nothing.
- Wildlife and aquatic habitat could potentially be deteriorated by impenetrable riparian stands and by excessive riparian water consumption.
- Fire and flood dangers associated with Arundo donax could be increased.
- Future flood will occur and flood damage could escalate beyond predictable levels (even for minor high-water events) because the Salinas River floodway becomes constricted by vegetation and sediment elevations at critical points.
- Flooding that impacts agricultural land could cause disruptions to food distribution systems and worker livelihoods.
- Highly productive agricultural soils could be lost.
- Food safety hazards could be increased, and therefore, fields will be temporarily fallowed.
- Public infrastructure such as flood control structures, transportation, telecommunications, and power could be weakened or destroyed.
- Private homes could be lost.
- Livelihoods could be impacted.

Is the SMP perfect? No. Can it be improved? Yes. There are clarifications and details that need to be addressed. This should happen through formal public input processes.

Please continue the public process towards adoption of the Salinas River Stream Maintenance Program.

Thank you for your consideration of the comments provided above.

Sincerely,



Dave Costa
Partner

14

Exhibit 3. Draft General Order (redline version); New Table C.5-1; Draft MRP (redline version)

Exhibit 3 - Draft General Order

STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

DRAFT GENERAL WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES FROM IRRIGATED LANDS

ORDER NO. R3-20XX-XXXX

February 21, 2020

Table of Contents

1

THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL COAST REGION FINDS

Part 1, Section A. Findings

Background and Purpose

1. As described in the Water Quality Control Plan for the Central Coastal Basin (Basin Plan), the central coast region of California represents approximately 7.2 million acres of land. There are approximately 540,000 acres of irrigated land and approximately 3,000 agricultural operations that may be generating wastewater that falls into the category of discharges of waste from irrigated lands.

2. The central coast region has more than 17,000 miles of surface waters (linear streams/rivers) and approximately 4,000 square miles of groundwater basins that are, or may be, affected by discharges of waste from irrigated lands. Of the nine hydrologic regions in the state, the central coast region is the most groundwater dependent region with approximately 86% of its water supply being derived from groundwater.

3. The State Water Resources Control Board (State Water Board) and Regional Water Quality Control Boards (Regional Water Boards) are the principal state agencies with primary responsibility for the coordination and control of water quality for the health, safety and welfare of the people of the state pursuant to the Porter-Cologne Water Quality Control Act (Porter-Cologne Act, codified in Water Code Division 7). The legislature, in the Porter-Cologne Act, directed the state, through the Water Boards, to exercise its full power and jurisdiction to protect the quality of the waters in the state from degradation and to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible, and considering that factors such as precipitation, topography, population, recreation, agriculture, industry, and economic development vary from region to region within the state (Water Code section 13000).

4. Since the issuance of the first Agricultural Order in 2004 and subsequent Agricultural Orders in 2010, 2012 and 2017, the California Regional Water Quality Control Board, Central Coast Region (Central Coast Water Board) has compiled additional and substantial empirical data demonstrating that water quality conditions in agricultural areas of the region continue to be severely impaired or polluted by waste discharges from irrigated agricultural operations and activities that impair beneficial uses. The main impacts from irrigated agriculture in the central coast region are nitrate discharges to groundwater and associated drinking water impacts, nutrient discharges to surface water, pesticide discharges and associated toxicity, sediment discharges, ~~and degradation of riparian and wetland areas~~ and the associated impairment or loss of beneficial uses.

Commented [TD1]: See Exhibit 1 for comments re: Riparian requirements.

5. The objectives of this Order are:

4

1. Protect and restore beneficial uses and achieve water quality objectives specified in the Basin Plan for commercial irrigated agricultural areas in the central coast region by:
a. Minimizing nitrate discharges to groundwater,
b. Minimizing nutrient discharges to surface water,
c. Minimizing toxicity in surface water from pesticide[1] discharges,
d. ~~Protecting and restoring riparian and wetland~~ habitat, and
e. Minimizing sediment discharges to surface water.

Commented [TD2]: See Exhibit 1 for comments re: Riparian requirements

1 A pesticide is any substance or mixture of substances intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any pest, as defined in the California Food and Agricultural Code section 12754.5 ~~control, destroy, repel, or otherwise mitigate a pest. The term pesticide is inclusive of all pest and disease management products, including insecticides, herbicides, fungicides, nematicides, rodenticides, algicides, etc.~~

Commented [TD3]: For consistency with legal definition.

2. Effectively track and quantify achievement of 1.a. through de. over ~~a specific, defined time schedule~~ time.

3. Comply with the State's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Policy), the State Antidegradation Policy, relevant court decisions such as those pertaining to Coastkeeper *et al* lawsuits, the precedential language in the Eastern San Joaquin Watershed Agricultural Order, and other relevant statutes and water quality plans and policies, including total maximum daily loads in the central coast region.

6. This Order regulates discharges of waste from irrigated lands by requiring individuals subject to this Order to comply with the terms and conditions set forth herein to ensure that such discharges do not cause or contribute to the exceedance of any applicable regional, state, or federal numeric or narrative water quality objectives or impair any applicable beneficial uses in waters of the state and of the United States.

7. Water Code section 13260(a) requires that any person discharging waste or proposing to discharge waste that could affect the quality of the waters of the state, other than into a community sewer system, must file with the appropriate Regional Board a report of waste discharge (ROWD) containing such information and data as may be required by the Central Coast Water Board, unless the Central Coast Water Board waives such requirement.

8. Water Code section 13263(a) requires the Central Coast Water Board to prescribe waste discharge requirements (WDRs~~), or waive WDRs, for the discharge~~. The requirements must implement the Basin Plan and must take into consideration the beneficial uses to be protected and the water quality objectives reasonably required for that purpose, other waste discharges, the need to prevent nuisance, and the provisions of Water Code section 13241.

Commented [TD4]: Not applicable here.

9. Water Code section 13263(b) states that, in prescribing requirements, the Central Coast Water Board need not authorize the utilization of the full waste assimilation capacities of the receiving

5

waters.

10. This Order does not create a vested right to discharge; all discharges are a privilege, not a right, as described in Water Code section 13263(g).

11. Water Code section 13263(i) authorizes the Central Coast Water Board to prescribe general WDRs for a category of discharges if the Central Coast Water Board finds or determines that all the criteria listed below apply to the discharges in that category. Discharges associated with irrigated agricultural operations that will be regulated under this Order are consistent with these criteria and therefore a general order is appropriate. a. The discharges are produced by the same or similar operations.
b. The discharges involve the same or similar type of waste.
c. The discharges require the same or similar treatment standards.
d. The discharges are more appropriately regulated under general WDRs than individual WDRs.

12. Water Code section 13243 authorizes the Central Coast Water Board, in a water quality control plan or in WDRs, to specify certain conditions or areas where the discharge of waste, or certain types of waste, will not be permitted.

Commented [TD5]: For consistency with Water Code.

13. Water Code section 13267 authorizes the Central Coast Water Board to prescribe monitoring and reporting requirements as set forth in Attachment B. ~~The Executive Officer may require Dischargers to locate (inventory) and conduct monitoring of private domestic wells in or near agricultural areas with high nitrate in groundwater and submit technical reports evaluating the monitoring results.~~

Commented [TD6]: Beyond EO legal authority to require monitoring of wells outside of operation.

14. Water Code section 13304 authorizes the Central Coast Water Board to, upon making the requisite findings, issue a cleanup and abatement order (CAO) that may require~~s Dischargers to provide emergency and long-term alternative water supplies or~~ the provision of, or payment for, uninterrupted replacement water service, which ~~replacement water service, including~~ may include wellhead treatment, to each affected public water supplier or private well owner~~s~~. A CAO is a separate action from this Order; this Order does not require Dischargers to provide for the provision of, or payment for, uninterrupted ~~alternative water supplies or~~ replacement water service.

Commented [TD7]: For consistency with Water Code.

Public Participation Process

15. In August 2017, Central Coast Water Board staff held a series of listening sessions throughout the central coast region to solicit stakeholder input on potential improvements to the previous agricultural order. The Central Coast Water Board discussed the input received from stakeholders during the September 2017 board meeting.

16. In February 2018, the Central Coast Water Board published an initial study to begin soliciting input related to environmental review for the California Environmental Quality Act (CEQA), in

preparation for developing a draft Environmental Impact Report (EIR). A 73-day public comment period was held for the initial study. In March 2018, Central Coast Water Board staff held a series of public CEQA scoping meetings throughout the region. Input received during the public comment period and public scoping meetings has been considered in the development of the draft EIR.

17. In March and May 2018, Central Coast Water Board meetings included informational items dedicated to a review of water quality conditions associated with agricultural activities and discharges. The March 2018 informational item focused on surface water quality conditions and agricultural discharges and the May 2018 informational item focused on groundwater quality conditions and nitrate impacts to groundwater. Both informational items incorporated presentations from several outside speakers.

18. In September 2018, the Central Coast Water Board's public meeting was dedicated to a workshop for agricultural order stakeholders. Panels of agricultural, environmental, and environmental justice representatives gave presentations to the board in response to a series of questions staff proposed:

a. What can growers and the regional board do to demonstrate quantifiable progress to minimize nitrate discharge to groundwater to achieve water quality objectives?
b. What can growers and the regional board do to demonstrate quantifiable progress to minimize nutrient discharge to surface waters to achieve water quality objectives?
c. What can growers and the regional board do to demonstrate quantifiable progress to minimize toxicity in surface waters from pesticide discharges to achieve water quality objectives?
d. What can growers and the regional board do to ensure that riparian and wetland habitat is protected due to agricultural activities and discharges?
e. What can growers and the regional board do to demonstrate quantifiable progress to minimize sediment discharge to achieve water quality objectives?
f. How can the regional board use discharge permit requirements to ensure current and future affordable, safe, and clean water for drinking and environmental uses?

19. In November 2018, the Central Coast Water Board published a set of five conceptual options tables that serve as the Central Coast Water Board's framework to address the questions posed in the September 2018 meeting. The Central Coast Water Board reviewed and discussed the options tables during its public meeting in November, and a 64-day written public comment period was subsequently held to solicit detailed stakeholder input. Central Coast Water Board staff held a series of outreach meetings throughout the region during the comment period.

20. In March 2019, after the 64-day public comment period, the Central Coast Water Board published updated versions of the five conceptual options tables. During the public meetings in March and May 2019, the Central Coast Water Board discussed the updated tables and received additional stakeholder comment.

21. In September 2019, during its public meeting, the Central Coast Water Board held a workshop

focused on co-managing food safety and environmental protection, the role of riparian vegetation in water quality and beneficial use protection, and Discharger experiences with food safety challenges.

22. On February 21, 2020, the Central Coast Water Board published the draft Order and draft EIR and began a 45-day public comment period. The comment period was subsequently extended several times until June 220, 2020.

Scope of Order

Irrigated Lands and Agricultural Discharges Regulated Under this Order

23. This Order regulates (1) discharges of waste from commercial irrigated lands, including, but not limited to, land planted to row, vineyard, field and tree crops where water is applied for producing commercial crops; (2) discharges of waste from commercial nurseries, nursery stock production, and greenhouse operations with soil floors that do not have point source-type discharges and are not currently operating under individual WDRs; and (3) discharges of waste from lands that are planted to commercial crops that are not yet marketable, such as vineyards and tree crops.

24. Discharges from irrigated lands regulated by this Order include discharges of waste to surface water and groundwater, such as irrigation return flows, percolation, tailwater, tile drain water, stormwater runoff flowing from irrigated lands, stormwater runoff conveyed in channels or canals resulting from the discharge from irrigated lands, and runoff resulting from frost control or operational spills. These discharges can contain wastes that could affect the quality of waters of the state and impair beneficial uses.

~~25. This Order also regulates agricultural activities such as the removal or degradation of riparian vegetation resulting in the loss or degradation of instream beneficial uses.~~

Commented [TD8]: See Exhibit 1 for comments re: Riparian requirements

Dischargers Regulated Under this Order

26. This Order regulates both landowners and operators of commercial irrigated lands ~~on or~~ from which there are discharges of waste ~~or activities~~ that could affect the quality of any ~~surface water or groundwater~~ water of the state or result in the impairment of beneficial uses assigned to the waters of the state (Dischargers). Dischargers are responsible for complying with the conditions of this Order. Both the landowner and the operator of the irrigated agricultural land are Dischargers under this Order. The Central Coast Water Board will hold both the landowner and the operator liable for noncompliance with this Order, regardless of whether the landowner or the operator is the party to enroll under this Order.

Commented [TD9]: Consistency with Water Code.

27. For the purposes of this Order, irrigated lands producing commercial crops are those operations that have one or more of the following characteristics:

8

a. The landowner or operator has obtained a pesticide use permit from a local County Agricultural Commissioner;
b. The crop is sold, including but not limited to 1) an industry cooperative, 2) a harvest crew/company, or 3) a direct marketing location, such as certified Farmers Markets;
c. The federal Department of Treasury Internal Revenue Service for 1040 Schedule F Profit or Loss from Farming is used to file federal taxes.

28. The electronic Notice of Intent (eNOI) serves as a report of waste discharge (ROWD) for the purposes of this Order.

29. The Central Coast Water Board recognizes that certain limited resource growers (as defined by the U.S. Department of Agriculture) may have difficulty achieving compliance with this Order. The Central Coast Water Board will prioritize assistance for these growers, including but not limited to technical assistance, grant opportunities, and necessary flexibility to achieve compliance with this Order (e.g., adjusted monitoring, reporting, or time schedules).

Agricultural Dischargers Not Covered Under this Order and Who Must Apply for Individual Waste Discharge Requirements

30. This Order does not cover point source-type discharges from commercial nurseries, nursery stock production, greenhouses, or other operations. This Order does not cover discharges of waste from fully contained greenhouse operations (i.e., those that have no groundwater discharge due to impermeable floors but may have other discharges associated with the operation). These operations must either eliminate all such discharges of waste or submit a ROWD to apply for individual WDRs as set forth in Water Code section 13260.

Enforcement for Noncompliance

31. The State Water Board's Water Quality Enforcement Policy (Enforcement Policy) describes progressive enforcement action for violations of WDRs when appropriate. However, the Enforcement Policy recommends formal enforcement as a first response to more significant violations. Progressive enforcement is an escalating series of actions that allows for the efficient and effective use of enforcement resources to 1) assist cooperative Dischargers in achieving compliance; 2) compel compliance for repeat violations and recalcitrant violators; and 3) provide a disincentive for noncompliance. Progressive enforcement actions may begin with informal enforcement actions such as a verbal, written, or electronic communication between the Central Coast Water Board and a Discharger. The purpose of an informal enforcement action is to quickly bring the violation to the Discharger's attention and to give the Discharger an opportunity to return to compliance as soon as possible. The highest level of informal enforcement is a Notice of Violation.

32. The Enforcement Policy recommends formal enforcement actions for the highest priority violations, chronic violations, and/or threatened violations. Violations of this Order that will be considered a priority include, but are not limited to:

a. Failure to obtain required regulatory coverage;
b. Failure to achieve numeric limits;
c. Falsifying information or intentionally withholding information required by applicable laws, regulations, or an enforcement order;
d. Failure to monitor or provide complete and accurate information as required;
e. Failure to pay annual fees, penalties, or liabilities; and
f. Failure to submit required reports on time.

33. Water Code section 13350 provides that any person who violates WDRs may be 1) subject to administrative civil liability imposed by the Central Coast Water Board or State Water Board in an amount of up to $5,000 per day of violation, or up to $10 per gallon of waste discharged; or 2) subject to civil liability imposed by a court in an amount of up to $15,000 per day of violation, or up to $20 per gallon of waste discharged. The actual calculation and determination of administrative civil penalties must be consistent with the Enforcement Policy and the Porter-Cologne Act.

Additional Findings and Regulatory Considerations

34. Attachment A to this Order, incorporated herein, includes additional findings that further describe the Water Board's legal and regulatory authority; compliance with CEQA requirements; applicable plans and policies adopted by the State Water Board and the Central Coast Water Board that contain regulatory conditions that apply to the discharge of waste from irrigated lands; and the rationale for this Order, including descriptions of the environmental and agricultural resources in the central coast region and impacts to water quality and beneficial uses from agricultural discharges.

35. The Central Coast Water Board encourages Dischargers to participate in third-party groups or programs (e.g., certification program, watershed group, water quality coalition, monitoring coalition, or other cooperative effort) to facilitate and document compliance with this Order. Third-party programs can be used to implement outreach and education, monitoring and reporting, management practice and/or water quality improvement projects. Regionally-scaled third-party programs addressing multiple Order requirements are preferred to provide economies of scale to reduce Discharger costs, maximize effectiveness, and streamline Water Board oversight; however, watershed- or basin-scale third-party programs of limited scope may be appropriate under certain circumstances and should be coordinated to the extent practicable for consistency and effectiveness. Commodity group certification programs may also be effective in facilitating compliance with this Order. Dischargers participating in an Executive Officer approved third-party program may be subject to permit fee reductions or be eligible for alternative compliance pathways ~~that substantively~~ to substantively comply with this Order.

36. The Central Coast Water Board acknowledges that it will take time to develop meaningful and effective third-party programs that facilitate compliance with this Order. The Order considers this by allowing an initial grace period for the phasing in of various requirements. The phasing in of various requirements is also intended to allow Water Board staff time to develop online reporting tools and templates and to conduct outreach and education to help Dischargers and service providers come up to speed on the new requirements.

10

37. Third-party programs are discussed in Part 2, Section A, below. The Central Coast Water Board will provide more detailed third-party expectation documents and/or third-party program requests for proposals (RFPs) to inform and solicit third-party program proposals for Executive Officer consideration.

Part 1, Section B. Phasing and Prioritization

1. Ranches are classified into geographic groundwater phase areas, and surface water priority areas, ~~and riparian priority areas~~ based on the relative level of water quality and beneficial use impairment and risk to water quality. Groundwater Phase 1 areas represent greater water quality impairment and higher risk to water quality relative to Groundwater Phase 2 and 3 areas. Similarly, Surface Water ~~and Riparian~~ Priority 1 areas represent greater water quality impairment and higher risk to water quality relative to Surface Water ~~and Riparian~~ Priority 2, 3, and 4 areas. ~~The~~Certain requirements and implementation schedules of this Order are based on the phase and priority areas listed below. Maps are provided to clarify the locations of the phase and priority areas (**Figure B-1**, **Figure B-2**, **Figure B-3**, and **Figure B-4**). Where there are alternative compliance pathways identified in the Order, different priorities and implementation schedules may apply.-

Commented [TD10]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for discussion of alternative compliance pathways

2. The Groundwater Phase, and Surface Water Priority, ~~and Riparian Priority~~ assigned to each ranch will be displayed in the eNOI in GeoTracker.

Groundwater Phase Areas

3. **Groundwater Phase 1** – Applies to all ranches overlying portions of the following groundwater basins, as shown in **Table B-1** and **Figure B-1**. All ranches that overlie these groundwater basins but are outside of the Groundwater Phase 1 areas shown in the map shown in **Figure B-1** are assigned either Groundwater Phase 2 or 3. a. Gilroy-Hollister Valley – Llagas Area
b. Salinas Valley – Forebay and Upper Valley Aquifers
c. Santa Maria River Valley
d. Santa Ynez River Valley

4. **Groundwater Phase 2** – Applies to all ranches that are not in Groundwater Phase 1 and that overlie the following groundwater basins, as shown in **Table B-1** and the map shown in **Figure B-1**. a. Gilroy-Hollister Valley – Llagas Area and North San Benito
b. Corralitos – Pajaro Valley
c. Salinas Valley – Forebay, Upper Valley, 180/400 Foot, and East Side Aquifers
d. Santa Maria River Valley
e. San Luis Obispo Valley

5. **Groundwater Phase 3** – Applies to all ranches that are not in Groundwater Phase 1 or Groundwater Phase 2 areas.

11

Surface Water Priority Areas

6. Ranches are assigned the Surface Water Priority of the HUC-8 watershed where the ranch is located, as shown in **Table B-2** and the map shown in **Figure B-2**. All ranches are assigned a Surface Water Priority of 1, 2, 3, or 4. Dischargers that select to comply with surface water provisions through Participation in Cooperative Monitoring Program and Enhanced Surface Water Follow-up Program in Part 2, Section C.5 will be subject to certain requirements based on the categorization of Surface Waters in Table C.5-1.

Commented [TD11]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for discussion of alternative compliance pathways; See proposed Table C.5-1 to Redline revisions to Draft Order

~~**Riparian Priority Areas**~~

~~7. Ranches are assigned the Riparian Priority of the HUC-12 watershed where the ranch is located, as shown in **Table B-3** and the map shown in **Figure B-3**. All ranches are assigned a Riparian Priority of 1, 2, 3, or 4.~~

Commented [TD12]: See Exhibit 1 for comments re: Riparian requirements

All Phase and Priority Areas

8. The map shown in **Figure B-4** shows all Groundwater Phase areas, and Surface Water Priority areas, ~~and Riparian Priority areas~~ in one figure.

9. In the event that a ranch spans multiple Groundwater Phase areas, the ranch will be assigned the earlier phase. For example, a ranch that spans both Groundwater Phase 1 and Groundwater Phase 2 areas will be assigned to Groundwater Phase 1.

10. In the event that a ranch spans multiple Surface Water Priority areas ~~or Riparian Priority areas~~, the ranch will either be assigned the earlier priority or will be assigned the priority of the watershed that the ranch drains or discharges to, if specific discharge information is provided to the Central Coast Water Board. Ranches that are farmed by Dischargers that have elected to comply with Surface Water provisions Parts 2. C.2, C.3 and C.4 through Part 2, Section C.5 will be categorized per Table C.5-1. In the event that a ranch spans multiple categories, the ranch will either be assigned the earlier category or will be assigned the category of the watershed that the ranch drains or discharges to, as determined appropriate by the cooperative monitoring program.

Commented [TD13]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for discussion of alternative compliance pathways

12

IT IS HEREBY ORDERED
that Order No. R3-2017-0002 is terminated as of the effective date of this Order except for the purposes of enforcement, and that pursuant to Water Code sections 13260, 13263, and 13267, Dischargers enrolled in this Order, their agents, successors, and assigns, must comply with the following terms and conditions to meet the provisions contained in Water Code Division 7 and regulations, plans, and policies adopted thereunder.

Part 2, Section A. Enrollment, Fees, Termination, General Provisions, and Third-Party Programs

1. This Order is effective upon adoption by the Central Coast Water Board.

2. Except where stated otherwise, all requirements of this Order apply to all Dischargers.

Enrollment

3. Enrollment in this Order requires the submittal of the electronic Notice of Intent (eNOI) pursuant to Water Code section 13260. Submittal of all other technical reports pursuant to this Order is required pursuant to Water Code section 13267. Failure to submit technical reports or the attachments in accordance with the time schedules established by this Order or MRP, or failure to submit a complete technical report (i.e., of sufficient technical quality to be acceptable to the Executive Officer), may subject the Discharger to enforcement action pursuant to Water Code sections 13261, 13268, or 13350. Dischargers must submit technical reports in the format specified by the Executive Officer.

4. Dischargers who are not currently enrolled in the existing agricultural order must submit to the Central Coast Water Board a complete eNOI prior to discharging. Upon submittal of a complete and accurate eNOI, the Discharger is enrolled under this Order, unless otherwise informed by the Executive Officer.

5. Dischargers who were enrolled in Order R3-2017-0002 as of the effective date of this Order are automatically enrolled in this Order.

6. In the case where an operator may be operating for a period of less than 12 months, the landowner must submit the eNOI. In all other cases, either the landowner or the operator must submit the eNOI. Both the landowner and the operator are Dischargers responsible for compliance with the requirements of this Order.

7. **Prior to any discharge or commencement of activities that may cause a discharge,** including land preparation prior to crop production, any Discharger proposing to control or own a new operation or ranch that has the potential to discharge waste that could ~~directly or indirectly reach waters of the state and/or~~ affect the quality of the waters of the state ~~any surface water and/or groundwater~~ must submit an eNOI.

Commented [TD14]: For consistency with Water Code

13

8. **Within 60 days** of any change in operation or ranch information, the Discharger must update the eNOI.

9. **Within 60 days** of any change in control or ownership of an operation, ranch, or land presently owned or controlled by the Discharger, the Discharger must notify the succeeding owner and operator of the existence of this Order.

10. **Within 60 days** of acquiring control or ownership of an existing operation or ranch, the succeeding Discharger must submit an eNOI.

11. Dischargers must submit all the information required in the eNOI form, including but not limited to the following information for the operation and individual ranch: a. Assessor parcel numbers (APNs) covered by enrollment,
b. Landowner(s),
c. Operator(s),
d. Contact information,
e. Option selected to comply with water quality monitoring requirements (cooperative or individual monitoring)
f. Location of operation, including specific ranch(es),
g. Map with discharge locations and groundwater wells identified,
h. Type and number of groundwater wells located on ranch parcels,
i. Total and irrigated acreage,
j. Crop types grown,
k. Irrigation system type,
l. Discharge type,
m. Chemical use,
n. ~~Slope~~,
o. ~~Impermeable surfaces,~~
p. Presence and location of any waterbodies on or adjacent to the ranch.

Commented [TD15]: Not appropriate for inclusion in eNOI

12. Dischargers or groups of Dischargers seeking regulatory requirements tailored to their specific operation, ranch, geographic area, or commodity may submit an ROWD to obtain an individual order or MRP, or request the development of a general order for a specific type of discharge (e.g., commodity-specific general order). This Order remains applicable to those Dischargers until the Central Coast Water Board adopts such an individual order, MRP, or general order, and, if applicable, the Dischargers are enrolled in the general order.

13. Dischargers seeking enrollment in this Order must submit a statement of understanding of the conditions of this Order and MRP signed by the Discharger (landowner or operator) with the eNOI. If the operator signs and submits the electronic NOI, the operator must provide a copy of the complete NOI form to the landowner(s).

14

14. Coverage under this Order is not transferable to any person except after the succeeding Discharger's submittal to the Central Coast Water Board of an updated eNOI and approval by the Executive Officer.

Fees

15. Dischargers must pay a fee to the State Water Resources Control Board in compliance with the fee schedule contained in Title 23 California Code of Regulations.

16. Dischargers must pay any relevant cooperative monitoring fees (e.g., Cooperative Monitoring Program) necessary to comply with monitoring and reporting conditions and alternative compliance programs of this Order or they must comply with monitoring and reporting requirements individually.

Commented [TD16]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for discussion of alternative compliance pathways

17. For Dischargers who choose to participate in a cooperative monitoring program, failure to pay cooperative monitoring program fees voids a selection or notification of the option to participate in the cooperative monitoring and hence requires individual monitoring report submittal per the MRP.

Termination

18. **Immediately**, if a Discharger wishes to terminate coverage under this Order for the operation or an individual ranch, the Discharger must submit a complete Notice of Termination (NOT). Termination from coverage is the date the termination request is approved, unless specified otherwise. All discharges must cease before the date of termination, and any discharges on or after the date of termination are violations of this Order, unless covered by other WDRs or waivers of WDRs. All required monitoring and reporting are due **within 60 days of the termination or March 1 following the termination date**, whichever is sooner, unless otherwise directed by the Executive Officer.

General Provisions

19. The discharge of any waste to a water of the state not specifically regulated by this Order, except in compliance with a separate permit and the Water Code, is prohibited.

Commented [TD17]: For consistency with Water Code

20. The discharge of waste at a location or in a manner different from that described in the eNOI is prohibited.

21. Dischargers must comply with the Monitoring and Reporting Program (MRP), incorporated herein as Attachment B.

15

22. All forms, reports, documents, and laboratory data must be submitted to the Central Coast Water Board electronically through the State Water Board's database systems (e.g., GeoTracker, CEDEN,[2] etc.).

[2] CEDEN is the California Environmental Data Exchange Network.

23. Dischargers are defined in this Order as both the landowner and the operator of irrigated agricultural land ~~on or~~ from which there are discharges of waste from irrigated agricultural activities that could affect the quality of any water of the state ~~surface water or groundwater~~. The Central Coast Water Board will hold both the landowner and the operator liable for noncompliance with this Order.

Commented [TD18]: For consistency with Water Code

24. The Executive Officer may propose, and the Central Coast Water Board may adopt, individual WDRs for any Discharger at any time.

25. The Central Coast Water Board or the Executive Officer may, at any time, terminate applicability of this Order with respect to an individual Discharger upon written notice to the Discharger.

26. Any instance of noncompliance with this Order constitutes a violation of the Water Code and its regulations. Such noncompliance is grounds for enforcement action and/or termination of coverage for waste discharges under this Order, subjecting the Discharger to enforcement under the Water Code ~~for further discharges of waste to surface water or groundwater~~.

Commented [TD19]: Enforcement is limited to past actions, not speculated future actions

~~27. The fact that it would have been necessary to halt or reduce the permitted discharge activity to maintain compliance with this Order is not a defense for the Discharger's violations of this Order.~~

Commented [TD20]: The law speaks for itself, such a finding is inappropriate

28. Provisions of this Order are severable. If any provision of this Order is found invalid, the remainder of this Order will not be affected.

29. ~~Upon~~Pursuant to the provisions of Water Code section 13267, the Central Coast Water Board's or Executive Officer's may request ~~and~~ (within a reasonable timeframe), a Discharger~~rs must~~ to submit ~~any~~ information required to determine compliance with this Order or to determine whether there is cause for modifying or terminating this Order.

Commented [TD21]: For consistency with Water Code

30. This Order may be reopened to address changes in statutes, regulations, plans, policies, or case law that govern water quality requirements for the discharges regulated herein.

Third-Party Programs

Commented [TD22]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for discussion of alternative compliance pathways

31. Dischargers may comply with portions of this Order by selecting alternative compliance

pathways that are administered by a participating in third-party groups or programs (e.g., certification program, watershed group, water quality coalition, monitoring coalition, or other cooperative effort). To administer a third party group or program, the third party must be approved by the Executive Officer. In this case, the third-party will assist individual growers in achieving compliance with this Order, including implementing water quality improvement projects and required monitoring and reporting as described in the MRP, and is applicable to the third-party's approved scope and purposes. Compliance with the requirements of this Order is still required for all members of the third-party program except as otherwise allowed through participation in an; however, the third-party may propose alternative compliance pathwayprogram that is part of this Order.s such as modified monitoring and reporting for approval by the Executive Officer. Third-party program proposals not specifically part of this Order will be evaluated on a case-by-case basis relative to their ability to document compliance with this Order.

32. Consistent with the Water Board's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Policy), the ineffectiveness of a third-party program through which a Discharger participates in nonpoint source control efforts cannot be used as a justification for lack of individual discharger compliance. Dischargers continue to be responsible for complying with this Order individually.

33. Dischargers who elect to meet certain requirements of this Order by joining a third-party program and participating in an alternative compliance program to facilitate compliance with this Order must retain their membership with the third-party in good standing. If the Discharger does not meet the requirements of membership in the third-party program, then the Discharger is responsible for complying with all requirements in this Order individually.

34. Third-party programs must meet the following minimum criteria:

Effectiveness of scale and scope – The program must be of sufficient scale and scope relative to its intended purpose to maximize Discharger participation, implementation effectiveness and Order compliance. Although rRegionally scaled programs are preferred, but may be administered on watershed- or basin-scale programs basis will be considered as needed appropriate to address localized water quality issues.

b. Clearly stated goals and objectives – The program must have meaningful and clearly stated goals, objectives and associated performance metrics relevant to the Order requirements that are the focus of the program.

c. Management and administration – The program must have a well-defined and robust governance and administrative structure with clearly defined roles and responsibilities.

d. Capacity and expertise – The program must demonstrate sufficient technical, managerial and financial capacity to successfully achieve its goals and objectives.

e. Physical presence – The program must have a physical presence in the central coast region, including staff and a headquarters, that can assist its members on a continual and as-needed basis.

f. Transparency and accountability – The program must provide regular assessments of its performance relative to its stated goals and objective based on meaningful performance metrics. This includes reporting of water quality data and farm-level data as needed to document

17

compliance with this Order.

g. Membership and fee accounting – The program must track and provide ongoing accounting of its Discharger membership and fees to document Discharger compliance.

h. Data management – The program must upload data as required by this Order to the Water Boards' various data management systems (e.g., CEDEN, GeoTracker, etc.).

i. Member requirements – The program must have clearly stated and enforced Discharger membership requirements and report out on them as needed to document compliance.

j. Coordination – The program must consider and coordinate with other third-party programs/groups or local entities as may be appropriate to create consistency; leverage the efforts, infrastructure and expertise of others; and streamline the program to maximize effectiveness (e.g., coordination with Groundwater Sustainability Agencies [GSAs], flood control management agencies, watershed restoration and management entities, etc.).

k. Specific project plan documents – The program must have a detailed work plan including a Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) as may be appropriate based on the program goals and objectives and associated order requirements.

18

Part 2, Section B. Planning, Education, Management Practices, and CEQA

Farm Water Quality Management Plan (Farm Plan)

1. Dischargers must develop, implement, and update as necessary a Farm Water Quality Management Plan (Farm Plan) for each ranch. A current copy of the Farm Plan must be maintained by the Discharger and must be available for inspection upon to the Central Coast Water Board upon request. At a minimum, the Farm Plan for Dischargers that do not elect to comply with Surface Water provisions through Part 2. Section C.5 must include the discrete sections listed below. Additional details regarding each section are included in subsequent sections of this Order. Certain elements included in the Farm Plan must be reported on; however, in general, the Farm Plan is a planning and recordkeeping tool used by Dischargers to manage various aspects of their agricultural operation.

Commented [TD23]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for discussion of alternative compliance pathways

a. Irrigation and Nutrient Management Plan (INMP)

b. Pesticide Management Plan (PMP)

c. Sediment and Erosion Management Plan (SEMP).

~~d. Riparian Area Management Plan (RAMP)~~

e. Water Quality Education

f. CEQA Mitigation Measure Implementation

2. For Dischargers that elect to comply with Surface Water provisions through Part 2, Section C.5, at a minimum, the Farm Plan must include the following:

Commented [TD24]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for discussion of alternative compliance pathways

a. Irrigation and Nutrient Management Plan (INMP)

b. Description and time schedule for any farm water quality management practices, treatment and/or control measures implemented to comply with this Order. This includes but is not limited to, management practices related to irrigation efficiency and management, pesticide management, nutrient management, salinity management, sediment and erosion control (including stormwater management), and aquatic habitat protection to achieve compliance with this Order. In addition, Farm Plans must describe tile drain discharges and the management measures Dischargers have implemented or will implement to minimize impacts to water quality.

c. Water Quality Education

19

d. CEQA Mitigation Measure Implementation.

3. The ~~INMP, PMP, SEMP, and RAMP sections of the~~ Farm Plan must include information on management practice implementation. Elements of the INMP are reported on in the Total Nitrogen Applied report or INMP Summary report. Elements of all the ~~sections~~ information identified ~~listed~~ above are reported on in the Annual Compliance Form (ACF). Additional information on the monitoring and reporting requirements related to each of these sections is included in the MRP.

3. Dischargers must maintain all records related to compliance with this Order for a minimum of ten years. Records include, but are not limited to, monitoring information, calculations, management practice implementation and assessment, education records, and all required reporting and information used to submit complete and accurate reports. Third parties that have been approved by the Executive Officer to assist Dischargers with complying with this Order, for example in the form of water quality monitoring, must also maintain all records for a minimum of ten years. Records must be submitted to the Central Coast Water Board ~~upon request or~~ as required by this Order or an approved work plan.

Continuing Education

4. Dischargers must attend outreach and education events to obtain technical skills and assistance necessary to achieve compliance with the limits established by this Order. Outreach and education events should focus on meeting water quality objectives and protecting beneficial uses by identifying water quality problems, implementing pollution prevention strategies, and implementing management practices designed to protect water quality and beneficial uses and resolve water quality problems to achieve compliance with this Order. Records of participation in continuing education must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request. Dischargers who ~~exceed the fertilizer nitrogen application limits, nitrogen discharge targets and limits~~ are outliers as compared to nitrogen target values, or exceed surface water limits after applicable compliance schedule dates ~~must~~ may need to complete additional water quality education and implement additional or improved management practices to avoid future exceedances.

Commented [TD25]: See subsequent revisions to Part C.1 and newly proposed C.5

~~5. Dischargers who exceed the fertilizer nitrogen application limits, nitrogen discharge targets and limits, or surface water limits must complete additional relevant water quality education to inform the implementation of additional or improved management practices to avoid future exceedances.~~

Commented [TD26]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for discussion of alternative compliance pathways

6. A copy of this Order and MRP must be kept at the ranch for reference by operating personnel. Key operating and site management personnel must be familiar with the content of both documents.

Management Practice Implementation

7. Dischargers must implement management practices, as necessary, to improve and protect

20

water quality, protect beneficial uses, achieve compliance with applicable water quality objectives, and achieve the limits and targets established in this Order. Management practices implemented must be documented in the appropriate section of the Farm Plan (e.g., irrigation and nutrient management practices must be documented in the INMP section of the Farm Plan). Dischargers must report on management practice implementation and assessment in the ACF, as described in the MRP.

CEQA Mitigation Measure Implementation, Monitoring, and Reporting

8. Dischargers must implement the mitigation measures identified in the final certified EIR.[3] Draft mitigation measures are available for review in the draft EIR.

[3] While this draft Order does not include the mitigation measures or associated mitigation monitoring and reporting program, the proposed Order for Central Coast Water Board consideration and adoption will include those elements.

9. Dischargers must report on mitigation measure implementation electronically in the Annual Compliance Form (ACF), as described in the MRP. Draft mitigation monitoring and reporting is available for review in the draft EIR.

Part 2, Section C.1. Irrigation and Nutrient Management ~~for Groundwater Protection~~Plan

1. Dischargers must ~~develop~~ prepare and implement an Irrigation and Nutrient Management Plan (INMP) ~~that addresses both groundwater and surface water~~ for each ranch. The INMP is a section of the Farm Plan and must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request. Summary information from the INMP must be submitted in the INMP Summary report to the Central Coast Water Board per the MRP. Dischargers may use an INMP and INMP Summary Report Template developed by a third-party group that is approved by the Executive Officer. At a minimum, the elements of the INMP ~~related to groundwater protection~~ must include:

a. Monitoring and recordkeeping necessary to submit complete and accurate reports, including the ACF, Total Nitrogen Applied (TNA) report, and INMP Summary report.

b. Planning and management practice implementation and assessment ~~that results in compliance with the fertilizer nitrogen application limits in **Table C.1-1** and the nitrogen discharge targets and limits in **Table C.1-2**~~.

c. Descriptions of all irrigation, nutrient, and salinity management practices implemented and assessed on the ranch.

d. ~~Where~~ Information to calculate an Applied/Removed (A/R) ratio for nitrogen and an Applied-Removed (A-R) difference for nitrogen.~~required by the Executive Officer based on groundwater quality conditions or exceedances of the targets or limits established in this Order, the INMP must incorporate ranch-level groundwater discharge monitoring described in the MRP. The ranch-level groundwater discharge monitoring must be designed and implemented to inform improved management practices to protect groundwater quality.~~

2. The equations used to calculate (A/R) and (A-R) require that nitrogen removed be calculated. To calculate the amount of nitrogen removed from the field through harvest or other removal of crop material (R_{HARV}), it is necessary to use a crop conversion coefficient (C_N), which is a crop-specific coefficient used to convert units of material removed per acre to units of nitrogen removed per acre. For many Central Coast crops, the data needed to develop a more precise C_N may not yet be available. Until such time that the Central Coast Water Board has approved more precise C_N the development of an appropriate range of A-R target values for specific crops, or types of crops, to identify outliers is premature. In the interim, the Central Coast Water Board shall use the values in Table C.1-1 to identify outliers.

3. If the Discharger is identified as an outlier by the Central Coast Water Board, the Discharger may be required to obtain additional education as ordered by the Executive Officer.

4. If the Discharger is identified as an outlier by the Central Coast Water Board, the INMP shall be certified in one of the following ways:

Certified by an irrigation and nitrogen management plan specialist as found in Attachment C of

22

Commented [TD27]: See Exhibit 4, Narrative Description of Proposed Redline Revisions for thorough discussion of revisions proposed to Part 2, C.1

this Order. The specialist that certifies the INMP must be capable of answering questions relevant to the INMP and should be fully competent and proficient by education and experience in the field(s) relevant to the development of the INMP. These specialists may include Professional Soil Scientists, Professional Agronomists, Crop Advisers[1] certified by the American Society of Agronomy, Technical Service Providers certified in nutrient management in California by the National Resource Conservation Service (NRCS), or Certified Agricultural Irrigation Management Specialists certified by The Irrigation Association; or

- Self-certified by the Member who attends a California Department of Food and Agriculture or other Executive Officer approved training program for nitrogen plan INMP certification. The Member must retain written documentation of their attendance in the training program; or
- Self-certified by the Member that the plan adheres to a site-specific recommendation from the Natural Resources Conservation Service (NRCS) or the University of California Cooperative Extension. The Member must retain written documentation of the recommendation provided; or
- Self-certified by the Member if the Member states that the Member applies no fertilizer to the field; or
- Certified by a nitrogen management plan specialist as defined in Attachment E of this Order. Such specialists include Professional Soil Scientists, Professional Agronomists, Crop Advisors certified by the American Society of Agronomy, or Technical Service Providers certified in nutrient management in California by the National Resource Conservation Service (NRCS).
- Certified in an alternative manner approved by the Executive Officer. Such approval will be provided based on the Executive Officer's determination that the alternative method for preparing the Nitrogen Management Plan meets the objectives and requirements of this Order.

5. If the Discharger is identified by the Central Coast Water Board as an outlier for two or more years consecutively, the Discharger must have their INMP certified by an irrigation and nitrogen management plan specialist unless the Discharger receives additional self-certification training provided by a qualified organization.

Quantifiable Milestones and Time Schedules

~~2. As shown in **Table C.1-1** and **Table C.1-2**, the fertilizer nitrogen application limits and nitrogen discharge targets and limits described below do not go into in effect until the second year of this Order (January 1, 2022).~~

6. By (three years from adoption of the Order), the Central Coast Water Board shall identify for Central Coast Water Board consideration more precise crop conversion coefficients for crops that collectively cover 85% of acreage within the Order's boundaries. Such crop conversion coefficients may be developed by Dischargers working cooperatively through an approved third-party group, and/or in cooperation with the University of California Cooperative Extension, California Department of Food and Agriculture, commodity organizations and other qualified organizations.

7. By (five years from adoption of the Order), the Central Coast Water Board shall identify for Central Coast Water Board consideration of crop-specific crop conversion coefficients for crops

[1] Any Certified Crop Adviser who certifies an INMP must also have completed the nitrogen management training program offered by the University of California Agriculture and Natural Resources and the California Department of Food and Agriculture.

that collectively cover at least 95% of the acreage within the Order's boundaries. Such crop conversion coefficients may be developed by Dischargers working cooperatively through an approved third-party group, and/or in cooperation with the University of California Cooperative Extension, California Department of Food and Agriculture, commodity organizations and other qualified organizations.

8. The Central Coast Water Board may approve more precise conversion crop coefficients after consulting with State Water Resources Control Board staff, and after following an opportunity for public review and comment.

9. Within two years of approving precise crop conversion coefficients for 85% of the total acreage, the Central Coast Water Board, in coordination with third party groups, the State Water Board, other regional water boards, CDFA, commodity groups and others, shall develop crop specific and/or crop-type ranges of target values using A-R for those crops with approved more precise crop conversion coefficients.[2]

10. Within one year of approving more precise crop conversion coefficients for 95% of acreage, the Central Coast Water Board , in coordination with third party groups, the State Water Board, other regional water boards, CDFA, commodity groups and others, shall develop crop specific and/or crop-type ranges of target values using A-R for those crops with approved more precise crop conversion coefficients.

11. For crops in which more precise crop conversion coefficients are not developed, the Central Coast Water Board shall use similar crop types for establishing A-R target value ranges.

11. It is expected that the A-R target values will be further refined over time for different conditions (e.g., irrigation method, soil types and saturation acceptance conditions) for each crop.

Fertilizer Nitrogen ~~Application Limits~~ Outliers

123. Starting in 2022, Dischargers ~~must not~~ that apply fertilizer nitrogen (A_{FER}) at rates greater than the ~~limits~~ values in **Table C.1-1** shall be considered outliers**.** Outlier determinations are ~~Compliance with fertilizer nitrogen application limits is~~ assessed for each specific crop type reported in the TNA report or INMP Summary report.

13. Once the Central Coast Water Board has adopted ranges of A-R target values, such target values shall be used to determine outliers. As A-R target values are developed for the crop types listed in Table C.1-1, the values in Table C.1-1 shall expire. Dischargers that have crop specific, or crop type A-R values as reported in their INMP Summary Report that are outside the range of adopted crop specific or crop type target values shall be considered outliers. Beginning the third year of reporting, for those locations with data available for three years, the Discharger may calculate and report a three-year running total for the A-R difference if the Discharger has grown the same crop on the same ranch for three or more years. When applicable, Dischargers shall be considered outliers if the three-year average is outside the range of adopted crop specific or crop

[2] Where multiple crops are grown in the same field within the multi-year period, it may be appropriate to use a weighted average of the target values for those crops.

24

type target values.

Nitrogen ~~Discharge Targets and Limits~~ Groundwater Protection Formula, Values & Targets

14. This Order requires the development of Groundwater Protection Formula, Targets and Values within five (5) years from Order adoption. Dischargers may elect to cooperatively develop Groundwater Protection Formula, Values and Targets through an approved third-party. Where the development of the Groundwater Protection Formula, Targets and Values is done through a cooperative third-party effort, the Groundwater Protection Formula, Values and Targets may be developed and applied on a broad spatial area basis (e.g., groundwater sub-basin) rather than on a ranch basis. Where there is a third party undertaking the development of the Groundwater Protection Formula, Values and Targets, the proposed Groundwater Protection Formula shall be submitted to the Central Coast Water Board by July 1, 2024. The Executive Officer shall approve the proposed GWP Formula after opportunity for public review and comment. Once the GWP Formula is approved, the third party shall compute GWP Values for the designated geographic areas, and then develop GWP Targets after obtaining GWP Values. The third party shall submit proposed GWP Targets to the Central Coast Water Board within 18 months of obtaining approval of the GWP Formula. The proposed GWP Targets may be phased in overtime.

15. Upon approval of the GWP Targets, Dischargers may elect to cooperatively develop a groundwater management program for Central Coast Water Board that provides for a proposed approach to meeting final GWP Targets by 2050. ~~to submit information on nitrogen applied (**A**) and nitrogen removed (**R**). This Order also establishes nitrogen discharge targets and limits based on the calculation of nitrogen applied minus nitrogen removed (**A-R**) using the formulas below. Nitrogen must not be discharged at rates greater than the targets and limits in **Table C.1-2**. Compliance with nitrogen discharge targets and limits is assessed annually for the entire ranch in the INMP Summary report through either of the two compliance pathways shown below. Compliance with both pathways is not required.~~

Monitoring and Reporting

16. As part of the INMP Summary Report, Dischargers must submit information on N applied and N removed. N applied consists of N applied in fertilizers (A_{FER}), and, as applicable, consists of N applied with the irrigation water (A_{IRR}), and N applied in compost adjusted for mineralization rate ($A_{COMP} \times C$). Information on irrigation water application must also be reported. The amount of N applied and N removed may be reported for all crops grown and harvested on the ranch in a single year, or for individual crops grown and harvested on the ranch within that reporting year.

Dischargers must record total nitrogen removed from the ranch. N removed (R) consists of N removed in the harvested portion of the crop (R_{HARV}), N sequestered in woody portions of semi-permanent and permanent crops, or sequestration by other methods (R_{SEQ}), N sequestered by cover cropping (R_{COVER}) and N removed by other means (R_{OTHER}).

The amount of crop material removed through harvest or other methods (R_{HARV}) must be calculated using the equations described below. Dischargers must either use the crop-specific conversion coefficient values (C_N) approved by the Executive Officer per paragraph 8, or develop

their own conversion coefficient values following the approved method in the MRP. If Dischargers develop their own conversion coefficient, they must maintain information on the method used in the Farm Plan, and these records must be submitted to the Central Coast Water Board upon request. Total Nitrogen Removed shall be determined, in part, by multiplying crop yield by a crop-specific nitrogen conversion coefficient, C_N.

To calculate total nitrogen applied and removed, Dischargers may use one of the following equations:

~~Compliance Pathway~~ Equation 1: $A_{FER} + (C \times A_{COMP}) + A_{IRR} - R$ = Remaining Nitrogen ~~Discharge~~

OR

~~Compliance Pathway~~ Equation 2: $A_{FER} + (C \times A_{COMP}) = R$

In both ~~formulas~~Equations, $R = R_{HARV} + R_{SEQ} + R_{COVER} + R_{TREAT} + R_{OTHER}$

a. A_{FER} is the amount of fertilizer nitrogen applied in pounds per acre.
b. **C** is the compost discount factor used to represent the amount of compost nitrogen and/or organic fertilizers mineralized during the year that the compost was applied.
c. A_{COMP} is the total amount of compost nitrogen and/or organic fertilizer applied in pounds per acre.
d. A_{IRR} is the nitrogen applied in the irrigation water estimated from the volume required for crop evapotranspiration (ET) and the background concentration of N in the irrigation water (e.g. well water) in pounds per acre.
e. **R** is the amount of nitrogen removed from the field through harvest, sequestration, or other removal methods, in pounds per acre.
f. R_{HARV} is the amount of nitrogen removed from the field through harvest or other removal of crop material.
g. R_{SEQ} is the amount of nitrogen sequestered ~~removed from the field through sequestration~~ in woody materials of permanent or semi-permanent crops or sequestration through other methods (e.g. on-site biomass from plant prunings, sequestration achieved by incorporation of inputs such as glycerin and high carbon compost, and other products that foster N sequestration, and other soil organic matter building practices and/or other practices supportive of CDFA's Healthy Soils Initiative).
h. R_{TREAT} is the amount of nitrogen removed from the ranch through a ~~quantifiable~~ treatment method (e.g., denitrification bioreactor).
j. R_{COVER} is the amount of nitrogen taken up and sequestered in a cover crop.
i. R_{OTHER} is the amount of nitrogen removed from the ranch through other methods not ~~previously quantified~~otherwise identified. These could include, but are not limited to, soil denitrification, volatilization from crop residue and mitigation activities.

17~~5~~. The Central Coast Water Board encourages the use of irrigation water nitrogen as a method of reducing the amount of fertilizer nitrogen applied to crops and reducing the amount of existing nitrate in the groundwater basins when possible. The use of irrigation water nitrogen is typically referred to as "pump and fertilize" and is incentivized through ~~compliance pathway~~ Equations 1 ~~and 2. in Table C.1-2.~~ Equation 1 provides a pathway to estimate and include a calculation that represents the amount of N in irrigation water actually taken up by the plant. The amount of

irrigation water nitrogen is not used in Equation 2. ~~the compliance calculation in the alternative compliance pathway.~~ The amount of nitrogen applied (lbs/acre) from irrigation water must be reported in the INMP Summary Report regardless of the ~~compliance pathway.~~Equation used.

~~6~~18. The Central Coast Water Board encourages the use of compost to improve soil health, nutrient and carbon sequestration, and water holding capacity consistent with the state's Healthy Soils Initiative. All compost nitrogen and/or organic fertilizer (**ACOMP**) applied to the ranch must be reported in the TNA report or INMP Summary report; however, the use of compost is incentivized through the option for Dischargers to use a compost "discount" factor (**C**). Dischargers may use the compost discount factor provided by the Central Coast Water Board in the MRP or may determine their own discount factor. The discounted compost nitrogen must, at a minimum, represent the amount of compost mineralized during the year the compost was applied to the ranch. If the Discharger uses their own compost discount factor, they must maintain records of the method used to determine the compost discount factor in the Farm Plan, and these records must be submitted to the Central Coast Water Board upon request.

~~7~~19. The amount of crop material removed through harvest or other methods (**RHARV**) must be calculated using the formula described below. Dischargers must ~~either~~ use the crop-specific conversion coefficient values that have been approved by the Central Coast Water Board in paragraphs 6 and 7 ~~found in the MRP~~ or develop their own conversion coefficient values following the approved method in the MRP. If Dischargers develop their own conversion coefficient, they must maintain information on the method used in the Farm Plan, and these records must be submitted to the Central Coast Water Board upon request. Until the more precise crop conversion coefficients are adopted by the Central Coast Water Board, the Discharger may use the conversion coefficient values found in the MRP, or those that they have developed individually for INMP and INMP Summary Report purposes.

RHARV = Conversion Coefficient x Material Removed

a. The **Conversion Coefficient** is a crop-specific coefficient used to convert from units of material removed per acre to units of nitrogen removed per acre.
b. **Material Removed** is the amount of nitrogen-containing material removed from the field, in units of pounds per acre.

~~8~~20. The amount of nitrogen removed through sequestration in woody material of permanent or semi-permanent crops or sequestration through other methods (e.g. on-site biomass from plant prunings, sequestration achieved by incorporation of inputs such as glycerin and high carbon compost, and other products that foster N sequestration, and other soil organic matter building practices and/or other practices supportive of CDFA's Healthy Soils Initiative) (**RSEQ**) must be estimated by the Discharger. Dischargers must maintain records detailing how they estimated the amount of nitrogen sequestered in their ~~permanent~~ crops. These records must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request.

~~9~~21. The Central Coast Water Board encourages Dischargers to develop and implement

innovative methods for removing nitrogen from the environment to improve water quality. Dischargers may use treatment methods (e.g., bioreactors) to remove nitrogen from groundwater or surface water and may count this towards their nitrogen removal (**R**) value if they are able to ~~quantify~~ estimate the amount of nitrogen removed. This ~~quantified~~ removal through treatment or other innovative methods must be reported as **RTREAT**. Dischargers electing to account for this nitrogen removal must monitor the volume and concentration of water entering and exiting their treatment system and calculate the amount of nitrogen removed. These records must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request.

~~10~~22. If Dischargers remove additional nitrogen through means other than removing crop material (**RHARV**), sequestration (**RSEQ**), or treatment methods (**RTREAT**), they must provide information that supports the additional removal ~~quantify~~ and report this additional removal as **ROTHER**. Dischargers must maintain records detailing how they calculated **ROTHER**. These records must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request.

~~11~~23. The discharge of nitrogen in excess of the ~~nitrogen discharge targets in **Table C.1-2**~~approve GWP Targets as phased in may result in additional requirements, including obtaining additional education, implementing additional or improved management practices~~, lower fertilizer nitrogen application limits~~, and increased monitoring and reporting.

~~12. The discharge of nitrogen in excess of the nitrogen discharge limits in **Table C.1-2** is prohibited and may result in additional requirements, including obtaining additional education, implementing additional or improved management practices, lower fertilizer nitrogen application limits, increased monitoring and reporting, or progressive enforcement actions.~~

~~13. Dischargers who apply more fertilizer nitrogen (**AFER**) than the fertilizer nitrogen application limits in **Table C.1-1** to any specific crop and who are able to demonstrate compliance with the final nitrogen discharge limit of 50 pounds of nitrogen per acre per year, as shown in **Table C.1-2**, through either compliance pathway, are exempt from the fertilizer nitrogen application limit.~~

~~14~~24. Dischargers who can ~~quantifiably~~ demonstrate that their ranches pose no threat to surface water quality or groundwater quality may submit a technical report to the Executive Officer for review. If approved, the Discharger is not required to conduct the nitrogen application (**A**) or removal (**R**) monitoring and reporting or to submit the INMP Summary report, regardless of what Groundwater Phase area the ranch is in. The technical report must demonstrate that nitrogen applied at the ranch does not percolate below the root zone in an amount that could degrade groundwater and does not migrate to surface water through discharges, including drainage, runoff, or sediment erosion. Dischargers must provide the Executive Officer with annual updates to confirm that the exemption is still applicable.

~~15~~25. Dischargers who can ~~quantifiably~~ demonstrate that their ranch (on an annual basis) does not cause or contribute to an exceedance of the primary maximum contaminant level for nitrate in groundwater ~~is achieving the final nitrogen discharge limit of 50 pounds of nitrogen per acre per~~

year, as shown in Table C.1-2, are not required to submit the nitrogen removal (**R**) reporting in the INMP Summary report, regardless of what Groundwater Phase area the ranch is in. Example situations where this may apply include participation in an approved third-party program that certifies that the Discharger is meeting the final discharge limit, or by submitting a technical report, subject to Executive Officer review, that quantifies the amount of nitrogen discharge based on the volume and nitrogen concentration of all discharges from the ranch. In these situations, confirmation of membership in the approved third-party program or Executive Officer approval of a submitted technical report constitute compliance with the nitrogen removed (**R**) reporting requirement in the INMP Summary report. This exemption only applies to removal (**R**) in the INMP Summary report; all other requirements, including the TNA report, still apply as described in this Order. Dischargers must provide the Executive Officer with annual updates to confirm that the exemption is still applicable. Dischargers that grow perennial crops must provide the Executive Officer with updates to confirm that the exemption is still applicable at least once every 2 years.

Monitoring and Reporting

ACF, TNA, and INMP Summary

2616. Dischargers must report on management practice implementation electronically in the ACF, as described in the MRP.

27.
17. Dischargers must record and report total nitrogen applied to all crops grown on the ranch, electronically in the TNA report form, as described in the MRP.

128. Dischargers must track and record the following elements of the INMP Summary report that are not included in the TNA report: total nitrogen removed from the ranch and information on irrigation water application and discharge volumes. Dischargers must submit this information electronically in the INMP Summary report form as described in the MRP.

129. The INMP Summary report contains the same nitrogen application information as the TNA report, plus additional information related to nitrogen removed and irrigation management. Therefore, the INMP Summary report satisfies the TNA report requirement and an additional TNA report is not required to be submitted when the INMP Summary report is submitted to the Central Coast Water Board.

Groundwater Monitoring

20. Dischargers must conduct irrigation well monitoring and reporting, either individually or as part of a cooperative effort, as described in the MRP.

231. Dischargers must conduct on-farm domestic well monitoring and reporting, either individually or as part of a cooperative effort, as described in the MRP.

29

232. Dischargers must conduct groundwater trend monitoring and reporting, either individually or as part of a cooperative effort, as described in the MRP. This requirement applies to all Dischargers enrolled in this Order, regardless of how many wells are currently present on their ranch.

a. Dischargers who elect to perform groundwater trend monitoring and reporting as part of a cooperative effort must form or join a third-party. The third-party must submit a work plan for Executive Officer review by the dates and covering the areas specified in the MRP. The work plan must be approved by the Executive Officer prior to implementation. Once approved by the Executive Officer, the work plan must be implemented.

b. Dischargers who elect to perform groundwater trend monitoring and reporting individually must submit a work plan for Executive Officer review, by the date specified in the MRP, based on their ranch location. The work plan must be approved by the Executive Office prior to implementation. The work plan must be developed by a qualified professional, must include a SAP and QAPP, and must describe how the ranch-level monitoring program will quantitatively evaluate groundwater quality trends over time and quantitatively assess the impacts of agricultural discharges on groundwater quality. Once approved by the Executive Officer, the work plan must be implemented.

~~23. When required by the Executive Officer based on groundwater quality data or exceedance of the nitrogen discharge targets or limits, Dischargers must complete ranch-level groundwater discharge monitoring and reporting, as described in the MRP. When ranch-level groundwater discharge monitoring and reporting is required, a work plan, including a SAP and QAPP, must be submitted for Executive Officer review prior to implementation. Once approved by the Executive Officer, the work plan must be implemented.~~

~~24. When required by the Executive Officer based on water quality data and pesticide use, Dischargers must conduct monitoring and reporting for pesticides in groundwater, either individually or as part of a cooperative effort. The Department of Pesticide Regulation (DPR) monitors groundwater for pesticides that have been detected in groundwater or have the potential to migrate to groundwater. Based on DPR's groundwater monitoring, prioritization, and annual compilation of pesticide use data, a subset of Dischargers may be required to conduct groundwater monitoring and reporting for specific pesticides.~~

Part 2, Section C.2. Irrigation and Nutrient Management for Surface Water Protection

1. Dischargers must develop and implement an Irrigation and Nutrient Management Plan (INMP) ~~as required in Part 2, C.1, that addresses both groundwater and surface water. The INMP is a section of the Farm Plan and must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request. Summary information from the INMP must be submitted in the INMP Summary report.~~ In addition to the requirements in Part 2, Section C.1, Aat a minimum, the elements of the INMP related to surface water protection must include:

Commented [TD28]: There is duplication and confusion with respect to Part C.2 and how it interacts with Part C.1. Revisions here are to help clarify that these requirements are those specific for surface water protection.

a. Monitoring and recordkeeping necessary to submit complete and accurate reports, including the ACF, TNA report, and INMP Summary report.

b. Planning and management practice implementation that results in compliance with the surface water limits in Table C.2-1 and Table C.2-2 that apply to their ranch based on the ranch location.

c. ~~Descriptions~~ Identification of all irrigation, nutrient, and salinity management practices implemented on the ranch.

Commented [TD29]: For clarification as to what needs to be included in the Farm Plan.

d. Where required by the Executive Officer based on surface water quality conditions or exceedance of the limits established in this Order, the INMP must incorporate ranch-level surface discharge monitoring described in the MRP. The ranch-level surface discharge monitoring must be designed and implemented to inform improved management practices to protect surface water quality.

2. Dischargers that elect to participate in the cooperative monitoring program's Enhanced Surface Water Follow-up Program set forth in Part 2, C.5 are not subject to the provisions of Part 2, C.2 of this Order.

Commented [TD30]: See proposed revisions to Part 2, C.5; see also Exhibit 4 for thorough discussion re: proposed redline revisions to Part 2, C.5

Quantifiable Milestones and Time Schedules

Commented [TD31]: Exhibit 1 provides Legal and Policy comments with respect to certain TMDLs and limits as incorporated into the Tables referenced in this section

~~2~~3. Dischargers in an area with an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Table C.2-1 in accordance with the compliance schedule specified in the Table.

~~3~~4. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Table C.2-2 in accordance with the compliance schedule specified in the Table.

~~4~~5. Dischargers in areas where the water quality for a pollutant is better (i.e., of higher quality) than the applicable limit in Table C.2-2 must not cause or contribute to an increase in the concentration of that pollutant in receiving waters, except as consistent with the antidegradation findings of this Order.

~~5~~6. Dischargers in areas that do not achieve an applicable limit in Table C.2-1 or Table C.2-2 in the surface receiving water may be required to perform ranch-level surface discharge monitoring and reporting and must achieve the applicable limit in Table C.2-1 or Table C.2-2 for the discharge from their ranch by the compliance date.

Commented [TD32]: See Exhibit 1, Legal and Policy comments with respect to prohibiting discharges in excess of limits. Notably, failure to comply with limits may result in an enforcement action. Prohibition as used here and in Parts C.3 and C.4 are inappropriate.

~~6~~7. The discharge of pollutants from a ranch in excess of the applicable limits after the compliance date in Table C.2-1 or Table C.2-2 ~~is prohibited and~~ may result in additional requirements,

31

including obtaining additional education, implementing additional or improved management practices, ~~lower fertilizer nitrogen application limits~~, follow-up monitoring and reporting, ranch-level surface discharge monitoring and reporting, ~~the prohibition of discharge from the ranch~~, and progressive enforcement actions.

Commented [TD33]: See revisions to Part 2, C.1 above

Monitoring and Reporting

Commented [TD34]: For the changes provided below, see Exhibit 4 for discussion of proposed redline revisions; see also redline revisions for Part 2, C.5

~~78~~. Dischargers must complete surface receiving water monitoring and reporting as described in the MRP. ~~, either individually or through a cooperative monitoring program approved by the Executive Officer.~~ Dischargers, ~~either individually or through a cooperative monitoring program,~~ must submit a work plan, including a SAP and QAPP as described the MRP, for Executive Officer review prior to implementation. Once approved by the Executive Officer, the work plan must be implemented. The work plan must include applicable monitoring for the pollutants in **Table C.2-1** or **Table C.2-2** and must describe the actions that will be taken to achieve the limits in the Tables.

~~89~~. Dischargers must develop a follow-up surface receiving water implementation work plan, ~~either individually or through a cooperative program approved by the Executive Officer~~, as described in the MRP. The work plan due date is based on the Surface Water Priority of the ranch. The work plan must include follow-up actions, such as outreach, education, and management practice implementation, and, where applicable for pollutant source identification and abatement, additional surface receiving water monitoring locations. The work plan must include a SAP and QAPP. The work plan must describe the implementation measures that will be taken to reduce the discharge of relevant pollutants and achieve the applicable surface water limits by the compliance dates in **Table C.2-1** or **Table C.2-2**. The work plan must be submitted for Executive Officer review prior to implementation. Once approved, the work plan must be implemented.

a. ~~Prior to the applicable compliance dates in **Table C.2-1** or **Table C.2-2**, Dischargers who elect to participate in a cooperative program to develop and implement their work plan will not be subject to ranch-level surface discharge monitoring and reporting, described below.~~

b. Dischargers ~~who elect to develop their work plan individually and~~ whose ranches are located in areas where surface receiving water monitoring shows an exceedance of an applicable surface water limit in **Table C.2-1** or **Table C.2-2** may be subject to ranch-level surface discharge monitoring and reporting, described below.

c. The work plan must take into consideration the level of water quality impairment identified through surface receiving water monitoring. Work plans for areas with persistent exceedances of the surface water limits in **Table C.2-1** or **Table C.2-2** must identify follow-up actions to restore the degraded areas (e.g., outreach, education, management practice implementation) and additional surface receiving water monitoring locations for pollutant source identification and abatement. Work plans for areas that are already achieving the surface water limits in **Table C.2-1** or **Table C.2-2** must identify actions to be taken to protect the high-quality areas (e.g., outreach and education).

32

910. When required by the Executive Officer, Dischargers must complete ranch-level surface discharge monitoring and reporting, as described in the MRP. Surface discharge monitoring and reporting may be required of a Discharger ~~or set of Dischargers~~ if surface receiving water monitoring shows an exceedance of an applicable surface water limit in Table C.2-1 or Table C.2-2. When ranch-level surface discharge monitoring and reporting is required, a work plan, including a SAP and QAPP, must be submitted for Executive Officer review prior to implementation. Once approved by the Executive Officer, the work plan must be implemented.

~~10~~11. Dischargers must report on nutrient management practice implementation electronically in the ACF, as described in the MRP.

Part 2, Section C.3. Pesticide Management for Surface Water Protection

1. Dischargers must develop and implement a Pesticide Management Plan (PMP). The PMP must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request. At a minimum, the PMP must include:

a. Monitoring and recordkeeping necessary to submit complete and accurate reports, including the ACF.

b. Planning and management practice implementation that results in compliance with the surface water limits in Table C.3-1 and Table C.3-2 that apply to their ranch based on the ranch location.

c. ~~Descriptions~~Identification of all pesticide management practices implemented on the ranch, including pesticide application characteristics (e.g., timing, formulations, wind and rainfall monitoring, etc.) and any integrated pest management (IPM) practices implemented (e.g., scouting, beneficial insects, etc.).

a. Where required by the Executive Officer based on surface water quality conditions or exceedance of the limits established in this Order, the PMP must incorporate ranch-level surface discharge monitoring described in the MRP. The ranch-level surface discharge monitoring must be designed and implemented to inform improved management practices to protect surface water quality.

2. Dischargers that elect to participate in the cooperative monitoring program's Enhanced Surface Water Follow-up Program set forth in Part 2. C.5 are not subject to the provisions of Part 2, C.3 of this Order.

Quantifiable Milestones and Time Schedules

~~2~~3. Dischargers in an area with an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Table C.3-1 in accordance with

33

Commented [TD35]: For clarification

Commented [TD36]: See proposed revisions to Part 2, C.5; see also Exhibit 4 for thorough discussion re: proposed redline revisions to Part 2, C.5

Commented [TD37]: Exhibit 1 provides Legal and Policy comments with respect to certain TMDLs and limits as incorporated into the Tables referenced in this section

the compliance schedule specified in the Table.

34. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to the exceedance of the pollutant's surface receiving water limit in Table C.3-2 in accordance with the compliance schedule specified in the Table.

45. Dischargers in areas where the water quality for a pollutant is better (i.e., of higher quality) than the applicable limit in Table C.3-2 must not cause or contribute to an increase in the concentration of that pollutant in receiving waters except as consistent with the antidegradation findings of this Order.

56. Dischargers in areas that do not achieve an applicable limit in Table C.3-1 or Table C.3-2 in the surface receiving water by the compliance date may be required to perform ranch-level surface discharge monitoring and reporting and must achieve the applicable limit in Table C.3-1 or Table C.3-2 for the discharge from their ranch.

67. The discharge of pollutants from a ranch in excess of the applicable limits after the compliance date in Table C.3-1 or Table C.3-2 ~~is prohibited and~~ may result in additional requirements, including obtaining additional education, implementing additional or improved management practices, follow-up monitoring and reporting, ranch-level surface discharge monitoring and reporting, ~~the prohibition of discharge from the ranch~~, and progressive enforcement actions.

~~7. The discharge of waste associated with the use of agricultural chemicals inconsistent with product labeling, storage instructions, or DPR requirements for pesticide applications is prohibited.~~

Monitoring and Reporting

89. Dischargers must complete surface receiving water monitoring and reporting as described in the MRP, ~~either individually or through a cooperative monitoring program approved by the Executive Officer~~. Dischargers, ~~either individually or through a cooperative monitoring program~~, must submit a work plan, including a SAP and QAPP as described the MRP, for Executive Officer review prior to implementation. Once approved by the Executive Officer, the work plan must be implemented. The work plan must include applicable monitoring for the pollutants in Table C.3-1 or Table C.3-2 and must describe the actions that will be taken to achieve the limits in the Tables.

910. Dischargers must develop a follow-up surface receiving water implementation work plan, ~~either individually or through a cooperative program approved by the Executive Officer,~~ as described in the MRP. The work plan due date is based on the Surface Water Priority of the ranch. The work plan must include follow-up actions, such as outreach, education, and management practice implementation, and, where applicable for pollutant source identification and abatement, additional surface receiving water monitoring locations. The work plan must include a SAP and QAPP. The work plan must describe the implementation measures that will be taken to reduce the

34

Commented [TD38]: See Exhibit 1, Legal and Policy comments with respect to prohibiting discharges in excess of limits. Notably, failure to comply with limits may result in an enforcement action. Prohibition as used here and in Parts C.3 and C.4 are inappropriate.

Commented [TD39]: Discharges of waste are subject to the limits in the Tables above. Failure to comply with pesticide labeling is subject to enforcement from County Ag Commissioners and should not create additional liability under the Draft Order

Commented [TD40]: For the changes provided below, see Exhibit 4 for discussion of proposed redline revisions; see also redline revisions for Part 2, C.5

discharge of relevant pollutants and achieve the applicable surface water limits by the compliance dates in Table C.3-1 or Table C.3-2. The work plan must be submitted for Executive Officer review prior to implementation. Once approved, the work plan must be implemented.

~~b. Prior to the applicable compliance dates in Table C.3-1 or Table C.3-2, Dischargers who elect to participate in a cooperative program to develop and implement their work plan will not be subject to ranch-level surface discharge monitoring and reporting, described below.~~

c. Dischargers ~~who elect to develop their work plan individually and~~ whose ranches are located in areas where surface receiving water monitoring shows an exceedance of an applicable surface water limit in Table C.3-1 or Table C.3-2 may be subject to ranch-level surface discharge monitoring and reporting, described below.

d. The work plan must take into consideration the level of water quality impairment identified through surface receiving water monitoring. Work plans for areas with persistent exceedances of the surface water limits in Table C.3-1 or Table C.3-2 must identify follow-up actions to restore the degraded areas (e.g., outreach, education, management practice implementation) and additional surface receiving water monitoring locations for pollutant source identification and abatement. Work plans for areas that are already achieving the surface water limits in Table C.3-1 or Table C.3-2 must identify actions to be taken to protect the high-quality areas (e.g., outreach and education).

~~10~~11. When required by the Executive Officer, Dischargers must complete ranch-level surface discharge monitoring and reporting, as described in the MRP. Surface discharge monitoring and reporting may be required of a Discharger ~~or set of Dischargers~~ if surface receiving water monitoring shows an exceedance of an applicable surface water limit in Table C.3-1 or Table C.3-2. When ranch-level surface discharge monitoring and reporting is required, a work plan, including a SAP and QAPP, must be submitted for Executive Officer review prior to implementation. Once approved by the Executive Officer, the work plan must be implemented.

~~11~~12. Dischargers must report on pesticide management practice implementation electronically in the ACF, as described in the MRP.

Part 2, Section C.4. Sediment and Erosion Management for Surface Water Protection

1. Dischargers must develop and implement a Sediment and Erosion Management Plan (SEMP). The SEMP must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request. At a minimum, the SEMP must include:

a. Monitoring and recordkeeping necessary to submit complete and accurate reports, including the ACF.

35

b. Planning and management practice implementation that results in compliance with the surface water limits in Table C.4-1 and Table C.4-2 that apply to their ranch based on the ranch location.

c. ~~Descriptions~~Identification of all sediment, erosion, irrigation, stormwater, road, and impermeable surface management practices implemented on the ranch.

Commented [TD41]: For clarification

e. Where required by the Executive Officer based on surface water quality conditions or exceedance of the limits established in this Order, the SEMP must incorporate ranch-level surface discharge monitoring described in the MRP. The ranch-level surface discharge monitoring must be designed and implemented to inform improved management practices to protect surface water quality.

2. Dischargers that elect to participate in the cooperative monitoring program's Enhanced Surface Water Follow-up Program set forth in Part 2. C.5 are not subject to the provisions of Part 2, C.4 of this Order.

Commented [TD42]: See proposed revisions to Part 2, C.5; see also Exhibit 4 for thorough discussion re: proposed redline revisions to Part 2, C.5

Quantifiable Milestones and Time Schedules

Commented [TD43]: Exhibit 1 provides Legal and Policy comments with respect to certain TMDLs and limits as incorporated into the Tables referenced in this section

~~2~~3. Dischargers in an area with an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Table C.4-1 in accordance with the compliance schedules in the Table.

~~3~~4. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to the exceedance of the pollutant's surface receiving water limit in Table C.4-2 in accordance with the compliance schedules in the Table.

~~4~~5. Dischargers in areas where the water quality for a pollutant is better (i.e., of higher quality) than the applicable limit in Table C.4-2 must not cause or contribute to an increase in the concentration of that pollutant in receiving waters except as consistent with the antidegradation findings of this Order.

~~5~~6. Dischargers in areas that do not achieve an applicable limit in Table C.4-1 or Table C.4-2 in the surface receiving water by the compliance date may be required to perform ranch-level surface discharge monitoring and reporting and must achieve must achieve the applicable limit in Table C.4-1 or Table C.4-2 for the discharge from their ranch.

~~6~~7. The discharge of pollutants from a ranch in excess of the applicable limits after the compliance date in Table C.4-1 or Table C.4-2 ~~is prohibited and~~ may result in additional requirements, including obtaining additional education, implementing additional or improved management practices, follow-up monitoring and reporting, ranch-level surface discharge monitoring and reporting, ~~the prohibition of discharge from the ranch~~, and progressive enforcement actions.

Commented [TD44]: See Exhibit 1, Legal and Policy comments with respect to prohibiting discharges in excess of limits. Notably, failure to comply with limits may result in an enforcement action. Prohibition as used here and in Parts C.3 and C.4 are inappropriate.

36

Impermeable Surfaces

~~7~~8. Stormwater discharge intensity from ranches with impermeable surfaces (defined in Attachment C of this Order) must not exceed stormwater discharge intensity from equivalent permeable area for any storm event up to and including the 10-year storm event. The *Santa Barbara Urban Hydrograph Method*[4] and the *Rational Method*[5] are methods for determining the stormwater discharge intensity match.

[4] The Santa Barbara Urban Hydrograph Method is based on the curve number approach and is useful for sheet flow over a plane surface, called overland flow.
[5] The Rational Method is used to determine peak discharge from runoff in a given area.
[6] The Curve Number Method was developed by the Soil Conservation Service to estimate runoff from rainfall on agricultural fields and provides runoff depth that can be used to calculate runoff volume.

~~8~~9. Stormwater discharge volume from ranches with impermeable surfaces must not exceed stormwater discharge volume from equivalent permeable area for any storm event up to and including the 95th percentile, 24-hour storm event. The *Curve Number Method*[6] is a method for determining the stormwater discharge volume match.

~~9~~10. Dischargers with impermeable surfaces on slopes equal to or greater than **5%** during the wet season (October 1 to April 30) must have a sediment and erosion control plan developed and certified by a qualified professional (defined in Attachment C of this Order).

Monitoring and Reporting

~~10~~11. Dischargers must complete surface receiving water monitoring and reporting as described in the MRP, ~~either individually or through a cooperative monitoring program approved by the Executive Officer~~. Dischargers, ~~either individually or through a cooperative monitoring program~~, must submit a work plan, including a SAP and QAPP as described the MRP, for Executive Officer review prior to implementation. Once approved by the Executive Officer, the work plan must be implemented. The work plan must include applicable monitoring for the pollutants in Table C.4-1 or Table C.4-2 and must descrtibe the actions that will be taken to achieve the limits in the Tables.

~~11~~12. Dischargers must develop a follow-up surface receiving water implementation work plan, ~~either individually or through a cooperative program approved by the Executive Officer~~, as described in the MRP. The work plan due date is based on the Surface Water Priority of the ranch. The work plan must include follow-up actions, such as outreach, education, and management practice implementation, and, where applicable for pollutant source identification and abatement, additional surface receiving water monitoring locations. The work plan must include a SAP and QAPP. The work plan must describe the implementation measures that will be taken to reduce the discharge of relevant pollutants and achieve the applicable surface water limits by the compliance dates in Table C.4-1 or Table C.4-2. The work plan must be submitted for Executive Officer review prior to implementation. Once approved, the work plan must be implemented.

37

Commented [TD45]: Lack of suggested revisions here does not mean that the Ag Partners are supportive of these provisions. Part 2, C.5 would be an alternative to complying with all of the Sediment and Erosion provisions.

Commented [TD46]: For the changes provided below, see Exhibit 4 for discussion of proposed redline revisions; see also redline revisions for Part 2, C.5

~~a. Prior to the applicable compliance dates in **Table C.4-1** or **Table C.4-2**, Dischargers who elect to participate in a cooperative program to develop and implement their work plan will not be subject to ranch-level surface discharge monitoring and reporting, described below.~~

b. Dischargers ~~who elect to develop their work plan individually and~~ whose ranches are located in areas where surface receiving water monitoring shows an exceedance of an applicable surface water limit in **Table C.4-1** or **Table C.4-2** may be subject to ranch-level surface discharge monitoring and reporting, described below.

c. The work plan must take into consideration the level of water quality impairment identified through surface receiving water monitoring. Work plans for areas with persistent exceedances of the surface water limits in **Table C.4-1** or **Table C.4-2** must identify follow-up actions to restore the degraded areas (e.g., outreach, education, management practice implementation) and additional surface receiving water monitoring locations for pollutant source identification and abatement. Work plans for areas that are already achieving the surface water limits in **Table C.4-1** or **Table C.4-2** must identify actions to be taken to protect the high-quality areas (e.g., outreach and education).

~~12~~13. When required by the Executive Officer, Dischargers must complete ranch-level surface discharge monitoring and reporting, as described in the MRP. Surface discharge monitoring and reporting may be required of a Discharger or set of Dischargers if surface receiving water monitoring shows an exceedance of an applicable surface water limit in **Table C.4-1** or **Table C.4-2**. When ranch-level surface discharge monitoring and reporting is required, a work plan, including a SAP and QAPP, must be submitted for Executive Officer review prior to implementation. Once approved by the Executive Officer, the work plan must be implemented.

~~13~~14. Dischargers must report on sediment and erosion control management practice implementation electronically in the ACF, as described in the MRP.

~~14~~15. Dischargers whose ranches have impermeable surfaces must report on the status of having their SEMP developed by a qualified professional and their sediment and erosion control and stormwater management practices electronically in the ACF, as described in the MRP.

Part 2, Section C.5. Alternative Compliance Through Participation in Cooperative Monitoring Program and Enhanced Surface Water Follow-up Program ~~Riparian Area Management for Water Quality Protection~~

Commented [TD47]: See Exhibit 4 for thorough discussion of the Alternative Compliance Program provided here

1. ~~1.~~ Dischargers ~~with riparian areas within or bordering their ranch must develop and implement a Ripari~~ that elect to participate in the cooperative monitoring program (CMP) and the Enhanced Surface Water Follow-up Program (ESWFP) are subject to the provisions of this Part 2, Section C.5, and are not subject to Part 2, Sections C.2, C.3, and C.4.

2. The purpose of the ESWFP is to allow Dischargers the option of working with the CMP to implement Part 2, Sections C.2, C.3 and C.4 through watershed-based customized strategies, one-on-one grower education and evaluations of grower operations, watershed-based monitoring and assessment, evaluation of changed best management practices and implementation of cooperative follow-up surface receiving water work plans.

3. Dischargers participating in the ESWFP will not be subject to a discharge prohibition for failing to meet applicable limits after the compliance dates in Tables C.2-1, C.2-2, C.3-1, C.3-2, C.4-1 and C.4-2.

4. Dischargers may receive additional time to comply with surface receiving water limits as contained in Tables C.2-1, C.2-2, C.3-1, C.3-2, C.4-1 and C.4-2, when approved by the Executive Officer.

5. Dischargers participating in the ESWFP will not be subject to ranch-level surface discharge monitoring and reporting.

6. Dischargers participating in the ESWFP will not be subject to the requirement to prepare and implement separate Pesticide Management and Sediment and Erosion Control Plans.

7. Participation in the ESWFP allows Dischargers and the CMP to address the highest watershed priorities throughout the Central Coast Region.

8. To retain compliance coverage through the ESWFP, Dischargers must do all of the following:

    a. Participate in the CMP.
    b. Participate in watershed specific education and outreach events[3].
    c. Agree to work directly with the CMP and participate in individual site visits to allow for one-on-one site evaluations by CMP staff and professionals.
    d. Adapt management practices as necessary, and to the extent practicable, to

[3] Participation in education and outreach may be fulfilled through participation by the Discharger, or the Discharger's designated responsible party.

39

address problematic pollutants identified in a one-on-one site evaluation and/or that may be contributing or causing to exceedances of surface water receiving water limitations.

e. Submit ACFs as required by the Order.
f. Implement the CMP's surface receiving water follow-up work plan that applies to the Discharger's watershed.
g. Minimize bare soil vulnerable to erosion near waterbodies, to the extent feasible and practicable.
h. Implement effective sediment discharge and erosion preventive practices to minimize or eliminate the discharge of sediment above background levels.
i. Maintain existing, naturally occurring, and established native riparian vegetative cover (e.g., trees, shrubs, and grasses), unless otherwise authorized under required permitting (e.g., Clean Water Act (CWA) section 404 permit, CWA section 401 certification, WDRs, waivers of WDRs, a California Department of Fish and Wildlife (CDFW) Lake and Streambed Alteration Agreement, and/or municipal ordinance).
j. Avoid disturbances in riparian areas, to the extent feasible and practicable, to minimize waste discharge and protect water quality and beneficial uses.
k. Document implementation of management practices in the Farm Plan.
l. Remain a member in good standing in the CMP.

Quantifiable Milestones and Time Schedules

9. ~~an Area Management Plan (RAMP).~~ The CMP shall implement the ESWFP on a watershed basis pursuant to the scheduled contained in Table C.5-1.

10. Dischargers participating in the ESWFP that are in an area with an established TMDL for a pollutant and where the compliance date has already passed must not cause or contribute to an exceedance of the pollutant's surface water receiving limit in Tables C.2-1, C.3-1, or C.4-1 on or after December 31, 2031.

11. Dischargers participating in the ESWFP that are in an area with an established TMDL for a pollutant and where the compliance date has not yet passed must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Tables C.2-1, C.3-1 or C.4-1 in accordance with the compliance schedules in the Tables or on or after December 31, 2031, whichever is later.

12. Dischargers participating in the ESWFP that are in an area without an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Tables C.2-2, C.3-2 or C.4-2 in accordance with the compliance schedules in the Table.

13. The Executive Officer may re-categorize watersheds as identified Table C.5-1 upon the request of the CMP, and upon a showing of good cause for the modification.

40

14. The Executive Officer may extend the schedules in paragraphs 10, 11 and 12 based on evidence that meeting the compliance date is technically or economically infeasible. Any such request must be submitted to the Executive Officer at least 6 months prior to expiration of the applicable compliance schedule.

Monitoring and Reporting

15. Dischargers electing to participate in the ESWFP and who were enrolled in Order R3-2017-0002 must notify the CMP and the Central Coast Water Board of their election to participate in the CMP and its ESWFP within 60 days of the effective date of this Order.

16. Dischargers electing to participate in the ESWFP and who are not currently enrolled in Order R3-2017-0002 must notify the CMP and the Central Coast Water Board of their election to participate in the CMP when submitting an eNOI.

17. Within 6 months of the effective date of this Order, the CMP shall provide to the Central Coast Water Board an initial watershed report for the watersheds identified in category 1 that includes the following:

    a. Evaluation of applicable CMP data, USGS stream gage data as applicable, and other readily available water quality data.
    b. Summary of existing management practices, aggregated from the Annual Compliance Forms.
    c. Other publicly available data and information as determined appropriate by the CMP (e.g., agricultural commissioner data and reports).
    d. A summary of outreach efforts and grower participation in such outreach efforts to date.

18. Initial watershed reports that include the information identified in paragraph 16, subparagraphs a – d for category 2 watersheds shall be due 1 one year from submittal of the initial watershed report for category 1 watersheds. For each subsequent category, initial watershed reports shall be due within one year from submittal of the previous category's report.

19. Within three months of submitting an initial watershed report for a specific watershed, the CMP shall start conducting outreach in the targeted watershed. CMP outreach shall consist of watershed based meetings, and individual site visits with individual growers/landowners should accomplish and/or include the following:

    a. Include an evaluation of the site to identify potential areas that may be contributing pollutants of concern to surface waters through irrigation return flows, tile drains or stormwater runoff.
    b. Identify, as necessary, potential management practices or improvements to existing management practices that the individual grower/landowner may wish to consider

41

employing to address pollutants of concern.

c. Identification of potential management practices shall take into consideration if the ranch in question has impermeable surfaces, and if so, identify types of management practices that are designed to address stormwater discharges from impermeable surfaces.
d. Train growers on identifying discharges that may be contributing to impairments detected at CMP monitoring sites.
e. Train growers to assess management practice choices for their potential to improve discharge water quality and/or substantially reduce discharge volume.
f. Train individual growers/landowners in documenting management practices in the Farm Water Quality Management Plan and ACF, and for proper implementation of grower selected management practices.
g. Refer growers to qualified technical assistance providers, as appropriate.

20. Within one year of submittal of an initial watershed report by the CMP for a specific watershed, and annually thereafter, the CMP shall prepare an Annual Watershed Report that evaluates the following:
    a. CMP water quality monitoring data.
    b. Available farm-level data related to nitrate in surface water runoff, sediment/turbidity, flow/discharge, toxicity and pesticides.
    c. Changes in water quality at CMP sites.
    d. Changes in management practices based on information contained in updated ACFs.
    e. Additional narrative information based on CMP's best professional judgment.
    f. Participation and outreach data and statistics
    g. Upstream monitoring data, when identified as applicable or appropriate by CMP.
    h. Discussion of any linkages that can be identified between substantial changes in water quality at the CMP monitoring site and management changes reported in ACFs.

21. As part of the Annual Watershed Report, the CMP shall include a Cooperative Follow-up Surface Receiving Water Implementation Work Plan for pollutants in the watershed that remain of concern. The Cooperative Follow-up Work Plan must identify CMP follow-up actions such as additional outreach, education, and additional management practices that may need to be implemented (individually or cooperatively), and, where applicable for pollutant source identification and abatement, additional surface receiving water monitoring locations.

a.
22. Dischargers must complete surface receiving water monitoring and reporting as described in the MRP through an approved cooperative monitoring program. Surface water receiving water monitoring must be conducted pursuant to a work plan, including a SAP and QAPP as described the MRP, for Executive Officer review prior to implementation. Once approved by the Executive Officer, the work plan must be implemented. The work plan must include applicable monitoring for the pollutants in Table C.4-1 or Table C.4-2.

42

23. Any Discharger that has elected to participate in the CMP's ESWFP and fails to meet the requirements of Part 2, Section C.5 shall immediately be subject to the terms and conditions of Part 2, Sections C.2, C.3 and C.4.

Additional Alternative 1: Surface Water Limit Compliance Through Riparian Area Management And A Cooperative Watershed Restoration Plan

24. Dischargers participating in the ESWFP may also elect to participate in riparian area management efforts through implementation of an approved Cooperative Watershed Restoration Plan. Dischargers electing to participate in the development and implementation of a Cooperative Watershed Restoration Plan (CWRP) will be considered to comply with the surface receiving water limits in Tables C.2-1, C.2-2, C.3-1, C.3-2, C.4-1 and C.4-2 upon Executive Officer approval of the Cooperative Watershed Restoration Plan.

25. To be approved, the CWRP must, at a minimum, include the following:

a. Projects that result in riparian establishment, re-establishment, and/or enhancement projects that benefit water quality objectives for sediment, toxicity, nutrients, and/or temperature, and are protective of applicable beneficial uses for inland surface waters, enclosed bays, and estuaries as outlined in section 3.3.2 of the Basin Plan. Projects that only serve to preserve and protect existing riparian areas do not meet the criteria for this requirement; projects initiated prior to adoption of this Order may qualify but are subject to Executive Officer approval.
b. Appropriate and reasonable success criteria for each project individually, or through implementation of the CWRP in its entirety.
c. Proposed schedule of implementation, including interim dates of actions to be taken.
d. Monitoring and recordkeeping necessary to submit reports showing implementation of the projects that are identified in the CWRP.
e. Plan for long-term maintenance of the Projects, including financial assurances for long-term maintenance.
f. Identification which types of activities are permitted or prohibited within the identified project area.
g. Consideration of other potential adverse impacts that need to be weighed when identifying projects.

26. Projects identified in the CWRP should include one or more of the following functions, depending on the waterbody's beneficial use designations in the Basin Plan.

a. Maintain the physical, chemical, and biological integrity of water resources;
b.. Treat polluted surface and subsurface waters through filtration, sequestration, biological degradation and chemical oxidation;
c. Prevent additional nonpoint source pollution of waters by providing buffers;
d.. Stabilize streambanks;
e. Maintain base flow of streams;
f.. Contribute organic matter that is a source of food and energy for biota and the aquatic ecosystem;
g.. Provide tree canopy to shade streams and moderate water temperature;
h.. Provide flood conveyance and storage;
i. Provide stormwater detention and purification;

43

j. Provide aquatic habitat or wildlife habitat that has a water quality benefit;
k. Maintain potable water supplies;
l. Maintain benthic organisms, fish and other aquatic life.

27. To develop a CWRP, Dischargers may work directly with a demonstrated professionals, entity or organization that has knowledge, information and experience in riparian area management or watershed restoration projects (e.g., Resource Conservation Districts, , Central Coast Wetlands Group, non-profit conservation groups).

28. The CWRP may be submitted to the Central Coast Water Board for consideration by a Discharger, group of Dischargers, or by a known conservation organization on behalf of the participating Dischargers. The CWRP shall identify the Dischargers that have elected to participate in preparation and implementation of the CWRP as well as other stakeholders that have participated in in preparation of the CWRP and that intend to play a role in implementation of the CWRP. The CWRP shall identify an individual or organization that intends to be the primary point of contact, and that intends to conduct any monitoring or reporting that is part of the CWRP.

29. The CWRP shall be made available for public comment prior to Executive Officer approval. The Executive Officer shall consider public comments received prior to approving the CWRP. In the event that the Executive Officer directs changes to the CWRP, the entities responsible for submittal of the CWRP shall have at least 60 days to respond to any proposed changes prior to the CWRP being considered approved for implementation. When it approves the CWRP, the Executive Officer shall also approve a lead entity as being responsible for CWRP monitoring and reporting on behalf of the Dischargers participating in the CWRP.

~~1.~~30. Once approved, the lead entity identified as being responsible for CWRP monitoring and reporting shall submit an annual report that identifies actions taken over the course of the year to implement the CWRP, and identify any potential concerns with respect to meeting interim or final milestones contained in the CWRP.

31. Once a CWRP is approved by the Executive Officer, the CWRP must be implemented as approved, including meeting interim dates as contained in the approved CWRP. The lead entity that is ensuring implementation of the CWRP may request an extension of timelines contained in the CWRP for implementation of identified actions for good cause (e.g., waiting for permits from other agencies). The request for the extension must be made at least 60 days prior to the due date when the action is otherwise supposed to be completed, and the extension is subject to approval by the Executive Officer.

Termination of Surface Water Limit Compliance Through Cooperative Watershed Restoration Plan

32. In the event that compliance with the surface receiving water limits in Tables C.2-1, C.2-2, C.3-1, C.3-2, C.4-1 and C.4-2 through Riparian Area Management is terminated by the Executive Officer for any of the reasons specified in paragraphs 30 and 31, the following

44

procedures and provisions shall apply.

33. If an approved CWRP is not implemented according to the schedule of activities contained in the approved plan, and no extension of the schedule has been approved by the Executive Officer, then the Dischargers in the watershed covered by the identified CWRP shall be subject to the surface water limits as otherwise applicable through the ESWFP.

34. If the CWRP does not achieve the success criteria as defined in an approved CWRP, and no extension of the schedule for meeting success criteria has been approved by the Executive Officer, then the Dischargers in the watershed covered by the identified CWRP shall be subject to the surface water limits as otherwise applicable through the ESWFP.

35. If any party or interested person objects to an Executive Officer decision to related to approval of a CWRP, or termination pursuant to paragraphs 30 and 31, the party or interested person may file a petition with the Central Coast Regional Water Quality Control Board challenging the Executive Officer's decision. In such a case, the petition must be filed within 30 days of the Executive Officer's decision. The Central Coast Water Board may decide to hold a hearing on the contested matter utilizing the provisions of Water Code section 13228.14.

11 For guidance on decontamination methods and species of concern, see CDFW's invasive species webpage: https://www.wildlife.ca.gov/Conservation/Invasives. This information will be used to determine compliance.

Quantifiable Milestones, Time Schedules, and Monitoring and Reporting for Ranches in Riparian Priority Areas

10. Dischargers in Riparian Priority areas whose riparian setback widths and vegetative cover already meet the values in **Table C.5-1** (and **Table C.5-2**, where applicable) have met this requirement. Dischargers must continue to protect riparian areas within or bordering their ranch.

11. Dischargers in Riparian Priority Areas whose riparian setback widths and vegetative cover do not meet the values in **Table C.5-1** (and **Table C.5-2**, where applicable) must comply with this requirement by selecting one of the four compliance pathways below. Dischargers must report their selected compliance pathway in the ACF, as described in the MRP.
a. Cooperative Approach;
b. On-Farm Setback;
c. Rapid Assessment Method;
d. Alternative Proposal.

Compliance Pathway 1: Cooperative Approach

12. Dischargers who select the Cooperative Approach compliance pathway must form or identify a third-party organization to develop a Cooperative Watershed Restoration Plan (CWRP) within the

45

watershed where the ranch is located.

13. The CWRP must identify and implement projects that result in riparian establishment, re-establishment, and/or enhancement projects that benefit water quality objectives for sediment, toxicity, nutrients, and temperature, and are protective of all beneficial uses for inland surface waters, enclosed bays, and estuaries as outlined in section 3.3.2 of the Basin Plan. Projects that only serve to preserve and protect existing riparian areas do not meet the criteria for this requirement.

14. The third party must submit the proposed CWRP to the Executive Officer for review by the date specified in the MRP. The CWRP must include success criteria and compliance dates, including interim dates, and must be approved by the Executive Officer prior to implementation. Once approved by the Executive Officer, the CWRP must be implemented. If a third party does not form or if the CWRP is not submitted by the date specified in the MRP, the Discharger must select a different compliance pathway.

15. If implementation of an approved CWRP does not begin by the date specified in the MRP, then the Discharger must select a different compliance pathway and update the compliance pathway selection in the ACF.

Compliance Pathway 2: On-Farm Setback

16. Dischargers who select the On-Farm Setback compliance pathway whose on-farm setbacks and vegetation do not meet the values in **Table C.5-1** (and **Table C.5-2**, if applicable) must update and implement their RAMP to achieve the minimum riparian and/or wetland setback distance and vegetation requirements in **Table C.5-1** (and **Table C.5-2**, if applicable) and the success criteria, as described in the MRP. Dischargers must report their on-farm setback width and vegetation in the ACF, as described in the MRP.

17. The minimum riparian setback must consist of a strip of vegetated land extending along the side of a waterbody and its adjacent wetlands, floodplains, or slopes at the widths outlined in **Table C.5-1** (and **Table C.5-2**, if applicable).

18. The minimum riparian setback width must be adjusted to include contiguous sensitive areas (e.g., steep slopes or erodible soils where disturbance may adversely affect water quality, streams, wetlands, or other waterbodies). The adjustments are outlined in **Table C.5-2**.

19. All new plants and seeds used to establish the minimum riparian setback must be native to California and naturally occur in the HUC-8 watershed where the ranch is located.[12]

[12] For guidance on decontamination methods and species of concern, see CDFW's invasive species webpage: https://www.wildlife.ca.gov/Conservation/Invasives. This information will be used to determine compliance.

46

20. Dischargers who do not achieve the minimum riparian setback, vegetation, and success criteria requirements by the interim compliance date specified in **Table C.5-3** must engage in adaptive management to achieve the minimum riparian setback, vegetation, and success criteria requirements by the final compliance date.

21. Dischargers must achieve the minimum riparian setback, vegetation, and success criteria requirements by the final compliance date specified in **Table C.5-3**.

Compliance Pathway 3: Rapid Assessment Method

22. By the date specified in the MRP, Dischargers who select the Rapid Assessment Method compliance pathway must have a Riparian Rapid Assessment Method (RipRAM) assessment performed for the existing riparian areas on their ranch. The RipRAM analysis must be conducted by a RipRAM Practitioner who has completed the required training. The score must be reported in the ACF, as described in the MRP.

23. Dischargers whose RipRAM score does not achieve the reference site score must update and implement their RAMP to achieve the reference site score, as described in the MRP.

24. Dischargers who do not achieve reference site score by the interim compliance date specified in **Table C.5-3** must engage in adaptive management to achieve the reference site score by the final compliance date.

25. Dischargers must achieve the reference site score by the final compliance date specified in **Table C.5-3**.

Compliance Pathway 4: Alternative Proposal

26. Dischargers who select the Alternative Proposal compliance pathway must submit an Alternative Proposal for review by the Executive Officer, prior to implementation, by the date specified in the MRP. Once approved by the Executive Officer, the Alternative Proposal must be implemented. If the Alternative Proposal is not submitted by the date specified in the MRP, the Discharger must select a different compliance pathway.

27. The Alternative Proposal must quantitatively demonstrate that the proposed alternative does not cause or contribute to the exceedance of any water quality objectives in the receiving water, does not cause or contribute to any degradation of receiving water quality inconsistent with the antidegradation findings of this Order, and protects all beneficial uses for inland surface waters, enclosed bays, and estuaries, as outlined in section 3.3.2 of the Basin Plan. The Alternative Proposal must result in the riparian areas providing all the functions described in the RAMP requirements (see the beginning of Part 2, Section C.5: Riparian Area Management for Water

47

~~Quality Protection for a description of the RAMP). The Alternative Proposal must include success criteria based on water quality monitoring data and a SAP and QAPP must be included. The Alternative Proposal must be prepared by a qualified professional in consultation with a riparian qualified biologist. Qualified professional and qualified biologist are defined in Attachment C to this Order.~~

28. If implementation of an approved Alternative Proposal does not begin by the date specified in the MRP, then the Discharger must select a different compliance pathway and update the compliance pathway selection in the ACF.

29. Dischargers who implement an approved Alternative Proposal must comply with the ranch-level surface discharge monitoring and reporting requirement described in the MRP, including submittal of a work plan and SAP and QAPP for review by the Executive Officer prior to implementation, to quantitatively demonstrate that their proposal is achieving its approved success criteria based on water quality data. Once approved by the Executive Officer, the work plan must be implemented.

30. Dischargers who do not achieve the success criteria defined in their approved work plan by the interim compliance date specified in **Table C.5-3** must engage in adaptive management to achieve the success criteria by the final compliance date.

31. Dischargers must achieve the success criteria defined in their approved work plan by the final compliance date specified in **Table C.5-3**.

Exemptions and Strahler Stream Order Designation Change Request

32. A ranch that is covered by a state or federal agency approved restoration and/or conservation plan which includes the application of management measures that achieve water quality objectives and protect beneficial uses for inland surface waters, enclosed bays, and estuaries, as outlined in section 3.3.2 of the Basin Plan, may be exempt from this requirement. Dischargers must have a RipRAM and/or CRAM assessment conducted on the existing riparian and/or wetland area on their farm and the scores must meet or exceed the minimum threshold reference site scores designated in the MRP to qualify for this exemption.

33. A ranch that is bordered by a manmade barrier between the operation and a waterbody that prevents the establishment of a riparian and/or wetland setback on the farm that is not under the Discharger's legal control may be exempt from this requirement (e.g., a flood control district levee, berm, etc.). This exemption only applies to the area of the farm that borders the barrier (e.g., if the farm has 1,000 feet of land adjacent to a waterbody but only 500 feet of that land borders a barrier, the Discharger must comply with the riparian and/or wetland setback requirement for the 500 feet of land adjacent to a waterbody that does not border the barrier).

34. A ranch that has a legally binding easement (e.g., flood control district access road, utility easement, conservation easement, etc.) that excludes activities that would be required to comply with this requirement on the farm may be exempt from this requirement. This exemption only applies to the area of the ranch that is subject to the easement (e.g., if the farm has 500 feet of land adjacent to a waterbody but only 50 feet of that land is subject to the easement, the Discharger must comply with the riparian and/or wetland setback requirement for the 450 feet of

land adjacent to a waterbody that is not subject to the easement).

35. A ranch that has an existing permanent structure within the required minimum setback area must include acreage equivalent to the acreage of the permanent structure in another segment of the setback on the farm or select an alternative compliance pathway.

36. To qualify for any of these exemptions, the Discharger must submit supporting documentation to the Executive Officer for review. Exemption claims require Executive Officer approval.

37. Dischargers[13] who believe that the Strahler Stream Order delineation for the waterbody on or adjacent to their ranch is incorrect may request a review to clarify or change the designation. Requested changes or clarification must be prepared by a qualified professional, in consultation with a qualified biologist, and provide evidence that the Strahler Stream Order delineation is inconsistent with the definition of the Strahler Stream Order used in this Order. Qualified professional and qualified biologist are defined in Attachment C to this Order.

[13] If the Discharger is not the landowner, the Discharger must notify the landowner, in writing, of their intent to request a change in the Strahler Stream Order delineation.

38. Requests for Strahler Stream Order delineation changes must be submitted to the Executive Officer for review and require Executive Officer approval.

Part 2, Section D. Additional Requirements and Prohibitions

Waste Discharge Control and Prohibitions

1. Except in compliance with the time schedules in this Order, Dischargers must not cause or contribute to exceedances of applicable water quality objectives, as defined in Attachment A, must protect all beneficial uses for inland surface waters, enclosed bays, and estuaries as outlined in section 3.3.2 of the Basin Plan, and must prevent nuisance as defined in Water Code section 13050.

2. Except in compliance with the time schedules in this Order, Dischargers must comply with applicable provisions of the Basin Plan and all other applicable water quality control plans as identified in Attachment A. In the event of a conflict between the requirements of this Order and any applicable provisions in the Basin Plan or other water quality control plan, the requirement that is more protective of water quality prevails.

3. In accordance with the time schedules in this Order, Dischargers must achieve applicable Total Maximum Daily Load (TMDL) Load Allocations (LAs) by achieving the surface water limits established in this Order. Dischargers must incorporate planning elements from applicable TMDLs into the appropriate section of their Farm Plan.

50

Commented [TD48]: Necessary to ensure that time schedules are applied.

Commented [TD49]: Too broad, and subjective. Requirements need to be adopted in the Order. Also, this accounts to an Order revision without public review, comment and hearing. Any changes in policies or plans require that the Order be reopened, can't be applied automatically in this fashion.

Commented [TD50]: See also Exhibit 1 Legal and Policy comments were TMDLs have been improperly incorporated into the Draft Order.

4. The discharge of rubbish, refuse, trash, irrigation tubing or tape, or other solid wastes into surface waters is prohibited. The placement of such materials where they discharge or have the potential to discharge to surface waters is prohibited.

5. The discharge of chemicals such as fertilizers, fumigants, pesticides, herbicides, or rodenticides down a groundwater well casing is prohibited.

6. The discharge of chemicals, including those used to control wildlife (such as bait traps or poison), directly into surface waters or groundwater is prohibited. The placement of chemicals in a location where they may be discharged to surface waters or groundwater is prohibited.

7. Dischargers who apply fertilizers, fumigants, pesticides, herbicides, rodenticides, or other chemicals through an irrigation system must have functional and properly maintained backflow prevention devices installed at the well or pump to prevent pollution of groundwater and surface water that comply with any applicable DPR requirements or local ordinances. Backflow prevention devices used to protect water quality must be those approved by the United States Environmental Protection Agency (USEPA), DPR, California Department of Public Health (CDPH), or the local public health or water agency.

8. Dischargers must properly destroy all abandoned groundwater wells, exploration holes or test holes, as defined by Department of Water Resources (DWR) Bulletin 74-81 and revised in 1988, in such a manner that they will not produce water or act as a conduit for mixing or otherwise transfer groundwater or waste pollutants between permeable zones or aquifers. Well abandonment must be performed in compliance with any applicable DWR requirements or local ordinances (including local well destruction permitting requirements).

9. This Order does not authorize the discharge of pollutants from point sources to waters of the United States, including wetlands. Where required, Dischargers must obtain authorization for such discharges by obtaining a Clean Water Act section 402 National Pollutant Discharge Elimination System (NPDES) permit or a CWA section 404 dredge and fill permit.

10. Dischargers who utilize containment structures (such as retention ponds or reservoirs) to achieve treatment or control of the discharge of waste must manage, construct, and maintain such containment structures to avoid discharges of waste to groundwater and surface water that cause or contribute to exceedances of water quality objectives or impairment of beneficial uses. Dischargers may choose the method of compliance appropriate for the individual ranch, which may include, but is not limited to: a. Implementing chemical treatment (such as enzymes);
b. Implementing biological treatment (such as wood chips);
c. Recycling or reusing contained water to minimize infiltration or discharge of waste;
d. Minimizing the volume of water in the containment structure to minimize percolation of waste; and/or
e. Minimizing percolation of waste via a synthetic, concrete, clay, or low permeability soil liner.

51

11. Dischargers must implement proper handling, storage, disposal, and management of fertilizers, fumigants, pesticides, herbicides, rodenticides, and other chemicals to prevent or control the discharge of waste to waters of the state that causes or contributes to exceedances of water quality standards. All chemical storage areas must have appropriate secondary containment structures to protect water quality and prevent discharge through spillage, mixing, or seepage.

12. Dischargers must implement water quality protective management practices ~~(such as source control or treatment)~~ to prevent erosion, reduce stormwater runoff quantity and velocity, and hold fine particles in place.

Commented [TD51]: Improper to suggest that treatment may be required.

13. Dischargers must minimize the presence of bare soil vulnerable to erosion and soil runoff to surface waters and implement erosion control, sediment, and stormwater management practices in non-cropped areas, such as unpaved roads and other heavy use areas.

14. Dischargers must comply with any applicable stormwater permits.

15. ~~Access roads must be constructed and maintained in compliance with the requirements of California Code of Regulations Title 14, Chapter 4.~~[14]

Commented [TD52]: All of the following road provisions are improper in that they are outside the Central Coast Water Board's authority. See also Exhibit 1, Legal and Policy comments.

~~[14]The Handbook for Forest Ranch, & Rural Roads provides guidance on how to implement the regulations of Title 14, Chapter 4: http://www.pacificwatershed.com/PWA-publications-library~~

~~16. Dischargers must ensure that all access roads are, to the extent possible, hydrologically disconnected from waters of the state by installing disconnecting drainage features, increasing the frequency of (inside) ditch drain relief as needed, constructing out-sloped roads, constructing energy dissipating structures, avoiding concentrating flows in unstable areas, and performing inspection and maintenance as needed to optimize access road performance.~~

~~17. Dischargers must ensure that access road surfacing, especially within a segment leading to waters of the state, minimizes sediment delivery to waters of the state and maximizes road integrity.~~

~~18. Dischargers must ensure that access roads are out-sloped whenever possible to promote even drainage of the access road surface, prevent the concentration of stormwater flow within an inboard or inside ditch, and to prevent disruption of the natural sheet flow pattern off a hill slope to waters of the state.~~

~~19. Access road stormwater drainage structures must not discharge onto unstable slopes, earthen fills, or directly into waters of the state. Drainage structures must discharge onto stable areas with straw bales, slash, vegetation, and/or rock riprap.~~

52

~~20. If used, chemical toilets or holding tanks must be maintained in a manner appropriate for the frequency and conditions of usage, sited in stable locations, and located outside of the minimum setback areas.~~

21. Dischargers who produce and apply compost in-house must comply with the following requirements: a. Materials and activities on-site must not cause, threaten to cause, or contribute to conditions of pollution, contamination, or nuisance;
b. Activities must be set back at least 100 feet from the nearest surface waterbody and/or the nearest water supply well;
c. Dischargers must implement practices to minimize or eliminate the discharge of waste that may adversely impact the quality or beneficial uses of waters of the state;
d. Dischargers must manage the application of water to compost (including from precipitation events) to reduce the generation of wastewater; e. Working surfaces must be designed to prevent, to the greatest extent possible, ponding, infiltration, inundation, and erosion, notwithstanding precipitation events, equipment movement, and other aspects of the facility operations;
f. Dischargers must maintain the following records in the Farm Plan. These records must be submitted to the Central Coast Water Board upon request.
i. Total operational footprint of compost activities (in acres), including ancillary activities;
ii. Compost operation records to provide background information on the composting operation history and a description of methods and operation used, including the following: feedstock types, volumes, sources, and suppliers. Description of the method of composting (e.g., windrow, static, forced air, mechanical). Description of how residuals are removed from the feedstocks and managed and/or disposed of.
iii. Description of water supply.
iv. Map detailing the location and size (in acres) of the working surface used for the storage of incoming feedstocks, additives, and amendments (receiving area); active and curing composting; final product; drainage patterns; location of any groundwater monitoring wells and water supply wells within and/or near the property boundary; location and distance (in feet) to nearby water supply wells (e.g., municipal supply, domestic supply, agricultural wells) from the nearest property boundary of the operation; identification of all surface waterbodies, including streams, ditches, canals, and other drainage courses; and distances from the nearest property boundary of the operation to these surface waterbody areas.
v. Records of appropriate monitoring (dependent on method of composting) for composting to develop final product (temperature, turning, air flow, etc.).
vi. Records of final product use, including locations and volumes.

Additional Requirements

~~22. Upon request, Dischargers must submit information regarding compliance with any DPR adopted or approved surface water or groundwater protection requirements to the Central Coast Water Board.~~

Commented [TD53]: Central Coast Water Board does not have authority to determine compliance with DPR regulations.

23. Upon request, Dischargers must submit proof of an approved Lake and Streambed Alteration Agreement or other authorization or release from the CDFW to the Central Coast Water Board for

any work conducted within the bed, bank, and channel, including riparian areas, of parcels enrolled in this order, that has the potential to result in erosion and discharges of waste to waters of the State.

24. Upon request, Dischargers must submit proof of a Clean Water Act section 404 dredge and fill permit from the United States Army Corps of Engineers (USACE) for any work that has the potential to discharge wastes considered "fill" material, such as sediment, to waters of the United States to the Central Coast Water Board.

~~25. Dischargers must comply with DWR Bulletin 74-81 and supplement 74-90, Water Code sections 13700 through 13755, and any local permitting requirements associated with installation of new wells.~~

Commented [TD54]: Provision exceeds Central Coast Water Board authority.

26. Pursuant to Water Code section 13267(c), Central Coast Water Board staff or its authorized representatives may inspect property subject to this Order to ascertain whether the purposes of the Porter-Cologne Act are being met and whether the Discharger is complying with the conditions of this Order. The inspection will be made with the consent of the owner or possessor of the facilities, or if consent is withheld, with a duly issued warrant pursuant to the procedure set forth in Title 13 Code of Civil Procedure Part 3 (commencing with section 1822.50). However, in the event of an emergency affecting the public health or safety, an inspection may be performed without consent or the issuance of a warrant.

27. This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the federal Endangered Species Act (16 U.S.C. sections 1531 to 1544). If a "take" will result from any act authorized under this Order, the Dischargers must obtain authorization for an incidental take prior to taking action. Dischargers are responsible for meeting all applicable requirements of the California and federal Endangered Species Acts for the discharge authorized by this Order.

28. Dischargers or a representative authorized by the Discharger must sign technical reports submitted to the Central Coast Water Board to comply with this Order. Any person signing or submitting a document must provide the following certification, whether written or implied:

"In compliance with Water Code section 13267, I certify under penalty of perjury that this document and all attachments were prepared by me, or under my direction or supervision, following a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. To the best of my knowledge and belief, this document and all attachments are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

54

xx. All reports prepared and submitted to the Executive Officer in accordance with the terms of this Order will be made available for public inspection at the offices of the Central Coast Water Board, except for reports, or portions of such reports, subject to an exemption from public disclosure in accordance with California law and regulations, including the Public Records Act, Water Code section 13267(b)(2), and the California Food and Agriculture Code. If a Discharger asserts that all or a portion of a report is subject to an exemption from public disclosure, it must clearly indicate on the cover of the report that it asserts that all or a portion of the report is exempt from public disclosure. The complete report must be submitted with those portions that are asserted to be exempt in redacted form, along with separately-bound unredacted pages (to be maintained separately by staff). The Discharger shall identify the basis for the exemption. If the Executive Officer cannot identify a reasonable basis for treating the information as exempt from disclosure, the Executive Officer will notify the Discharger that the information will be placed in the public file unless the Central Coast Water Board receives, within 10 calendar days, a satisfactory explanation supporting the claimed exemption. NOIs shall generally not be considered exempt from disclosure.

Commented [TD55]: Provision is in Ag Order 3.0 and ESJ Order. Needs to be included here as well.

Commented [TD56]: Please note that redline revisions to the tables were not possible in this converted document. They have been deleted for ease of transmission. See Exhibit4 for suggested revisions to the Tables.

~~[1]As defined in the 2019 California Department of Water Resources Bulletin 118~~

~~**Table B-2. Surface Water Priority Areas**~~

~~[1]As defined by the National Hydrography Dataset Plus Watershed Boundary Dataset~~

~~**Table B-3. Riparian Priority Areas**~~

55

[1]As defined by the National Hydrography Dataset Plus Watershed Boundary Dataset

56

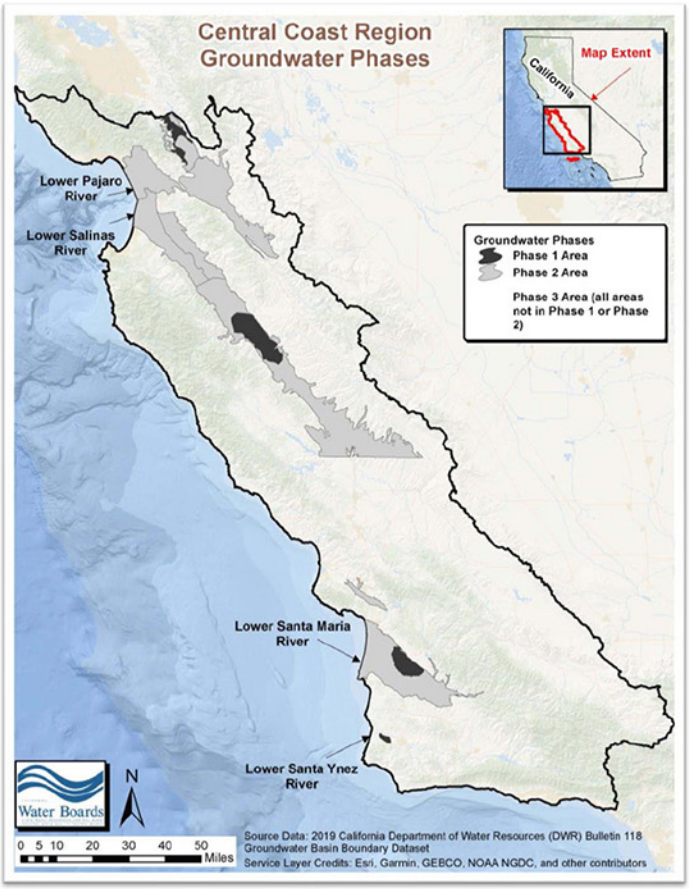


Figure B-1: Groundwater Phase Areas

57

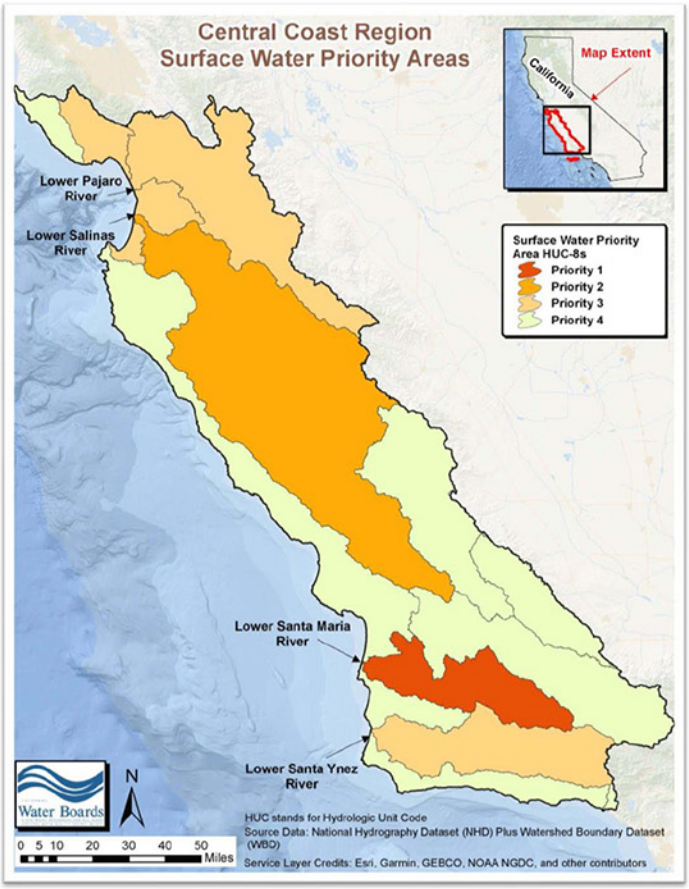
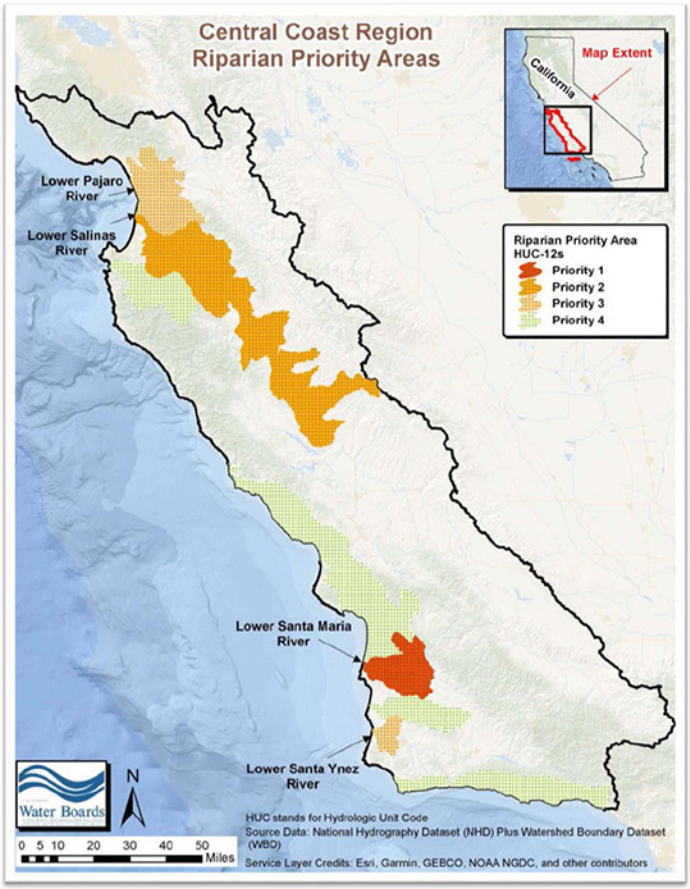


Figure B-2: Surface Water Priority Areas

58



~~Figure B-3: Riparian Priority Areas~~

59

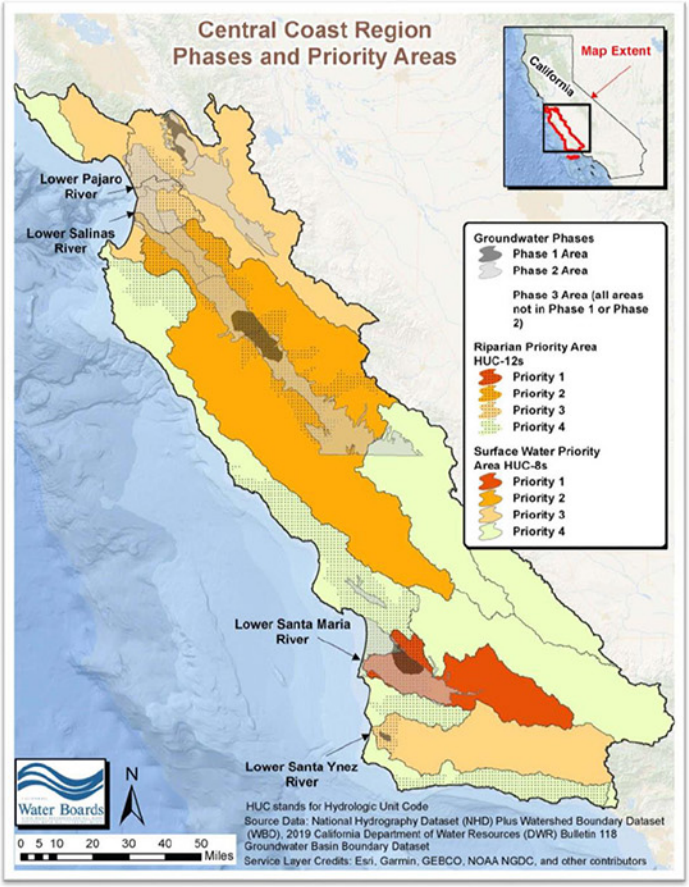


Figure B-4: All Phase and Priority Areas

60

Tables and Figures related to Part 2, Section C.2: Irrigation and Nutrient Management for Surface Water Protection

Table C.2-1. Time Schedule for Nutrient Limits (TMDL)

Table C.2-2. Time Schedule for Nutrient Limits (Non-TMDL)

[1]mg/L is milligrams per liter
[2]Calculated using total ammonia and onsite instream measurements (field measurements) of pH and water temperature.

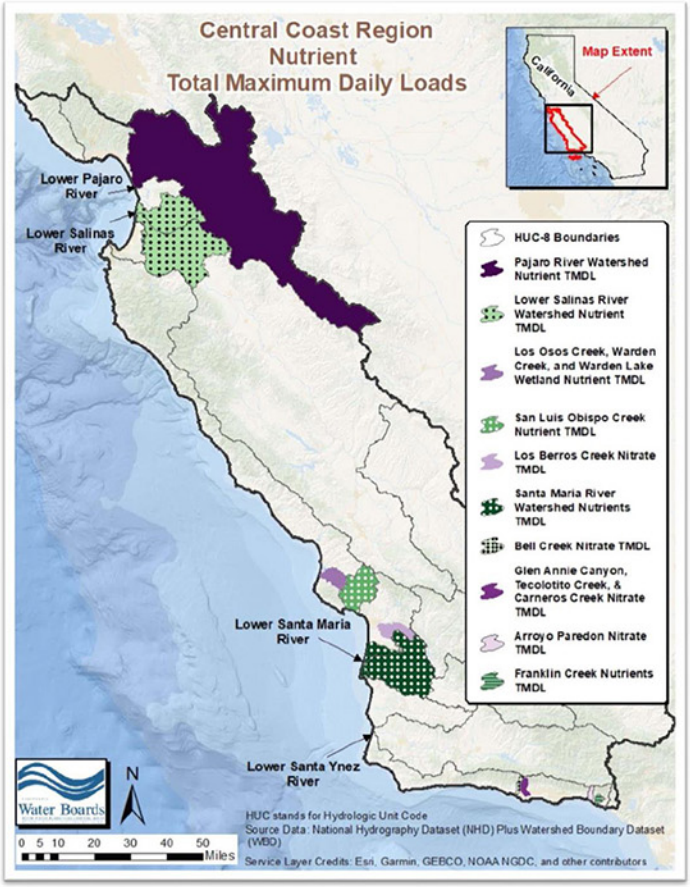


Figure C.2-1: Nutrient TMDL Areas

63

Tables and Figures related to Part 2, Section C.3: Pesticide Management for Surface Water Protection

Table C.3-1. Time Schedule for Pesticide and Toxicity Limits (TMDL)

Table C.3-2. Time Schedule for Pesticide and Toxicity Limits (non-TMDL)

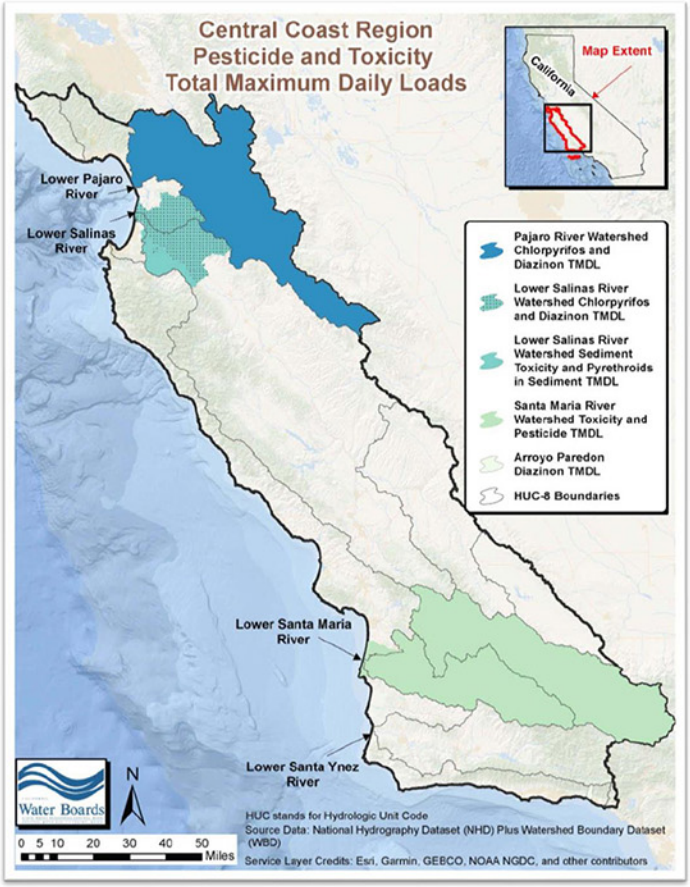


Figure C.3-1: Pesticide and Toxicity TMDL Areas

66

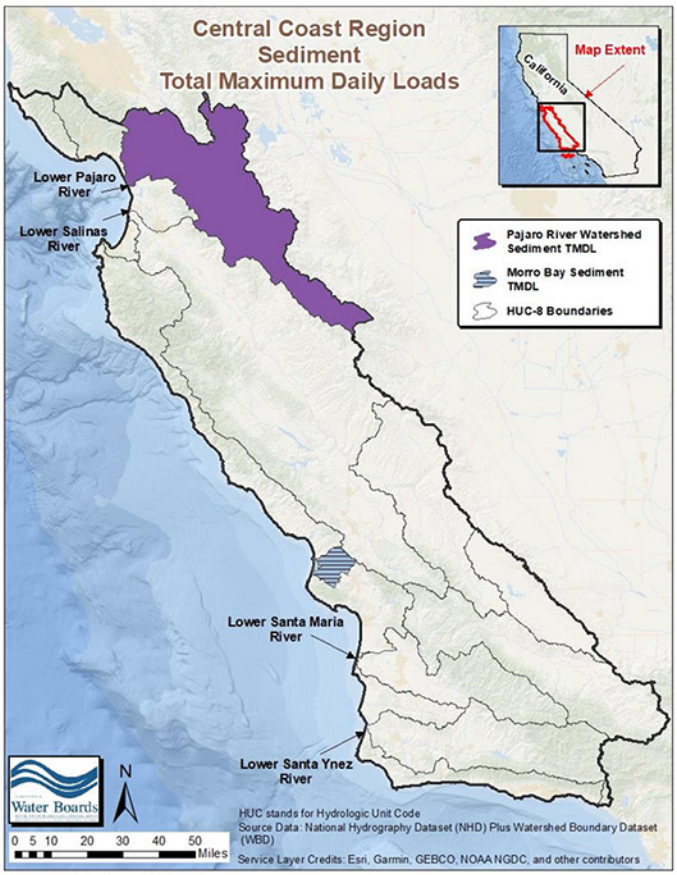


Figure C.4-1: Sediment TMDL Areas

67

Formatted: Page break before

68

Table C.5-1 Surface Water Body Categories for Enhanced Surface Water Follow-up Program

Most Impaired	
305FUF	Furlong Creek at Frazier Lake Rd.
309ALG	Salinas Reclamation Canal at La Guardia
309CCD	Chualar Creek west of Highway 101
309CRR	Chualar Creek North Branch east of Highway 101
309ESP	Espinosa Slough upstream from Alisal Slough
309JON	Salinas Reclamation Canal at San Jon Rd.
309MER	Merrit Ditch upstream of Highway 183
309NAD	Natividad Creek upstream of Salinas Reclamation Canal
309OLD	Old Salinas River at Monterey Dunes Way
309QUI	Quail Creek at culvert on east side of Highway 101
309TEH	Tembladero Slough at Haro St.
312BCC	Bradley Canyon Creek at Culvert
312BCJ	Bradley Channel at Jones Street
312GVS	Green Valley at Simas
312MSD	Main Street Canal upstream of Ray Road at Highway 166
312OFC	Oso Flaco Creek at Oso Flaco Lake Road
312ORC	Orcutt Solomon Creek upstream of Santa Maria River
312ORI	Orcutt Solomon Creek at Highway 1
312SMA	Santa Maria River at Estuary
Intermediate	
305BRS	Beach Road Ditch at Shell Rd.
305CAN	Carnadero Creek upstream of Pajaro River
305CHI	Pajaro River at Chittenden Gap
305FRA	Pajaro River Millers Canal at Frazier Lake Rd
305LCS	Llagas Creek at Southside Ave.
305PJP	Pajaro River at Main St.
305SJA	San Juan Creek at Anzar Rd.
305TSR	Tequisquita Slough upstream of Pajaro River at Shore Rd.
305WCS	Watsonville Creek (aka Corncob Canyon) at Elkhorn Rd/Hudson Lndg
309ASB	Alisal Slough at White Barn
309BLA	Blanco Drain below Pump
309GAB	Gabilan Creek at Boronda Rd.
309MOR	Moro Cojo Slough at Highway 1
309RTA	Santa Rita Creek at Santa Rita Creek Park
310LBC	Los Berros Creek at Century Rd.
310PRE	Prefumo Creek at Calle Joaquin
310USG	Arroyo Grande Creek at old USGS gage
310WRP	Warden Creek at Wetlands Restoration Preserve
312OFN	Little Oso Flaco Creek
312SMI	Santa Maria River at Highway 1
313SAE	San Antonio Creek at San Antonio Rd east
314SYN	Santa Ynez River at 13th
315BEF	Bell Creek at Winchester Canyon Park
315FMV	Franklin Creek at Mountain View Lane
315GAN	Glenn Annie Creek
315LCC	Los Carneros Creek at Calle Real

Table C.5-1 Surface Water Body Categories for Enhanced Surface Water Follow-up Program

Least Impaired	
305COR	Salsipuedes Creek d/s of Corralitos Creek, u/s of Highway 129
305WSA	Watsonville Slough at San Andreas Rd.
309GRN	Salinas River (Mid) at Elm Rd. in Greenfield
309SAC	Salinas River at Chualar
309SAG	Salinas River at Gonzales River Rd. Bridge
309SSP	Salinas River (Lower) at Spreckles Gage
310CCC	Chorro Creek upstream of Chorro Flats
314SYF	Santa Ynez River at Flordale
314SYL	Santa Ynez River at River Park
315APF	Arroyo Paredon Creek at Foothill Bridge

Category 1: Most-impaired sites. Recommended for Years 1-5 of Follow-up effort.

Category 2: Sites with intermediate impairment. Recommended for Years 5-8 of Follow-up effort.

Category 3: Least-impaired sites. Recommended for Years 9 & 10 of Follow-up effort.

EXHIBIT 3 – DRAFT MRP

STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

DRAFT GENERAL WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES FROM IRRIGATED LANDS

ORDER NO. R3-20XX-XXXX

February 21, 2020

ATTACHMENT B

Monitoring and Reporting Program

TABLE OF CONTENTS

A. General Monitoring and Reporting Requirements

1. This Monitoring and Reporting Program (MRP) is issued pursuant to California Water Code section 13267, which authorizes the Central Coast Regional Water Quality Control Board (Central Coast Water Board) to require preparation and submittal of technical and monitoring reports.

2. The Central Coast Water Board needs the information required by this MRP to determine compliance with Order No. R3-20XX-XXXX. The evidence supporting the need for and benefits of to be obtained from these monitoring and reporting requirements is included in the findings the Order.

3. Pursuant to Water Code section 13268, a violation of a request made pursuant to section 13267 may subject the Discharger to civil liability of up to $1000 per day. Pursuant to Water Code section 13350, a violation of a request made pursuant to section 13350 may subject the Discharger to civil liability of up to $5000 per day.

4. Dischargers must submit reports in the format specified by the Executive Officer. Reports must be submitted electronically, unless otherwise specified by the Executive Officer. A transmittal letter must accompany each report, containing the following penalty of perjury statement signed by the Discharger or the Discharger's authorized agent:

"In compliance with Water Code section 13267, I certify under penalty of perjury that this document and all attachments were prepared by me, or under my direction or supervision, following a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. To the best of my knowledge and belief, this document and all attachments are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

5. All technical and monitoring reports submitted in compliance with this MRP must be complete and accurate. The submittal of an incomplete or inaccurate report does not constitute compliance with the requirement.

6. All water quality analyses must be conducted at a laboratory certified for such analysis through a California Environmental Laboratory Accreditation Program (ELAP) certified laboratory according to approved standard and United States Environmental Protection Agency (USEPA) methods.[1] Unless otherwise noted,

all sampling, sample preservation, and analyses must be performed in accordance with the latest edition of Test Methods for Evaluating Solid Waste, SW-846, USEPA, and analyzed as specified herein by the above analytical methods and reporting limits indicated.

[1] Certified laboratories can be found online:
https://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/gw_labs_6_16.pdf

7. Any laboratory data submitted to the Central Coast Water Board must be submitted by, or under the direction of, a state registered professional engineer, registered geologist, state certified laboratory, or other similarly qualified professional. Surface water quality data must be submitted electronically, in a format that is compatible with the California Environmental Data Exchange Network (CEDEN), or as directed by the Executive Officer. Groundwater quality data must be submitted in a format compatible with the electronic deliverable format (EDF) electronic data deliverable (EDD) criteria and protocols used by the State Water Board's GeoTracker data management system, or as directed by the Executive Officer.

8. Dischargers must provide the geographic information necessary to determine the Groundwater Phase Area, and Surface Water Priority Area, ~~and Riparian Priority Area~~ that applies to each individual ranch when they enroll or update their electronic Notice of Intent (eNOI).

9. The Central Coast Water Board encourages Dischargers to participate in cooperative monitoring programs to comply with these monitoring and reporting requirements. Dischargers not participating in a cooperative monitoring program must conduct required monitoring and reporting individually. Participation in a cooperative monitoring program does not relieve Dischargers of the responsibility to comply with these requirements or of the requirement to have their ranch-level data reported to the Central Coast Water Board.

10. The section titled *Summary of Reporting Periods and Due Dates* at the end of this MRP includes tables that summarize the monitoring and reporting dates associated with the requirements in this MRP.

B. Total Nitrogen Applied (TNA) Monitoring and Reporting

Commented [TD1]: In general, the structure of this section is confusing with respect to when TNA monitoring is required as compared to the INMP Summary Report.

1. **Upon adoption of the Order,** all Dischargers, regardless of Groundwater Phase, who were enrolled in Order R3-2017-0002 (Ag Order 3.0) and required to submit TNA reports under Ag Order 3.0 must continue to conduct monitoring and recordkeeping, as described below, to submit a complete and accurate TNA report.

2. **By March 1, 2021, and March 1, 2022,** all Dischargers, regardless of Groundwater Phase, who were enrolled in Order R3-2017-0002 (Ag Order 3.0) and required to submit TNA reports under Ag Order 3.0 must submit a TNA report, electronically in the TNA report form.

3. **Beginning January 1, 2022,** Dischargers in Groundwater Phase 1 areas must conduct monitoring and reporting consistent with the requirements outlined in *Section C. Irrigation and Nutrient Management Plan (INMP) Summary Report Monitoring and Reporting*. The INMP Summary report includes the same nitrogen application information as the TNA report, as well as additional expanded reporting related to nitrogen removed and irrigation, and therefore satisfies the TNA requirement. Beginning March 1, 2023, the INMP Summary report requirement, that includes modified TNA reporting, will apply to Dischargers with ranches in Groundwater Phase 1 areas.

Commented [TD2]: The MRP appears to inadvertently not indicate when INMP Summary Reporting starts for those in GW Phase 1 areas.

4. **Beginning January 1, 2022,** Dischargers in Groundwater Phase 2 areas must conduct monitoring and recordkeeping, as described below, to submit a complete and accurate TNA report.

5. **By March 1, 2023, and March 1, 2024**, Dischargers with ranches in Groundwater Phase 2 areas must submit a TNA report, electronically in the TNA report form. Beginning March 1, 2024, the INMP Summary report requirement, that includes modified TNA reporting, will apply to Dischargers with ranches in Groundwater Phase 2 areas.

6. **Beginning January 1, 2022,** Dischargers in Groundwater Phase ~~1~~3 areas must conduct monitoring and recordkeeping, as described below, to submit a complete and accurate TNA report.

7. **By March 1, 2023, March 1, 2024, March 1, 2025, and March 1, 2026**, Dischargers with ranches in Groundwater Phase 3 areas must submit a TNA report, electronically in the TNA report form. Beginning March 1, 2026, the INMP Summary report requirement, that includes modified TNA reporting, will apply to Dischargers with ranches in Groundwater Phase 3 areas.

8. Dischargers required to submit the TNA report must monitor and report the total amount of nitrogen applied from all sources, as described below, including fertilizer nitrogen (**AFER**), compost nitrogen (**ACOMP**), irrigation water nitrogen (**AIRR**), nitrogen present in the soil, nitrogen concentration of the irrigation water, volume of irrigation water applied to the ranch, and additional information. The information must be recorded for the calendar year prior to the report due date (for example, if a report is due March 1, 2022, the monitoring information must be recorded from January 1 through December 31, 2021). The physical area reported on in each TNA report form must represent no more than 640 acres; if a ranch is greater than 640 acres in size then multiple reports must be submitted.

9. Fertilizer nitrogen (**AFER**), for each specific crop.

a. Dischargers must monitor and report the total amount of nitrogen applied to the ranch from fertilizers during the reporting period. **AFER** includes nitrogen applied from fertilizers and amendments and all other materials or products containing nitrogen in any form or concentration, including but not limited to, organic and inorganic fertilizers, fertilizers applied through the irrigation water (i.e., fertigation), foliar fertilizers, slow release products, compost, compost teas, manure, and extracts.

10. Compost nitrogen (**ACOMP**), by specific crop or for the entire ranch.

a. Dischargers must monitor and report the total amount of compost nitrogen and/or organic fertilizer applied to the ranch during the report period.

b. Dischargers have the option of using a compost discount factor (**C**) to calculate the amount of compost nitrogen and/or organic fertilizer mineralized during the report year the compost and/or organic fertilizer was applied to the ranch. The compost discount factor can only be applied to compost and/or organic fertilizer reported as **ACOMP**. If compost and/or organic fertilizer is reported under **AFER** then the compost discount factor cannot be applied.

Commented [TD3]: For consistency with changes in Ag Partners redline revisions of Draft Order.

Commented [TD4]: In general, organic fertilizers are distinguishable from conventional fertilizers. They mineralize like compost thus a discount factor needs to apply.

c. The Central Coast Water Board's standard compost discount factors (**C**) are defined below. Different compost discount factors are applied based on the carbon to nitrogen (C:N) ratio of the product.[2]

i. For C:N ratio > 11:1, **C = 0.05**. That is, 5 percent of the nitrogen in the compost and/or organic fertilizer will be counted in the A-R compliance calculation.

ii. For C:N ratio ≤ 11:1, **C= 0.10**. That is, 10 percent of the nitrogen in the compost and/or organic fertilizer will be counted in the A-R compliance calculation.

d. Only a final product (or stabilized compost) can receive the compost discount factors defined above. Other materials containing nitrogen that are not final products are not eligible for the compost discount factor. Vegetative food materials include the crop residues left on the field after harvest and are not considered to be a final product. A final product is a material that has been composted and completed the curing composting phase. Organic fertilizers are considered a final product.

e. Dischargers who elect to use their own compost discount factor (**C**) to determine the amount of compost and/or organic fertilizer nitrogen mineralized during the report year must report their **C** value. Records detailing the rationale and sampling methods used to determine the **C** value must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request.

f. If compost and/or organic fertilizer nitrogen is reported as **ACOMP** it should not also be included in the **AFER** calculation (i.e., it should not be reported twice in the same report form).

11. Irrigation water nitrogen (**AIRR**), for the entire ranch. AIRR is the nitrogen applied in the irrigation water estimated from the volume required for crop evapotranspiration (ET) and the background concentration of N in the irrigation water (e.g., well water) in pounds per acre.

Commented [TD5]: For consistency with Ag Partners redline revisions.

a. The amount of irrigation water nitrogen applied, **AIRR**, is the nitrogen applied in the irrigation water

[2] Attachment A, Section C.1 includes information on the source of the standard compost discount factors.

estimated from the volume required for crop evapotranspiration (ET) and the background concentration of N in the irrigation water (e.g., well water) in pounds per acre~~calculated using the nitrogen concentration of the irrigation water and the volume of water~~ applied to the ranch during the reporting period.

b. A_{IRR} does not include liquid fertilizers applied during fertigation.

c. The volume of water used in this calculation must include all water applied, including water applied for irrigation, leaching, runoff, backflush, operational spills, etc. Rainwater should not be included in this calculation.

12. Nitrogen present in the soil.

a. Dischargers must conduct soil nitrogen monitoring to inform fertilizer application decisions for their ranch. Dischargers must measure and report the amount of soil nitrogen present in the soil at least once per reporting period. Soil nitrogen monitoring locations and frequencies should be representative of cropping patterns and soil types as needed to inform nitrogen management decisions.

b. Dischargers may take a soil sample for laboratory analysis, use a nitrate quick test, or use an alternative method to evaluate nitrogen content in the soil prior to planting, prior to seeding the field, prior to pre-side dressing, or when appropriate to determine nitrogen available in the soil for the current or following crop, prior to applying fertilizer nitrogen. These records must be maintained in the Farm Plan and submitted to the Central Coast Water Board upon request.

c. Soil nitrogen content must be measured at the time of year or the stage during the crop cycle when soil nitrogen content is high and therefore should be accounted for as a source of nitrogen. Records describing the timing of the soil nitrogen monitoring and the rationale used to determine the timing must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request.

13. Nitrogen concentration of the irrigation water.

a. Dischargers required to submit the TNA report must, at a minimum, obtain and report ~~a precise~~an estimated[3] nitrogen concentration from the primary source of irrigation water (e.g., primary irrigation well, municipal supply water, recycled water, etc.) during the reporting period. If Dischargers ~~obtain~~use multiple ~~precise~~ nitrogen samples from their primary irrigation well, they must compute

~~[3] For the purposes of this MRP, a "precise" represents an exact measurement (e.g., 2.5 mg/L or 4 mg/L), as opposed to a measurement expressed as a range (e.g. 1-5 mg/L).~~

and report the average nitrogen concentration based on all samples taken. Records describing the method used to estimate the nitrogen concentration from the primary source of irrigation water must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request. Dischargers are encouraged to obtain a precise measurement of nitrogen concentration using portable measuring devices, or other methods.

Commented [TD6]: The revisions here reflect what is required in the ESJ Order, which are estimates – not precise measurements. However, we do believe it is appropriate to encourage dischargers to obtain more precise measurements.

b. Dischargers using an irrigation source for their ranch that is not located on their ranch property (e.g., sharing an irrigation well with a neighbor) are still responsible for obtaining an estimated ~~precise~~ nitrogen concentration from the primary source of irrigation water.

c. Examples of methods used to obtain precise values include laboratory analyses and portable measuring devices, which is encouraged. A method that produces a concentration range, such as a nitrate quick test strip, cannot be used to obtain precise values ~~satisfy this requirement~~ unless additional technology or methods are used to obtain a precise value from the test strip.

d. Where possible, Dischargers are encouraged to obtain precise nitrogen samples from all sources of irrigation water and compute a weighted average irrigation water nitrogen concentration. The weighted average is calculated using volume and concentration information from each water source. The methodology for calculating the weighted average is described in the *Nitrogen Applied* section in section C below.

~~e. Details on the required frequency and methods for monitoring irrigation wells are included in the *Irrigation Wells* section in section D below.~~

Commented [TD7]: With the groundwater trend monitoring provision, and the estimation or precise methods used for determining N in irrigation water, additional irrigation well monitoring is not necessary.

14. Volume of irrigation water applied to the ranch.

a. Dischargers required to submit the TNA report must, at a minimum, estimate and report the total volume of irrigation water applied to the ranch during the reporting period. Where possible, Dischargers are encouraged to measure the volume of irrigation water applied to the ranch or to each specific crop grown. Records describing the method used to estimate the volume of irrigation water applied must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request.

15. Additional information.

a. Dischargers must report additional information required in the TNA report form, including acres of each specific crop grown, whether each specific crop was grown using organic or conventional methods, and information describing the basis for the amount of nitrogen applied (e.g., University of California (UC) Farm Advisor consultation, on-farm research trials, trade publication, etc.).

C. Irrigation and Nutrient Management Plan (INMP) Summary Report Monitoring and Reporting

1. The INMP Summary report contains the same nitrogen application information as the TNA report, plus additional information related to nitrogen removed and irrigation management. Therefore, the INMP Summary report satisfies the TNA report requirement and an additional TNA report is not required to be submitted when the INMP Summary report is submitted to the Central Coast Water Board.

2. After the Central Coast Water Board adopts more precise crop conversion coefficients and ranges of A-R target values, ~~T~~the INMP Summary report ~~is~~will be used to determine ~~compliance if~~ Dischargers are outliers as compared to the adopted ranges of ~~with the nitrogen discharge targets and limits established in the Order~~A-R target values. ~~via the two available compliance pathways. Dischargers must input the information in the formulas described below into the INMP Summary report.~~ Until Groundwater Protection Targets are adopted, the INMP Summary report will calculate the A-R value for each crop type using one of the equations below. After Groundwater Protection Targets are adopted t~~T~~he INMP Summary report will calculate the ~~nitrogen discharge based on~~ A-R value for the ranch (all crops combined) by using nitrogen applied minus nitrogen removed (A-R) ~~for the ranch~~ by using one of the equations below. If Groundwater Protection Targets have been developed and are applicable to a broad spatial area, the ranch level (A-R) reported in the INMP Summary Report will be combined with ranch level A-R values for all ranches in the defined area to determine if GWP Targets are being met.

Commented [TD8]: The revisions here clarify how A-R reported in the INMP Summary Report will be used to identify outliers first, and then to determine progress towards meeting Groundwater Protection Targets, once approved.

These revisions incorporate the revisions made in the Ag Partners redline version of the Draft Order.

~~**Compliance Pathway**~~ **Equation 1: A_{FER} + (C x A_{COMP}) + A_{IRR} – R = Remaining Nitrogen ~~Discharge~~**

Commented [TD9]: Revisions to the equations and definitions are consistent with revisions to the Draft Order.

OR

~~**Compliance Pathway**~~ **Equation 2: A_{FER} + (C x A_{COMP}) = R**

In both ~~formulas~~equations, R = R_{HARV} + R_{SEQ} + Rcover + R_{TREAT} + R_{OTHER}

a. **A_{FER}** is the amount of fertilizer nitrogen applied in pounds per acre.
b. **C** is the compost discount factor used to represent the amount of compost nitrogen and/or organic fertilizer mineralized during the year that the compost was applied.
c. **A_{COMP}** is the total amount of compost nitrogen and/or organic fertilizer applied in pounds per acre.
d. **A_{IRR}** is the ~~amount of irrigation water~~ nitrogen applied in the irrigation water estimated from the volume required for crop evapotranspiration (ET) and the background concentration of N in the irrigation water (e.g., well water) in pounds per acre.
e. **R** is the amount of nitrogen removed from the field through harvest, sequestration, or other removal methods, in pounds per acre.
f. **R_{HARV}** is the amount of nitrogen removed from the field through harvest or other removal of crop material.
g. **R_{SEQ}** is the amount of nitrogen sequestered ~~removed from the field through sequestration~~ in woody materials of permanent or semi-permanent crops or sequestration through other methods (e.g., on-site biomass from plant prunings, sequestration achieved by incorporation of inputs such as glycerin and high carbon compost, and other products that foster N sequestration, and other soil

organic matter building practices and/or other practices supportive of CDFA's Health Soils Initiative).
h. **RTREAT** is the amount of nitrogen removed from the ranch through a ~~quantifiable~~ treatment method (e.g., denitrification bioreactor).
i. **Rcover** is the amount of nitrogen taken up and sequestered in a cover crop.
i. **ROTHER** is the amount of nitrogen removed from the ranch through other methods not otherwise identified. These could include, but are not limited to, soil denitrification, volitization from crop residue and mitigation activities. ~~previously quantified.~~

3. **Beginning January 1, 2022,** Dischargers in Groundwater Phase 1 areas must conduct monitoring and recordkeeping, as described below, to submit a complete and accurate INMP Summary report.

4. **By March 1, 2023, and by March 1 annually thereafter**, Dischargers in Groundwater Phase 1 areas must submit an INMP Summary report, electronically in the INMP Summary report form.

5. **Beginning January 1, 2024**, Dischargers in Groundwater Phase 2 areas must conduct monitoring and recordkeeping, as described below, to submit a complete and accurate INMP Summary report.

6. **By March 1, 2025, and by March 1 annually thereafter**, Dischargers in Groundwater Phase 2 areas must submit an INMP Summary report, electronically in the INMP Summary report form.

7. **Beginning January 1, 2026**, Dischargers in Groundwater Phase 3 areas must conduct monitoring and recordkeeping, as described below, to submit a complete and accurate INMP Summary report.

8. **By March 1, 2027, and by March 1 annually thereafter**, Dischargers in Groundwater Phase 3 areas must submit an INMP Summary report, electronically in the INMP Summary report form.

9. Dischargers required to submit the INMP Summary report must monitor and report the total amount of nitrogen applied from all sources, the amount of nitrogen removed from the field, and information on irrigation management, as described below. The physical area reported on in each INMP Summary report must represent no more than 640 acres; if a ranch is greater than 640 acres in size then multiple reports must be submitted.

Nitrogen Applied

10. See section B above for fertilizer nitrogen (**AFER**), compost nitrogen (**ACOMP**), irrigation water nitrogen (**AIRR**), nitrogen present in the soil, and additional information requirements. These sections are the same in the TNA report and INMP Summary report. The INMP Summary report includes expanded requirements for the nitrogen concentration of the irrigation water and volume of irrigation

water applied sections of the TNA report, and includes additional requirements related to nitrogen removed and irrigation water that are not required in the TNA report.

11. Nitrogen concentration of the irrigation water.

a. Dischargers required to submit the INMP Summary report must obtain and report ~~a precise~~ an estimated nitrogen concentration from all sources of irrigation water (e.g., each irrigation well, municipal supply water, recycled water, etc.) used during the reporting period. ~~Minimum irrigation well reporting requirements are included in the *Irrigation Wells* section in section D below) of this MRP~~. If Dischargers ~~obtain~~ use multiple ~~precise~~ nitrogen samples from a given irrigation well or wells, they must compute and report the average nitrogen concentration based on all samples taken from that well or wells. Records describing the method used to estimate the nitrogen concentration from sources of irrigation water must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request. Dischargers are encouraged to obtain a precise measurement of nitrogen concentration using portable measuring devices, or other methods.

Commented [TD10]: The revisions here reflect what is required in the ESJ Order, which are estimates – not precise measurements. However, we do believe it is appropriate to encourage dischargers to obtain more precise measurements.

b. Dischargers using an irrigation source for their ranch that is not located on their ranch property (e.g., sharing an irrigation well with a neighbor) are still responsible for obtaining an estimated ~~precise~~ nitrogen concentration from the primary source of irrigation water.

c. Dischargers must calculate and report a weighted average irrigation water nitrogen concentration. The weighted average is calculated using volume and concentration information from each water source.

d. The ~~following formula~~ equation can be used to compute the weighted average nitrate concentration of the irrigation water. Here, C1 represents the concentration of well 1, V1 represents the volume of well 1, C2 represents the concentration of well 2, etc.

e. ~~Dischargers must obtain sufficient samples to calculate the amount of nitrogen applied with the irrigation water to be used in determining compliance with nitrogen discharge targets and limits. At a minimum,~~ Dischargers are encouraged to ~~must~~ obtain a precise sample from each source of irrigation water once during the reporting period. Dischargers may obtain additional samples to increase the accuracy of their reporting and improve their ability to utilize irrigation water nitrogen in place of fertilizer nitrogen.

f. Dischargers must maintain records of all irrigation water sampling conducted and of all weighted average calculations performed. These records must be maintained in the Farm Plan and must be submitted upon request.

~~g. Details on the required frequency and methods for monitoring irrigation wells are included in the *Irrigation Wells* section in section D below.~~

12. Volume of irrigation water applied to the ranch.

a. Dischargers required to submit the INMP Summary report must measure ~~and report~~ or estimate the total volume of irrigation water applied to the ranch during the reporting period. Dischargers must estimate, and where possible are encouraged to measure the volume of irrigation water applied to each specific crop. Records describing the method used to measure the volume of irrigation water applied to the ranch and/or to estimate or measure the volume of irrigation water applied to each specific crop must be maintained in the Farm Plan and must be submitted to the Central Coast Water Board upon request.

Commented [TD11]: Estimating the volume of irrigation water applied is consistent with the ESJ Order.

Nitrogen Removed

$$Weighted\ Average\ Concentration = \frac{((C1 * V1) + (C2 * V2) + (C3 * V3) + \cdots)}{(V1 + V2 + V3 + \cdots)} \quad 13.$$

Nitrogen removed from the field, for each specific crop.

a. Dischargers must monitor and report the total amount of nitrogen removed from the field through harvest, sequestration, or other removal methods, **(R).**

R = RHARV + RSEQ + RCOVER + RTREAT + ROTHER.

b. **RHARV = Conversion Coefficient x Material Removed**

i. All Dischargers must monitor the total mass of each specific crop in pounds per acre removed from the field during the reporting period.

ii. To calculate the amount of nitrogen removed from the field, Dischargers must either use a conversion coefficient provided by the regional board in **Table MRP-1** or develop and use their own conversion coefficient. After the Central Coast Water Board has adopted more precise conversion coefficients, such conversion coefficients shall replace those as provided in **Table MRP-1**. Dischargers who elect to develop their own conversion coefficient must do so by obtaining a laboratory result from samples collected from their operation, following standard protocols approved by the Executive Officer, to determine the nitrogen concentration in the crop material. Dischargers must maintain any data collected and rationale used in determining their individual conversion coefficient in the Farm Plan. This information must be submitted to the Central Coast Water Board upon request.

Commented [TD12]: Revisions to the Draft Order provide a time schedule for adoption of more precise crop conversion coefficients to replace those in the MRP. The approach in the redline version of the Draft Order is consistent with the ESJ Order.

iii. After the Central Coast Water Board has adopted more precise conversion coefficients, Ffor crops that do not ~~yet~~ have approved conversion coefficients ~~in Table MRP-1~~, Dischargers must either select a conversion coefficient for a crop that is similar to their crop or develop their own conversion coefficient using the approved method described above. Dischargers must maintain records detailing how and why they selected a particular conversion coefficient for their crop and, if applicable, information on the method used to obtain their own conversion coefficient in the Farm Plan. These records must be submitted to the Central Coast Water Board upon request.

c. **RSEQ**

i. Dischargers with permanent or semi-permanent crops may determine the amount of nitrogen sequestered in their crops during the reporting year and ~~quantify and~~ report this as **RSEQ** for use in their nitrogen applied minus nitrogen removed reporting. Dischargers that account for sequestration through other methods may determine the amount of nitrogen sequestered during the reporting year and report this as **RSEQ**. Dischargers must maintain any data collected and rationale used in determining the amount of sequestered nitrogen in the Farm Plan. This information must be submitted to the Central Coast Water Board upon request.

d. **RTREAT**

i. Dischargers using treatment systems may monitor the inflow and outflow nitrate concentration and volume of their treatment systems and ~~quantify and~~ report this as **RTREAT** for use in their nitrogen applied minus nitrogen removed reporting. Dischargers must maintain any data collected and rationale used in determining the amount of nitrogen removed through treatment in the Farm Plan. This information must be submitted to the Central Coast Water Board upon request.

e. **Rcover**

i. Dischargers using cover crops may determine the amount of nitrogen sequestered in the cover crops during the reporting year and report this as Rcover for use in their nitrogen applied minus nitrogen removed reporting. Dischargers must maintain any data collected and rationale used in determining the amount of sequestered nitrogen in the cover crop in the Farm Plan. This information must be submitted to the Central Coast Water Board upon request.

f. **ROTHER**

i. If Dischargers remove nitrogen from their ranch in ways not ~~quantified~~ identified above, they may monitor this nitrogen removed and report this as **ROTHER** for use in their nitrogen applied minus nitrogen removed reporting. Dischargers must maintain any data collected and rationale used in determining any other methods of nitrogen removal in the Farm Plan. This information must be submitted to the Central Coast Water Board upon request.

Commented [TD13]: As noted previously, we have added an additional category of R for cover crops in the redline version of the Draft Order.

Irrigation Water

14. Crop evapotranspiration.

a. Dischargers must calculate and report the evapotranspiration for each specific crop. Acceptable methods include, but are not limited to, using reference evapotranspiration data from a local weather station (e.g., California Irrigation Management Information System (CIMIS)[4] or an on-farm station) with a crop coefficient conversion value, and direct measurement.

[4] CIMIS can be found online at https://cimis.water.ca.gov/

15. ~~Irrigation discharge to surface water and groundwater.~~

~~a. Dischargers must estimate and report the volume of water discharged through surface outflows, including tile drains, and the volume of water discharged to groundwater through percolation.~~

D. Groundwater Monitoring and Reporting

This section contains ~~four~~ ~~three~~ two types of monitoring and reporting related to groundwater quality: *On-Farm Domestic Wells*, ~~*Irrigation Wells*~~, and *Groundwater Quality Trends* that are required of all Dischargers ~~and *Ranch-Level Groundwater Discharge* that must be completed when required by the Executive Officer~~.

1. All groundwater monitoring data sampled to meet the minimum groundwater monitoring requirements of the Order must be submitted electronically to the State Water Board's GeoTracker database by the testing laboratory. Submitted data must include the ranch AGL, the well coordinates (latitude and longitude), the well name (i.e., Location Identifier (LOCID)/Field Point Name) that is consistently and repeatedly used to refer to the same well each time the well is sampled, and the well type (i.e., Field Point Class; PRIW for Domestic/Private Drinking Water Well or AGIR for Agricultural/Irrigation Well). It is recommended the well name be affixed to the well to eliminate confusion during sample collection and labeling and laboratory reporting.

On-Farm Domestic Wells

2. **Between March 1 and May 31 annually**, all Dischargers, regardless of what Groundwater Phase their ranch is in, must conduct sampling of all on-farm domestic drinking water supply wells (see definition in Attachment C). Dischargers must report monitoring results by **July 31 each year**.

If the nitrate concentration is below 8 mg/L nitrate+nitrite as N in three consecutive annual samples, Dischargers may conduct sampling every five years going forward.

Sampling may cease if a drinking water well is taken out of service and no longer provides drinking water, including where the well is taken out of service because sufficient replacement water is being supplied. The Discharger must keep any records (e.g., photos, bottled water receipts) establishing

Commented [TD14]: These two requirements are inconsistent with the ESJ Order and need to be removed.

Commented [TD15]: The added language here is consistent with the ESJ Order.

that the well is not used for drinking water.

3. Dischargers must collect samples at or near the well head (before the pressure tank and prior to any well head treatment). If this is not possible, the water sample must be collected from a sampling point as close to the pressure tank as possible, or from a cold-water spigot located before any filters or water treatment devices or systems.

4. At a minimum, samples must be analyzed for ~~total dissolved solids (TDS), general minerals (anions and cations), 1,2,3-trichloropropane (1,2,3-TCP), and~~ nitrate as nitrogen or nitrate + nitrite as nitrogen as specified in **Table MRP-2**. Dischargers are encouraged to also analyze for total dissolved solids (TDS), general minerals (anions and cations), and 1,2,3 trichloropropane (1,2,3 TCP).

Commented [TD16]: The ESJ Order encourages analysis of 1,2,3 TCP does not require that domestic well sampling for 1,2.3 TCP occur. Accordingly, it should not be a requirement.

5. Based on a well's location and well construction, one or more on-farm domestic wells may be appropriate to include in a groundwater trend monitoring program. In such cases, Dischargers ~~must~~ may supplement analytical requirements described in **Table MRP-2** with additional constituents of concern the Executive Officer has approved for a trend monitoring program.

Notification to On-Farm Domestic Well Users

6. Dischargers must provide well users with laboratory analytical results within **10 days** of receiving results from the laboratory. Dischargers must also provide notification of the most recent laboratory analytical results to any new well users (e.g., tenants and employees with access to the sampled well) within **10 days** whenever there is a change in the population using the well.

7. Notification of laboratory results to well users must be accompanied by a statement regarding health risks associated with consuming and/or cooking with well water containing nitrate in excess of the Maximum Contaminant Level (MCL) (10 mg/L nitrate [or nitrate plus nitrite] as nitrogen). In addition, the notification must include a statement indicating that boiling water should not occur. Notifications must be provided in Spanish as well as English as needed to sufficiently inform all well users.

8. Dischargers must update their Annual Compliance Form (ACF; see section F below) within **30 days** of receiving results from the laboratory to confirm the following: a. Well users have been provided with laboratory analytical results.
b. Well users have been provided with information regarding health risks associated with consuming and/or cooking with well water containing nitrate in excess of the MCL.

c. Well users have an alternate source of water for drinking and cooking if the sampled well contains nitrate in excess of the MCL.
d. If there has been a change in the population using the well in the past year (e.g., new tenants), confirm that new well users have been provided with the information and resources described

above.

Irrigation Wells

9. ~~Between the months specified below, Dischargers must conduct monitoring of the primary~~ irrigation ~~well located on their ranch. Dischargers must report monitoring results by **July 31 each year**.~~
~~a. Ranches in Groundwater Phase 1 areas must monitor all irrigation wells, as described below.~~
~~b. **March 1 to May 31, 2022 and 2023**, for ranches in Groundwater Phase 2 areas.~~
~~c. **March 1 to May 31, 2022, 2023, 2024, and 2025** for ranches in Groundwater Phase 3 areas.~~

~~10. Between the months specified below, Dischargers must conduct monitoring of all irrigation wells located on their ranch. Dischargers must report monitoring results by **July 31 each year**.~~
~~a. **March 1 to May 31, 2022**, and annually thereafter, for ranches in Groundwater Phase 1 areas.~~
~~b. **March 1 to May 31, 2024**, and annually thereafter, for ranches in Groundwater Phase 2 areas.~~
~~c. **March 1 to May 31, 2026**, and annually thereafter, for ranches in Groundwater Phase 3 areas.~~

~~11. At a minimum, samples must be analyzed for total dissolved solids (TDS), general minerals (anions and cations), and nitrate as nitrogen or nitrate + nitrite as nitrogen as specified in **Table MRP-3**.~~

12. Based on a well's location and construction, one or more irrigation wells may be appropriate to include in a groundwater quality trend monitoring program as required below. In such cases, Dischargers ~~must~~ may supplement analytical requirements noted in **Table MRP-3** with additional constituents of concern the Executive Officer has approved for a trend monitoring program.

Groundwater Quality Trends

Third-Party Cooperative Approach

13. An approved third-party representing Dischargers must develop and submit a regional groundwater trend monitoring and reporting work plan, by the dates and covering the areas specified below. The work plan must include a Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP). The work plan must be prepared by a qualified professional and designed to quantitatively evaluate groundwater quality trends and quantitatively assess the impacts of agricultural discharges on groundwater quality over time.
a. **September 1, 2023** for all groundwater basins with Groundwater Phase 1 areas;
b. **September 1, 2025** for all groundwater basins with Groundwater Phase 2 areas;
c. **September 1, 2027** for all other areas.

14. The work plan must include the following, at a minimum: a. Description of the geographic and hydrogeologic area in which the trend monitoring program will be established, including maps and

Commented [TD17]: For the reasons specified above, the irrigation well monitoring is duplicative and unnecessary.

cross-sections.
b. Rationale for a sufficiently representative monitoring well network to monitor discrete depth intervals with an emphasis on shallow or first encountered groundwater, including supporting soils, geologic, and hydrogeologic information such as cross-sections and groundwater depth and flow characteristics.
c. Location and construction details associated with proposed wells composing the monitoring network, including existing and new wells.
d. If applicable, a description of how data from existing monitoring networks will be incorporated into the groundwater trend monitoring program and how those data will be uploaded to GeoTracker.
e. Table showing proposed monitoring constituents that will be evaluated to assess changes in concentration over time. At a minimum, trend monitoring wells must be sampled in accordance with **Table MRP-4**.
f. Proposed protocol used to evaluate trends in groundwater quality data, including statistical methods and data depiction.
g. Proposed reporting schedule for water quality trend analysis.
h. Proposal for obtaining well completion reports and/or well driller's logs and maintaining such data.
i. SAP and QAPP (see Section G below).

15. If one or more wells from an ongoing, established non-agricultural monitoring program are incorporated into the trend monitoring network, monitoring data from these wells must also be uploaded to the GeoTracker database and must comply with GeoTracker EDF and EDD criteria and protocols. Incorporation of such data must occur as described in the work plan approved by the Executive Officer.

Groundwater Quality Trends – Individual Approach

16. Dischargers who elect to perform groundwater trend monitoring and reporting individually must submit an individual trend monitoring work plan, based on their ranch location, by the dates specified below. The work plan must be developed and certified by a qualified professional, include a SAP and QAPP, and describe how the ranch-level monitoring program will quantitatively evaluate groundwater quality trends over time and quantitatively assess the impacts of agricultural discharges on groundwater quality.
a. **September 1, 2023** for all groundwater basins with Groundwater Phase 1 areas;
b. **September 1, 2025** for all groundwater basins with Groundwater Phase 2 areas;
c. **September 1, 2027** for all other areas.

17. Dischargers who elect to perform groundwater trend monitoring and reporting individually must provide well completion reports (WCRs) to the Central Coast Water Board for all wells located on all enrolled parcels. WCRs must be uploaded to the GeoTracker database as a Bore Log File (i.e., GEO_BORE) in a PDF format.
a. **September 1, 2023** for all groundwater basins with Groundwater Phase 1 areas;
b. **September 1, 2025** for all groundwater basins with Groundwater Phase 2 areas;
c. **September 1, 2027** for all other areas.

18. Dischargers must enlist a qualified professional (e.g., hydrogeologist, geologist, or engineer) registered in California to develop and certify their work plan. The work plan must include, at a minimum:
a. Evaluation of well construction characteristics on all WCRs for determination of well suitability for use in trend monitoring.
b. Identification of specific wells for trend monitoring on the enrolled parcel, including the water-bearing zone monitored by each well. Determination of the wells used in trend monitoring must be justified.
c. Determination of the location(s) and well construction characteristics for one or more new purpose-built monitoring wells to be used in trend monitoring if existing wells are not adequate for long-term monitoring.
d. Determination of the statistical method that will be used for groundwater trend evaluation.
e. SAP and QAPP (see Section G below).

19. Dischargers must submit to the Central Coast Water Board a signed and dated document from the qualified professional who conducted activities described above in a format specified by the Executive Officer containing the following statement:

*I certify under penalty of law that I have used sound scientific and professional judgement to conduct the evaluation, and generate determinations and recommendations provided to [*name and AGL of grower*]. To the best of my knowledge and belief, information provided to [*name grower*] is true, accurate, and complete. I am aware that there are penalties for knowingly submitting false information. I am not responsible for any damages, loss, or liability arising from implementation of my determinations or recommendations by [*name of grower*] in a manner that is inconsistent with my determinations or recommendations for groundwater quality trend monitoring. This certification does not create liability for claims for environmental violations.*

20. Enrollees in the Order who do not have a well on their parcel, and do not choose to join a third party coalition for regional groundwater trend monitoring, must install a purpose-built monitoring well, or wells, as needed, to evaluate water quality trends in the shallowest water-bearing zone beneath their parcel.

21. **Quarterly**, Dischargers must monitor wells used in groundwater quality trend monitoring. Monitoring results must be uploaded by **January 31, April 30, July 31, October 31 each year.** At a minimum, groundwater quality trend monitoring wells must be sampled in accordance with **Table MRP-4**.

22. **By January 31 annually**, Dischargers must submit a trend evaluation report. The trend evaluation report must be uploaded to the GeoTracker database.

23. At a minimum, the trend evaluation report must include the following: a. For each well used in trend monitoring, figures showing concentration versus time for all constituents of concern.
b. Description of the statistical method used to evaluate water quality trends.

c. Discussion of the statistical trend analysis results as they pertain to farm management practice impacts on groundwater quality.

~~***Ranch-Level Groundwater Discharge***~~

~~24. When required by the Executive Officer based on groundwater quality data or exceedance of the nitrogen discharge targets or limits, Dischargers must conduct ranch-level groundwater discharge monitoring. Dischargers must submit a work plan for review by the Executive Officer prior to implementation. The work plan must be submitted within **90 days** of being required by the Executive Officer. Once approved, the work plan must be implemented. The work plan must meet the following minimum criteria: a. Be designed to quantify the Discharger's impact on groundwater quality;~~
~~b. Monitor the concentration of nitrate and other relevant constituents;~~
~~c. Monitor the volume of water that percolates through the soil;~~
~~d. Identify how the ranch-level groundwater discharge monitoring data will be used to asses and improve management practices;~~
~~e. Include a time schedule for implementation;~~
~~f. Result in compliance with the nitrogen discharge limits in the Order;~~
~~g. SAP and QAPP (see Section G below).~~

Commented [TD18]: Reasons for deletion of Ranch level groundwater discharger monitoring and reporting are provided in Exhibit 1 – legal and policy comments.

E. Surface Water Monitoring and Reporting

This section contains three types of monitoring and reporting related to surface water quality: *Surface Receiving Water Quality Trends* and *Follow-Up Surface Receiving Water* that are required of all Dischargers and *Ranch-Level Surface Discharge* that must be completed when required by the Executive Officer.

Surface Receiving Water Quality Trends

1. Surface receiving water refers to water flowing in creeks and other surface waters of the State. Surface receiving water monitoring and reporting must be conducted through either a cooperative monitoring program on behalf of Dischargers, or Dischargers may choose to conduct surface receiving water monitoring and reporting individually. Key monitoring and reporting requirements for surface receiving water monitoring are shown in **Table MRP-5** and **Table MRP-6**.

2. Dischargers must select a surface receiving water monitoring option (cooperative receiving water monitoring or individual receiving water monitoring) to comply with the surface receiving water monitoring requirements. Dischargers must identify the option selected in the operation eNOI. Dischargers that select the cooperative receiving water monitoring are also automatically electing to participate in the cooperative receiving water monitoring program's Enhanced Surface Water Follow-up Program.

3. Dischargers, either individually or as part of a cooperative program, must conduct surface receiving water monitoring and reporting to achieve the following:

a. Evaluate the impact of irrigated agricultural waste discharges on receiving waters;
b. Evaluate compliance with the numeric limits described in the Order;
c. Evaluate the status of receiving water quality, including whether water quality objectives are attained and beneficial uses are protected; d. Evaluate short-term patterns and long-term trends (five to ten years or more) in receiving water quality;
e. Evaluate water quality impacts of tile drain discharges from irrigated agricultural operations;
f. Evaluate water quality impacts of stormwater discharges from irrigated agricultural operations;
g. Evaluate the condition of existing perennial, intermittent, and ephemeral streams and riparian and wetland areas, including degradation resulting from erosion or irrigated agricultural discharges of waste;
h. Identify specific sources of water quality problems.

4. **By July 1, 2021**, Dischargers, either individually or as part of a cooperative program, must submit a surface receiving water work plan including a Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP; see Section G below). The SAP must be developed to describe how the proposed monitoring will achieve the objectives of the MRP and evaluate compliance with the Order. The SAP may propose alternative monitoring and reporting site locations, adjusted monitoring parameters, and other changes as necessary to assess the impacts of irrigated agricultural waste**d** discharges to receiving water. The Executive Officer must approve the SAP and QAPP prior to implementation.

5. Dischargers, either individually or as part of a cooperative program, must perform surface receiving water monitoring and reporting in accordance with the work plan, SAP, and QAPP approved by the Executive Officer.

6. The work plan must, at a minimum, include monitoring sites to evaluate waterbodies identified in **Table MRP-5**, unless otherwise approved by the Executive Officer. The SAP must include sites to evaluate receiving water quality impacts most directly resulting from areas of irrigated agricultural discharge (including areas receiving tile drain discharges). Site selection must take into consideration the existence of any long-term monitoring sites included in related monitoring programs (e.g., Central Coast Ambient Monitoring Program (CCAMP) and the existing cooperative monitoring program). Sites may be added or modified, subject to prior approval by the Executive Officer, to better assess the pollutant loading from individual sources or the impacts to receiving waters caused by individual discharges. Any modifications must consider sampling consistency for purposes of trend evaluation.

7. The work plan must, at a minimum, include the types of monitoring and evaluation parameters listed below and identified in **Table MRP-6**.
a. Flow monitoring;
b. Water quality (physical parameters, metals, nutrients, pesticides);
c. Toxicity (water and sediment);
d. Assessment of benthic invertebrates, physical habitat monitoring, ~~and Riparian Rapid Assessment Method (RipRAM) monitoring~~.

8. The work plan must include a schedule for sampling. Timing, duration, and frequency of monitoring must be based on the land use, complexity, hydrology, and size of the waterbody. Table MRP-6 includes minimum monitoring frequency and parameter lists. Agricultural parameters that are less common may be monitored less frequently. Modifications to the receiving water quality monitoring parameters, frequency, and schedule must be submitted for Executive Officer consideration and approval. At a minimum, the SAP schedule must consist of monthly monitoring of common agricultural parameters, including two major storm events during the wet season (October 1 – April 30).

9. Water column toxicity analyses must be conducted on 100% (undiluted) samples. At sites where persistent unresolved toxicity is found, the Executive Officer may require concurrent toxicity and chemical analyses and a Toxicity Identification Evaluation (TIE) to identify the individual discharges causing the toxicity.

10. Stormwater monitoring must be conducted within 18 hours of storm events, preferably including the first flush run-off event (see definition in Attachment C) that results in significant increase in stream flow. For the purposes of this MRP, a storm event is defined as precipitation producing onsite runoff (surface water flow) capable of creating significant ponding, erosion, or other water quality problems. A significant storm event will generally result in greater than a half-inch of rain within a 24-hour period.

11. **By January 1, April 1, July 1, and October 1 of each year**, Dischargers, either individually or as part of a cooperative program, must submit water quality monitoring data electronically to CEDEN, according to CEDEN submittal guidelines, or in a format specified by the Executive Officer. Each quarterly data submittal must be accompanied by an Exceedance Report, wherein exceedances of water quality objectives and relevant water quality limits in the Order are summarized.

12. **By July 1 annually**, Dischargers, either individually or as part of a cooperative program, must submit an Annual Report for the previous year of collected data, electronically, in a format specified by the Executive Officer. The Annual Report must include the following minimum elements: a. Signed transmittal letter;
b. Title page;
c. Table of contents; d. Executive summary;
e. Summary of Exceedance Reports submitted during the reporting period;
f. Monitoring objectives and design;
g. Monitoring site descriptions and rainfall records for the time period covered;
h. Location of monitoring sites and map(s);
i. Results of all analyses arranged in tabular form so that the required information is readily discernible;
j. Summary of water quality data for any sites monitored as part of related monitoring programs and used to evaluate receiving water as described in the SAP;
k. Discussion of data to clearly illustrate compliance with the Order, water quality standards, and surface water limits required by the Order, including watershed-level data analysis for each

hydrologic subarea in Table MRP-5 (for example data analysis and discussion for sub-watersheds 30510, 30530, etc.);
l. Discussion of short-term patterns and long-term trends in receiving water quality and beneficial use protection;
m. Evaluation of pesticide and toxicity analyses results, and recommendation of candidate sites for TIEs;
n. Sampling and analytical methods used;
o. Copy of chain-of-custody forms;
p. Field data sheets, signed laboratory reports, laboratory raw data;
q. Associated laboratory and field quality control samples results;
r. Summary of Quality Assurance Evaluation results;
s. The method used to obtain flow at each monitoring site during each monitoring event;
t. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date;
u. Potential follow-up actions to correct any observed exceedances of the surface water limits;
v. Conclusions.

Cooperative Monitoring Program and Enhanced Surface Water Follow-up Program

Commented [TD19]: The additional language here incorporates the redline revisions to the Draft Order for the alternative compliance approach to surface water.

1. Within 6 months of the effective date of this Order, the CMP shall provide to the Central Coast Water Board an initial watershed report for the watersheds identified in category 1 of Table C.5-1 that includes the following:

    a. Evaluation of applicable CMP data, USGS stream gage data as applicable, and other readily available water quality data.
    b. Summary of existing management practices, aggregated from the Annual Compliance Forms.
    c. Other publicly available data and information as determined appropriate by the CMP (e.g., agricultural commissioner data and reports).
    d. A summary of outreach efforts and grower participation in such outreach efforts to date.

2. Initial watershed reports that include the information identified in paragraph 16, subparagraphs a – d for category 2 watersheds identified in Table C.5-1 of the Order shall be due 1 one year from submittal of the initial watershed report for category 1 watersheds. For each subsequent category identified in Table C.5-1, initial watershed reports shall be due within one year from submittal of the previous category's report.

3. Within one year of submittal of an initial watershed report by the CMP for a specific watershed, and annually thereafter, the CMP shall prepare an Annual Watershed Report that evaluates the following:
    a. CMP water quality monitoring data.
    b. Available farm-level data related to nitrate in surface water runoff, sediment/turbidity,

flow/discharge, toxicity and pesticides.
c. Changes in water quality at CMP sites.
d. Changes in management practices based on information contained in updated ACFs.
e. Additional narrative information based on CMP's best professional judgment.
f. Participation and outreach data and statistics
g. Upstream monitoring data, when identified as applicable or appropriate by CMP.

4. As part of the Annual Watershed Report, the CMP shall include a Cooperative Follow-Up Surface Receiving Water Implementation Work Plan for pollutants in the watershed that remain of concern. The Cooperative Follow-Up Work Plan must identify CMP follow-up actions such as additional outreach, education, and additional management practices that may be implemented (individually or cooperatively) implementation, and, where applicable for pollutant source identification and abatement, additional surface receiving water monitoring locations.

Individual Follow-Up Surface Receiving Water

13. Dischargers, ~~either individually or as party of a~~ that are not part of the cooperative program, must develop a follow-up surface receiving water implementation work plan to achieve the following:
a. Identify and abate source of water quality impacts;
b. Evaluate the impact of irrigated agricultural waste discharges on receiving waters;
c. Evaluate compliance with the numeric limits described in the Order;

d. Identify follow-up actions, including outreach, education, additional monitoring and reporting, and management practice implementation that will be implemented to achieve compliance with the numeric limits described in the Order.

14. The work plan must be submitted by the dates specified below, based on the ranch's Surface Water Priority Area: a. **March 1, 2022** for Surface Water Priority 1 areas;
b. **March 1, 2023** for Surface Water Priority 2 areas;
c. **March 1, 2024** for Surface Water Priority 3 areas;
d. **March 1, 2025** for Surface Water Priority 4 areas.

15. The work plan must include the following minimum components:

a. Description of implementation measures that will be taken to reduce the discharge of relevant constituents and comply with the limits established in the Order.

b. Interim quantifiable milestones to confirm progress is being made to reduce the discharge of relevant constituents and achieved the limits established in the Order, consistent with their time schedule.

c. Consideration of the level of water quality impairment identified through surface receiving water monitoring. Work plans for areas with persistent exceedances of the surface water limits in the Order must identify follow-up actions to restore the degraded areas (e.g., outreach, education, management practice implementation) and additional surface receiving water monitoring locations for pollutant source identification and abatement. Work plans for areas that are already achieving the surface water limits in the Order must identify actions to be taken to protect the high-quality areas (e.g., outreach and education).

d. Where appropriate based on water quality data, follow-up monitoring sites to further evaluate the waterbody(s) specified by the Executive Officer. The work plan must include sites to evaluate receiving water quality impacts most directly resulting from areas of irrigated agricultural discharge (including areas receiving tile drain discharges). Site selection must take into consideration the existence of any long-term monitoring sites included in related monitoring programs (e.g., CCAMP and the existing cooperative monitoring program). Sites may be added or modified, subject to prior approval by the Executive Officer, to better assess the pollutant loading from individual sources or the impacts to receiving waters caused by individual discharges.

e. SAP and QAPP (see Section G below). The SAP must be developed to describe how the proposed monitoring will achieve the objectives of the MRP, identify additional follow-up monitoring sites upstream of observed exceedances to identify sources of the exceedances, and evaluate compliance with the limits established in the Order

16. The parameters to be monitored through follow-up monitoring may vary based on the water quality exceedances observed at downstream sites through the surface receiving water trend monitoring. The work plan must, at a minimum, include the types of monitoring and evaluation of parameters identified by the Executive Officer as requiring follow-up monitoring, such as the parameters listed below and identified in **Table MRP-6**.
a. Flow monitoring;
b. Water quality (physical parameters, metals, nutrients, pesticides);
c. Toxicity (water and sediment);

17. The work plan must include a schedule for sampling. Timing, duration, and frequency of monitoring must be based on the land use, complexity, hydrology, and size of the waterbody. **Table MRP-6** includes minimum monitoring frequency for parameters requiring follow-up monitoring by the Executive Officer. Agricultural parameters that are less common may be monitored less frequently. Modifications to the follow-up receiving water quality monitoring parameters, frequency, and schedule may be submitted for Executive Officer consideration and approval. At a minimum, the work plan schedule must consist of monthly monitoring of common agricultural parameters, including two major storm events during the wet season (October 1 – April 30).

18. If water column toxicity analyses must be conducted to comply with follow-up monitoring requirement, the analyses must be performed on 100% (undiluted) samples. At sites where persistent unresolved toxicity is found, the Executive Officer may require concurrent toxicity and

chemical analyses and a TIE to identify the individual discharges causing the toxicity.

19. Stormwater monitoring must be conducted within 18 hours of storm events, preferably including the first flush run-off event (see definition in Attachment C) that results in significant increase in stream flow. For the purposes of this MRP, a storm event is defined as precipitation producing onsite runoff (surface water flow) capable of creating significant ponding, erosion, or other water quality problems. A significant storm event will generally result in greater than half-inch of rain within a 24-hour period.

20. **By January 1, April 1, July 1, and October 1 of each year**, Dischargers~~, either individually or~~ that are not ~~as~~ part of ~~athe~~ cooperative monitoring program, must submit follow-up surface receiving water quality monitoring data electronically to CEDEN, according to CEDEN submittal guidelines, or in a format specified by the Executive Officer. Each quarterly data submittal must be accompanied by an Exceedance Report, wherein exceedances of water quality objectives and relevant water quality limits in the Order are summarized.

21. **By July 1 annually**, Dischargers~~, either individually or as part of a cooperative program,~~ that are not part of the cooperative monitoring program must submit an Annual Report, electronically, in a format specified by the Executive Officer. The Annual Report must include the following minimum elements:
a. Signed transmittal letter;
b. Title page;
c. Table of contents;
d. Executive summary;
e. Summary of Exceedance Reports submitted during the reporting period;
f. Monitoring objectives and design;
g. Monitoring site descriptions and rainfall records for the time period covered;
h. Location of monitoring sites and map(s);
i. Results of all analyses arranged in tabular form so that the required information is readily discernible;
j. Summary of water quality data for any sites monitored as part of related monitoring programs and used to evaluate receiving water as described in the work plan;
k. Discussion of data to clearly illustrate compliance with the Order, water quality standards, and surface water limits required by the Order;
l. Discussion of specific information about the identified sources of water quality impairment;
m. Discussion of management practice implementation and other follow-up activities performed to correct the persistent water quality impairment;
n. Sampling and analytical methods used;
o. Copy of chain-of-custody forms;
p. Field data sheets, signed laboratory reports, laboratory raw data;
q. Associated laboratory and field quality control samples results;
r. Summary of Quality Assurance Evaluation results;
s. The method used to obtain flow at each monitoring site during each monitoring event;

t. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID

and date;
u. Conclusions.

Ranch-Level Surface Discharge

22. When required by the Executive Officer, Dischargers that are not part of the Cooperative Monitoring Program must conduct ranch-level surface discharge monitoring and reporting to achieve the following. Monitoring and reporting efforts, including planning, must be explicitly designed and implemented to achieve these goals.
a. Assess their contribution to exceedances of applicable surface water quality limits, including concentration and load for all applicable parameters in their discharge;
b. Evaluate effects of their discharge on receiving water quality and beneficial uses;
c. Evaluate compliance with applicable surface water limits.

23. **Within 90 days** of being required to conduct individual surface discharge monitoring, Dischargers that are not part of the Cooperative Monitoring Program must submit a ranch-level surface discharge work plan, to the Executive Officer for review prior to implementation. The work plan must be designed to monitor individual discharges of irrigation water and stormwater that leave the ranch from an outfall location, including tile drain discharge points. Section G includes more information on the required elements of the SAP and QAPP.

24. **Within 90 days** of receiving Executive Officer approval, or in accordance with an alternate schedule approved in the work plan, the work plan must be implemented.

25. Dischargers that are not part of the Cooperative Monitoring Program must select monitoring sites that characterize both irrigation and stormwater discharges. For irrigation discharge, Dischargers that are not part of the Cooperative Monitoring Program must select monitoring points to characterize at least 80 percent of the estimated maximum irrigation discharge volume, based on the typical discharge patterns of the ranch, and must include points of tailwater and tile drain (if present) discharges. The SAP must be designed such that monitoring must occurs when it is highly probable that the irrigation discharge volume is the greatest during an irrigation event. Stormwater discharge sites must be selected to characterize the majority of stormwater discharge and must include first-flush monitoring. All selected monitoring sites must characterize discharge from the required farm/ranch, i.e., the discharge is not comingled with discharge from adjacent farms.

26. Dischargers that are not part of the Cooperative Monitoring Program must conduct monitoring for all parameters necessary to achieve the goals described for individual discharge monitoring.

27. Analytical methods, maximum practical quantitation limits (PQL), and reporting limits (RL) must be consistent with those outlined in Section G, or as approved by the Executive Officer.

28. Individual surface discharge sampling must occur at each site a minimum of four times per year,

with one sample drawn during each of the following calendar quarters: **January to March**, **April to June**, **July to September**, **October to December**, or as approved by the Executive Officer.

29. **By March 1 and September 1 of each year**, Dischargers that are not part of the Cooperative Monitoring Program must submit individual surface discharge monitoring data and information. The information must be submitted electronically and must contain the items listed below, unless otherwise approved by the Executive Officer.

a. All data and information from monitoring occurring in the preceding two calendar quarters and data not yet reported on previous semi-annual reports.
b. Data and Exceedance Report, in a tabular format, showing all data results and identifying any exceedances of water quality objectives and applicable surface water limits required by the Order, for each parameter and each monitoring event.
c. Electronic laboratory data i. All reports of results must contain the ranch name and Global ID, site name(s), project contact, and date.
ii. Electronic laboratory data reports of chemical results must include analytical results, as well as associated quality assurance data including method detection limits, reporting limits, matrix spikes, matrix spike duplicates, laboratory blanks, and other quality assurance results required by the analysis method.
iii. Electronic laboratory data reports of toxicity results shall include summary results comparable to those required in a CEDEN file delivery, including test and control results. For each test result, the mean, associated control performance, calculated percent of control, statistical test results and determination of toxicity, must be included. Test results must specify the control ID used to calculate statistical outcomes.
iv. Field data results, including temperature, pH, conductivity, turbidity and flow measurements, any field duplicates or blanks, and field observations. v. Calculations of un-ionized ammonia concentrations (based on total ammonia value and field measurements for pH and water temperature).
vi. Calculations of total flow and pollutant loading (for nitrate, pesticides if sampled, total ammonia, and turbidity) (include formulas);

d. Location of sampling sites and map(s);
e. Sampling and analytical methods used;
f. Specify the method used to obtain flow at each monitoring site during each monitoring event;
g. Photos obtained from all monitoring sites, clearly labeled with location and date;
h. Sample chain-of-custody forms do not need to be submitted but must be made available to Central Coast Water Board staff, upon request.

F. Annual Compliance Form (ACF)

1. **By March 1, 2021~~1~~2, and annually thereafter by March 1**, all Dischargers that are not part of the Cooperative Monitoring Program must submit an ACF electronically, in a format specified by the Executive Officer. The ACF includes, but is not limited to, the items listed below.

a. Irrigation, stormwater, and tile drain discharge characteristics (e.g., number of discharge points,

estimated flow and volume, and number of tailwater days).

b. Status of Farm Plan development and implementation.

c. Identification of specific water quality management practices implemented and assessed on the ranch to reduce water quality impacts, including:
i. Irrigation management practices;
ii. Nutrient management practices;
iii. Salinity management practices;
iv. Pesticide management practices;
v. Sediment and erosion management practices; and,
vi. Stormwater management practices.; and
~~vii. Riparian and wetland area management practices.~~

d. Reporting on the Sediment and Erosion Management Plan (SEMP), if applicable.
i. Confirmation that sediment and erosion control measures (e.g., sediment basins) are properly designed and maintained; and
ii. Where applicable, confirmation that the SEMP has been developed by a qualified professional.

~~e. Reporting on the Riparian Area Management Plan (RAMP). i. Current setback width, in feet;~~
~~ii. Current total vegetative cover, in percent;~~
~~iii. Current vegetative cover by type, in percent (trees, shrubs, grasses, non-vegetated);~~
~~iv. Digital map of farm and setback boundaries;~~
~~v. Compliance pathway selection if ranch is located in a Riparian Priority area;~~
~~vi. When the Cooperative Approach compliance pathway is selected, membership status in the cooperative.~~
~~vii. When the On-Farm Setback compliance pathway is selected, status of achieving success the success criteria in **Table MRP-7**.~~
~~viii. When the Rapid Assessment Method compliance pathway is selected, RipRAM or CRAM results, to be compared with the appropriate reference sites and scores shown in **Table MRP-8**.~~
~~ix. When the Alternative Proposal compliance pathway is selected, status of implementing approved work plan and achieving approved success criteria.~~
~~x. See below for details on reporting due dates.~~

Commented [TD20]: See Exhibit 1 – Legal and Policy Comments.

f. Reporting on water quality and management practice education obtained.

g. Status of drinking water notification to well users.

~~***Riparian Setback Monitoring and Reporting***~~

~~2. The Order establishes four compliance pathways for Dischargers to select from to comply with the riparian setback requirements. Monitoring and reporting dates for each of the compliance pathways are included below.~~

Cooperative Approach Compliance Pathway

3. By the date specified below, the third-party representing Dischargers who selected the Cooperative Approach compliance pathway must submit the Cooperative Watershed Restoration Plan (CWRP) to the Executive Officer.
a. **March 1, 2023** for Riparian Priority 1 areas;
b. **March 1, 2024** for Riparian Priority 2 areas;
c. **March 1, 2025** for Riparian Priority 3 areas;
d. **March 1, 2026** for Riparian Priority 4 areas.

4. Upon approval of the CWRP or by the date specified below, the third-party representing Dischargers who selected the Cooperative Approach compliance pathway must begin implementation of an approved CWRP. a. **March 1, 2025** for Riparian Priority 1 areas;
b. **March 1, 2026** for Riparian Priority 2 areas;
c. **March 1, 2027** for Riparian Priority 3 areas;
d. **March 1, 2028** for Riparian Priority 4 areas.

5. **By March 1 following the approval of the CWRP, and by March 1 annually thereafter,** the third-party representing Dischargers who selected the Cooperative Approach compliance pathway must submit an annual report that details the status of identifying and implementing approved restoration projects and their progress toward meeting the approved success criteria. The contents of the annual report must be outlined in the approved CWRP.

On-Farm Setback Compliance Pathway

6. By the date specified below, Dischargers who selected the On-Farm Setback compliance pathway and whose setback width and vegetation do not achieve the riparian setback requirements in the Order must update their Riparian Area Management Plan (RAMP) to identify measures and practices that will be implemented to achieve the riparian setback requirements and success criteria in **Table MRP-7** and **Table MRP-8**.
a. **March 1, 2022** for Riparian Priority 1 areas;
b. **March 1, 2023** for Riparian Priority 2 areas;
c. **March 1, 2024** for Riparian Priority 3 areas;
d. **March 1, 2025** for Riparian Priority 4 areas.

Rapid Assessment Method Compliance Pathway

7. Dischargers who selected the Rapid Assessment Method pathway must have Riparian Rapid Assessment Method (RipRAM) assessments performed to confirm compliance with the minimum reference site score of **69**. The RipRAM assessment must be conducted by a RipRAM Practitioner who has completed the required training.

8. By the date specified below, Dischargers who selected the Rapid Assessment Method

compliance pathway must have a RipRAM assessment performed for the existing riparian areas on their ranch and report the results in the ACF. Dischargers whose RipRAM score does not achieve the minimum reference site score of **69** must update their RAMP to identify measures and practices that will be implemented to achieve the minimum score.

a. **March 1, 2022** for Riparian Priority 1 areas;
b. **March 1, 2023** for Riparian Priority 2 areas;
c. **March 1, 2024** for Riparian Priority 3 areas;
d. **March 1, 2025** for Riparian Priority 4 areas.

9. By the date specified below, Dischargers who selected the Rapid Assessment Method compliance pathway must perform an additional RipRAM analysis and report the results in the ACF. If their RipRAM score does not achieve the minimum score of **69**, they must engage in adaptive management to achieve the minimum score within 3 years.
a. **March 1, 2027** for Riparian Priority 1 areas;
b. **March 1, 2028** for Riparian Priority 2 areas;
c. **March 1, 2029** for Riparian Priority 3 areas;
d. **March 1, 2030** for Riparian Priority 4 areas.

10. By the date specified below, Dischargers who selected the Rapid Assessment Method compliance pathway must perform an additional RipRAM analysis and report the results in the ACF to confirm that the site has achieved the minimum score of **69**.
a. **March 1, 2030** for Riparian Priority 1 areas;
b. **March 1, 2031** for Riparian Priority 2 areas;
c. **March 1, 2032** for Riparian Priority 3 areas;
d. **March 1, 2033** for Riparian Priority 4 areas.

Alternative Proposal Compliance Pathway

11. By the date specified below, Dischargers who selected the Alternative Proposal compliance pathway must submit a work plan to the Executive Officer for review prior to implementation. The work plan must include success criteria, measures that will be implemented to achieve the success criteria, and ranch-level surface discharge monitoring and reporting as described in section E. Once approved, the work plan must be implemented.
a. **March 1, 2022** for Riparian Priority 1 areas;
b. **March 1, 2023** for Riparian Priority 2 areas;
c. **March 1, 2024** for Riparian Priority 3 areas;
d. **March 1, 2025** for Riparian Priority 4 areas.

12. Upon approval of the work plan or by the date specified below, Dischargers who selected the Alternative Proposal compliance pathway must begin implementation of an approved work plan and must update their RAMP to incorporate their approved work plan.
a. **March 1, 2024** for Riparian Priority 1 areas;
b. **March 1, 2025** for Riparian Priority 2 areas;

~~c. March 1, 2026 for Riparian Priority 3 areas;~~
~~d. March 1, 2027 for Riparian Priority 4 areas.~~

G. Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP)

1. The SAP must include the following minimum components as applicable depending on the monitoring requirement:

a. Monitoring strategy to achieve objectives of the Order and MRP;
b. Map and Global Positioning System (GPS) coordinates of monitoring sites (e.g., well, receiving water locations, outfall locations etc.);
c. Monitoring parameters;
d. Monitoring schedule, including description and frequencies of monitoring events;
e. Identification of beneficial uses and applicable water quality standards (with the following as appropriate for surface water monitoring); i. Identification of known water quality impairments and impaired waterbodies per the most recent USEPA approved Clean Water Act 303(d) List of Impaired Waterbodies (List of Impaired Waterbodies);
ii. Identification of applicable Total Maximum Daily Loads (TMDLs);

f. Sample collection and handling procedures (e.g., preservation, storage, transport, holding times, etc.);
g. Chain of custody procedures;
h. Quality Assurance and Quality Control (QA/QC) sampling and analysis criteria and procedures;
i. Data management and reporting procedures;
j. Description of data analytical methods, specifications and limits (e.g., PQL and RL).

2. The QAPP must include site-specific information, project organization and responsibilities, and quality assurance components of the MRP. The QAPP must also include the laboratory and field requirements to be used for analysis and data evaluation. The QAPP must contain adequate detail for project and Water Board staff to identify and assess the technical and quality objectives, measurement and data acquisition methods, and limitations of the data generated under the monitoring program. All sampling and laboratory methodologies and QAPP content must be consistent with USEPA methods. Following USEPA guidelines,Following USEPA guidelines,Following USEPA guidelines,

5 USEPA. 2001 (2006) USEPA Requirements for Quality Assurance Project Plans (QA/R-5) Office of Environmental Information, Washington, D.C. USEPA QA/R-5

a. Project Management: Address basic project management, including the project history and objectives, roles and responsibilities of the participants, and other aspects.
b. Data Generation and Acquisition: Address all aspects of project design and implementation. Implementation of these elements ensures that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and quality control activities are employed and are properly documented. Quality control requirements are applicable to all the constituents sampled as part of the MRP, as described in the appropriate method.
c. Assessment and Oversight: Address the activities for assessing the effectiveness of the

implementation of the project and associated quality assurance (QA) and quality control (QC) activities. The purpose of the assessment is to provide project oversight that will ensure that the QAPP is implemented as prescribed.
e. Data Validation and Usability: Address the quality assurance activities that occur after the data collection, laboratory analysis and data generation phase of the project is completed. Implementation of these elements ensures that the data conform to the specified criteria, thus achieving the MRP objectives. The Executive Officer may conduct an audit of contracted laboratories at any time in order to evaluate compliance with the SAP and QAPP.

3. The SAP and QAPP, and any proposed revisions, are subject to approval by the Executive Officer. The Executive Officer may also revise the SAP, including adding, removing, or changing monitoring site locations, changing monitoring parameters, and other changes as necessary to assess the impacts of irrigated agricultural discharges on water quality.

Tables for Monitoring and Reporting Requirements

Table related to Section C: Irrigation and Nutrient Management Plan (INMP) Monitoring and Reporting

Crop	Conversion Coefficient	Crop	Conversion Coefficient
Alfalfa - Hay	**0.03115**	Lemons	**0.00154**
Alfalfa - Silage	**0.01200**	Lettuce, Baby	**0.00376**
Apples	**0.00050**	Lettuce, Iceberg	**0.00132**
Apricots	**0.00280**	Lettuce, Romaine	**0.00181**
Asparagus	**0.00293**	Melon, Cantaloupe	**0.00240**
Avocados	**0.00220**	Melon, Watermelon	**0.00070**
Barley - Grain	**0.01680**	Mixed Greens	**0.00405**
Barley - Straw	**0.00770**	Mizuna	**0.00405**
Beans, dry - Blackeye	**0.03650**	Oat Hay	**0.01085**
Beans, dry - Garbanzo	**0.03360**	Olives	**0.00314**
Beans, dry - Lima	**0.03615**	Onions, dry	**0.00197**
Beans, green (snap beans)	**0.00289**	Oranges	**0.00150**
Broccoli	**0.00460**	Peaches	**0.00113**
Brussels Sprouts	**0.00649**	Pears	**0.00065**
Cabbage Green	**0.00218**	Peppers, Bell	**0.00185**
Cabbage Red	**0.00224**	Pistachios	**0.02800**
Carrots	**0.00160**	Plums	**0.00142**
Cauliflower	**0.00288**	Potatoes	**0.00310**
Celery	**0.00120**	Pumpkin	**0.00368**
Cherries - Sweet	**0.00220**	Ryegrass, Perennial - Hay	**0.02745**
Cilantro	**0.00605**	Safflower	**0.02840**
Corn - Grain	**0.01200**	Spinach, Bunch	**0.00371**
Corn - Silage	**0.00378**	Spinach, Clip	**0.00427**
Corn - Sweet	**0.003585**	Spring Mix	**0.00405**
Cucumbers	**0.00108**	Squash, Winter	**0.001835**
Figs	**0.00127**	Strawberry	**0.00133**
Garlic	**0.00760**	Tangerines	**0.00127**
Grapefruit	**0.00150**	Tomatoes, Fresh Market	**0.00130**
Grapes - Table	**0.00113**	Walnuts, English	**0.01590**
Grapes - Wine	**0.00131**	Wheat, Common - Grain	**0.00690**
Kale, Baby	**0.00504**		

Table MRP-1. Nitrogen Removal Conversion Coefficients

Commented [TD21]: The conversion of the Tables from pdf to word has corrupted the tables and made them difficult to revise. Please note that the Tables will need to be revised to be consistent with the revisions identified above. But we are unable to show suggested revisions for several of the tables below.

Commented [TD22]: After more precise crop conversion coefficients are adopted, they will replace the values provided in this table.

Note: Refer to Attachment A for a discussion of the source of these coefficients.

Tables related to Section D: Groundwater Monitoring and Reporting

Table MRP-2. On-Farm Domestic Drinking Water Supply Well Monitoring Constituents and

Parameter	RL[2]
pH	0.1

Reporting Due Date

[1]The MRP allows analysis of "nitrate plus nitrite" to represent nitrate concentrations (as N). The "nitrate plus nitrite" analysis allows for extended laboratory holding times and relieves the Discharger of meeting the short holding time required for nitrate.
[2]RL – Reporting Limit or level of quantification defined as the level that can be reliably detected and quantified within acceptable limits of precision and bias for a given method.
[3]Dischargers may use alternative analytical methods approved by USEPA after obtaining Executive Officer approval.
[4]General chemistry parameters (major cations and anions) represent geochemistry of water bearing zone and assist in evaluating quality assurance/quality control of groundwater monitoring and laboratory analysis.

Parameter	RL[2]
pH	0.1

Table MRP-3. Irrigation Well Monitoring Constituents and Reporting Due Date

[1]The MRP allows analysis of "nitrate plus nitrite" to represent nitrate concentrations (as N). The "nitrate plus nitrite" analysis allows for extended laboratory holding times and relieves the Discharger of meeting the short holding time required for nitrate.
[2]RL – Reporting Limit or level of quantification defined as the level that can be reliably detected and quantified within acceptable limits of precision and bias for a given method.
[3]Dischargers may use alternative analytical methods approved by USEPA after obtaining Executive Officer approval.
[4]General chemistry parameters (major cations and anions) represent geochemistry of water bearing zone and assist in evaluating quality assurance/quality control of groundwater monitoring and laboratory analysis.

Parameter	RL2
pH	0.1

Table MRP-4. Groundwater Trend Monitoring Constituents and Reporting Due Dates

1The MRP allows analysis of "nitrate plus nitrite" to represent nitrate concentrations (as N). The "nitrate plus nitrite" analysis allows for extended laboratory holding times and relieves the Discharger of meeting the short holding time required for nitrate.
2RL – Reporting Limit or level of quantification defined as the level that can be reliably detected and quantified within acceptable limits of precision and bias for a given method.
3Dischargers may use alternative analytical methods approved by USEPA after obtaining Executive Officer approval.
4General chemistry parameters (major cations and anions) represent geochemistry of water bearing zone and assist in evaluating quality assurance/quality control of groundwater monitoring and laboratory analysis.

Tables related to Section E: Surface Water Monitoring and Reporting

Hydrologic SubArea	Waterbody Name	Hydrologic SubArea	Waterbody Name
30510	Pajaro River	30920	Quail Creek
30510	Salsipuedes Creek	30920	Salinas Reclamation Canal
30510	Watsonville Slough	31022	Chorro Creek
30510	Watsonville Creek	31023	Los Osos Creek
30510	Beach Road Ditch	31023	Warden Creek
30530	Carnadero Creek	31024	San Luis Obispo Creek
30530	Furlong Creek	31024	Prefumo Creek
30530	Llagas Creek	31031	Arroyo Grande Creek
30530	Miller's Canal	31031	Los Berros Creek
30530	San Juan Creek	31210	Bradley Canyon Creek
30530	Tesquisquita Slough	31210	Bradley Channel
30600	Moro Cojo Slough	31210	Green Valley Creek
30910	Alisal Slough	31210	Main Street Canal
30910	Blanco Drain	31210	Orcutt Solomon Creek
30910	Old Salinas River	31210	Oso Flaco Creek
30910	Salinas River (below Gonzales Rd.)	31210	Little Oso Flaco Creek
30920	Salinas River (above Gonzales Rd. and below Nacimiento R.)	31210	Santa Maria River
30910	Santa Rita Creek	31310	San Antonio Creek
30910	Tembladero Slough	31410	Santa Ynez River
30920	Alisal Creek	31531	Bell Creek
30920	Chualar Creek	31531	Glenn Annie Creek
30920	Espinosa Slough	31531	Los Carneros Creek
30920	Gabilan Creek	31534	Arroyo Paredon Creek
30920	Natividad Creek	31534	Franklin Creek

Table MRP-5. Major Waterbodies in Agricultural Areas

Note: At a minimum, monitoring sites must be included for these waterbodies in agricultural areas, unless otherwise approved by the Executive Officer. Monitoring sites may be proposed for addition or modification to better assess the impacts of waste discharges from irrigated lands to surface water. These waterbodies are included because they are listed waterbodies on the most recent USEPA approved 303(d) List of Impaired Waters that are associated with areas of agricultural discharge. The list is subject to change based on most recent USEPA approved 303(d) List of Impaired Waters and/or other changes approved by the Executive Officer.

Table MRP-6. Surface Receiving Water Quality Monitoring Parameters

Parameters and Tests	RL3	Monitoring Frequency[1]
Photo Monitoring Upstream and downstream photographs at monitoring location		With every monitoring event
RipRAM RipRAM assessment and score at each monitoring location collected in accordance with the CCWG SOP		Annually beginning the first full calendar year following adoption of the Agricultural Order
Bioassessment Benthic invertebrate and associated physical habitat assessment collected in accordance with the SWAMP SOP. Data reported with CSCI numeric values for each monitoring location on Santa Ynez, Salinas, Santa Maria and Pajaro Rivers		Every five years beginning in 2023 from April-June
WATER COLUMN SAMPLING		
Physical Parameters and General Chemistry		
Flow (field measure) (CFS) following SWAMP field SOP[9]	0.25	Monthly, including 2 stormwater events
pH (field measure)	0.1	"
Parameters and Tests	**RL3**	**Monitoring Frequency[1]**
Electrical Conductivity (field measure) (µS/cm)	2.5	"
Dissolved Oxygen (field measure) (mg/L)	0.1	"
Temperature (field measure) (°C)	0.1	"
Turbidity (NTU)	0.5	"
Total Dissolved Solids (mg/L)	10	"
Total Suspended Solids (mg/L)	0.5	"
Total Alkalinity (as CaCO3)	EPA 310.1 or 310.2	"
	0.05	"
	0.02	"
Calcium	0.1	"
Magnesium	0.1	"
Sodium	1.0	

[1]Minimum monitoring frequency may be used as a guide for developing alternative Sampling and Analysis Plans implemented by individual growers.
[2]Pesticide list may be modified based on specific pesticide use in Central Coast Region. Analytes on this list must be reported, at a minimum.
[3] Reporting Limit, taken from SWAMP where applicable.
[4] Holmgren, Meyer, Cheney and Daniels. 1993. Cadmium, Lead, Zinc, Copper and Nickel in Agricultural Soils of the United States. J. of Environ. Quality 22:335-348.
[5]Sax and Lewis, ed. 1987. Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987. Zinc arsenate is an insecticide.
[6]Boron is applied directly or as a component of fertilizers as a plant nutrient.
[7]Madramootoo, Johnston, Willardson, eds. 1997. Management of Agricultural Drainage Water Quality. International Commission on Irrigation and Drainage. U.N. FAO. SBN 92-6-104058.3.
[8] Include Nonylphenol. Phenols are breakdown products of herbicides and pesticides. Phenols can be directly toxic and cause endocrine disruption. Requirement may be removed or modified based on 2019-2020 monitoring results.
[9]See SWAMP field measures SOP, p. 17
mg/L – milligrams per liter; ug/L – micrograms per liter; ug/kg – micrograms per kilogram; NTU – Nephelometric Turbidity Units; CFS – cubic feet per second.

Tables related to Section F: ACF - Riparian Setback Monitoring and Reporting

Vegetative Cover	Invasive Species Cover	Bare Ground	Years Without Supplemental Irrigation[1]
> 75%	< 5%	< 20%	2

Table MRP-7. On-Farm Setback Success Criteria for Riparian Areas

[1]Riparian vegetation must be maintained to the extent that success criteria will be achieved for two consecutive years without irrigation.

Hydrophytic Vegetative Cover	Emergent Vegetative Cover	Invasive Species Cover
> 75%	> 65%	<10%

Table MRP-8. On-Farm Setback Success Criteria for Wetland Areas

Summary of General Reporting Periods and Due Dates

General Requirements

Ranches Required	Annual Compliance Form Monitoring	Annual Compliance Form Due Date

Table MRP-9. Annual Compliance Form

Groundwater Requirements

Ranches Required	TNA Report Monitoring Period	~~Primary Irrigation Well Monitoring Period~~	TNA Report Due Date	~~Primary Irrigation Well Reporting Due Date~~
All ranches required under Ag Order 3.0	Jan 1 – Dec 31 2020 – 2021	-	Mar 1 2021 – 2022	-
Groundwater Phase 1	-	-	-	
Groundwater Phase 2	Jan 1 – Dec 31 2022 – 2023	~~Mar 1 – May 31 2022–2023~~	Mar 1 2023 – 2024	~~July 31 2022 – 2023~~
Groundwater Phase 3	Jan 1 – Dec 31 2022 – 2025	~~Mar 1 – May 31 2022 – 2025~~	Mar 1, 2023 – 2026	~~July 31 2022 – 2025~~

Formatted Table

Ranches Required	INMP Summary Report Monitoring Period	~~All Irrigation Wells Monitoring Period~~	INMP Summary Report Due Date	~~All Irrigation Wells Reporting Due Date~~
Groundwater Phase 1	Jan 1 – Dec 31, 2022 Annually thereafter	~~Mar 1 – May 31, 2022 Annually thereafter~~	Mar 1, 2023 Annually thereafter	~~July 31, 2022 Annually thereafter~~
Groundwater Phase 2	Jan 1 – Dec 31, 2024 Annually thereafter	~~Mar 1 – May 31, 2024 Annually thereafter~~	Mar 1, 2025 Annually thereafter	~~July 31, 2024 Annually thereafter~~
Groundwater Phase 3	Jan 1 – Dec 31, 2026 Annually thereafter	~~Mar 1 – May 31, 2026 Annually thereafter~~	Mar 1, 2027 Annually thereafter	~~July 31, 2026 Annually thereafter~~

Table MRP-10. TNA Report and Primary Irrigation Well

Table MRP-11. INMP Summary Report and All Irrigation Wells

Note: Based on Groundwater Phase, Dischargers submit either the TNA Report or the INMP Summary Report.

Ranches Required	All On-Farm Domestic Wells Monitoring Period	All On-Farm Domestic Wells Reporting Due Date
All ranches	Mar 1 – May 31, 2021 Annually thereafter	July 31, 2021 Annually thereafter

Table MRP-12. On-Farm Domestic Wells

Table MRP-13. Groundwater Quality Trends

Ranch	Cooperat	Individ

Surface Water Requirements

Ranches Required	~~Cooperative or~~ Individual Selection

Work Plan Due Date	Upload Data to CEDEN	Exceedance Report Due Date	Annual Report Due Date
All ranches	July 1, 2021	Quarterly by Jan 1, Apr 1, July 1, Oct 1	Quarterly by Jan 1, Apr 1, July 1, Oct 1	Annually by July 1

C
o
o
p
e
r
a
t

Table MRP-14. Surface Receiving Water Trend Monitoring

Table MRP-15. Surface Receiving Water Follow-Up Implementation

~~*Riparian Requirements*~~

~~Ranches Required~~	~~Operational Setback Compliance Date~~	~~Operational Setback Reporting Date~~
~~All ranches (with waterbodies on or adjacent~~	~~October 1, 2022~~	~~Mar 1, 2023 (in Annual Compliance Form)~~

~~**Table MRP-16. Operational Setback**~~

Table MRP-17. Cooperative Approach Compliance Pathway

*Implementation must begin once the work plan is approved or by the date specified in the table

Table MRP-18. On-Farm Setback Compliance Pathway

~~Table MRP-19. Rapid Assessment Method Compliance Pathway~~

Ranches
Reporton
Initial
Interin
FinalRin
Reporton

~~Table MRP-20. Alternative Proposal Compliance Pathway~~

~~*Implementation must begin once the work plan is approved or by the date specified in the table~~

Rep
Begin
Surface

Exhibit 5. ERA Economics Technical Memorandum No. 1 – Attachment 1

Attachment 1

[see resumes on the following pages]

20

Stephen Hatchett, Ph.D.
Director, ERA Economics

ERA Economics
Environment • Resources • Agriculture

Bio: Steve is a senior economist and project manager specializing in water resources, agriculture, mathematical modelling, and statistical analysis. He was senior principal economist and project manager in the Sacramento office of CH2M HILL for more than 20 years, from 1987-1998 and 2009-2018, and was principal and owner of Western Resource Economics from 1999 to 2009. Steve has more than 30 years of experience in project evaluation, including financial analysis, benefit-cost analysis, cost allocation, and regional economic impacts. He has assisted federal, state, and local agencies in implementing large programs resulting from new laws, regulations, and court decisions.

Education

Ph.D., Agricultural Economics, University of California at Davis
M. A., Administration, University of California at Riverside
B. S., Forestry, University of California at Berkeley

Selected Projects

Project Manager, Implementation and Rulemaking for the Sustainable Groundwater Management Act, Department of Water Resources, Sacramento, CA; 2015-16. Assisted DWR with developing regulations, including supporting economic analysis and other documents, to implement the Sustainable Groundwater Management Act of 2015.

Task Manager, Economic Impact Analysis of the Proposed Long-term Irrigated Lands Regulatory Program, Central Valley Regional Water Quality Control Board, Sacramento, CA; 2010-2011. As part of a team of experts, assessed the potential direct and indirect costs of alternative water quality management regulations on agricultural producers in the Central Valley of California. Used a regional agricultural production model to evaluate the economic effects of five implementation alternatives on different regions and crops.

Project Manager, Rulemaking Assistance and Quantification of Public Benefits for the Water Storage Investment Program, California Water Commission, Sacramento, CA; 2015-present. Currently working with California Water Commission and DWR staff to develop and implement methods for quantification and management of public benefits. Helped staff prepare regulation text on quantification of benefits. The team assisted the Commission in reviewing the water operations, economic, and financial analysis in applications submitted for State funding. Over $2.5 billion in funding is expected to be provided for 8 water storage projects.

Economics Task Manager; Efficiency Conservation Program; Imperial Irrigation District; El Centro, CA; 2005-2009. With Davids Engineering, worked with the District Program Manager and staff to develop and implement IID's water conservation program. Responsible for designing and evaluating alternative incentive programs to encourage growers to adopt water-conserving irrigation technologies. Worked with engineers and hydrologists to develop a field-level grower decision model of the District that compared costs and water savings under different conservation program designs.

Economist; Economic Analysis of the 2014 Drought for California Agriculture. California Department of Food and Agriculture and UC Davis; Sacramento, CA; 2014-2015. With ERA Economics, assisted a team of agricultural economists that updated and revised the SWAP agricultural production model to assess economic impacts of the drought on California agriculture. Developed a framework to assess the effect of changing water supply availability and cost on the agricultural economy.

Economic Review of Grant Program Applications, Department of Water Resources, Sacramento, CA; 2001-2017. Assisted the Department in developing guidelines and reviewing ten rounds of grant applications submitted for local funding, including proposals for water conservation, integrated regional water management, flood control, groundwater recharge and storage, and desalination.

Project Manager, Implementation of the Water Conservation Act of 2009, Department of Water Resources, Sacramento, CA; 2010-2013. Worked with DWR management, staff, and stakeholder committees to implement urban and agricultural water use efficiency provisions of the 2009 law. Tasks included developing guidelines for urban agencies to meet the 20-by-2020 water conservation goals; developing standard methodologies to quantify agricultural water use efficiency; preparing regulations and supporting documentation to implement agricultural water measurement; assisting stakeholder technical panels to develop new best management practices for water use and conservation.

Task Manager, Economic Impact Analysis of the Proposed Long-term Irrigated Lands Regulatory Program, Central Valley Regional Water Quality Control Board, Sacramento, CA; 2010-2011. As part of a team of experts, assessed the potential direct and indirect costs of alternative water quality management regulations on agricultural producers in the Central Valley of California. Used a regional agricultural production model and economic impact model to evaluate the effects of five alternatives.

Selected Publications

With D. MacEwan, M. Cayar, A. Taghavi, D. Mitchell, and R. Howitt. Hydroeconomic Modeling of Sustainable Groundwater Management. Water Resources Research. Vol: 53, Pages: 2384–2403. 2017.

With Lisa Porta. Coordinated Use of a Regional Groundwater Model and an Agricultural Economic Production Model to Assess Impacts of Water Policy. Presented at the Groundwater Resources Association of California Conference, Sacramento, CA. March 5, 2014.

Economic Modeling of Agricultural Water Use and Production. Presented at the California Water and Environment Modeling Forum, Technical Workshop at Univ. of California, Davis, CA. January, 2014.

With R. Bliesner, J. Eckhardt, and G. Davids. Alternatives for Implementing Efficiency Conservation in the Imperial Irrigation District. Prepared for the Proceedings of the U.S. Committee on Irrigation and Drainage Water Management Conference. Scottsdale, AZ. May 2008.

Calibration Methods for Irrigated Agricultural Models. Presented at the 1998 Annual Meeting of the American Agricultural Economics Association. Salt Lake City, UT. August 2-5, 1998.

Jay Noel, Ph.D.
Senior Principal Economist, ERA Economics

ERA Economics
Environment • Resources • Agriculture

Bio: Jay joined ERA Economics in 2015 and is professor emeritus in the Agribusiness Department at California Polytechnic State University. He has more than 30 years of experience in California agriculture. He previously served as the Director of the California Institute for the Study of Specialty Crops and as the Chief Operating Officer of RGA. Jay's experience includes agriculture and specialty crop policy analysis, agribusiness strategic management, and regulatory impact analysis. He has developed economic analyses of issues ranging from specialty crop transportation to agricultural risk, uncertainty, and regulatory impacts on agricultural profitability.

Education

Ph.D., Agricultural Economics, University of California Davis
M.S., Agricultural Economics, University of California Davis
B.S., Soil and Water Science, University of California Davis

Professional Memberships

American Agricultural Economics Association (AAEA)
Western Agricultural Economics Association

Selected Projects

Processing Tomato Industry Baseline Analysis, California Tomato Growers Association, Sacramento, CA. 2018 - Present. Jay is the technical advisor for an assessment of the processing tomato industry costs, returns, markets, and market potential. The analysis was commissioned by the Association due to significant cost, price, and regulatory pressure faced by the industry. The study includes establishing production cost, regulatory costs, and returns under current and future market conditions. A second phase of the analysis was developed to evaluate domestic and international market trends for tomato products.

Kern Delta Water Allocation Plan Supplemental EIR, Kern Delta Water District, Bakersfield, CA, 2015 – 2017. In support of litigation between the Kern Delta Water District and opponents of the proposed amendments to the Kern Delta Water Allocation Plan, Jay was the technical advisor to the economic impact assessment of changes in surface water supply and groundwater pumping in Kern Delta Water District and areas north of the Kern River.

San Joaquin Valley Agriculture Regulatory Impact Analysis, California Air Resources Board (CARB) Sacramento, CA. 2015-2017. Jay was the technical advisor for an assessment of the regulatory compliance costs for specialty crops producers under new air emission standards in the San Joaquin Valley. ERA Economics was responsible for developing an integrated modelling framework which CARB can use to assess the economic and fiscal impacts of increased regulatory costs on agricultural enterprises. The study included close coordination with an agricultural advisory group consisting of agribusiness representatives in the San Joaquin Valley.

Kern Delta Water Allocation Plan Supplemental EIR, Kern Delta Water District, Bakersfield, CA, 2015 – 2018. In support of litigation between the Kern Delta Water District and opponents of the proposed amendments to the Kern Delta Water Allocation Plan, Jay was the technical advisor to the economic impact assessment of changes in surface water supply and groundwater pumping in Kern Delta Water District and areas north of the Kern River. Jay led the grower outreach portion of the analysis. He developed farm cost-of-production budgets for major crops produced in the region, interviewed growers to establish local market conditions, and evaluated trends in prices and costs. The farm production budgets were integrated into a regional economic model of agriculture that was used to establish the impact of changes in surface and groundwater availability and cost.

Selected Publications

Noel, Jay E.; Eivis Qenani, New Age, New Learners, New Skills: What Skills Do Graduates Need to Succeed in the New Economy? International Food and Agribusiness Management Review Vol. 16, Special Edition 3, 2013.

Noel, Jay E.; Eivis Qenani; Thomas Mastin, *A Benefit Transfer Estimation of Agro-Ecosystems Services;* Western Economics Forum, Volume 08, Number 01, Spring 2009.

Paggi, Mechel S; Jay E. Noel; The *U.S. 2008 Farm Bill: Title X and Related Support for the U.S. Specialty Crop Sector* Choices Volume 23, Issue 3, 3rd Quarter 2008.

Thompson, R.P.; J.E. Noel; R. Hanna; D.D. Piirto *"Hedonic Valuation of Forest Attributes on Small Urban-Interface Properties"* Journal of Arboriculture, 25(5) September, 1999.

Noel, Jay E. and Charles V. Moore. "Valuation of Transferable Delivery Rights in Marketing Cooperatives *Journal of Cooperatives* pg.: 1-17, 1995.

Noel, J.E., and R.E. Howitt. "*Conjunctive Multibasin Management: An Optimal Control Approach" Water Resources Research*, Vol. 18 No.4 August 1982, pg. 753-763.

Noel, J.E., B.D. Gardner and C.V. Moore *"Optimal Regional Conjunctive Water Management"* American Journal of Agricultural Economics, Vol. 52, 1980, pg. 489-498.

Noel, Jay E.; Mechel S. Paggi; Sean Hurley; Fumiko Yamazaki; Michael McCullough; *The Impacts of Changes in Agricultural Transportation Sector on the Competitiveness of the California Specialty Crop* Industry Reports to: California State University Statewide Agricultural Research Initiative; Agricultural Marketing Service. USDA; California Department of Food and Agriculture Specialty Crop Block Grant August, 2012.

Noel, Jay E. *A Cross State Comparison and Analysis of the Impact of Regulatory Policies on the Competiveness of Selected Specialty Crops: The Cases of California/Arizona Lettuce and California Strawberries,* California State University Statewide Agricultural Research Initiative report April, 2012.

Paggi, M., Fumiko Yamazaki and Jay E. Noel *"The Economic Competitiveness of Processed Tomato Production: A Representative Farm Model Approach"* California State University, Fresno Center for Agribusiness report June, 2009.

Duncan MacEwan, Ph.D.
Principal Economist, ERA Economics

ERA Economics
Environment • Resources • Agriculture

Bio: Duncan is the managing partner of ERA Economics. He previously worked as a consultant economist with CH2M (now Jacobs) and concurrently held a position as a postdoctoral scholar in Agricultural and Resource Economics at UC Davis. At ERA he manages a portfolio of clients and projects ranging from local economic feasibility studies to regulatory impact analyses, benefit-cost analyses, and litigation support. His primary focus is on issues related to water and agricultural economics, including assessing economic impacts of proposed agricultural regulations and local, state, and federal water resource policies. He works with private clients to value water assets and prepare crop market assessments. Duncan is currently the lead economist on four Groundwater Sustainability Plans in subbasins in the San Joaquin Valley and Sacramento Valley.

Education

Ph.D., Economic Geography, University of California Davis
Fields: Resource Economics, Econometrics, GIS
M.S., Agricultural and Resource Economics, University of California Davis
B.S., Mathematical Economics and Applied Math, California State University Long Beach

Professional Memberships

American Agricultural and Applied Economics Association
Western Agricultural Economics Association

Selected Projects

Crop and Water Risk Assessments. Farm Credit West. California. 2017 - Present. Farm Credit West engaged ERA Economics to develop regional crop market assessments and water risk evaluations. Water risk assessments establish water costs, value, and risk under current and projected future availability of irrigation water supply to agricultural regions in California.

Processing Tomato Industry Baseline Analysis, California Tomato Growers Association, Sacramento, CA. 2018 - Present. Duncan is the project manager for an assessment of the processing tomato industry costs, returns, markets, and market potential. The analysis was commissioned by the Association due to significant cost, price, and regulatory pressure faced by the industry. The study includes establishing production cost, regulatory costs, and returns under current and future market conditions. A second phase of the analysis was developed to evaluate domestic and international market trends for tomato products.

Groundwater Sustainability Plan (GSP) Development, Chowchilla and Madera Subbasins, Madera County, CA, 2017 - Present. Duncan is the lead economist on the Madera and Chowchilla Subbasin GSPs. The GSP consultant team is working with stakeholders to develop a set of projects and management actions that when fully implemented result in a cost-effective sustainable groundwater condition in the subbasin.

Economic and Financial Feasibility of District-wide Pressurized Irrigation, South San Joaquin Irrigation District, Manteca, CA, 2014 – 2016. Worked with Davids Engineering as the lead agricultural economist to evaluate the financial and economic feasibility of alternative pressurized irrigation sytems. Economic and financial feasibility was assessed using a series of economic models to establish grower willingess and ability to pay. The findings of the analysis were presented to district staff and at public Board meetings.

Agricultural Impact Analysis of Groundwater Pumping Charges, Santa Clara Valley Water District, San Jose, CA, 2013 – 2014. Developed an economic model of Santa Clara County agriculture to evaluate the fiscal and land use impacts to agriculture from decreasing the Open Space Credit (increasing groundwater charge). Presented findings at public workshops and to the Board; the charge was left unchanged.

Fiscal Impact Analysis of Proposed Pesticide Regulations, Pyrethroids Working Group, Sacramento, CA, 2017 – 2018. Led a multi-part study to quantify the economic value that pyrethroid insecticides provide to California specialty crop farmers. The analysis included a farm budget and market analysis of pest management approaches under current conditions and a complete ban on pyrethroids.

Agricultural Water Use in The Metropolitan Water District Service Area, California Avocado Commission, Irvine, CA, 2013. Developed an analysis of the total agricultural applied water within the Metropolitan Water District service area. Quantified trends in agricultural markets and production within the area and estimated the crop footprint and corresponding applied water.

Economic Contribution of Specialty Crop Agriculture to the Sacramento Region, Sacramento Area Council of Governments, Sacramento, CA, 2015 – 2016. Project manager for a study to assess the total economic value created by specialty crop producers, processors, and distributors in the greater Sacramento area. The analysis quantified the total employment, value-added, and tax contributions from specialty crop businesses generated in the regional economy.

Agricultural Impact Analysis of Groundwater Pumping Charges, Santa Clara Valley Water District, San Jose, CA, 2013 – 2014. Developed an economic model of Santa Clara County agriculture to evaluate the fiscal and land use impacts to agriculture from decreasing the Open Space Credit (increasing the groundwater pumping charge). Presented findings at a series of public workshops and to the Board.

Selected Publications

MacEwan, D., M. Cayar, A. Taghavi, D. Mitchell, S. Hatchett, and R. Howitt, Hydroeconomic modeling of sustainable groundwater management, *Water Resources Research,* 53, (2017).

Richard E. Howitt, Josue Medellin-Azuara, Duncan MacEwan, and Jay R. Lund. (2012). Calibrating Disaggregate Economic Models of Agricultural Production and Water Management. *Environmental Modeling and Software*. 38, 244-258.

MacEwan, D., Richard Howitt, and Josué Medellín-Azuara, Estimating Behavioral Response to Salinity. *Water Economics and Policy* 02, 1650010 (2016)..

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

Richard E. Howitt, Ph.D.
Director, ERA Economics

ERA Economics
Environment • Resources • Agriculture

Bio: Richard is a founding partner of ERA Economics and professor emeritus in the Department of Agricultural and Resource Economics at the University of California Davis. He has more than 40 years of experience in agricultural, resource, and environmental economics and has provided consulting expertise for numerous water and agriculture projects, for litigation and policy analysis. Richard has extensive experience working with federal, state, and local agencies to convey complex economic issues to a broad audience. He is a leading expert on the economics of irrigated agriculture and has published his research in over 130 referred journal articles, as well as 327 additional publications with over 3,500 citations. Richard has earned six national research awards and was made a Fellow of the American Agricultural and Applied Economics Association in 2009.

Education

Ph.D., Agricultural Economics, University of California Davis
M.S., Agricultural Economics, University of California Davis
B.S., Agricultural Economics, Oregon State University

Professional Memberships

American Agricultural Economics Association, Fellow (2009)
Western Agricultural Economics Association
Australian Agricultural & Resource Economics Society

Selected Projects

Economic Impacts of the 2014 and 2015 Drought, California Department of Food and Agriculture, Sacramento, CA, 2014 - 2016. Richard led the economic impact analysis of the 2014 and 2015 drought on California agriculture. The project included a full assessment of drought impacts and extensive public outreach, in coordination with CDFA staff and Secretary Karen Ross.

Agricultural Economic Analysis of the Santa Clara Valley Water District's Open Space Credit, Santa Clara Valley Water District, San Jose, CA, 2013. Assisted in developing an integrated agricultural economic model of Santa Clara County agriculture and groundwater use to evaluate changes in the rates farmers are charged for irrigation groundwater.

Economic Multiplier Analysis of Specailty Crop Agriculture in the Sacramento Area, SACOG, Sacramento, CA, 2015 – 2016. SACOG engaged ERA Economics to develop an assessment of the economic value of specialty crop agriculture in the Sacramento area. Richard was the project techincal advisor. ERA developed an economic analysis of specialty crop production, values, employment, and trends in the Sacramento area. The study data and modeling framwork were used to quantify the contribution of specialty crop agriculture to jobs, taxes, and regional value. ERA Economics worked with SACOG to assess the economic benefits of its Farm-to-Fork initiatives to encouage business growth in the region.

Economic Impacts of Executive Order B-29-15, State Water Resources Control Board, Sacramento, CA. 2015. Richard was the technical advisor to a team of consultant economists evaluating the economic

impacts of Governor Brown's 2015 Executive Order (EO) mandating urban water conservation targets. The economic analysis quantified the regulatory impact of the EO on California businesses and individuals.

California Agriculture Off-Road Vehicle Emissions Regulatory Impact Analysis, California Air Resources Board Sacramento, CA, 2014 – Present. Technincal advisor for developing an integrated modelling framework which ARB can use to assess the economic impacts of increased regulatory costs. The economic decision support framework can assess the fiscal impacts and direct, indirect, and induced socioeconomic impacts of new regulations at the farm, local, and statewide levels. The project involves a series of interviews with growers and agribusiness leaders to collect sensitive financial information and determine the ability to absorb additional regulatory costs.

Agribusiness Acquisition Feasibility Assessment, Confidential Client, Dallas, TX. 2016. Developed a feasibility analysis of a proposed purchase of a grower-packer-shipper operation located on the east-side of the San Joaquin Valley. The study involved reviewing financial records and performing an independent risk assessment that included short and long-term water supply reliability risk for the operation in question, and a financial feasibility assessment. The results of the study were presented to the potential investors, and the investors ultimately decided not to move forward with the acquisition.

Selected Publications

Newman, C, R. Howitt, D. MacEwan, How are western water districts managing groundwater basins?, *California Agriculture.* 72(1):28-37. (2018).

MacEwan, D., M. Cayar, A. Taghavi, D. Mitchell, S. Hatchett, and R. Howitt, Hydroeconomic modeling of sustainable groundwater management, *Water Resour. Res.,* 53, doi:10.1002/2016WR019639. (2017).

MacEwan, D., Richard Howitt, and Josué Medellín-Azuara, Estimating Behavioral Response to Salinity. *Water Economics and Policy* 02, 1650010 (2016).

Forni, Laura G., et al. "Integrating complex economic and hydrologic planning models: An application for drought under climate change analysis." *Water Resources and Economics* 16 (2016): 15-27.

Burnett, K., Howitt, R.E., Roumasset, J., Wada, C. (2015) Routledge Handbook of Water Economics and Institutions. Eds. Routledge Handbooks, New York.

Howitt, R.E. (2014) "Are Water Markets Still Emerging in California?" Chapter 7 in *"Water Markets for the 21st Century: What Have We Learned?"* Eds K.W. Easter and Q. Huang. Springer.

Mérel, P. and R.E. Howitt (2014) "Theory and Application of Positive Mathematical Programming in Agriculture and the Environment" *Annual Review of Resource Economics*

Maneta, M and R. E. Howitt. (2014). "Stochastic Calibration and Learning in Non-Stationary Hydro-Economic Models". *Water Resources Research.* 10.1002/2013WR015196

Howitt, R.E. and S. Msangi (2014) "Entropy Estimation of Disaggregate Production Functions: An Application to Northern Mexico" *Entropy* 2014, *16*, 1349-1364; doi:10.3390/e16031349

Exhibit 7. Exponent Technical Memorandum – Appendix A

APPENDIX A

Exponent®
Engineering & Scientific Consulting

Susan C. Paulsen, Ph.D., P.E.
Principal Scientist & Practice Director | Environmental & Earth Sciences
1055 East Colorado Boulevard, Suite 500 | Pasadena, CA 91106
(626) 204-4089 tel | spaulsen@exponent.com

Professional Profile

Dr. Paulsen has more than 25 years of experience with projects involving hydrodynamics, hydrology, aquatic chemistry, and the environmental fate of a range of constituents. She has provided expert testimony on matters involving the Clean Water Act, state water quality regulations, and hydraulics and hydrology. She also provides scientific and strategic consultation on matters involving Superfund (CERCLA) and Natural Resources Damages (NRD). She has expertise designing and implementing field and modeling studies of dilution and analyzing the fate and transport of organic and inorganic pollutants, including DDT, PCBs, PAHs, copper, lead, and selenium, in surface and groundwater and in sediments. Dr. Paulsen's expertise also includes field and modeling studies to evaluate storm flows, flood events, and associated sediment transport and changes in geomorphology.

Dr. Paulsen has designed and implemented field studies in reservoir, river, estuarine, and ocean environments using dye and elemental tracers to evaluate the impact of pollutant releases and treated wastewater, thermal, and agricultural discharges on receiving waters and drinking-water intakes. Dr. Paulsen has designed and managed modeling studies to evaluate transport and mixing, including the siting and design of diffusers, and has evaluated water quality impacts of stormwater runoff, irrigation, wastewater and industrial process water treatment facilities, and desalination brines. Dr. Paulsen has extensive knowledge of California water supply issues, including expertise in California's Bay-Delta estuary, the development of alternative water supplies, and integration of groundwater basins into supply and storage projects.

Dr. Paulsen has designed studies using one-dimensional hydrodynamic models (including DSM2 and DYRESM), three-dimensional CFD modeling, longitudinal dispersion modeling, Monte Carlo analysis, and hydrologic and hydraulic models. Dr. Paulsen has participated in multi-disciplinary studies of the fate and transport of organic and inorganic pollutants, including DDT, PCBs, PAHs, copper, lead, selenium, and indicator bacteria in surface waters, groundwaters, and/or sediments. She has worked on matters involving both CERCLA and NRDA, including several involving the fate and transport of legacy pollutants, and she has evaluated the impacts of oil-field operations on drinking-water aquifers.

Dr. Paulsen has broad expertise with water quality regulation through the Clean Water Act and state regulations in California, Washington, Hawaii, and other states, and has worked on temperature compliance models, NPDES permitting, permit compliance and appeals, third-party citizens' suits, and TMDL development. She has evaluated the importance of background and natural sources on stormwater and receiving-water quality, the development of numeric limits for storm flows and process-water discharges, and factors affecting storm flow volumes and flow rates. Dr. Paulsen is the author of multiple reports describing the history and development of water quality regulations and has provided testimony on regulatory issues, water quality, water rights, and water management.

Academic Credentials & Professional Honors

Ph.D., Environmental Engineering Science, California Institute of Technology (Caltech), 1997

M.S., Civil Engineering, California Institute of Technology (Caltech), 1993

B.S., Civil Engineering, Stanford University, 1991

Licenses and Certifications

Licensed Professional Civil Engineer, California, #66554

Prior Experience

Various positions including President, Flow Science Incorporated, Pasadena, California, 1997-2014

Consultant to Flow Science Incorporated, Pasadena, California, 1994-1997

Staff Engineer, Dames & Moore, Civil Design Group, San Francisco, California, 1990-1992

Graduate Research and Teaching Assistant, Hydrologic Transport Processes and Fluid Mechanics, California Institute of Technology, Pasadena, California, 1993-1997

Research Engineer, Fraunhofer Institute for Atmospheric Environmental Research, Garmisch-Partenkirchen, Germany (West), 1989

Instructor, Technical Communications Program (joint Business School/School of Engineering program), Stanford University, Stanford, CA, 1989-1990

Professional Affiliations

American Society of Civil Engineers — ASCE

National Ground Water Association

Languages

Italian

German

Publications

California Council for Environmental and Economic Balance (CCEEB); authored by Paulsen SC. Optimizing Storm Water: A supplement to the "Clear Path" report with recommendations to optimize storm water in California's local water supplies. CCEEB: San Francisco, CA. 2018. Available at www.cceeb.org.

Mead AM, Paulsen SC, Seyfried R. Dealing with drought: Modeling the effects of California's recent drought on a POTW discharge to the Sacramento River. Proceedings of the Water Environment Federation, WEFTEC 2016, New Orleans, pp. 3490-3513, September 2016.

Paulsen SC, Mesard PM. Opportunity under our feet: Successfully managing groundwater basins to balance stakeholder interests. American Bar Association, 44th Spring Conference on Environmental Law, San Francisco, CA, 2015.

Mead AM, Paulsen SC, Seyfried R. Dealing with drought: Modeling the effects of California's recent drought on a POTW discharge to the Sacramento River. Proceedings of the Water Environment Federation, WEFTEC 2016, New Orleans, pp. 3490-3513, September 2016.

Byard JL, Paulsen SC, Tjeerdema RS, Chiavelli D. DDT, Chlordane, Toxaphene and PCB Residues in Newport Bay and Watershed: Assessment of Hazard to Wildlife and Human Health. Reviews of Environmental Contamination and Toxicology 2015; 235.

California Council for Environmental and Economic Balance (CCEEB); authored by Paulsen SC. A Clear Path to Cleaner Water: Implementing the vision of the State Water Board for improving performance and outcomes at the State Water Boards. CCEEB: San Francisco, CA. 2013. Available at www.cceeb.org.

South Orange Coastal Ocean Desalination (SOCOD) Project; authored by Expert Panel Member Paulsen SC. Expert Panel Report: Offshore Hydrogeology/Water Quality Investigation Scoping, Utilization of Slant Beach Intake Wells for Feedwater Supply. Municipal Water District of Orange County (MWDOC): Fountain Valley, CA. 2012. Available at http://www.mwdoc.com/filesgallery/FINAL_Expert_Panel_Rept_10_9_2012.pdf.

Paulsen SC, Goteti G, Kelly BK, Yoon VK. Automated flow-weighted composite sampling of stormwater runoff in Ventura County, CA. Proceedings, Water Environment Federation 2011.12 (2011): 4186-4203. Also published as automated flow-weighted composite sampling of stormwater runoff. Water Environment Laboratory Solutions 2012; 19(2):1-6.

Paulsen SC, List EJ, Kavanagh KB, Mead AM, Seyfried R, Nebozuk S. Dynamic modeling and field verification studies to determine water quality and effluent limits downstream of a POTW discharge to the Sacramento River, California. Proceedings, Water Environment Federation 2007; 12:5695-5721.

Paulsen SC, List EJ. Potential background constituent levels in storm water at Boeing's Santa Susana Field Laboratory. Report to Expert Panel convened by The Boeing Company and Regional Water Quality Control Board, Los Angeles Region, 2007. Available at http://www.boeing.com/assets/pdf/aboutus/environment/santa_susana/water_quality/tech_reports/2007_background/2007_background_report.pdf.

Paulsen SC, List EJ, Santschi PH. Modeling variability in 210Pb and sediment fluxes near the Whites Point Outfalls, Palos Verdes Shelf, California. Environmental Science & Technology 1999; 33:3077-3085.

Paulsen SC, List EJ, Santschi PH. Comment on "In situ measurements of chlorinated hydrocarbons off the Palos Verdes Peninsula, California." Environmental Science & Technology 1999; 33:3927-3928.

Paulsen SC, List EJ. A study of transport and mixing in natural waters using ICP-MS: Water-particle interactions. Water, Air, and Soil Pollution 1997; 99:149-156.

Paulsen SC, List EJ. Tracing discharges in ocean environments using a rare earth tracer. Presented at the 27th IAHR Congress, San Francisco, CA, August 1997.

Presentations

Brown, KI, Paulsen SC, Graham KE, Soller J, and Boehm AB. Risk-based threshold for a mixture of human and gull-associated microbial source tracking markers in recreational water: implications for regulatory programs. California Stormwater Quality Association (CASQA) annual meeting, October 2019.

Paulsen, SC, Conkle J, Brooks B, Cayan D, Chairs. Water: Bringing science and engineering together to address impacts of climate change on water supply and water quality. Spotlight session, Society of Environmental Toxicology and Chemistry (SETAC) North America meeting, November 2018.

Goodfellow W, Paulsen SC. Strategies for ecotoxicology assessment of physical, biological, and chemical stressors in ambient waters. Society of Environmental Toxicology and Chemistry (SETAC) North America meeting, November 2018.

Thacher R, Paulsen SC, Marjanovic K. Availability of Water in Clifton Court, Sacramento-San Joaquin Delta, to Byron-Bethany Irrigation District during Drought Conditions. American Water Resources Association Annual Conference. Portland, Oregon. November 2017.

Thacher R, Mead AM, Paulsen SC, Henrion M. Decisions, Decisions: Decision Support Modeling in Groundwater Sustainability Planning. American Water Resources Association Annual Conference. Portland, Oregon. November 2017.

Goodfellow WL, Paulsen SC, Marjanovic KC. 2017. Toxicity assessments for NPDES compliance: Traditional TSD methods versus the TST approach. SETAC 38th Annual Meeting, Minneapolis, MN. November 2017.

Love N, Canton C, Skigen S, Yoon VK, Paulsen SC, Claff R. Critical analysis of the Test of Significant Toxicity and the implications for Whole Effluent Toxicity testing. Presented at SETAC National Conference, November 21, 2013.

Deposition & Trial Testimony

Depositions

Coastal Environmental Rights Foundation v. Watkins Manufacturing Corporation, Case No. '18CV0555GPC KSC, in the United States District Court, Southern District of California. October 29, 2019.

Suncoast Waterkeeper, Our Children's Earth Foundation, Ecological Rights Foundation v. City of Gulfport, Case No. 8:17-CV-35-T-24MAP, in the United States District Court, Middle District of Florida. June 4, 2019.

Connecticut General Life Insurance Company v. 7510 Hazard, LLC, et al., Case No. 2013-00036924-CUBC-CTL, in the Superior Court of the State of California, County of San Diego (Central). May 10, 2018.

Glen Harmer v. Steven M. Thomas et al., Case No. 4:16-cv-04233-JSW, in the United States District Court, Northern District of California. July 18, 2017.

Robert Bruncati and Maureen Bruncati v. Billy Wayne Andrews, Jr., et al., Case No. CIVDS1309044, in the Superior Court of the State of California, County of San Bernardino, San Bernardino District. August 24, 2015, and September 8, 2015.

City of Cerritos, et al., v. Water Replenishment District of Southern California, Case No. BS128136, in the Superior Court of the State of California, County of Los Angeles. November 24, 2014.

The Boeing Company et al. v. State of Washington, Department of Ecology, Appeal of the 2010 Industrial Stormwater General Permit, Pollution Control Hearings Board, State of Washington. Case No. 09-140. 2011.

Puget Soundkeeper Alliance v. BNSF Railway Co., Case No. C09-1087-JCC, in the United States District

Court, Western District of Washington at Seattle. 2011.

Trials and Hearings

Hearing Proceedings Regarding Petition Filed by the Department of Water Resources and U.S. Bureau of Reclamation Requesting Changes in Water Rights for the California WaterFix Project, California State Water Resources Control Board. December 14, 2016; May 23, 2017; June 22, 2017; March 23, 2018; March 26, 2018; and August 24, 2018.

Robert Bruncati and Maureen Bruncati v. Billy Wayne Andrews, Jr., et al., Case No. CIVDS1309044, in the Superior Court of the State of California, County of San Bernardino, San Bernardino District. 2015.

The Boeing Company et al. v. State of Washington, Department of Ecology, Appeal of the 2010 Industrial Stormwater General Permit, Pollution Control Hearings Board, State of Washington. Case No. 09-140. 2011.

Exponent®
Engineering & Scientific Consulting

Ben Kocar, Ph.D., C.P.S.S.
Managing Scientist | Environmental & Earth Sciences
15375 SE 30th Place, Suite 250 | Bellevue, WA 98007
(425) 519-8730 tel | bkocar@exponent.com

Professional Profile

Dr. Kocar specializes in the science of soils, sediments and water. A Certified Professional Soil Scientist (CPSS), he uses his multidisciplinary expertise in geochemistry, microbiology, and hydrogeology to solve complex problems involving the fate of chemicals and the flow of water within natural and engineered systems.

Dr. Kocar's project experience includes delineating water movement and chemical migration in agricultural and industrial soils, wetlands, landfills, coal-ash impoundments, aquifers and groundwater basins, and surface waters. He has employed groundwater and geochemical modeling tools to understand and predict the flux of water and chemicals in complex geologic settings. He has applied his expertise to problems involving the timing and extent of chemical release from point and non-point sources (environmental forensics) and exposure of ecological receptors to chemicals. Dr. Kocar has studied the fate and transport of inorganic and organic chemicals, including metal(loids) such as arsenic, lead, mercury, and chromium; radionuclides such as radium, radon and uranium; nutrients such as carbon, nitrogen and phosphorus; trace gases such as methane, carbon dioxide, and nitrous oxide; and various organics, including pesticides and halogenated compounds.

Dr. Kocar has supported matters and litigation relating to the Clean Water Act (CWA), Superfund (CERCLA), California's Sustainable Groundwater Management Act (SGMA), and insurance claims. Before joining Exponent, he served for over 7 years as an instructor and professor at Stanford University and the Massachusetts Institute of Technology, respectively, where he taught classroom, laboratory, and field-based subjects in environmental chemistry, contaminant hydrogeology, and soil science. He also worked as an engineering physicist at the Stanford Synchrotron Radiation Lightsource at SLAC National Laboratory, where he supported numerous research groups using advanced, X-ray-based analytical techniques to decipher the chemistry of minerals, polymers, fossils, and experimental batteries. Dr. Kocar has published over 35 peer-reviewed articles and book chapters and has authored or co-authored over 85 conference presentations (multiple key-note and invited), including the annual American Geophysical Union, Goldschmidt (geochemistry), Soil Science Society of America, and American Chemical Society meetings.

Academic Credentials & Professional Honors

Ph.D., Geological and Environmental Science, Stanford University, 2008

M.S., Land Resources and Environmental Chemistry, Montana State University, 2002

B.S., Chemistry-Biochemistry, Montana State University, 2000

B.S., Soil and Environmental Science, Montana State University, 2000

SSSA Emil Truog Award for Best PhD Dissertation in Soil Science, 2009

U. S. EPA STAR Graduate Fellowship, 2004-2007

Best Graduate Student Presentation: 84th Meeting of AAAS-Pacific Division, 2003

J. Thomas Dutro, Jr. Award for Excellence in the Geosciences, AAAS, 2003

Graduate Student Fellowship: Montana State University Thermal Biology Institute, 2000-2002

Licenses and Certifications

Certified Professional Soil Scientist (CPSS) #61958

Prior Experience

Visiting Professor, Dept of CEE, Massachusetts Institute of Technology, 2018- Present

Assistant Professor, Dept of CEE, Massachusetts Institute of Technology, 2014-2018

Private Consulting, Modeling Contaminant Fate and Transport, 2017-2018

Member, MIT-NIH Center for Environmental Health Sciences, 2016-2018

Guest Appointment, Woods Hole Oceanographic Institute, 2017-2018

Engineering Physicist, Stanford Synchrotron Radiation Lightsource, 2011-2014

Lecturer, Stanford University, Dept of Earth System Science, 2011-2013

Post-Doctoral Scholar, Environmental Biogeochemistry, Stanford University, 2008-2011

Graduate Student Appointment, Soil and Environmental Biogeochemistry (Stanford), 2002-2008

Graduate Student Appointment, Thermal Biology Institute, Montana State University, 2000-2002

Professional Affiliations

Soil Science Society of America (SSSA), American Geophysical Union (AGU)

Reviewer for Scientific Journals: Environmental Science and Technology, Environmental Chemistry, Journal of Colloid and Interface Science, Science of the Total Environment, European Journal of Soil Sciences, Geochemical Transactions, Chemosphere, Applied Geochemistry, Geoderma, Geochimica et Cosmochimica Acta, Environmental Pollution, Frontiers in Microbial Geochemistry, Journal of Hazardous Materials, Nature Geoscience.

Reviewer for Funding Agencies: National Science Foundation-Geobiology and Low Temperature Geochemistry Program. Department of Energy, Program in Subsurface Biogeochemical Research. Department of Energy, Science Focus Areas for National Laboratory System.

Conference Sessions and Workshops Organized:

Co-Organizer: Biogeochemical Cycling of Metals, Radionuclides and Associated Colloids within Earth's

Critical Zone. For Goldschmidt Conference, 2018 (Boston).

Organizer: Biogeochemical Cycling of Nutrients and Contaminants in Physically Complex Environments. For American Chemical Society Meeting, 2015 (Boston).

Organizer: Emerging Metal Contaminants in Soils and Natural Waters. For Soil Science Society of America Annual Meeting. 2014 (Long Beach). Co-Organizer and Instructor: Use of X-rays in Cultural Heritage, Stanford Synchrotron Radiation Users Meeting, 2013.

Service at MIT (while an assistant professor): Undergraduate Curriculum Committee, CEE. Responsible for reviewing and evaluating undergraduate curriculum and ensuring adherence to Accreditation Board for Engineering and Technology (ABET). Attended ABET workshop in Baltimore, MD for ensuring continued accreditation. Freshman Admissions Committee: reviewed applications for undergraduate admittance to the institute. Committee on Radiation Protection: Appointed to review and approve use of ionizing and non-ionizing radiation sources, risk assessment, and monitoring.

Publications

Mehta, N., Benzerara, K., Kocar, B.D. (corresponding author), Chapon, V. (2019). Sequestration of Radionuclides Radium-226 and Strontium-90 by Cyanobacteria Forming Intracellular Calcium Carbonates. Environmental Science and Technology. 53, 12639-12647.

Mehta, N. and Kocar, B.D. (2019) Geochemical Conditions Conducive for Retention of Trace Elements and Radionuclides during Shale-Fluid Interactions. Environmental Science: Impact and Processes. 21, 764.

Prommer, H., Sun, J., and Kocar, B.D. (2019) Using Reactive Transport Models to Quantify and Predict Groundwater Quality. Elements. 15, 87-92.

Mehta, N and Kocar, B.D. (2018) Deciphering and Predicting Microscale Controls on Radon Production in Soils, Sediments and Rock. Soil Processes. 2, 30, 1-14.

Chen, M.A. and Kocar, B.D. (2018) Radium Sorption to Iron (hydr)oxides, Pyrite and Montmorillonite: Implications for Mobility. 52, 4023-30. Environmental Science and Technology.

Hagan, D., Issacman-VanWertz, G., Franklin, JP, Wallace, LMM, Kocar, B.D., Heald, CL, Kroll, JH. (2018) Calibration and assessment of electrochemical air quality sensors by co-location with regulatory-grade instruments. Atmospheric Measurement Techniques. 11, 315-328.

L. Li…, Kocar B.D. et al (2017). Expanding the Role of Reactive Transport Models in Critical Zone Processes. Earth-Science Reviews. 165. 280-301.

Johnson, J. Savalia, P., Davis, R. Kocar, B.D., Webb, S. Nealson, K.H., Fischer, W. (2016) Real-Time Manganese Phase Dynamics during Biological and Abiotic Manganese Oxide Reduction. Environmental Science and Technology. 8, 4248-4258.

Stuckey, J., Schaefer, M.V., Kocar B.D. Benner, S.G. and Fendorf S. (2016) Arsenic Release Metabolically Limited to Permanently Saturated Soil in Mekong Delta. Nature Geoscience. 9, 70-

Kraal, P. Burton, E.D., Rose, A.L, Grice, K., Lockhart, R.S., Tan, E., Bush, R.T., Webb, S.M., Kocar, B.D. (2015) Phosphorus Dynamics in Eutrophic Estuarine Sediments with Contrasting Iron Redox Chemistry. Chemical Geology. 392, 19-31.

Stuckey, J.W., Schaefer, M.V., Kocar, B.D., Ditmar, J.D., Pacheco, J.L., Benner, S.G., Fendorf, S. (2015). Peat formation concentrates arsenic within sediment deposits of the Mekong Delta. Geochimica et

Cosmochimica Acta: 149, 190-205.

Burton, E.D., Johnson, S.G, Kocar, B.D. (2014) Arsenic Mobility during Flooding of Contaminated Soil: The Effect of Microbial Sulfate Reduction. Environmental Science and Technology. 48 (23) 13660-7.

Prouty, N.G., Roark, E.B., Koenig, A.E., Demopoulos, A.W.G., Batista, F.C., Kocar, B.D., Selby, D., McCarthy, M.D., Mienis, F. (2014). Deep Sea Coral Record of Human Impact on Watershed Quality in the Mississippi River Basin. Global Biogeochemical Cycles: (28) 9, 29-43.

Kocar B.D., Benner, S.G. and Fendorf S. (2014) Deciphering and Predicting Spatial and Temporal Concentrations of Arsenic within the Mekong Delta Aquifer. Environmental Chemistry. 11 (5).

Masue-Slowey, Y., Ying, S.C., Kocar, B.D., Pallud, C.E., Fendorf, S. (2013) Dependence of Arsenic Fate and Transport on Biogeochemical Heterogeneity Arising from Physical Structure of Soils and Sediments. Journal of Environmental Quality: 42 (4), 1119-1129.

Seyfferth, A., Kocar, B.D., Lee, J.A., Fendorf, S. (2013). Seasonal Dynamics of Dissolved Silicon in a Rice Cropping System after Straw Incorporation. Geochimica et Cosmochimica Acta. 123, 120-133.

Ying, S.C., Masue-Slowey, Y., Kocar, B.D., Griffis, S.D., Webb, S., Marcus, M., Francis, C. and Fendorf, S. (2013). Distributed Microbially- and Chemically-Mediated Redox Processes Controlling Arsenic Dynamics within Mn/Fe-oxide Constructed Aggregates. Geochimica et Cosmochimica Acta. (104) 29-41.

Kozubal, M.A., Macur, R.E., Jay, Z.J., Beam, J.P., Malfatti, S.A., Tringe, S.G., Kocar, B.D., Borch, T., and Inskeep, W.P. (2012). Microbial Iron Cycling in Acidic Geothermal Springs of Yellowstone National Park: Integrating Molecular Surveys, Geochemical Processes, and Isolation of Novel Fe-Active Microorganisms. Frontiers in Microbiology. 3 (109), 1-16.

Ying, S.C., Kocar, B.D., and Fendorf, S. Oxidation and Competitive Retention of Arsenic between Iron and Manganese Oxides. (2012). Geochimica et Cosmochimica Acta: 96 (1) 294-303.

Ushizima, D., Parkinson, D., Nico, P., Ajo-Franklin, J., Macdowell, A., Kocar, B.D., Bethel, W., Sethian, J. (2011) Statistical Segmentation and Porosity Quantificaiton of 3D X-ray Micro-tomography. Applications of Digital Image Processing. Vol 8135, Article no. 813502.

Sharma, P., Rolle, M., Kocar, B.D., Grathwohl, Pl, Fendorf, S., Kappler, A. (2011) Influence of Natural Organic Matter on Arsenic Transport and Retention. Environmental Science and Technology. 45 (13) 5572-5579.

Kocar, B.D. and Fendorf, S. (2011). Arsenic Release and Transport in Sediments of the Mekong Delta. In: Interdisciplinary Studies on Environmental Chemistry –Environmental Pollution and Ecotoxicology. pp 117-124.

Masue-Slowey, Y., Kocar, B.D., Jofre, S., Mayer, K.U., and Fedorf, S. (2010). Transport Implications Resulting from Internal Redistribution of Arsenic and Iron within Constructed Soil Aggregates. Environmental Science and Technology. 45 (2) 582-588.

Kocar, B.D., Borch, T., and Fendorf. (2010). Arsenic Mobilization and Repartitioning During Biogenic Sulfidization and Transformation of Ferrihydrite. Geochimica et Cosmochimica Acta. 74, 980-994.

Robinson, D.A., Lebron, I., Kocar, B.D., Phan, K., Sampson, M., Crook, N. Fendorf, S. (2009). Time-lapse Geophysical Imaging of Soil Moisture Dynamics in Tropical Deltaic Soils: An Aid to Interpreting Hydrological and Geochemical Processes. Water Resources Research. 45, W00D32, 1-12.

Busbee, M.W., Kocar B.D., Benner, S.G. (2009). Irrigation Produces Elevated Arsenic in the Underlying

Groundwater of a Semi-Arid Basin in Southwestern Idaho. Applied Geochemistry, 24, 843.

Kocar, B.D., and Fendorf, S. (2009). Thermodynamic Constraints on Reductive Reactions Influencing the Biogeochemistry of Arsenic in Soils and Sediments. Environmental Science and Technology. 43, 4871-4877.

Benner, S.G., Polizzotto, M.P., Kocar, B.D., Sampson, M. and Fendorf, S. (2008) Groundwater Flow in an Arsenic-Contaminated Aquifer, Mekong Delta. Applied Geochemistry, 23 (11) 3072-3087.

Polizzotto, M., Kocar, B.D., Benner, S., Sampson, M., and Fendorf, S. (2008) Near-Surface Wetland Sediments as a Source of Arsenic Release to Groundwater in Asia. Nature. 454. 505-508.

Kocar B.D., Polizzotto, M.L., Benner, S.G., Ying, S.C., Ung, M., Ouch, K., Samreth, S., Suy, B., Phan, K., Sampson, M., Fendorf, S. (2008) Integrated Biogeochemical and Hydrologic Processes Driving Arsenic Release from Shallow Sediments to Groundwaters of the Mekong Delta. Applied Geochemistry, 23 (11) 3059-3071.

Kocar, B.D., Herbel, M.J., Tufano, K., and Fendorf, S. (2006). Contrasting Effects of Dissimilatory As(V) and Fe(III) reduction on Arsenic Retention and Transport. Environmental Science and Technology. 40 (21): 6715-6721.

Kocar, B.D., Garrott, R., and Inskeep, W.P. (2004) Elk Exposure to Arsenic in Geothermal Waters of Yellowstone National Park, USA. Environmental Toxicology and Chemistry, 23: 982-989.

Johnson, S.B., Yoon, T.H., Kocar, B.D., and G.E. Brown, Jr. (2004). Adsorption of Organic Matter at Mineral/Water Interfaces II: Outer-sphere Adsorption of Maleate and Implications for Dissolution Processes. Langmuir. 20 (12): 4996-5006.

Macur, R.E., Langner, H.W., Kocar, B.D., and Inskeep, W.P. (2004). Linking Geochemical Processes with Microbial Community Analysis: Successional Dynamics in an Arsenic-Rich, Acid-Sulfate-Chloride Geothermal Spring. Geobiology 2, 165-167

Kocar B.D. and Inskeep, W.P. (2003). Photochemical Oxidation of Arsenite in Ferrioxalate Solutions (2003). Environmental Science and Technology. 37: 1581-1588.

Book Chapters

Fendorf, S., Herbel, M., Tufano, K., Kocar, B.D. (2007). Biogeochemical Processes Controlling the Cycling of Arsenic in Soils and Sediments. In Biophysico-chemical Processes of Heavy Metals and Metalloids in Soil Environments. Wiley and Sons, San Francisco. (ISBN: 978-0-471-73778-0)

Fendorf, S., Nico, P., Kocar, B.D., Masue, Y., Tufano, K., (2010). Arsenic Chemistry in Soils and Sediments. In Developments in Soil Science: Synchrotron-Based Techniques in Soils and Sediments. Elsevier (ISBN-13: 978-0444532619)

Invited Presentations and Lectures

Kocar, B.D. (Keynote). Examining Nanoscale Biogeochemical Controls on Metals, Radionuclides and Soil-Aqueous Particulate Organic Carbon Using Conventional and Synchrotron-Based Techniques (August, 2018), for Goldschmidt Annual Meeting, Boston, MA.

Kocar, B.D. (2017) Measuring and Deciphering Microscale Biogeochemical Controls on Soil-Sedimentary Nutrients and Contaminants using Synchrotron-Based Techniques. For NSLS-II Symposium, 2017, Brookhaven, NY.

Kocar, B.D. (2014) Using X-ray Microprobe Techniques to Examine Coupled Biogeochemical-Hydrologic Processes responsible for Contaminant Mobilization and Retention in Soils and Sediments. For NSLS-II Users Meeting, Brookhaven, NY.

Kocar, B.D. Understanding Biogeochemistry in Complex Physical Environments (2014). For United States Geological Survey (USGS), Santa Cruz, CA.

Kocar, B.D. Understanding Biogeochemistry in Complex Physical Environments (2013). For Massachusetts Institute of Technology.

Kocar, B.D., Deciphering and Scaling Biogeochemical Processes Responsible for the World's Largest Mass Poisoning. (2013). For University of Michigan.

Kocar, B.D. Arsenic Release and Transport in Sediments of the Mekong Delta. (2011) For Symposium on Advanced Studies in Environmental Research, Global Center of Excellence Institute, Ehime University, Japan.

Kocar, B.D. Defining and Scaling Coupled Hydrological-Biogeochemical Processes Responsible for the World's Largest Mass Poisoning (2011). For Department of Environmental Science and Engineering, California Institute of Technology.

Kocar, B.D. Defining and Scaling Coupled Geochemical-Hydrologic Processes Responsible for the World's Largest Mass Poisoning. (2011). For Department of Earth Sciences, Dartmouth College.

Fendorf, S. Masue, Y., Kocar, B.D. (speaker), Ying, S. (2010). Biogeochemically Induced Mineral Transformations Controlling the Fate of Arsenic. Keynote Presentation, For Goldschmidt annual meeting, Knoxville, TN.

Kocar, B.D. and Fendorf, S. Defining and Predicting Biogeochemical Processes Contributing to Arsenic Release in Sediments of the Mekong Delta. (2009). For Charles University, Prague, Czech Republic.

Kocar, B.D. and Fendorf, S. Biogeochemical Processes Governing the Fate of Arsenic in Sediments of South and Southeast Asia. (2009). For Department of Earth and Ocean Sciences, University of British Columbia, Canada.

Kocar, B.D. and Fendorf, S. Soil-Sediment Processes Governing Arsenic Release and Transport in Sediments of South and Southeast Asia (2009). For Center for Applied Geoscience-Geomicrobiology. University of Tübingen, Germany.

Kocar B.D., S. Ying, M. Polizzotto, and S. Fendorf. (2008). Defining and Simulating the Coupled Biogeochemical and Hydrologic Processes Governing Arsenic Mobility within Soils and Sediments of the Mekong Delta, Cambodia. For Annual meeting of the Stanford-National Science Foundation Environmental Molecular Sciences Institute.

Kocar B.D. S. Ying, M. Polizzotto, and S. Fendorf. (2007). Arsenic Release During Sulfidization and Transformation of Ferrihydrite. Stanford University. Annual meeting of the Stanford-National Science Foundation Environmental Molecular Sciences Institute.

Kocar B.D., S. Ying, M. Polizzotto, and S. Fendorf. (2006). Arsenic Release from Tropical Soils. Stanford University. San Francisco State University, San Francisco CA.

Kocar B.D., S. Ying, M. Polizzotto, and S. Fendorf. (2006). Arsenic Desorption from Ferrihydrite During Biogenic Sulfide Production. Stanford University. Annual meeting of the Stanford-National Science Foundation Environmental Molecular Sciences Institute.

Kocar B.D., B.S. Stewart, and S. Fendorf. (2004). (A)Biotically Generated Hydrogen Sulfide and Ferrous Iron Reactions with Arsenic-Doped Ferrihydrite: Pathways of Arsenic Mobilization and Sequestration. Stanford University. Soil Science Society of America annual meeting, Seattle, WA.

Kocar B.D., R.A. Garrott, and W.P Inskeep. (2003). Elk Exposure to Arsenic in the Madison-Firehole Watershed, Yellowstone National Park. Stanford University. Soil Science Society of America annual meeting, Denver, CO.

Presentations-Volunteered

Kocar B.D., Mehta N., Gadol H.J., Chen M. Gelfond, C.E., Carrasquillo A.J. Deciphering Coupled Mineralogical-Redox Controls on Methane Cycling in Variably Saturated Soils and Sediments. (2017). For AGU annual meeting, New Orleans, LA

Kocar B.D., Gelfond C.E. Photochemically-Driven Reduction of Mercury-(II) in the Presence of Particulate Organic Matter. (2016). For American Geophysical Union Annual Meeting, San Francisco CA

Kocar B.D. and Webb S. (2012). Soft X-Ray Microscopy at the Stanford Synchrotron Radiation Lightsource. For the XAFS Conference, Shanghai, China.

Kocar B.D and Fendorf, S. Variation in Biogeochemical Processes Controlling Uranium and Chromium Induced by Soil Physical Complexity. (2010). For Soil Science Society of America annual meeting, Long Beach, CA.

Kocar B.D and Fendorf S. Diffusive Controls and Thermodynamic Constraints on Reductive Biogeochemical Reactions. (2009). For Soil Science Society of America annual meeting, Pittsburgh, PA.

Kocar B.D. and Fendorf S., (2009). Diffusive Controls and Thermodynamic Constraints on Reductive Biogeochemical Reactions. For Goldschmidt, 2009, Davos, Switzerland.

Kocar B.D., Polizzotto M., Ying S, Benner S.G., Sampson M., Fendorf S. (2009). Measuring and Simulating the Near-Surface Biogeochemical and Hydrologic Processes Governing Arsenic Transport in the Mekong Delta, Cambodia. For AGU Chapman Conference in Siem Reap, Cambodia.

Kocar B.D., Polizzotto M., Ying S, Benner S.G., Sampson M., Fendorf S. (2009). Coupled Biogeochemical and Hydrologic Processes Governing Arsenic Mobility within Sediments of Southeast Asia. For AGU Annual Meeting, San Francisco, USA.

Kocar B.D., Polizzotto M., Ying S, Benner S.G., Sampson M., Fendorf, S. (2008). Coupled Biogeochemical and Hydrologic Processes Governing Arsenic Mobility within Sediments of Southeast Asia. For AGU Annual Meeting, San Francisco, USA.

Kocar B.D., Ying S.C., Polizzotto, M.L., Benner S.G., Ung M., Suy B., Phan K., Sampson M., Fendorf S. Coupled Biogeochemical and Hydrologic Processes Governing Arsenic Transport within Evolving Sedimentary Basins of Southeast Asia. (2008). For Soil Science Society of America annual meeting, Houston, TX.

Kocar B.D., Ying S, Polizzotto M., Ung M., Suy B, Phan K, Samreth S., Sampson M., Benner S. Fendorf S. (2008). Defining and Simulating the Coupled Biogeochemical and Hydrologic Processes Governing Arsenic Transport within Evolving Sedimentary Basins of Southeast Asia. For Goldschmidt Annual Meeting, Vancouver, BC, Canada.

Kocar B.D. and S. Fendorf. (2007). Sulfidogenesis Controls on Ferrihydrite Transformation and Repartitioning of Sorbed Arsenic. Stanford University. For American Geophysical Union Annual Meeting, San Francisco, CA.

Kocar B.D., Ying S.C., and Fendorf S. (2007). Release and Transport Pathways of Arsenic with Seasonally Saturated, Tropical Wetlands of the Mekong Delta. For Soil Science Society of America annual meeting, New Orleans, LA.

Kocar B.D., Ying S.C., Polizzotto M., Ung M., Samreth S., Leng M., Sampson M., and Fendorf S. (2006). Arsenic Retention and Release from Ferrihydrite and Tropical Soils during Iron and Sulfate Reduction. For American Geophysical Union Annual Meeting, San Francisco, CA.

Kocar B.D., Ying S.C., Polizzotto M., Ung M., Samreth S., Leng M., Sampson M., and Fendorf. S. (2006). Iron (hydr) Oxide Transformation and Release of Arsenic from Tropical Soils During Iron and Sulfate Reduction. For Soil Science Society of America annual meeting, Indianapolis, IN.

Kocar B.D., Masue Y., Tufano K, Ying S.C., Polizzotto M., Borch T., and Fendorf S. (2006). Iron (Hydr)oxide Transformation and Release of Arsenic from Ferrihydrite and Tropical Soils during Sulfate Reduction. For World Soils Congress, PA, USA.

Kocar B.D., T. Borch and S. Fendorf. (2005). Release of Arsenic and Transformation of Iron (Hydr)oxides During Sulfidogenesis. For Soil Science Society of America annual meeting, Salt Lake City, UT.

Kocar B.D., T. Borch, S. Fendorf. (2005). Sulfidogenesis Controls on Iron (Hydr)oxide Transformation and Release of Arsenic. Stanford University. For 230th ACS Meeting, Washington, D.C.

Kocar B.D., K. Tufano, Y. Masue, B. Stewart, M. Herbel, S. Fendorf. (2005). Reactions of Biogenic Ferrous Iron and Sulfide with Arsenic-Doped Ferrihydrite: Pathways of Arsenic Mobilization and Sequestration. For ISSM/ISEB Meeting, Jackson Hole, WY.

Kocar B.D., K. Tufano, Y. Masue, B.S. Stewart, M. Herbel, S. Fendorf. (2005). Arsenic Mobilization Influenced by Iron Reduction and Sulfidogenesis. For Goldschmidt Annual Meeting, Moscow, ID.

Kocar B.D., B.S. Stewart, M. Herbel M., Fendorf S. (2004). Arsenic Mobilization Influenced by Iron Reduction and Sulfidogenesis under Dynamic Flow. For American Geophysical Union Annual Meeting, San Francisco, CA.

Kocar B.D. (2004). (A)Biotically Generated Hydrogen Sulfide and Ferrous Iron Reactions with Arsenic-Doped Ferrihydrite: Pathways of Arsenic Mobilization and Sequestration. EPA STAR Fellowship Conference. Washington, D.C.

Kocar B.D. and Inskeep W.P.. (2003). Photochemically Induced Oxidation of Arsenite in Ferrioxalate Solutions. Proceedings of the American Association for the Advancement of Science-Pacific Division. 84th Annual Meeting, San Francisco, CA.

Kocar B.D., Macur R.E., and Inskeep W.P. (2000). Photochemically Induced Oxidation of Arsenite in the Presence of Fe(III) and Oxalate. For Soil Science Society of America annual meeting, Minneapolis, MN.

Project Experience

Representative Projects

Groundwater Management Issues Relating to the Sustainable Groundwater Management Act (SGMA, California, USA).

Evaluated historical data and numerical models to understand and quantify groundwater storage and flux in a geologically complex basin. Performed analysis to quantify safe yield of the basin over time periods hydrologically representative of local long-term climate. Supported litigation relating to groundwater rights

and SGMA.

Clean Water Act (CWA) Citizen Suits (Several Locations in California, USA).

Investigated alleged waterway contamination (e.g., metals, oil and grease) resulting from storm water runoff from several different industrial sites. Evaluated storm water pollution prevention plans (SWPPPs), including site implementation of best management practices (BMPs) and best available technology (BAT). Analyzed precipitation records and site storm water connection to municipal separate storm sewer systems (MS4s) and adjacent waterways. Conducted site visits and assisted with expert and rebuttal reports.

Management of Acid Rock Drainage (Arid West, USA)

Performed technical analysis of processes contributing to acid rock drainage. Supported litigation involving the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, Superfund) regarding acid rock placement strategies and scenarios. Assisted with preparation of expert report.

Fate and Transport of Metals in Soil (Mining Industry, USA).

Deciphered fate and transport of metals in soil arising from fugitive dust inputs. Directed laboratory analysis of samples, including sequential chemical extractions, to constrain the extent of source material weathering and release of zinc, copper, lead and cadmium to soil porewater. Prepared technical report.

Volatile Organic Compounds: Fate and Transport (Several Locations Nationwide, USA).

Supported several cases involving the timing, release, and transport of volatile organic compounds (VOCs) such as trichloroethylene and tetrachloroethylene (TCE, PCE respectively) within complex hydrogeologic settings. Performed technical review of site and regional history, hydrostratigraphy, and groundwater flow.

Protection of Groundwater from Soil Metals (California, USA).

Performed geochemical modeling to calculate a soil screening level of lead for protection of groundwater resources.

Dioxin Release and Fate (East Coast, USA).

Provided technical support for litigation relating to dioxin release into a major waterway. Assisted with preparation of technical report.

Pesticide Overspray and Crop Damage (California, USA).

Investigated an insurance claim relating to alleged pesticide overspray resulting in substantial crop loss. Conducted a site visit and prepared a technical memorandum.

Fate and Transport of Aquatic Pesticides (USA).

Performed calculations and modeling to determine appropriate dosing rate of algaecide within a large reservoir system used to supply water to a major city. Modeled the residence time of copper based on reservoir flushing, mass flux of algaecide into sediments, and partitioning with organic matter. Computed copper concentrations in water and compared them to the criterion continuous concentration (CCC) for aquatic life derived from the California Toxics Rule (CTR).

National Pollutant Discharge Elimination System (NPDES) Permit Compliance (West Coast, USA).

Designed a study to examine the suitability and accuracy of different ICP-MS analytical methods for determining ppb-level nickel, copper, and zinc concentrations in dewatering discharges to brackish groundwater.

Mobilization of Metals in Plumbing Systems (USA).

Identified chemical reactions responsible for mobilization of metals relating to the disinfection system for a large municipal building project.

Landfill Arsenic Study (Massachusetts, USA).

Elucidated geochemical mechanisms of arsenic release and transport from a landfill on a former military installation. Performed geochemical modeling, evaluated the potential efficacy of groundwater management and monitored natural attenuation (MNA) on the downstream fate of arsenic.

Pesticide Registration (USA).

Provided technical support for pesticide product registration in the United States.

Geochemistry of Coal Ash Impoundments (USA).

Evaluated geochemical and hydrologic conditions conducive to the release and mobilization of constituents of interest (COIs), including arsenic, antimony, boron, chromium, cobalt, lithium, molybdenum. Developing tools for predicting COI mobility under different coal ash impoundment closure scenarios. Preparation of work plan (project ongoing).

Other Skills

(Bio)Geochemical, Groundwater and Reactive Transport Models: MIN3P, Crunchflow, PHREEQC, Geochemist Workbench, MINTEQ, MODFLOW.

Computer Languages and Other Software Packages: Intermediate Proficiency (for data analysis and instrument control): Python. Basic Proficiency (for data analysis and modifying pre-existing code): R, C, FORTRAN.

Conventional Instrumentation: ICP-MS/OES, IC, AA, GC-MS, MIMS/RGA, SEM, TEM, Electron Microprobe, ICP-DRIE (clean-room microfluidic device fabrication), XRD (powder), FTIR, XPS, Microscopy — Standard, Fluorescence, Confocal. Microwave digestion.

Advanced Instrumentation: Numerous synchrotron-based techniques for solid phase speciation analysis (XRF mapping, confocal XRF mapping, XANES/EXAFS, NEXAFS, s-XRD) for understanding contaminant dynamics in soils and sediments. Fourier Transform Ion Cyclotron Resonance (FTICR) for identifying compounds within complex organic and inorganic mixtures.

Exponent®
Engineering & Scientific Consulting

William L. Goodfellow, Jr., BCES
Principal Scientist & Practice Director | Ecological & Biological Sciences
1800 Diagonal Road, Suite 500 | Alexandria, VA 22314
(717) 793-2791 tel | wgoodfellow@exponent.com

Professional Profile

Mr. William Goodfellow is a Principal Scientist and the Director of Exponent's Ecological and Biological Sciences practice. Mr. Goodfellow is a Board-Certified Environmental Scientist with special emphasis in Environmental Toxicology. He has more than 35 years of experience in environmental toxicology and causal effect assessments. His technical experience includes environmental assessment of chemical and biological contaminants in surface water, groundwater, soil and sediment, and their toxicological risk associated with potential contaminants of concern; design and performance of Toxicity Reduction Evaluations (TREs) for municipal and industrial discharges; assisting with treatability assessments of contaminated sediments, soils, and wastewater; researching and writing technical documents on federal and state water quality criteria and other water pollution control issues; and conceptual and experimental evaluations on the toxicity, fate, and effects of chemicals in aquatic ecosystems; assessment of environmental damage resulting from point- and non point-source discharge; assessment and remediation of potentially toxic sediment, dredge materials.

Mr. Goodfellow is an internationally recognized expert in toxicology and TRE technology. He is a Past President of the international professional society, Society of Environmental Toxicology and Chemistry and a SETAC Fellow. Mr. Goodfellow has served on peer-review panels, advisory boards, task forces, and editorial committees for natural resources, toxicology, and TRE issues, as well as being widely published.

Academic Credentials & Professional Honors

M.S., Fishery Management, Frostburg State University, 1982

B.S., Biology, York College of Pennsylvania, 1979

A.S., Chemistry, York College of Pennsylvania, 1978

Executive Education Certification, University of Pennsylvania, Wharton School of Business;

Philadelphia, Pennsylvania; 2011 - Essentials of Management; 2005-2006; Implementing

Strategy; 2006; Leading and Influencing People; 2010; Strategic Persuasion Workshop: The Art and Science of Selling Ideas; 2011

Executive Education, Harvard Business School; Boston, Massachusetts; 2008 - Leading Professional Service Firms

Co-Editor-in-Chief, SETAC Globe (an international electronic newsletter of the Society of Environmental

Toxicology and Chemistry, 2014-Present

SETAC Fellow - November 2015

Presidential Award - SETAC, 2015

SETAC International Award, Herb Ward Excellence in Service Award Presented at the 32nd Annual Meeting of the Society of Environmental Toxicology and Chemistry, Boston, Massachusetts, 2011

Society of Environmental Toxicology and Chemistry-SETAC World Council (World Board of Directors), 2007 - 2014; SETAC World Council, Vice President, 2012; President, 2013; Immediate Past President, 2014; North America Board of Director, 2004-2011 and North America Executive Committee, 2006-2011, SETAC-North America-Secretary/Treasurer, 2007-2008; North America-Vice President, 2009; North America-President, 2010; North America Immediate Past President, 2011; North America-Finance Committee, 2006 - 2014; World Council-Finance Committee, 2007 - Present

Presidential Award- SETAC, 2011

SETAC-Endowment Trustee, 2007 - Present

Standard Methods Committee and Joint Task Group Member, Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 1985 - 2014

Meeting Chairman for the Gulf Oil Spill, Focus Topic Meeting, SETAC, Pensacola Beach, Florida, April 2011

Meeting Chairman for the 26th Annual Meeting of the SETAC, Baltimore, MD, November 2005

Presidential Award - SETAC, 2004

Chairman and Steering Committee Member, Industrial Chemical Advisory Council, South-Central Pennsylvania, 2002 - Present; Vice Chairman, 2007-2010; Chairman, 2011 - Present

Chairman of the Awards and Fellowship Subcommittee - SETAC, 2003-2006

Member of the SETAC Board of Director's Standing Program Committee, 2001-2003

Presidential Award - SETAC, 2001

Meeting Chairman 22nd Annual Meeting of the SETAC, Baltimore, MD, November 2001

Elected to Editorial Board, Environmental Toxicology and Chemistry, 1998-2002

Awards Committee — SETAC Founders Award, SETAC/EA Jeffrey Black Award, ACC Young Researchers Award, Procter and Gamble Predoctoral Award, ICC Significant Achievement Award and ICA/Chris Lee Award for Metals Research, SETAC, 1998-2012

Delegate to 25th "Pellston Workshop" on Whole Effluent Toxicity, SETAC/SETAC Foundation, 1995

Member of Biomonitoring Task Group, Water Environment Federation, 1992-1998

Member — Sediment Subcommittee - ASTM, 1989-2001

Distinguished Men and Women in Science, 1988

William Goodfellow, Jr., BCES
04/18 | Page 2

Fellow — American Institute of Fishery Research Biologists, 1982-1987

Licenses and Certifications

Board Certified Environmental Scientist, Environmental Toxicology (BCES), Certification Number, 13-60004, American Academy of Environmental Scientists Board of American Academy of Environmental Engineers and Scientists

Society of Environmental Toxicology and Chemistry (SETAC) Fellow

OSHA 40-hour Hazwoper Training, annual 8-hour refresher (December 2015)

Prior Experience

Vice President and Business Unit Director, EA Engineering, Science and Technology, Inc., 1984-2013 (other titles and responsibilities during tenure)

Associate Biologist, The Johns Hopkins University, Applied Physics Laboratory, 1982-1984

Research Assistant, University of Maryland, Appalachian Environmental Laboratory, 1979-1982

Biological Technician, Taxonomic Consultants, Inc., 1980-1982

Water Chemistry Technician, Texas Instruments, Inc., 1980

Quality Control and Research and Development Supervisor, National Brick Corporation, 1979

Biological Consultant, Dr. Robert F. Denoncourt, 1978-1979

Senior Laboratory Technician, Quality Control (part-time), Gent-L-Kleen, Inc., 1977-1979

Teaching Assistant, Summer Instructor for Chemistry Department, York College of Pennsylvania, 1977

Professional Affiliations

American Academy of Environment Engineers and Scientists (AAEES)

American Bar Association (ABA), Associate Member

American Chemistry Society (ACS)

- Environmental Science Division

Chemical Industry Advisory Council

- Chairman CIAC

Society of Environmental Toxicology and Chemistry (SETAC)

- SETAC World Council Past President
- North America Past President
- SETAC-North America Past Treasurer

- SETAC-North America and SETAC World Council (SWC) Board of Directors
- SETAC-Endowment (Trustee)
- Publications Advisory Committee (SWC)
- Communications Committee (SWC)
- Sediment Advisory Group (SWC)
- Metals Advisory Group (SWC)

Chesapeake and Potomac Regional Chapter (SETAC)

Society of Petroleum Engineers (SPE)

Society of Toxicology (SOT)

University of Michigan, Water Center-Advisory Council

Publications

Canedo-Arguelles M, Hawkins CP, Kefford BJ, Schafer RB, Dyack BJ, Brucet S, Buchwalter D, Dunlop J, Fror O, Lazorchak J, Coring E, Fernadez HR, Goodfellow W, Gonzalez Achem AL, Hatfield-Dodds S, Karimov BK, Mensah P, Olson JR, Piscart C, Prat N, Ponsa S, Schulz CJ, Timpano AJ. Saving freshwater from salts: Ion-specific standards are needed to protect biodiversity. Science 2016; 351 (6276): 4-6.

Deines AM, Goodfellow, Jr. WL, Murray KJ. DNA testing and the next generation of environmental forensics. Environmental Perspectives, Volume 2, December 2015.

Liber K, Goodfellow W, Den Bestern P, Clements W, Galloway T, Gerhardt A, Green A, Simpson S. In situ-based effects measures: Considerations for improving methods and approaches. Integrated Environmental Assessment and Management 2007; 3(2): 246-258.

Norberg-King TJ, Ausley L, Burton D, Goodfellow W, Miller J, Waller WT (eds). Toxicity reduction and toxicity identification evaluations for effluents, ambient waters, and other aqueous media. SETAC Press, Pensacola, FL, 455 pp, 2005.

Norberg-King TJ, Ausley LW, Burton DT, Goodfellow WL, Miller JL Waller WT. Introduction to toxicity reduction evaluations. Chapter 1, p 1-29. In: Toxicity reduction and toxicity identification evaluations for effluents, ambient waters, and other aqueous media. SETAC Press, Pensacola, FL, 455 pp, 2005.

Goodfellow WL, Brils J, Burgess RM, Doi J, Downey PJ, Matthews DL, Norberg-King TJ, Phillips BM. Wastewater toxicity identification evaluations. Chapter 3, p 59-92. In: Toxicity reduction and toxicity identification evaluations for effluents, ambient waters, and other aqueous media. SETAC Press, Pensacola, FL, 455 pp, 2005.

Burton DT, Norberg-King TJ, Ausley LW, Goodfellow WL, Miller JL, Waller WT. Workshop summary, recommendations, and conclusions. Chapter 5, p 115-126. In: Toxicity reduction and toxicity identification evaluations for effluents, ambient waters, and other aqueous media. SETAC Press, Pensacola, FL, 455 pp, 2005.

Baummer JC, Goodfellow WL, McCulloch W. Large petroleum refinery/petrochemical production facility, Gulf Coast, USA. Case Study 6.24, p 299-306. In: Toxicity reduction and toxicity identification evaluations for effluents, ambient waters, and other aqueous media. SETAC Press, Pensacola, FL, 455 pp, 2005.

Baummer JC, Goodfellow WL, McCulloch W. The military perspective, Fort Campbell, Kentucky, USA. Case Study 6.25, p 306-312. In: Toxicity reduction and toxicity identification evaluations for effluents, ambient waters, and other aqueous media. SETAC Press, Pensacola, FL, 455 pp, 2005.

Goodfellow WL, McCulloch W. Minimal toxicity necessary for an effective toxicity identification evaluation. Case Study 6.31, p 338-344. In: Toxicity reduction and toxicity identification evaluations for effluents, ambient waters, and other aqueous media. SETAC Press, Pensacola, FL, 455 pp, 2005.

Goodfellow WL, Jr. The aquatic environment. In: Environmental Toxicity Testing. Thompson KC, Wadhia K, Loibner AP (eds), Blackwell Publishing, CRC Press, Oxford, United Kingdom, 388 pp, 2005.

Ferretti JA, Calesso DF, Lazorchak JM, Dolce TJ, Arnold J, Goodfellow WL, Smith ME, Serbst JR. Interlaboratory Comparison of a Reduced Volume Marine Sediment Toxicity Test Method Using the Amphipod Ampelisca abdita. Environmental Toxicology and Chemistry 2004; 23(3):632-637.

Goodfellow WL. Toxicity Testing and Bioavailability of Contaminants in Sediments. Chapter 5. In: Sediment Guidance Compendium. Electric Power Research Institute, Inc., Concord, California, Report 1005216, 2001.

Goodfellow WL. Treating water in wintery weather: How temperature affects biomass, receiving waters and sampling strategies. Pollution Engineering 2000; 32 (11):28-29.

Goodfellow WL, Ausley LW, Burton DT, Denton DL, Dorn PB, Grothe DR, Heber MA, Norberg-King T, Rodgers JH. Major Ion Toxicity in Effluents: A Review with Permitting Recommendations. Environmental Toxicology and Chemistry 2000; 19(1):175-182.

Reash RJ, Seegert GL, and Goodfellow WL. Experimentally-derived upper thermal tolerance for redhorse suckers: revised 316(a) variance conditions at two generating facilities in Ohio. Environmental Science and Policy 2000, 3: S191-S196.

MacFarlane I, Goodfellow W, Reimold R. Tracking the status of endocrine disruptors in remediation. Soil and Water Contamination, California, March 1999.

Goodfellow W, Firstenberg C. Beyond compliance: Sampling as a management tool. World Dredging Mining & Construction 1998; 34 (8):12-13, 26.

Ausley L, Burton D, Denton D, Dorn P, Goodfellow W, Gulley J, Heber M, Norberg-King T, Rodgers J, Waller T. Tackling tough issues in whole effluent toxicity testing: Progress of the SETAC WET, 1997.

Chapman GA, Anderson BA, Bailer AJ, Baird RB, Berger R, Burton DT, Denton DL, Goodfellow WL, Jr.., Heber MA, MacDonald LL, Norberg-King TJ, Ruffier PJ. Methods and appropriate endpoints. In: Whole Effluent Toxicity Testing: An evaluation of methods and prediction of receiving system impacts. Grothe DR, Dickson KL, Reed-Judkins DK (eds), Session 3: SETAC Press, Pensacola, FL, 346 pp, 1996.

Johnson GL, Goodfellow WL. Pollution Prevention. The Military Engineer 1996; 88(580):50-51.

Bradley TD, et al. 1996. Waste Water Sampling from Process and Quality Control Manual of Practice No. OM-1. Prepared by Task Force on Waste Water Sampling for Process and Quality Control, T.D. Bradley (chair), Goodfellow W co-author. Water Environment Federation, Alexandria, Virginia. 194 pp, 1996.

McCulloch WL, Goodfellow WL, Jr. Characterization, identification, and confirmation of total dissolved solids as effluent toxicants. In: Environmental Toxicology and Risk Assessment: 2nd Volume, ASTM STP 1261, Gorsuch JW, Dwyer FJ, Ingersoll CG, LaPoint TW (eds), ASTM, Philadelphia, PA, 1993.

Botts JA, Braswell JW, Morris TL, Welch MC, Goodfellow WL, Jr.., Moore SB. Toxicity Reduction

Evaluation Protocol for Municipal Waste Water Treatment Plants. Second edition, EPA, Cincinnati, OH, 1990.

Goodfellow WL, Jr., Rue WJ. Evaluation of a chronic estimation toxicity test using Mysidopsis bahia. In: Aquatic Toxicology and Hazard Assessment: 12th Volume, ASTM STP 1027, Cowgill UM, Williams LR (eds), ASTM, Philadelphia, PA, 1989.

Goodfellow WL, Jr., McCulloch WL, Botts JA, McDearmon AG, Bishop DF. Long-term multispecies toxicity and effluent fractionation study at a municipal wastewater treatment plant. In: Aquatic Toxicology and Hazard Assessments, 11th Volume, ASTM, STP 1007, Suter GW II, Lewis MA (eds), ASTM, Philadelphia, PA, 1989.

Zyman J, Braswell JW, Botts JA, Sullivan EC, Moore SB, Goodfellow WL, Jr. Toxicity Reduction Evaluation (for Municipal Waste Water Treatment Plants) Protocol. EPA, Water Engineering Research Laboratory, Cincinnati, OH, 1987.

Botts JA, Braswell JW, Sullivan EC, Goodfellow WL, Jr., Sklar BD, McDearmon AG. Toxicity reduction evaluation at the Patapsco Waste Treatment Plant. Final Report for Cooperative Agreement CR812790-01-1. EPA, Water Engineering Research Laboratory, Cincinnati, OH, 1987.

Botts JA, Braswell JW, Goodfellow WL, Jr., Bishop DF. Project summary of the toxicity reduction evaluation at the Patapsco Waste Water Treatment Plant, Baltimore, MD, U.S. Environmental Protection Agency, Water Engineering Research Laboratory, Cincinnati, OH, 1987.

Goodfellow WL, Jr., Morgan RP, Stauffer JR, Jr., Hocutt CH. An intergeneric hybrid, Campostoma anomalum x Rhinichthys atratulus, from the Youghiogheny River Drainage, West Virginia. Biochemical Systematics and Ecology 1986; 14:233-238.

Goodfellow WL, Jr., Klauda RJ, Graves WC. Test chamber for experiments with early life stages of fishes. Progressive Fish-Culturist 1985; 47:193-194.

Cooper KR, Burton DT, Goodfellow WL, Jr., Rosenblatt DH. Bioconcentration and metabolism of picric acid (2,4-6 trinitrophenol) and picramic acid (2-amino-4,6-dinitrophenol) in rainbow trout, Salmo gairdneri. Journal of Toxicology and Environmental Health 1984; 14:731-747.

Goodfellow WL, Jr., Hocutt CH, Morgan RP, II, Stauffer JR, Jr. Biochemical assessment of the taxonomic status of "Rhinichthys bowersi" (Pisces, Cyprinidae). Copeia 1984; (3):652-659.

Morgan RP, II, Goodfellow WL, Jr., Hocutt CH, Stauffer JR, Jr. Karyotype of Nocomis micropogon, Rhinichthys cataractae, and their supposed hybrid, Rhinichthys bowersi (Pisces, Cyprinidae). Copeia 1984; 4:991-992.

Burton DT, Cooper KR, Goodfellow WL, Jr., Rosenblatt DH. Bioconcentration, elimination and metabolism of 14C-picric acid and 14C-picramic acid in the American oyster (Crassostrea virginica). Archives of Environmental Contamination and Toxicology 1984; 13:653-663.

Goodfellow WL, Jr.. Etheostoma exile, the Iowa darter. Pennsylvania Inventory of Plant and Animal Species of Special Concern. Carnegie Museum of Natural History, Special Publication 1984; 10: 207-209.

Goodfellow WL, Jr., Smith RE, Jr. 1984. Polyodon spathula, the paddlefish. Pennsylvania Inventory of Plant and Animal Species of Special Concern. Carnegie Museum of Natural History, Special Publication 1984; 10: 230-231.

Goodfellow WL, Jr., Burton DT, Graves WC, Hall WL, Jr., Cooper KR. Acute toxicity of picric acid and picramic acid to rainbow trout, Salmo gairdneri, and American oyster, Crassostrea virginica. Water

Resources Bulletin 1983; 19:641-648.

Stauffer JR, Jr., Gates JE, Goodfellow WL, Jr. Preferred temperature of two sympatric Ambystoma larvae: A proximate factor in niche segregation? Copeia 1983; (4):1001-1005.

Goodfellow WL, Jr., Burton DT, Cooper KR. Effect of picric and picramic acids on growth of rainbow trout, Salmo gairdneri, and the American oyster, Crassostrea virginica. Chemosphere 1983; 12(9/10):1259-1268.

Burton DT, Goodfellow WL, Jr., Cooper KR. Bioconcentration, elimination and metabolism of picric and picramic acid in fresh water fish and estuarine bivalves. Final Report, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland; U.S. Army Medical Research and Development Command, Fort Detrick, Maryland. Army MIPR 2506, 125 pp, 1983.

Mosher JA, Morgan RP, II, Goodfellow WL, Jr., Haug EA. Serum proteins of selected Falconiformes and Strigiformes. Biochemical Systematics and Ecology 1982; 10:373-376.

Goodfellow WL, Jr., Stauffer JR, Jr., Morgan RP, II, Hocutt CH, Esmond EF. Taxonomic status of Rhinichthys bowersi. U.S. Dept. of Agriculture, Forest Service, Elkins, West Virginia, 87 pp, 1982.

Goodfellow WL, Jr. Electrophoretic analysis of Nocomis micropogon (river chub), Rhinichthys cataractae (longnose dace), and their F1 hybrid (Cyprinidae). Master Thesis, University of Maryland, Appalachian Environmental Laboratory, Frostburg State College, Frostburg, MD, 1982.

Goodfellow WL, Jr., Morgan RP, II, Hocutt CH, Stauffer JR, Jr. Electrophoretic analysis of Campostoma anomalum, Rhinichthys cataractae, and their F1 offspring. Biochemical Systematics and Ecology 1982; 10:95-98.

Stauffer JR, Jr., Morgan RP, II, Hocutt CH, Goodfellow WL, Jr. Selected physical parameter analysis of the Youghiogheny River, Maryland. Maryland Dept. Health and Mental Hygiene, Annapolis, MD, 1981.

Goodfellow WL, Jr., Lebo JR. Fishes of the Town Creek Drainage, Bedford County, Pennsylvania and Allegheny County, Maryland. Proceedings, Pennsylvania Academy of Science 1981; 55:147-152.

Presentations

Goodfellow WL, Paulsen SC, Marjanovic KC. 2017. Toxicity assessments for NPDES compliance: Traditional TSD methods versus the TST approach. SETAC 38th Annual Meeting, Minneapolis, MN. November 2017.

Goodfellow WL, Masue-Slowey Y. 2017. Advancements in technologies often change previous norms for recycling strategies. SETAC 38th Annual Meeting, Minneapolis, MN. November 2017.

Kashuba R, Goodfellow WL. 2017. How statistical artifacts affect the reliability of toxicity thresholds calculated from distribution tails of field monitoring data. SETAC 38th Annual Meeting, Minneapolis, MN. November 2017.

Mebane C, Fairbrother A, Augspurger T, Canfield T, Goodfellow WL, Guiney PD, LeHuray A, Maltby L, Mayfield DB, McLaughlin M, Ortego LS, Schlekat TH, Scroggins RP, Sumpter JP, Verslycke T. 2017. Scientific integrity issues in environmental toxicology. SETAC 38th Annual Meeting, Minneapolis, MN. November 2017.

Goodfellow WL, Kashuba R, Menzie CA. Use of multiple sources of field data in assessment of streams and rivers. Ninth International Conference on Remediation and Management of Contaminated Sediments. New Orleans, LA. January 2017.

Goodfellow WL, McArdle ME, Kulacki KJ. Designing, performing, and reviewing toxicity tests for effective presentations in reports and journals. SETAC 7th World Congress and 37th Annual Meeting, Orlando, FL. November 2016.

Menzie C, William P, Cantor R, Cox T, Wenning R, Landis W, Reiss R, Goodfellow W. Joint SRA/SETAC Roundtable: Scientific Integrity in Publications. Society of Risk Analysis, Arlington, VA. December 2015.

Goodfellow WL. Developing Toxicity Identification Evaluation test strategies: When and how to make mid-evaluation changes. SETAC 36th Annual Meeting, Salt Lake City, UT, November 2015.

Goodfellow WL, Menzie C, Koshuba R. Expressing total dissolved solids toxicity as conductivity or individual ions? SETAC 36th Annual Meeting, Salt Lake City, UT, November 2015.

Goodfellow WL, Menzie C, Masure-Slowey Y. Is manure a RCRA Solid Waste? SETAC 36th Annual Meeting, Salt Lake City, UT, November 2015.

Goodfellow WL, Staveley J, Wentsel R, Canfield T, Maier K. Building environmental programming through tripartite representation: Successes and challenges. SETAC 36th Annual Meeting, Salt Lake City, UT, November 2015.

Goodfellow WL and Saba T. Hydraulic Fracturing: Data Analysis Tools to Evaluate Environmental and Ecological Risks. Professional Training Course. SETAC 36th Annual Meeting, Salt Lake City, UT, November 2015.

Goodfellow WL. Causal Analysis: Assessment of Complex Environmental Problems. Col. Unidad Modelo, Mexico City, Mexico. June 2015.

Goodfellow W, Booth P. Ecological Risk Assessment of Shale Oil/Shale Gas and Mining Operations. Two-day Short Course. SETAC Mexico Branch, Mexico City, Mexico. June 2015.

DeLeo P, Ciarlo M, Williams S, Greggs W, Goodfellow W. What's out there in consumer products and the environment? A survey of home and personal care product ingredients and related safety information. SETAC 34th Annual Meeting, Nashville, TN, November 2013.

Williams S, Ciarlo M, Greggs W, Horne C, Connors K, Brooks B, Goodfellow W, DeLeo P. A summary of public available primary and categorical human health hazard data for cleaning product ingredients. SETAC 34th Annual Meeting, Nashville, TN, November 2013.

Williams S, Ciarlo M, Greggs W, Horne C, Connors K, Brooks B, Goodfellow W, DeLeo P. Cleaning products ingredient safety initiative: Process for acquiring publicly available human health hazard data and assessment of data availability. SETAC 34th Annual Meeting, Nashville, TN, November 2013.

Chanov M, McCulloch W, Connelly R, Goodfellow W. Case study: Zebra Mussel (Dreisena polymorpha) embryonic testing as a freshwater biomonitoring tool in the United States. SETAC 34th Annual Meeting, Nashville, TN, November 2013.

McCulloch W, Chanov M, Goodfellow W. Laboratory toxicity testing using three species to evaluate ion toxicity thresholds in industrial wastewaters. Presented at Major Ion Toxicity Workshop, US EPA Region V, Chicago, IL, April 2-4, 2012.

Goodfellow WL, Greenberg MS, Jr., Vigon B, Schiefer G. SETAC Gulf of Mexico Oil Spill Focused Topic Meeting: I. Summary on ecosystem assessment, risk and damage assessment and seafood safety and human health issue sessions. SETAC, 32nd Annual Meeting, Boston, MA, November 2011.

Greenberg MS, Jr., Goodfellow WL, Vigon B, Schiefer G. SETAC Gulf of Mexico Oil Spill Focused Topic Meeting: II. Summary on current response technology and capabilities. SETAC, 32nd Annual Meeting, Boston, MA, November 2011.

Goodfellow WL, McCulloch WL, Chanov MK. Case study of effluent discharged in transition zone of freshwater and estuaries. SETAC, 32nd Annual Meeting, Boston, MA, November 2011.

Goodfellow WL, Greenberg MS. Gulf Oil Spill focus topic meeting closing plenary and panel session. Gulf Oil Spill, Focus Topic Meeting, SETAC, Pensacola Beach, FL, April 2011.

Goodfellow WL, McCulloch WL, Chanov MK. Toxicant identification evaluations as an effective tool for managing effluents that are only sublethally toxic. SETAC, 31st Annual Meeting, Portland, OR, November 2010.

Goodfellow WL, Cheatwood C, Snead V, Papageorgis C, Neubauer J, Logan C. Proportional risk as a site management tool. SETAC-Europe, 20th Annual Meeting, Seville, Spain, May 2010.

Goodfellow WL, McCulloch WL, Purcell TW. How successful are toxicant identification evaluations of sublethally toxic effluents? SETAC, 30th Annual Meeting, New Orleans, LA, November 2009.

Ciarlo MC, Goodfellow WL, Papageorgis C, Derrick P. Evaluating dredged material suitability for habitat creation-tools and trends beyond the guidance. SETAC-Europe, 19th Annual Meeting, Goteborg, Sweden, May 2009.

Goodfellow WL, Ciarlo MC, McCulloch WL, Neubauer RJ, Baummer JC. Toxicity testing: integration of potential chemicals of concern using bioavailability. American Chemical Society, 237th National Meeting, Salt Lake City, UT, 2009.

McCulloch WL, Leasure CW, Goodfellow WL, Derrick PA, Olsen KA. Upland plant bioaccumulation testing of a predominately clay sediment with naturally high cadmium content. SETAC, 29th Annual Meeting, Tampa, FL, 2008.

Watlington KJ, Graham AM, Bouwer EJ, Baummer JC, Goodfellow WL, McCulloch WL. Bioassay testing of Baltimore harbor sediments spiked with Cr (VI). SETAC, 28th Annual Meeting, Milwaukee, WI, 2007.

Barranco FT, Hinckley DA, Rue WJ, Pine FW, Goodfellow WL. Methods for evaluating and examining groundwater trace metal transport from urban fill material to tidal surface water. SETAC 26th Annual Meeting, Baltimore, MD, November 2005.

Goodfellow WL, Rue WJ, McCulloch WL, Connelly RA, Dixon KM, Christensen L. The use of chronic in-situ toxicity assessment as part of site specific criterion development. SETAC, 25th Annual Meeting and Fourth SETAC World Congress, Portland, OR, November 2004.

Baummer JC, McCulloch WL, Hammer J, Meyer J, Goodfellow WL. Toxicity identification evaluation of nitrite in food processing wastewater. SETAC, 25th Annual Meeting and Fourth SETAC World Congress, Portland, OR, November 2004.

Baummer JC, McCulloch WL, Hammer J, Meyer J, Goodfellow WL. Acute toxicity of nitrite to Ceriodaphnia dubia and Pimphales promelas. SETAC, 25th Annual Meeting and Fourth SETAC World Congress, Portland, OR, November 2004.

Goodfellow WL, Baummer JC, McCulloch WL. Identification of specific ion toxicity testing (potassium) in three industrial effluents. SETAC, 24th Annual Meeting, Austin, TX, November 2003.

McCulloch WL, Boltz J, Derrick P, Goodfellow W, Mayhew D, Sohn V. Surrogate sediment evaluation:

Risk assessment for a dredge material island restoration program. SETAC, 24th Annual Meeting, Austin, TX, November 2003.

Baummer JC, Shamas JY, McCulloch WL, Botts JA, Hockenbury MR, Goodfellow WL. Part I. Toxicity Identification evaluation procedures for phenolic compounds and solids in a pulp and paper mill effluent. SETAC, 23rd Annual Meeting, Salt Lake City, UT, November 2002.

McCulloch WL, Goodfellow WL, Sohn VA, Hartzell LA, Hartzell R. Experimental design concerns for large sediment toxicity testing programs. SETAC, 22nd Annual Meeting, Baltimore, MD, November 2001.

Norberg-King TJ, Ausley LW, Burton DT, Goodfellow WL, Miller J, Waller WT. Toxicity Identification Evaluation Workshop — Part I: What Works, what doesn't, and developments for effluents and aqueous media. SETAC, 22nd Annual Meeting, Baltimore, MD, November 2001.

Miller J, Ausley LW, Burton DT, Goodfellow WL, Norberg-King TJ, Waller WT. Toxicity Identification Evaluation Workshop — Part II: What works, what doesn't, and developments for effluents and aqueous media. SETAC, 22nd Annual Meeting, Baltimore, MD, November 2001.

Baummer JC, McCulloch WL, Goodfellow WL. Toxicity identification evaluation of a complex industrial effluent. SETAC, 22nd Annual Meeting, Baltimore, MD, November 2001.

Rodgers JH, Ausley LW, Denton DL, Dorn PB, Goodfellow WL, Gully J, Norberg-King TJ, Waller WT, Burton DT. Total maximum daily loads: After point sources, what can we do next? SETAC, 22nd Annual Meeting, Baltimore, MD, November 2001.

Sohn VA, Goodfellow WL, McCulloch WL. Selection of an appropriate reference toxicant for marine WET testing. SETAC, 22nd Annual Meeting, Baltimore, MD, November 2001.

Baummer JC, McCulloch WL, Goodfellow WL. Overprediction of acute toxicity by the Gas Research Institute Salinity Toxicity Relationship Model Computer Program. SETAC, 22nd Annual Meeting, Baltimore, MD, November 2001.

Goodfellow WL, Ausley LA, Burton DT, Denton DL, Dorn PB, Gully JR, Norberg-King NJ, Rodgers JH, Waller WT. Watershed management: Historical perspective to the future. SETAC, 21st Annual Meeting, Nashville, TN, November 2000.

Goodfellow WL, Khan A, Hartzell LA, McHellon J, Sewell GJ. Management of water and wastewater quality at Fort Campbell, Kentucky. SETAC, 21st Annual Meeting, Nashville, TN, November 2000.

Derrick PA, Pine FW, McCulloch WL, Rue WJ, Powell MW, Goodfellow WL, Peddicord RK, Correale CE, McKee JA. Evaluation of dredged material proposed for open-water placement at Site 104, Chesapeake Bay, Maryland. SETAC, 21st Annual Meeting, Nashville, TN, November 2000.

Rue WJ, Christensen LR, Dixon KD, Gustafson LN, McCulloch WL, Powell MW, Connelly RA, Goodfellow WL. Site-specific ammonia standard for Salt Creek. Integration of In-Situ Toxicity, Bioassessment and WET Results. SETAC, 21st Annual Meeting, Nashville, TN, November 2000.

Derrick PA, Goodfellow WL, Powell MW, Sohn VA. Theoretical bioaccumulation potential vs. measured bioaccumulation: Is TBP an effective screening tool? SETAC, 21st Annual Meeting, Nashville, TN, November 2000.

Baummer JC, McCulloch WL, Gustafson LN, Goodfellow WL, Rue WJ. Toxicity identification of non-polar organic components (surfactants) in an effluent dominated by nickel. SETAC, 21st Annual Meeting, Nashville, TN, November 2000.

Goodfellow WL, Barranco FR. Biological availability and its role in sediment toxicity. EPRI Sediment Seminar II, St. Simon's Island, GA, October 2000.

Botts JA, Goodfellow WL, Sohn VA, Spain TM, Hicks RC. Development of the toxicity tracking system for evaluating sources of complex intermittent, low-level organics toxicants. SETAC, 20th Annual Meeting, Philadelphia, PA, November 1999.

Goodfellow WL, Derrick PA-Creep, Peddicord RK, Firstenberg CE, Ward T, Sohn VA. Evaluation of sediment samples with cellulose acetate butylate (CAB) and polycarbonate. SETAC, 20th Annual Meeting, Philadelphia, PA, November 1999.

Goodfellow WL, Derrick PA-Creep, McCulloch WL, Sohn VA, Hartzell LA, Hartzell RS. Testing considerations for the evaluation of sediments with high clay characteristics. SETAC, 20th Annual Meeting, Philadelphia, PA, November 1999.

Goodfellow W, McCulloch W, MacFarlane I. Endocrine disruptors: Management impacts for water and wastewaters. Virginia Dischargers Association, Arlington, VA, 1999.

Goodfellow W, Firstenberg C, Creep DP, Fehring W. Daniel Island Marine Terminal Development Project: Dredged material characterization study. Western Dredging Association, Louisville, KY, 1999.

Botts J, Goodfellow W, Jr., Sohn V, Diehl R, Spain T, Routh. Toxicity tracking: An Alternative to exhaustive TIE studies. SETAC Abstract, 19th Annual Meeting, Charlotte, NC, 1998.

Connelly RA, McCulloch WL, Goodfellow WL, Jr., Hartzell RS, Sohn VA, Bastian MV, Black JA. In situ testing: Development of an instream chamber. SETAC, Abstract, 19th Annual Meeting, Charlotte, NC, 1998.

Hartzell L, Goodfellow WL, Jr., Elseroad J. Toxicity testing considerations for low tonic strength effluents. SETAC, Abstract, 19th Annual Meeting, Charlotte, NC, 1998.

Sohn V, Goodfellow WL, Jr. Evaluation of "Green Sand" as a treatment option to remove manganese from an effluent. SETAC, Abstract, 19th Annual Meeting, Charlotte, NC, 1998.

Goodfellow WL, Jr., Botts J. Assessment of potential inhibition to a wastewater treatment plant as part of a pretreatment evaluation. SETAC, Abstract, 19th Annual Meeting, Charlotte, NC, 1998.

Goodfellow WL, Jr., McCulloch WL, Sohn V, Bastian M, Koerber A, Christensen L. The relationship of fluctuating dose on chronic toxicity of ammonia. SETAC Abstract, 19th Annual Meeting, Charlotte, NC, 1998.

Goodfellow WL, Jr., McCulloch W, Sohn V, Hartzell L. Minimal toxicity necessary for an effective TIE. SETAC Abstract, 19th Annual Meeting, Charlotte, NC, 1998.

Goodfellow WL, Jr., DeGraeve M, Smith G, Matthews M, McCulloch W, Pletl J. Whole effluent toxicity testing. SETAC Course, 19th Annual Meeting, Charlotte, NC, 1998.

Ausley L, Denton D, Norberg-King T, Arnold R, Matthews M, Peltier B, Goodfellow W, Pletl J. Whole effluent toxicity testing. Water Environment Federation, WEFTEC 98, Short-course Instructors, 71st Annual Meeting, Orlando, FL, 1998.

Goodfellow WL, Jr., Sohn V, Smith-Hartzell L, Black J, Hartzell R. Toxicological characterization of contaminated sediments using a multispecies approach. SETAC, Abstract, 18th Annual Meeting, San Francisco, CA, 1997.

Bastian M, Goodfellow W, Rue W, McCulloch W, Black J, Koerber A, Christensen L, Paulson C. Assessment of ammonia effects from municipal discharges to a freshwater system with high salinity. SETAC, Abstract, 18th Annual Meeting, San Francisco, CA, 1997.

Barry T, deVlaming, Foe C, Goodfellow W, Norberg-King T, Miller J, Mount D. Pesticides in the toxicity identification evaluation process. SETAC, Short-Course Instructors, 18th Annual Meeting, San Francisco, CA, 1997.

Goodfellow W, Jr., McCulloch WL, MacFarlane ID, Black JA. Toxicity testing for determining cleanup levels. The 7th Southern States Annual Environmental Conference, Biloxi, MI, 1997.

DeVlaning V, Barry T, Foe C, Goodfellow W, Jr., Norberg-King T, Miller J, Mount D. Pesticides in the toxicity identification evaluation process. SETAC, Short Course, 18th Annual Meeting, San Francisco, CA, November 16, 1997.

Bastian M, Goodfellow W, Jr., Rue W, McCulloch W, Black J, Christensen L, Paulson C. Assessment of the impact of municipal effluent discharges to a fresh water system with high salinity. SETAC, 18th Annual Meeting, San Francisco, CA, 1997.

Ausley L, Burton D, Denton D, Dorn P, Goodfellow W, Jr., Gully J, Heber M, Norberg-King T, Rodgers J, Waller T. Tackling touch issues in whole effluent toxicity testing: Progress of the SETAC WET Steering Committee. SETAC, 18th Annual Meeting, San Francisco, CA, 1997.

Goodfellow W, Jr., Sohn V, Smith-Hartzell L, Black J, Hartzell R. Toxicological characterization of contaminant sediments using a multispecies approach. SETAC, 18th Annual Meeting, San Francisco, CA, 1997.

Goodfellow WL, Jr., MacFarlane ID, McCulloch WL, Black JA. Toxicity testing for determining cleanup levels. The 7th Southern States Annual Environmental Conference, Biloxi, MI, 1997.

McCulloch WL, Smith L, Koerber A, Black J, Goodfellow W, Muessig P. Toxicological and behavioral evaluation of potential impacts of a zebra mussel control treatment strategy. SETAC, Abstract, 18th Annual Meeting, Washington, D.C., 1997.

Goodfellow WL, Jr., McCulloch WL. The use of toxicity reduction evaluations as a pollution prevention tool. ASTM, 7th Symposium on Environmental Toxicology and Risk Assessment, St. Louis, MO, 1997.

Goodfellow WL, McCulloch WL, Rue WJ, Black JA. Implementation issues associated with effluent dominated receiving waters. SETAC, Abstract, 17th Annual Meeting, Washington, D.C., 1996.

Goodfellow WL, Sohn V, Rickey M, Yost J. Identification of manganese as a toxicant in a groundwater treatment system: Addressing naturally occurring toxicants. SETAC 17th Annual Meeting, Washington, D.C., 1996.

Johnson GE, Tyahla S, Goodfellow WL, Jasper K, Sewell G. 1996. Using the Toxicity Reduction Evaluation as a tool for implementing pollution prevention (P2) initiatives. American Defense Preparedness Association, 22nd Environmental Symposium, Orlando, FL, 1996.

Goodfellow WL, Bastain MV, McCulloch WL, Humphries K. Specific toxicant identification for a municipal wastewater treatment plant. Common components and problems encountered for TIEs. Pesticides in the Environment, Northern California SETAC, Sacramento, CA, June 1996.

McCulloch WL, Goodfellow WL, Black JA, Rue WJ. Management of effluent that produce minimally chronic or ephemeral toxicity: Lessons learned. SETAC, 16th Annual Meeting, Vancouver, Canada, 1995.

Goodfellow WL, Sohn VA, Kotulak MA. Performance of a second generation toxicity reduction evaluation. Presented at the 15th Annual Meeting, SETAC, Denver, CO, October 29-November 3, 1994.

Black JA, Goodfellow WL, McCulloch WL. Augmentation of necessary ions for the toxicology evaluation of low and high ionic strength effluents. Presented at the 15th Annual Meeting, SETAC, Denver, CO, October 29-November 3, 1994.

Bastian MV, Goodfellow WL. Source evaluation of specific toxicants identified as part of a municipal TRE. Presented at the 15th Annual Meeting, SETAC, Denver, CO, October 29-November 3, 1994.

Collins MA, Wilson EK, LaRocca CA, Goodfellow WL. Chronic toxicity identification evaluation analyses using Mysidopsis bahia. Water Environmental Federation, Chicago, IL, August 1994.

Goodfellow WL, McCulloch WL, Black JA, Kotulak MA, Sohn VA, Hartzell RS, Smith LA. Chronic toxicity identification evaluations: Common components, problems encountered and research needs for the future. Presented at the SETAC 14th Annual Meeting, Houston, TX, November 14-18, 1993.

Goodfellow WL, McCulloch WL, Gustafson L, Kotulak MA. A chronic toxicity reduction evaluation at a large military facility. Presented at the SETAC 14th Annual Meeting, Houston, TX, November 14-18, 1993.

Goodfellow WL, McCulloch WL. Toxicity or physiological imbalance? Presented at Inorganic Salts TIE Meeting (work group), Houston, TX, November 14, 1993.

Goodfellow WL, Jr., McCulloch WL, Black JA, Kotulak MA, Sohn VA. Evaluation of effluents from industrial and municipal wastewater treatment plants — Correlation of chronic toxicity endpoints. Presented at the SETAC 13th Annual Meeting, Cincinnati, OH, 1992.

Black JA, Goodfellow WL, Jr., McCulloch WL, Sohn VA, Kotulak MA. Toxicity test data quality: Interpretation of results. Presented at the SETAC 13th Annual Meeting, Cincinnati, OH, 1992.

Goodfellow WL, Jr., McCulloch WL, Rue WJ. Toxicity identification evaluations: Recent municipal case studies. Presented as part of a short-course titled Recent Developments in Toxicity Reduction Evaluations. SETAC, 12th Annual Meeting, Seattle, WA, 1991.

Goodfellow WL, Jr., McCulloch WL, Braswell JW. An industrial toxicity reduction evaluation: From problem identification to resolution. SETAC, 12th Annual Meeting, Seattle, WA, 1991.

Goodfellow WL, Jr., McCulloch WL, Rue WJ, Botts JA, Morris TL. Toxicity reduction evaluations: Present status and future directions. Presented at Chesapeake System Research and Management Conference, Baltimore, MD, 1990.

McCulloch WL, Goodfellow WL, Jr., Rue WJ, Jr., Botts JA, Morris TL. Will ammonia in your effluent trigger your facility into a TRE? Presented at the 21st Annual Conference of the Water and Waste Water Operators Association of Maryland, Delaware, and District of Columbia, and the Chesapeake Water Pollution Control Association, Ocean City, MD, June 19-27, 1990.

Morris TL, Botts JA, Braswell JW, Welch MC, Goodfellow WL, Jr. Toxicity reduction evaluation at the Linden Roselle Sewerage Authority Wastewater Treatment Plant. Environmental Protection Agency, Cincinnati, OH, 1990.

Botts JA, Morris TL, Kornegay BH, Sun WW, Goodfellow WL, Jr. Use of simulations to estimate the chronic effluent toxicity of future wastewater treatment plants. Presented at the SETAC 11th Annual Meeting, Washington, D.C., November 11-15, 1990.

Goodfellow WL, Jr. McCulloch W. Determination of ammonia as a principal toxicant contributing to effluent toxicity. Presented at the SETAC 11th Annual Meeting, Washington, D.C., November 11-15, 1990.

Goodfellow WL, Jr., McCulloch WL, Rue WJ, Jr. Chronic toxicity evaluation of effluent wastewaters. Presented at the New Jersey Water Pollution Control Federation Annual Meeting, Atlantic City, NJ, 1990.

Botts JA, Fillmore L, Durham E, Goodfellow WL, Jr., Pereira T, Bishop DF. Evaluation of the role of diazinon in the toxicity of a municipal wastewater treatment plant effluent. Proceedings of the 3rd National Pesticide Conference, Richmond, VA, November 1990.

Fillmore L, Botts JA, Pereira T, Goodfellow W, Jr., Bishop D, Cannell J. Implementation of the EPA Municipal TRE Protocol at the Fayetteville Waste Water Treatment Plant: A case study. Presented at the Annual Conference of the North Carolina American Water Works Association and Water Pollution Control Association, November 1990.

Morris TL, Botts JA, Conley M, Goodfellow WL, Jr., Williams R. Tracing sources of effluent toxicity, a case study. Presented at the 75th Annual Meeting of the New Jersey Water Pollution Control Association, Atlantic City, NJ May 1990.

Morris TL, Botts JA, Bishop DF, Goodfellow WL, Jr. Implementation of the EPA Municipal TRE Protocol: Case study examples. Presented at the SETAC 11th Annual Meeting, Arlington, VA, November 11-15, 1990.

McCulloch WL, Rue WJ, Jr., Goodfellow WL, Jr. Toxicity reduction evaluations for municipal and industrial facilities — Case studies. Presented at the Joint Annual Meeting of the Water and Waste Operators Association of Maryland, Delaware, and District of Columbia, and the Chesapeake Water Pollution Control Association, Ocean City, MD, 1989.

Goodfellow WL, Jr., McCulloch WL, Baummer JC. Evaluation of the acute toxicity of ammonia in estuarine waters. Presented at the SETAC 10th Annual Meeting, Toronto, Canada, 1989.

McCulloch WL, Goodfellow WL, Jr. The influence of total dissolved solids on the interpretation of the TIE fractionation results. Presented at the SETAC Advanced TIE/TRE Workshop, Toronto, Canada, 1989.

Rue WJ, Jr., Goodfellow WL, Jr., McCulloch WL, Botts JA. The use of toxicity testing and effluent fractionation in a municipal TI/RE. Presented at WPCF Specialty Conference on Toxicity Based Applications for National Pollutant Discharge Elimination System (NPDES) Permits and Laboratory Techniques, New Orleans, LA, April 17, 1989.

Rue WJ, Jr., Goodfellow WL, Jr., McCulloch WL, Gift JJ. TREs: Real-world experience gained over the last five years. Presented at New Jersey WPCA's 74th Annual Conference, Atlantic City, NJ, May 3, 1989.

Goodfellow WL, Jr., McCulloch WL, Rue WJ. The role of toxicity testing and toxicity reduction evaluations in the NPDES permitting process. Presented at the Joint Annual Meeting of the Water and Waste Operators Association of Maryland, Delaware, and District of Columbia, and the Chesapeake Water Pollution Control Association, Ocean City, MD, 1988.

Rue WJ, Jr., McCulloch WL, Goodfellow WL, Jr. The application of effluent fractionation as part of toxicity reduction evaluations. Presented at the Annual Meeting of the New Jersey Water Pollution Control Federation, Atlantic City, NJ, 1988.

Goodfellow WL, Jr., McCulloch WL, and Rue WJ, Jr. Toxicity identification in a complex effluent: Municipal case study. Presented at the SETAC 8th Annual Meeting, Environmental Risk: Recognition,

Assessment, and Management, Pensacola, FL, 1987.

Goodfellow WL, Jr., McCulloch WL. A technique for the rapid evaluation of effluent acute toxicity. Presented at the SETAC 8th Annual Meeting, Environmental Risk: Recognition, Assessment, and Management, Pensacola, FL, 1987.

Botts JA, Sullivan EC, Braswell JW, Goodfellow WL, Jr., McCulloch WL, McDearmon AG, Bishop DF. Toxicity reduction evaluation at a municipal wastewater treatment plant. Presented at the Seminar on Waste Water Treatment for the United States/Soviet Bilateral Agreement, Cincinnati, OH, 1987.

Botts JA, Braswell JW, Goodfellow WL, Jr., Sklar BD, Bishop DF. Patapsco Waste Water Treatment plant toxicity reduction evaluation. Presented at the International Conference on Innovative Biological Treatment of Toxic Waste Waters, Arlington, VA, 1986.

Klauda RJ, Goodfellow WL, Jr., Jepson MA. Influence of delayed initial feeding on mortality of striped bass larvae to arsenic and selenium. Presented at Annual Meeting, American Fisheries Society, Sun Valley, ID, 1985.

Rue WJ, Jr., Ferris JS, Fava JA, Goodfellow WL, Jr., McCulloch WL. Technical Considerations in effluent toxicity testing. Presented to the ASTM, Aquatic Toxicology and Environmental Fate, 9th Symposium, Philadelphia, PA, 1985.

Chrostowski PC, Hinchee RE, Goodfellow WL, Jr., Ferris JS. Thermal effects on bioaccumulation: A thermodynamic approach. Presented at the SETAC 5th Annual Meeting, Arlington, VA, 1984.

Goodfellow WL, Jr., Hocutt CH, Morgan RP, II, Stauffer JR, Jr. Evidence in support of species status for the Cheat Minnow, Rhinichthys bowersi. Proceedings, 61st Annual Meeting American Society of Ichthyologists and Herpetologists, Corvallis, OR, 1981.

Project Experience

Environmental Assessments

Mr. Goodfellow evaluated the effects on many recreational and commercially important fish stocks from pollution and habitat-related issues; species include rainbow trout, brown trout, brook trout, smallmouth and largemouth bass, striped bass, sturgeon, American oyster, Pacific oyster, scallops, hard clams, unionid mussels, snails, blue mussel, and blue crab. He has assessed the impacts of cooling-water intake and plant effluent to aquatic systems as part of 316(a) and (b) demonstrations. Assessed the removal or eradication of problem species from aquatic environments such as the zebra mussel, various biofouling organisms for cooling-water intakes in freshwater and estuarine/marine environments, menhaden, gizzard shad, and various plants and algae. Assessed habitat and chemical impacts on populations of American and Pacific oysters and their increased susceptibility to diseases resulting from bacteria and viruses.

Determined the overall impacts of existing habitat and water quality conditions and the overall impacts of reintroducing commercially important fishery resources — such as paddlefish, striped bass, rainbow trout, Atlantic salmon, brook trout, American oyster, and hard clams — that at one time existed in the aquatic resource, as well as the environmental effects of the introduction of populations of brown trout, striped bass, white bass, white bass/striped bass hybrid, and many South American and African species (in the tropical and semi-tropical waters of Florida) to aquatic systems where the species do not normally exist. Performed risk analysis of drinking water for municipal water systems. Investigated the nutrient and toxic impact of municipal discharges to watersheds. Investigated environmental impact of nitrophenols to rainbow trout and American oyster, along with assessment of potential environmental hazard to humans after consumption of fish and oyster flesh using various assessment techniques.

Led or supported as a senior subject matter expert the environmental assessment of a several large steel mills in Indiana, West Virginia, and Maryland including the assessment of operations and the impacts to the environment. These assessments required the review of operations and the effects on wastewater treatment and effluent discharges, hazardous waste generation and disposal, sediment and surface water impacts, groundwater impacts, soil contamination, fugitive dust, coal pile run-off, slagging operations, as well as indirect discharges. Experience has involved terrestrial as well as freshwater and estuarine ecosystems. Operations reviews have incorporated coke operations, furnace operations, cooling water systems, milling operations (e.g., cold rolling, tin operations, cleaning/acid baths, etc.). Many of these reviews have been of existing operations as well as historic operations starting in the early 1900s.

Performed facility reviews evaluating industrial and commercial activities by performing environmental system audits and investigating manufacturing operations and solid and liquid waste handling processes in order to assess impacts to soil, surface water, sediment, and groundwater. Led assessments for industries such as mining, pulp and paper manufacturing, and petroleum and chemical storage and refining and at facilities involved in the production of chemicals, pesticides, and steel and other metals, as well as municipal wastewater treatment, landfill, and hazardous treatment facilities. Additionally performing these activities at U.S. Army, U.S. Navy, and U.S. Air Force installations.

Evaluated environmental impact of paper-mill effluents to aquatic organisms and humans, including toxicological and fish flavor impairment studies. Also evaluated potential effects of ambient and effluent water quality in relation to pertinent federal and state edge-of-mixing-zone standards for power facilities, industrial facilities, and municipal wastewater treatment plants. Determined acute and chronic toxicity of organophosphate and methiocarbonate pesticides to aquatic organisms. Evaluated impacts on fish and macrobenthic communities associated with acid mine and thermal pollution discharges, as well as future impacts due to siting of power and municipal sewage treatment plants. Designed and conducted treatability studies to access ability of municipal and industrial wastewater treatment plants to treat and reduce effluent toxicity and meet pre-treatment requirements. Evaluated coliform contamination of large drinking-water distribution system. Program investigated potential cross connections, distribution system flushing, storage tanks and reservoir, and coliform contamination within distribution system. Provided expert testimony for the ecological and human health of groundwater contamination related to ethylene dibromide and trichloroethylene.

Mr. Goodfellow has considerable international experience, including peer reviewer of several large environmental programs, including the Canadian Water Network, UK National Rivers Program, SETAC programs in South America, Africa, and the United Nations, as well as several World Bank and U.S. Agency for International Development programs. His specific project experience includes the environmental assessment of contaminated sediment in the waterways of Kottayam and Kochi (southern India), environmental issues related to oil industry in Mexico, and evaluation of industrial activities in Brazil, evaluated the impacts from aerial spraying to sugar cane fields and wastewater treatment of distillery wastes in Guatemala, as well as mining impacts in Canada, Chile, Venezuela, and Papua, New Guinea. Peer review of the overall program for the Canada Water Network, including evaluation of the research program, public outreach, and young professional training program. Environmental siting and permitting in Puerto Rico, Guam, and Egypt. Environmental assessment of ocean discharges in Puerto Rico. Development of Environmental Assessment and Environmental, Health, and Safety Manuals for Abu Dhabi Department of Transportation, Main Roads Division. Co-Chair for the Watersheds Consortium Management Committee for the Canada Water Network. Delegate to and Immediate Past President of the SETAC World Council. Presented papers at the Brazilian Academy of Toxicology (Victoria, Brazil), SETAC-Europe meetings in Warsaw, Poland; Goteberg, Sweden; and Seville, Spain, as well as numerous papers in Canada.

Abu Dhabi, UAE Environmental Standards Manuals — Directed and provided senior technical review of the Environmental Impact Assessment Manual and the Environmental, Health and Safety Manuals. Other responsibilities included participation in workshops and stakeholder meetings at Abu Dhabi DOT. These manuals serve as the standards for the Abu Dhabi DOT.

Permitting and IFIM Assessment — Provided senior technical review and oversight for various permitting and special studies performed as part of the development of environmental documentation for a nuclear power generating station and the assessment for construction of a third unit.

Studies to Support an Alternative Water Intake in the Potomac River — Managed the National Environmental Policy Act (NEPA) and other associated permitting activities for development of an alternative water intake. Actively involved in water quality and biological studies to evaluate the feasibility of an alternative offshore water intake structure, including turbidity assessment, mussels relocation, ecological risks; and federal, state, and local permitting.

Agricultural Operations — As Principal, prepared a comment document of the environmental impact assessment of the proposed land use activity resulting from a Combined Animal Feeding Operation (CAFO) and dairy operation. Assessment included important and threatened terrestrial and aquatic species such as water fowl, seabirds, marine turtles, marine mammals, coral, invertebrates and plant species. Performed an assessment of crop damage caused by wind and hail to a large commercial vineyard.

Mining and Shale Oil/Gas Extraction — Provided senior technical review of environmental assessments of several development projects, located in the northern Rocky Mountains. The assessment was used to determine whether expansion of the operations would have a significant effect on native mammals. Also evaluated the modeled water quality parameters against EPA and Environment Canada water quality criteria. Additional consulting included multi-day stakeholders meetings with First Nations on their reservation to present these assessments. Evaluated the environmental impacts from coal mining in the Appalachian Mountains region to terrestrial and aquatic ecosystems. He has extensive experience in addressing the effects of mining on aquatic and terrestrial ecosystems throughout the United States and Canada such as the site inspection of abandoned gold and silver mines in Oregon; water quality and toxicological assessments of Red Dog Mine (AK), Miggs Mine (WI), Humboldt Pit Mine (NV), Metike Mining (WV, KY, MD), and Kemess Mine (Canada); and the effects of acid mine drainage and milling wastes on surface waters.

Directed the preparation of affected environment and future without-project conditions for the environmental impact statement for the Brazos Island Harbor Channel Improvement Project in Brownsville, Texas. Sensitive resource areas included Bahia Grande (part of the Laguna Atascosa National Wildlife Refuge), South Bay (a designated Coastal Preserve that is part of the Gulf Ecological Management Site), Laguna Madre (a shallow-water hypersaline lagoon), Padre Island (a National Seashore and important sea turtle nesting area), and the Lower Rio Grande Valley National Wildlife Refuge. The studies supported the proposed channel improvements (widening and/or deepening) and potential opportunities to restore more than 6,500 acres of tidal marsh in Bahia Grande.

Aviation Services — As Principal, assisted in providing environmental support services for large capital construction programs such as planning and environmental assessment of infrastructure projects; new terminal and access and interior roadway networks; functional assessment of stream system in accordance with USACE protocol for determining mitigation requirements; participated in permitting wetland fill for capital projects development, including new concourses and runways; develop permit-specific Compliance Guides for use by contractors during construction; preparation of NEPA documents for concourse, internal automated people-mover system, roadways, and infrastructure systems; technical review of environmental impact statement for new runways under preparation by the Federal Aviation Administration; development of compliance database tracking permit and NEPA status of construction activities; geographic information system, including topography; wetlands; rare, threatened, and endangered habitats; streams; archaeological sites; construction projects; and infrastructure; creation and management of website with compliance and geographic information system data; seasonal ecological surveys to characterize terrestrial and aquatic habitats and determine the presence of rare, threatened, and endangered species; support public outreach activities, including planning and hosting public outreach workshops for proposed construction projects; and development of sitewide hydrologic and hydraulic models for predicting floodplain changes and stormwater management requirements attendant

William Goodfellow, Jr., BCES
04/18 | Page 17

to project planning.

Impingement and Entrainment Baseline Studies in Maryland, New York, Pennsylvania, Ohio, West Virginia, Wisconsin, and Virginia — Directed baseline studies identified in Proposal for Information Collection. Mobilized new field offices and responsible for hiring 54 field staff to support baseline studies for power plants, to comply with new regulations implemented by EPA under Section 316(b) of the Clean Water Act. Studies include monitoring of impingement and entrainment abundance, and seasonal sampling of the fish community in the vicinity of each facility using a variety of fisheries gear.

Sub-Aqueous Blast Monitoring Plan — Developed scope of studies for monitoring program for blasting bedrock as part of navigational channel improvement/deepening the Mid-Atlantic bight. Designed and implement monitoring program for measurement of pressure-wave characteristics in the aquatic environment associated with impacts to biological resources.

Comprehensive Coliform Contamination Remediation Evaluation — Principal scientist responsible for assessment of coliform contamination within the distribution system at a large military facility. Developed specific test and operating procedures for monitoring of drinking-water distribution system in the future. Identified the source of contamination and helped repair the public image of the Air Force Base with regard to coliform contamination.

Bacterial Source Tracking — Project directed the source evaluation of coliform contamination with in several sewer systems. Developed strategy for sample collection, reviewed laboratory analysis, as well as directed the risk communication of the studies. The objective of this program was to assess the origination of fecal material and identify if it was of human origin, domestic animal, avian, or other wildlife. This information was important to determine if the fecal coliform detections were a result of damaged sewer infrastructure. Directed projects to assess the impacts of recreational use as part of a watershed management system and protection of drinking water resources and water quality. The majority of these meetings had public meetings or risk communication.

Ecotoxicology and Toxicity Reduction Evaluations

Mr. Goodfellow's specific toxicological experience includes the investigation of bioaccumulation, tissue distribution, metabolism, and depuration of organic and inorganic chemicals in fish and macroinvertebrates. He has directed the assessment of chemical constituents of personal care products and evaluated the toxicological impacts of organic and inorganic contaminants in surface water, groundwater, and sediments. Mr. Goodfellow has conducted acute and chronic bioassays on a variety of freshwater and estuarine vertebrates and invertebrates, and has investigated organic and inorganic compounds in effluents, as well as and single-chemical exposures. He has evaluated bioaccumulation of single chemicals and selected components of effluents, sediments, dredge materials, and soils to freshwater, estuarine, marine, and terrestrial organisms. His research also included the evaluation of sublethal effects of organic and inorganic compounds to various aquatic organisms during long term exposure.

Mr. Goodfellow developed and managed Water Effect Ratio and Biological Translator studies for freshwater and marine/estuarine organisms. Served as Project Manager for the Referee Laboratory program for the Whole Effluent Toxicity (WET) Program. He has developed and conducted more than 90 TREs for numerous industrial, municipal, and federal facilities. His responsibilities included characterizing effluents' chemical constituents and associated toxicity, assessing the variability of effluent, identifying components causing toxicity in effluent, and developing strategy for removal of toxicity from effluent. Directed engineering activities associated with TREs, including plant performance evaluations, housekeeping surveys, source identification evaluations, and treatability studies/refractory toxicity assessments. Performed TIEs of various toxic samples using fractionation procedures such as those outlined in EPA's TIE Procedural manuals. Co wrote original and revised TRE municipal protocol manual. Participated as panel member for Technical Peer Review of EPA's effluent assessment program. Participated on the Steering Committee and as a panel member in a TIE workshop for determination of

the state of the science for TIEs. Co-editor of a compendium on TIEs for aquatic media. Taught short courses and seminars on TRE strategy, methods, and research needs for the future. Invited delegate to SETAC Education Foundation-sponsored Pellston Workshop to address the science of WET testing, and co-author of resulting book on WET testing. He is widely published in area of TREs.

Industrial Operations Review — As part of the TRE process, have directed and performed operations process review and wastewater treatment plant evaluations for numerous industrial facilities including chemical manufacturing, oil refineries, pulp paper facilities, fuel storage facilities, iron and steel mills, electronic manufacturing facilities, personal care products manufacturing facilities, pharmaceutical manufacturing facilities, agricultural products and food processing plants, mining and ore processing facilities, air and rail transportation industry, and shipbuilding/repair facilities. These evaluations included a detail review of the industries processes, chemical uses, water use, solid waste generation and their resulting wastewaters and treatment.

Agricultural Products and Food Processing — Directed the environmental evaluation of agricultural product manufacturing facilities such as nitrogen and phosphorus based fertilizer operations, lime processing/encapsulation manufacturing units and CAFO operations for cattle, swine, and poultry. These evaluations included detailed operations review, understanding of the chemical use and processing, and waste disposal. Evaluated food processing operations and use of aerobic and anaerobic digestion of wastestreams including plant and animal processing operations. Assessed the inhibition of methane production as part of anaerobic treatment by physical and chemical variables. Developed land management plans for the application of manure and wastewater treatment biosolids as part of soil augmentation and nutrient controls. Performed an environmental assessment of potential impacts from a large thermal reaction/release at a nitrogen based fertilizer storage facility. Contributing author of technical monograph on environmental toxicity relating to the fertilizer industry and ammonia-nitrogen/nutrient issues.

Construction Material Assessment — Assessed the acute and chronic toxicity of various construction materials and ballast to freshwater and estuarine organisms. Materials evaluated included slag from steel making processes, concrete from bridge decommissioning and the use in freshwater and marine reef building, grindings from asphalt road resurfacing, concrete made with bottom and fly ash material, fill materials from mining operations, as well as rock and ballast from various quarries. Evaluated the toxicity of various products used from dust control and soil compaction to freshwater and marine organisms. These products were petroleum based, biological/enzyme based, as well as inorganic salts.

Personal Care Products — Assessment of Human Health Risk and Development of a Public Information Program — Directed an assessment of the human health risk of personal care products used by the cleaning industry. Attended project meetings in collaboration with academic institutions, and provided senior technical review of work products.

Seafood Safety — Principal Scientist for the evaluation of freshwater and marine seafood safety and radionuclide levels (Cesium) in fish products resulting from a nuclear power plant discharge.

Development of Technical Comments for Draft Ambient Water Quality Criteria for Chesapeake Bay — Reviewed Phase I draft criteria documents prepared by EPA Chesapeake Bay Program for dissolved oxygen, water clarity, chlorophyll a, and designated uses. Developed comments on the technical basis and potential implementation issues associated with the proposed dissolved oxygen criteria, with particular reference to the Potomac River. Participated in an ongoing interagency and stakeholder work group to review and address issues submitted during comment periods related to dissolved oxygen criteria, designated uses, and implementation procedures.

Evaluation of Perchlorate Toxicity to Aquatic and Terrestrial Species — As Senior Toxicologist, oversaw an assessment of the acute and chronic toxicity of perchlorate to selected freshwater aquatic species and a terrestrial plant (lettuce) species.

Evaluation of Aqueous Film-forming Foam (AFFF) to Aquatic and Terrestrial Species — As Senior Toxicologist, directed the assessment of the acute and chronic toxicity of various formulations of AFFF to Ceriodaphnia, dubia, Daphnia magna, fathead minnows, opossum shrimp and sheepshead minnow using standardized test protocols. Also assisted in the development of performance specifications used in procurement activities. Evaluated the assessment of AFFF releases as part of fire-fighting training and hanger operations including the potential impacts to terrestrial and aquatic ecosystems.

Bioaccumulation of Dioxin from Effluent Samples — Served as Senior Toxicologist and mobilized field program to evaluate potential accumulation of dioxin from effluent samples by freshwater fishes. Evaluated potential impairment of taste for edible fillets from walleyes and rainbow trout exposed to various concentrations of final effluent from wastewater treatment plant. Developed temporary field laboratory operations on site.

Toxicological and Behavioral Response of Trout to Intermittent Chlorination — Senior Toxicologist assessing the toxicity to rainbow trout exposed to intermittent doses of chlorine to simulate the treatment reservoir water to eliminate zebra mussels. A companion study was also performed to determine rainbow trout avoidance behavior of potentially encountered chlorine concentrations.

Hexavalent Chromium Characterization — Directed a hexavalent chromium characterization program, developing best management options to control hexavalent chromium contamination and land use activities.

Sediment and Dredged Material Assessments

Mr. Goodfellow has evaluated the toxicological effects of sediments, sludges, dredged materials, and soils to freshwater and marine organisms, as well as terrestrial invertebrates and plants. Performed sediment toxicity identification evaluation (TIE) analyses of sediment elutriates, pore water, and municipal sewage sludges. Managed several large sediment programs as part of an environmental impact study, including vibracoring samples, analyzed testing, toxicity testing, and bioremediation assessment. Member of the Sediment Advisory Panel (Maryland) and also SETAC Global Sediment Advisory Group.

Sediment Evaluation — Directed studies to assess the ecological risk of elevated cadmium concentrations in Miocene clays proposed for dredging to deepen a major Harbor Federal Navigation Channel. Studies were designed to assess the potential impact (ecological risk) of exposing sediment with elevated cadmium as a result of dredging and to assess the potential impact (ecological risk) of upland placement of the dredged material at the existing upland placement areas. Project included sediment profile imaging and side-scan sonar surveys to identify areas with exposed Miocene clays and to characterize the physical characteristics of the channel bottom; benthic community evaluation to characterize the benthic organisms using the existing bottom substrates (clays, fine-medium sands, coarse sands, and silty sands) as habitat; collection of low-cadmium and high-cadmium sediments using vibracoring equipment; collection and analysis of reference sediment; collection and analysis of upland reference soil; collection and analysis of dredging and receiving water; porewater analysis; standard and effluent elutriate testing; Simplified Laboratory Runoff Procedure; aquatic bioaccumulation studies to assess uptake of cadmium by aquatic organisms; plant uptake studies to assess cadmium uptake by plants in the upland placement sites; and ecological risk assessment of impacts in the riverine and upland environment. Results of the studies indicated low risk for riverine impacts and suggested that management options (i.e., capping) be implemented for upland placement areas to avoid risk to wildlife receptors.

Dredge Point Monitoring — Directed studies designed to assess sediment plumes that originate from clamshell dredging operations. The focus of the monitoring was to identify total suspended solids and chemical constituents in the sediment plume, define the rate of dilution of the plume, and identify the distance over which the plume dissipates to background levels. The monitoring consisted of current meter deployment and the use of an acoustic Doppler current profiler and optical backscatter unit to identity the centerline and densest area of the plume. Water samples were collected at max flood, max ebb, high

slack, and low slack on the plume centerline at 40, 80, and 160 m away from the point of dredging at the depth of greatest density. The physical and chemical water-column data were used in conjunction with the USACE-Waterways Experiment Station DREDGE model. Results will be used to assess dredging as a "source" for total maximum daily loads in impaired waterways.

Sediment Quality Characterization — Directed project to assess extent and degree of contamination in sediments consisting of collecting sediment cores to 12 ft below the sediment surface and testing the sediments for a suite of organic and inorganic contaminants (metals, pesticides, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, and dioxin/furan congeners).

Chemical And Biological Testing of Natural Clay — Managed sampling program for ecotoxicological and analytical testing of red clay formations in the navigation channels in the Newark Bay/Staten Island Kills Complex. Because of the complex and unique characteristics of the test media, the project involved whole-sediment and bioaccumulation testing with both raw clay and prepared clays that were treated with various concentrations of total organic carbon (a food source for the test organisms).

Technical Support of Litigation

Provided expert report and testimony on the ecotoxicity of an emerging contaminant that was manufactured since the 1950s, but only recently became a chemical of concern.

Prepared comment document to address a proposed land use activity resulting from a Combined Animal Feeding Operation (CAFO) and dairy operation.

Prepared written report in support of the assessment of surface water impacts and lose of beneficial use as part of a citizen suit.

Provided written and oral testimony to the New York City Council on the environmental effectiveness of recycling expanded polystyrene (EPS) foam.

Provided expert report for the assessment of ammonia discharged from a wastewater treatment facility to a large freshwater and estuarine ecosystem. In addition prepared rebuttal report of other experts with regards to ecotoxicity, ecological risk and fishery assessment of a large estuary.

Provided expert report and testimony on agricultural plant varieties as part of a patent-use litigation.

Provided expert consulting services for the evaluation of genetically modified organisms and possible contamination of a fertilizer product.

Provided expert consulting services for aquatic organism impacts from mining and harmful algae bloom in an ecosystem with a substantial sport fishery (muskellunge), endangered and threatened unionid mussels, and species of special interest (muddy puppy).

Provided expert consulting services for the impact of an industrial chemical release to a WWTP and the resulting fish kill.

Directed expert consulting services for the assessment of a large industrial operations with regards to soil, sediment, groundwater and surface water impacts.

Provided an expert report for the assessment of seafood safety and cesium levels resulting from a nuclear power plant discharge.

Provided expert testimony on hazard assessment and human health risk assessment for a Superfund site. Testimony was provided as written testimony and deposition.

Provided expert testimony on water quality issues and sediment toxicity related to a major watershed.

Provided expert testimony on water quality issues related to ammonia, total dissolved solids, and discharge to a large river system.

Provided technical guidance and supported activities associated with deposition concerning effluent toxicity and a toxicity reduction evaluation.

Provided technical guidance for NPDES violations on behalf of dischargers.

Provided technical guidance on biomonitoring permit requirements and toxicity reduction evaluations on behalf of dischargers.

Supported administrative NPDES permit appeals and permit negotiations on behalf of counsel for municipal and industrial discharges. Support included participation in administrative hearings on NPDES permits.

Peer Reviewer

Instructor — TSCA One-Year Out. Chemical Watch Workshop, Arlington, VA. October 2017

SETAC World Congress Planning Committee, Spot Light Session and Plenary Speaker Subcommittee, Abstract Review Subcommittee, Fund-raising Subcommittee. September 2015-2016

Battelle Sediment Conference (for 2017) Planning Committee. January 2016-present

Advisory Council, University of Michigan-Water Center. Ann Arbor, MI. January 2013-present

Chair for the Watersheds Consortium Management Committee for the Canada Water Network, May 2012-present

Member of Research Management Committee, Canada Water Network, May 2012-present

Instructor — SETAC Short Course. Hydraulic Fracturing: Data Analysis Tools to Evaluate Environmental and Ecological Risk. November 2015

Instructor — SETAC Mexico Short Course. Ecological Risk Assessment for Shale Oil/Shale Gas and Mining Operations. Mexico Branch, Mexico City. June 2015

Co-Meeting Chair for SETAC Focus Topic Meeting on the Gulf Oil Spill, Pensacola Beach, FL, April 2011

Peer Reviewer for Canadian Water Network-September 2007 and 2011, Toronto, Ontario, Canada

Peer Reviewer for the U.S EPA Freshwater Ammonia Water Quality Criteria, March 2009

Peer Reviewer for U.S. EPA Sediment TIE Guidance Manual, September/October 2006

Steering Committee Member, In situ testing workshop, SETAC, Pensacola, FL, 2003-2004

Member of Steering Committee for Whole Effluent Expert Technical Panels, SETAC/SETAC Foundation, 1996-2004

Panel Member — Technical Peer Review of U.S. EPA's Effluent Assessment Program, June 1991

Instructor — SETAC Short Course. Whole Effluent Toxicity Testing Training Course. November 1998,

November 1999, and November 2000

Instructor — SETAC Short Course. TIEs/TREs. November 1998, November 1999, and November 2000

Instructor — Water Environment Federation Short Course. WEFTEC 98. Whole Effluent Toxicity Testing Training Course. October 1998

Instructor — SETAC Short Course. Recent Developments in the Identification and Reduction of Effluent Toxicity, November 1991

Instructor — 1-day seminar on TREs, presented for E.I. duPont de Nemours and Company. April 1990

Panel Member — TRE Research Meeting to identify and analyze toxicity reduction approaches and methods, 1987

Instructor-SETAC Short Course. Pesticides in the TIE Process. November 1997

Manuscript Peer Reviews — Water Pollution Control Federation Journal, Transactions for American Fisheries Society, Biochemical Systematics and Ecology, Copeia, Pennsylvania Academy of Sciences, Toxicological Sciences, Archives of Environmental Contamination and Toxicology, Water, Air and Soil Pollution, Environmental Toxicology and Chemistry, Integrated Environmental Assessment and Management, and Chemosphere

William Goodfellow, Jr., BCES
04/18 | Page 23

Exponent®
Engineering & Scientific Consulting

Roxolana Kashuba, Ph.D.
Managing Scientist | Ecological & Biological Sciences
1150 Connecticut Ave NW, Suite 100 | Washington, DC 20036
(202) 772-4952 tel | rkashuba@exponent.com

Professional Profile

Dr. Kashuba has 16 years of experience assessing ecological risk and regulatory criteria using quantitative data analysis of water, air, aquatic and terrestrial ecosystems. She specializes in the development, interpretation, and critique of statistical modeling techniques used to evaluate environmental causality, i.e., changes in ecological resources in response to natural and anthropogenic drivers, such as nutrients, pesticides, temperature, weather patterns, industrial and naturally-occurring chemicals (e.g., heavy metals, PCBs, PAHs, perfluorinated compounds including PFOS and PFOA), and land use changes such as urbanization, farming, chemical manufacturing, oil and gas production, and mining. Dr. Kashuba focuses on understanding and quantifying sources of variability and uncertainty, and the impact of data quality in environmental assessments.

With her regulatory (EPA) and private sector experience and strong interdisciplinary background in chemistry, public health, environmental science, pesticide risk assessment, air and water quality modeling, and environmental statistics, Dr. Kashuba provides technical advice on the application of environmental models and data analysis techniques for legal and regulatory issues such as pesticide registration, endangered species impacts, water quality evaluation, oil spill assessment and natural resource damage. She has experience programming in R, Matlab, SAS, Hugin, Nettica, Mathematica, Simulistics, and Vensim, as well as experience applying pre-programmed models such as PRZM-EXAMS, SCI-GROW, QUAL2E, WQSTAT, and LSPC. Dr. Kashuba serves on the Board of the Women's Council on Energy and the Environment (WCEE).

Academic Credentials & Professional Honors

Ph.D., Water Quality Modeling, Duke University, 2010

M.S., Environmental Health Science, University of Illinois, Chicago, 2003

B.A., Chemistry, Northwestern University, 2001

International Research & Exchanges Board (IREX) Embassy Policy Specialist (EPS) Program fellowship funded by the US Department of State to conduct environmental risk assessment research in Ukraine

United States Department of Interior STAR (Special Thanks for Achievement) Award

United States Environmental Protection Agency Office of Pesticide Programs Superior Accomplishment Recognition Monetary Award for assessment of Prothioconazole Ecological Risk

Chair of United States Environmental Protection Agency Office of Pesticide Programs Environmental Fate and Effects Division Fate and Transport Technology Team

United States Environmental Protection Agency Office of Inspector General Superior Accomplishment Recognition Monetary Award for instrumental contribution to BioWatch preliminary research

Elected to Delta Omega Public Health Honor Society

Prior Experience

Research Hydrologist and Environmental Modeler, United States Geological Survey, 2008-2012

Water Quality Modeling and Decision Analysis Research Assistant, Duke University, 2006-2008

Environmental Scientist and Modeler, United States Environmental Protection Agency, 2003-2006

Air Quality Modeler, Illinois Environmental Protection Agency, 2002-2003

International Occupational Health Research Assistant, University of Illinois at Chicago School of Public Health, 2001-2002

Professional Affiliations

Women's Council on Energy and the Environment - WCEE, (2012-present)

- Member of the Board of Directors (2014-present)
- Secretary, Executive Committee (2017-present)
- Chair, Lunch & Learn Committee (2014-2017)

Society for Risk Analysis — SRA, (2012-present)

Society for Environmental Toxicology and Chemistry — SETAC, (2013-present)

Society of Women Environmental Professionals — SWEP, (2010-2012)

- North Carolina chapter Communications Committee Chair 2010-2012

American Water Resources Association — AWRA, (2008-2013)

Water Environmental Federation — WEF, (2009-2010)

North Carolina Association of Environmental Professionals — NCAEP, (2009-2010)

Statistical and Applied Mathematical Sciences Institute — SAMSI, (2006-2008)

Air and Waste Management Association — AWMA, (2002-2004)

American Public Health Association — APHA, (2001-2003)

American Industrial Hygiene Association — AIHA, (2001-2003)

Languages

Ukrainian

Publications

Dantzker H, Kashuba R, Shah M, Kenney M, Evanylo G, Rockler A, Ross Z. Evaluation of the Chesapeake Bay Stewardship Fund's Innovative Nutrient and Sediment Reduction (INSR) Program. Prepared for the National Fish and Wildlife Foundation. April 7, 2017. (http://www.nfwf.org/results/evaluationreports/Documents/insr-evaluation-final.pdf)

Kashuba R, McMahon G, Cuffney TF, Qian S, Reckhow K, Gerritsen J, Davies S. Linking urbanization to the Biological Condition Gradient (BCG) for stream ecosystems in the Northeastern United States using a Bayesian network approach. U.S. Geological Survey Scientific Investigations Report 2012-5030, 48 p. (http://pubs.usgs.gov/sir/2012/5030/)

Cuffney TF, Kashuba R, Qian SS, Alameddine I, Cha Y, Lee B, Coles J, McMahon, G. Multilevel regression models describing regional patterns of invertebrate and algal responses to urbanization across the United States. Journal of the North American Benthological Society 2011 Sept; 30(3):797-819.

Kashuba RO. Bayesian methods to characterize uncertainty in predictive modeling of the effect of urbanization on aquatic ecosystems. Ph.D. dissertation, Duke University, 2010. (http://hdl.handle.net/10161/2366)

Kashuba R, Cha Y, Alameddine I, Lee B, Cuffney T. Multilevel hierarchical modeling of benthic macroinvertebrate responses to urbanization in nine metropolitan areas across the conterminous United States. U.S. Geological Survey Scientific Investigations Report 2009-5243, 88p. (http://pubs.usgs.gov/sir/2009/5243/)

Cuffney TF, McMahon G, Kashuba R, May JT, Waite IA. Responses of benthic macroinvertebrates to environmental changes associated with urbanization in nine metropolitan areas of the conterminous United States. Proceedings, 3rd Interagency Conference on Research in the Watersheds, September 8-11, 2008.

Kashuba RO, Scheff PA. Nonlinear regression adjustments of multiple continuous monitoring methods produce effective characterization of short-term fine particulate matter. Journal of the Air and Waste Management Association 2008 Jun; 58(6):812-820.

Salice C, Kashuba R, Steeger T, Jones RD. Environmental fate and ecological risk assessment for the Section 3 registration decision of Prothioconazole. (PC code: 113961, DP barcode: D324660, Decision number 341716), Part of EPA-HQ-OPP-2005-0312; FRL-8113-6. Joint review with Canadian Pest Management Regulatory Authority (PMRA), June 1, 2006.

Kashuba R, Sutton C, Jones RD. Drinking water assessment for the Section 3 registration decision of prothioconazle. (PC Code: 113961, DP barcode: D324659), Part of EPA-HQ-OPP-2005-0312; FRL-8113-6. Joint review with Canadian Pest Management Regulatory Authority (PMRA), April 26, 2006.

Kiernan B, Kashuba R, Steeger T, Jones RD. Environmental fate and ecological risk assessment for the Section 3 registration decision of aminopyralid. (PC codes: 005100, 005209, DP barcodes: D301658, D301682, D301691, D306825, Decision number 341121), Part of EPA-HQ-OPP-2004-0408; FRL-7690-9, May 10, 2005.

Kashuba R, Jones RD. Drinking water assessment for the Section 3 Registration decision of aminopyralid. (PC codes: 005100, DP barcode: D301682), Part of EPA-HQ-OPP-2004-0408; FRL-7690-9, February 3, 2005.

Kashuba RO, Scheff PA, Rizzo M. Characterization of nephelometer- measured short-term fine particulate matter in Region 5. Proceedings, AWMA Symposium on Air Quality Measurement Methods and Technology, Durham, NC, April 2004.

Roxolana Kashuba, Ph.D.

Selected Presentations

Kashuba, R.; Menzie, C; Buonagurio, J. Why Many Field-Based Toxicity Thresholds are Unreliable: Statistical Artifacts Affecting Causal Inference, at the Society for Risk Analysis (SRA) 2017 Annual Meeting, Arlington, VA, December 12, 2017.

Menzie, C., Kashuba, R. The Development and application of Weight-of-evidence Methodologies for Human and Ecological Risk Assessment: Common Pathways over Uneven Terrain, at the Society for Risk Analysis (SRA) 2017 Annual Meeting, Arlington, VA, December 13, 2017.

Kashuba, R. Goodfellow, W. How Statistical Artifacts Affect the Reliability of Toxicity Thresholds Calculated from Distribution Tails of Field Monitoring Data, at the Society of Environmental Toxicology and Chemistry (SETAC) 2017 Annual Meeting, Minneapolis, MN, November 14, 2017

Kashuba, R., Warren-Hicks, W. Role of Statistics in Public Policy and Litigation at Beveridge & Diamond, Washington, DC, November 6, 2017.

Kashuba, R., Vizcarra, H. What's Bugging Our Streams? Biocriteria and Water Quality Standards, at Beveridge & Diamond, Washington, DC, May 11, 2017.

Goodfellow, W., Menzie, C., Kashuba, R. Use of Multiple Sources of Field Data in Assessments of Streams and Rivers, at the Ninth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA, January 11, 2017.

Kashuba R, Morrison A, Palmquist K. Framework for environmental causal analysis that accounts for uncertainty in data quality. Presented at the Session: Integrated Risk Assessment and Emerging Lines of Evidence to Address Uncertainty, at the Society for Risk Analysis (SRA) 2016 Annual Meeting, San Diego, CA, December 12, 2016.

Kashuba R. Environmental Causal Analysis: Accounting for Differences in Data Quality. Lunch & Learn professional development seminar presented to the Women's Council on Energy and the Environment, Washington, DC, December 7, 2016. http://www.wcee.org/events/EventDetails.aspx?id=881097&group=

Kashuba R, Morrison A, Menzie C. The Application and Misapplication of Directed Acyclic Graphs for Causal Inference in Ecology. Presented at the Session: Integrated Environmental Assessment and Management General- Part 2, at the Society of Environmental Toxicology and Chemistry (SETAC) North America 36th Annual Meeting, Salt Lake City, UT, November 1-5, 2015.

Kashuba R, Palmquist K, Menzie C. What You See Is Not (Necessarily) All There Is: Evaluating the Data Quality of Causal Evidence for Environmental and Ecological Pathways. Presented at the Session: Perceptions of Risk Versus Actual Risk in Ecological Assessments, at the Society for Risk Analysis (SRA) 2015 Annual Meeting, Arlington, VA, December 6-9, 2015.

Menzie C, Kashuba R, Law, S. Incorporating Ecosystem Services into a Conceptual Model of Cumulative Risk Assessment: Cardiovascular Disease as a Case Study. Poster presentation at the Society for Risk Analysis (SRA) 2015 Annual Meeting, Arlington, VA, December 6-9, 2015.

Kashuba R, Menzie C, Cerreto K, Palmquist K, Kessel C. Challenges in deriving causal relationships from field observational data: A case study in West Virginia headwaters. Presented at the Session: Bayesian Networks and Other Probabilistic Methods Applied to Ecological Risk, at the Society for Risk Analysis (SRA) 2014 Annual Meeting, Denver, CO, December 10, 2014.

Kashuba R, Cerreto K, Palmquist K, Kessel C, Menzie C. Cautions for deriving causal relationships and water quality benchmarks from field observational data: A case study in West Virginia headwaters.

Presented at the Session: Assessing Contaminant Effects in Multi-stress Ecosystems, at the Society of Environmental Toxicology and Chemistry (SETAC) North America 35th Annual Meeting, Vancouver, BC, Canada, November 9-13, 2014.

Kashuba R. Career talk: Early career professional opportunities for PhD and Master's degrees. Invited industry representative. Noontime seminar at the Society of Environmental Toxicology and Chemistry (SETAC) North America 35th Annual Meeting, Vancouver, BC, Canada, November 9-13, 2014.

Kashuba R, Fairbrother A, Carbone J, Hillwalker W. Don't raise your voice; Strengthen your argument: Basing biological opinions on sound science (with already available information). Presented at the Session: Implementing the National Academy of Sciences Recommendations for Protecting Threatened and Endangered Species, at the Society of Environmental Toxicology and Chemistry (SETAC) North America 35th Annual Meeting, Vancouver, BC, Canada, November 9-13, 2014.

Kashuba R, Menzie C. Developing effect-based conceptual models for Cumulative Risk Assessment (CRA) that can accommodate diverse stressors. Presented at the Symposium: Proposed Methods for U.S. Environmental Protection Agency (EPA)'s Cumulative Risk Assessment (CRA) Guidelines, at the Society for Risk Analysis (SRA) 2013 Annual Meeting, Baltimore, MD, December 8-11, 2013.

Kashuba R, Fairbrother A, Tinsworth R. Probabilistic methods to address ecological risk of secondary ingestion exposure to chemicals. Presented in Session: Updates in Ecological Risk Assessment Models, at the Society for Risk Analysis (SRA) 2013 Annual Meeting, Baltimore, MD, December 8-11, 2013.

Menzie C, Kashuba R. A conceptual model for cumulative risk analysis using CVD as an example. Presented at the U.S. Environmental Protection Agency (EPA) Methods Workshop to Integrate Chemical and Non-Chemical Stressors in Cumulative Risk Assessment (CRA): Cardiovascular Disease (CVD), EPA Laboratories, Research Triangle Park, NC, November 26-27, 2012.

Kashuba R. Probabilistic air pollution risk assessment in Ukraine: challenges and opportunities. Presented at US Embassy Briefing for International Research & Exchanges Board (IREX) Embassy Policy Specialist (EPS) fellowship, Kyiv, Ukraine, 2012.

Kashuba R. Bayesian methods of modeling the interacting ecological pathways leading to impaired stream biology in urban watersheds. Presented in Bayesian Approaches to Water Modeling special session at American Water Resources Association (AWRA) Annual Water Resources Conference, Albuquerque, NM, session chair, 2011.

Kashuba R. Quantifying a conceptual model of ecosystem functionality using a Bayesian network approach. Presented at George Wright Society Conference: Bayesian workshop, New Orleans, LA, 2011.

Kashuba R. How to build a Bayesian network to model the complex interactions of stream ecosystems in urban watersheds. Lecturer for Northwestern University, Department of Civil and Environmental Engineering: Chemical & Biological Complexity in Aquatic Environments (CEE-448), Evanston, IL, 2011.

Kashuba R. Linking urbanization to the Biological Condition Gradient using Bayesian statistics. Presented at Albemarle-Pamlico National Estuary Program (APNEP) Scientific and Technical Advisory Committee (STAC), Washington, NC, 2011.

Kashuba R. Using a Bayesian network to model the interacting ecological pathways leading to impaired stream biology in urban watersheds. Presented at Integrated Approaches to Modeling Processes in Watersheds session, Geological Society of America (GSA) Annual Meeting, Denver, CO, 2010.

Kashuba R. Using a Bayesian network approach to model the system of effects of urbanization on aquatic ecosystems. Presented at 3rd USGS Modeling Conference: Understanding and Predicting for a Changing World, Denver, CO, 2010.

Kashuba R, Cuffney TF, McMahon G, Reckhow K, Gerritsen J, Davies S. Parameterizing the biological condition gradient in the Northeast U.S. using a Bayesian network approach. Presented at North American Benthological Society (NABS) Annual Meeting, Special Session - Applying the Biological Condition Gradient for Protecting Our Waters: Regional and State Experiences, Grand Rapids, MI, 2009.

Cuffney T, Kashuba R. Modeling in support of the EUSE (Effect of Urbanization on Stream Ecosystems studies). Presented at United States Geological Survey (USGS) National Water Quality Assessment Program (NAWQA) Ecological National Synthesis (ENS) modeling meeting, Reston VA, 2009.

Kashuba R. Using a Bayesian network approach to model the effects of urbanization on the condition of benthic macroinvertebrate assemblages. Presented at USGS Water Science Center Water Table Seminar, Raleigh, NC, 2009.

Kashuba R, Lee B. Multilevel modeling clarifies effects of urbanization on stream macroinvertebrates. Presented at American Water Resources Association (AWRA) Annual Water Resources Conference, New Orleans, LA, 2008.

Kashuba R, Lee B. Macroinvertebrate community responses to urbanization. Presented at Water Resources Research Institute of the University of North Carolina Annual Conference: Drought Management and Water Conservation, Raleigh, NC, 2008.

Kashuba R. A Poisson problem: Killing fish with statistics. Presented at Duke University Nicholas School of the Environment Ph.D. Graduate Afternoon Seminar, Durham, NC, 2007.

Kashuba RO. Synthesizing multiple sources of data on hydrolytic, photolytic, and metabolic breakdown of pesticides to predict aquatic environmental concentrations. Presented at United States Environmental Protection Agency Environmental Fate and Effects Division Drinking Water Assessment Training Conference, Washington, DC, 2005.

Kashuba R, Scheff PA, Rizzo M. Characterization of nephelometer- measured short-term fine particulate matter in Region 5. Presented at Air and Waste Management Association Symposium on Air Quality Measurement Methods and Technology, Research Triangle Park, NC, 2004.

Kashuba R, Scheff PA, Rizzo M. Using linear and non-linear regression to compare PM2.5 measurements from different monitoring technologies across varying time scales. Presented at American Industrial Hygiene Conference and Exhibition, Dallas, TX, 2003.

Project Experience

Environmental Modeling

Created, parameterized, and verified innovative hierarchical multilevel models and Bayesian networks to quantify the effect of urbanization on aquatic stream biota (macroinvertebrates, algae, and fish) at basin and region scales. Developed method for linking ecosystem response to probability of meeting water quality criteria for watershed management. Programmed statistical models in R and Hugin software.

Designed and implemented hydrological models to characterize:

- Water flux through soil columns of different hydraulic conductivities
- Effect of land use on infiltration and subsequent ground water recharge
- River and stream dissolved oxygen deficit as a function of wastewater discharge
- Rainfall-driven runoff as affected by different watershed properties

- Water quality contaminant trend analysis and watershed nutrient loading

Programmed models in R, Matlab, Mathematica, Simulistics, Vensim, and Nettica software.

Synthesized multiple sources of information (lab studies, models, expert judgment) to predict pesticide fate and transport in various application scenarios as ecological risk assessor in EPA's Office of Pesticide Programs Environmental Fate and Effects Division (EPA OPP EFED). Reviewed pesticide environmental fate studies for scientific validity, logic, and coherence. Modeled loading and hydrolytic, photolytic, and metabolic breakdown of pesticides of varying acidity, solubility, and mobility using complex, process-based terrestrial and surface and groundwater models (PRZM-EXAMS and SCI-GROW).

Planned, researched, and conducted evaluation to determine effectiveness of EPA's participation in the BioWatch program and in setting coal-fire mercury emission standards. Identified and determined usefulness of data sources internal and external to the EPA.

Collected, quality controlled and analyzed complex data sets of air pollution concentrations. Developed linear and nonlinear multivariate regression models to predict 24-hour gravimetric PM2.5 concentrations from hourly TEOM, beta-gauge and nephelometer measurements, accounting for meteorological influence (temperature and humidity). Programmed models in SAS software.

Translated and statistically analyzed Ukrainian, Russian, and Belarusian medical data collected as part of an epidemiological study to link occupational exposure to effects on coal miner lungs. Collaborated with doctors who administered physical exams and x-rays to demonstrate the detrimental effects of coal mine exposure on miners. Informed occupational health regulations in Eastern Europe.

Risk Assessment and Causal Analysis

Managed the scoping, strategy development, and execution of major components of large ecological litigation expert witness efforts including scientific argument construction, data analysis and interpretation, and expert report creation and vetting.

Conducted vehicle emission environmental impact assessment, ecological regulatory criteria analysis, technical critique of statistical methods for development of environmental benchmarks, identification and triage of scientific flaws, data gaps, and misinterpretations in state and federal regulatory processes.

Probabilistically quantify exposure and effects of compounds under new TSCA risk assessment process.

Evaluate strength of alleged causal relationships between potential stressors and ecological endpoints, develop and implement methods to assess multiple stressor impacts and interactions.

Use water quality models to estimate sediment and nutrient load reductions from innovative management strategies and quantify and rank effectiveness of different types of strategies on different land types.

Peer Reviewer

Estuarine, Coastal and Self Science

Integrated Environmental Assessment and Management

Reviews of Environmental Contamination and Toxicology

Wetlands

Roxolana Kashuba, Ph.D.
08/18 | Page 7