Order No: R1-202X-XXXX

Attachment B: Supplemental Findings

The North Coast Water Board additionally finds that:

1. For the purposes of adoption of this Order, the North Coast Water Board is the lead agency pursuant to the California Environmental Quality Act (CEQA) (Public Resources Code, section 21000 et seq.). Recognizing that 20 years has passed since the analysis of environmental impacts in the Scott TMDL and Shasta TMDL, and a host of smaller considerations, the North Coast Water Board has prepared and circulated an Environmental Impact Report (EIR) that analyzes the potential environmental impacts of this Order (SCH number 2025020048). The North Coast Water Board certified the EIR pursuant to CEQA on [TO COME: adoption date] when it adopted Resolution No. [TO COME].

I. Relevant Actions outside of Regional Board Authority

2. On March 12, 2020, National Oceanographic and Atmospheric Administration National Marine Fisheries Service (NOAA NMFS) staff contacted North Coast Water Board staff out of concern for low flows in the Scott River based on below average winter snowpack conditions. North Coast Water Board staff began coordinating with other State and Federal agencies in response to these drought concerns in both the Shasta and Scott watersheds, recognizing the impact of low flows on beneficial uses within these watersheds. As of the date of this Order, this collaboration continues with bi-weekly coordination calls among a diverse set of interested parties.
3. On April 21, 2021, Governor Newsom declared a drought state of emergency in Siskiyou County under the provisions of the California Emergency Services Act and ordered state agencies to take immediate actions to increase drought resilience across the state. On May 10, 2021, Governor Newsom extended the drought proclamation to include counties within the Klamath River, Sacramento-San Joaquin Delta, and the Tulare Lake watersheds. This proclamation directed the State Water Resources Control Board (State Water Board) and California Department of Fish and Wildlife to evaluate minimum instream flows and other actions to protect salmon, steelhead, and other native fishes in critical systems in the State.
4. On September 26, 2026, Governor Newsom signed into law Assembly Bill No. 263, which extended the 2021 emergency flow regulations through January 1, 2031 or until permanent rules establishing and implementing long-term instream flow requirements are adopted for the Scott and Shasta Watersheds, whichever occurs first.

II. Scott River Temperature TMDL Findings

5. Multiple factors contribute to the temperature impairments for the Scott River, including the following five anthropogenically alterable factors described within the Scott River Temperature TMDL:

    a. stream shade,

    b. stream flow via changes in groundwater accretions,

    c. stream flow via surface diversion,

    d. channel geometry, and

    e. microclimate.

6. Anthropogenic impacts to stream shade include legacy hydrologic modification from flood control projects, placer dredge mining, livestock grazing, tillage practices within the riparian zone, and groundwater depletion via pumping for irrigation, which can locally depress groundwater levels past the root zone and deprive vegetation of adequate water.

7. Anthropogenic impacts to stream flow are driven by both surface diversion and groundwater pumping. Surface diversions are especially impactful in smaller tributaries, including French Creek, Kidder Creek, Shackleford Creek, Mill Creek (tributary to Shackleford), the East Fork Scott River, where the total diversion volume is a high proportion of unimpaired stream flow. Excessive groundwater pumping for irrigation can reduce groundwater accretions instream, reducing cold water input and, in some cases, accelerating the disconnection of reaches of the Scott River under certain water year types.

8. Both surface diversion and groundwater pumping result in increased temperatures by reducing thermal mass of water in the Scott River and its tributaries, increasing travel time from cold-water source areas to the mouth of the Scott River, which increases the amount of time water is exposed to solar radiation and atmospheric heating as it moves through the watershed.

9. Anthropogenic changes to channel geometry include legacy hydrologic modifications from flood control projects and ongoing management actions including but not limited to tillage practices within the riparian zone, non-process-based bank stabilization projects, and unmanaged livestock access. Historic straightening of stream courses has had a significant impact on channel geometry, decreasing the overall length of a given stream course, increasing its slope, and driving incision. These incised reaches result in rapid dewatering of shallow groundwater in the late spring and early summer, depleting groundwater resources that would support instream accretions of cold water and riparian vegetation health.

10. Anthropogenic changes to microclimate[1] are generally driven by management induced changes to riparian vegetation, where air masses previously separated by dense riparian vegetation are no longer meaningfully separated following the removal of riparian vegetation. This results in elevated air temperatures, changes in relative humidity, and elevated instream temperatures.

III. Scott River Sediment TMDL Findings

11. Multiple factors contribute to the sediment impairments for the Scott River, including the following anthropogenic sources described within the Scott River Sediment TMDL[2]:

12. Anthropogenic activities — including road construction and maintenance, timber harvest, livestock grazing, and land clearing — have increased both the frequency and magnitude of sediment delivery to the Scott River and its tributaries. Large discrete streamside features, including eroding cut banks, terrace scarps, and legacy mine tailings, contribute chronic sediment loads directly to watercourses. Small discrete streamside features — fill failures at stream crossings, eroding skid trail approaches, and destabilized banks from unmanaged livestock access — deliver fine sediment that degrades spawning habitat, fills pools, and reduces intergravel dissolved oxygen critical for egg incubation and alevin survival. These anthropogenic sediment sources are additive to natural background erosion and represent the controllable load reduction targets established by the Scott River Sediment TMDL.

    a. landslides,

    b. large discrete streamside features,

    c. small discrete streamside features,

    d. road related sources, and

    e. unique landslide features.

    Surveys by North Coast Water Board staff found that common factors related to these sources include activities that create disturbances in unstable areas and management of runoff from roads, skid trails, and other anthropogenic features in the uplands. The identified sources were often exacerbated by the interaction of

[1] Microclimate refers to the localized air temperature, humidity, wind conditions, etc that are influenced by the presence or absence of waterbodies, vegetation, land aspect, slope, and other physical features.

[2] This summary is based on Chapter 3 of the Staff Report for the Action Plan for the Scott River Watershed Sediment and Temperature Total Maximum Daily Loads, available at https://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/scott_river/092005/sr/05ch.3.sediment.pdf

multiple human activities. These anthropogenic activities result in additional discharges of fine sediment in to surface waterbodies, carried downstream and deposit in gravels used by salmonids for spawning, reducing usable spawning habitat. Deposited sediments also reduce channel complexity and fill in deep pools that provide cold water refugia for rearing salmonids.

13. The Action Plan for the Scott River Sediment and Temperature Total Maximum Daily Loads (TMDL Action Plan) directs parties responsible for roads and sediment waste discharge sites[3] to take actions necessary to prevent, minimize, and control road-caused sediment waste discharges.

14. The TMDL Action Plan requires parties responsible for roads, on an as-needed site-specific basis, to develop and submit an Erosion Control Plan and a Monitoring Plan upon request of the North Coast Water Board's Executive Officer. The TMDL Action Plan requires dischargers to address sediment waste discharge sites identified in their Erosion Control Plan, or by other means developed in coordination with North Coast Water Board staff, and monitor sites that could negatively affect the quality of waters of the State, through appropriate permitting or enforcement actions.

IV. Scott River Biostimulatory Conditions Listing Findings

15. "Biostimulatory Conditions" describe the effects of multiple factors that result in the proliferation of nuisance algae and shifts in river metabolism towards high levels of general primary productivity. Factors such as riparian cover, flow, stream channel configuration, and water temperature affect how nutrients are processed within the stream and play a large role in determining whether or not biostimulatory conditions will occur. Factors specific to the Scott River watershed that influence biostimulatory conditions include anthropogenic changes in:

    a. channel morphology that decrease geomorphic complexity;

    b. riparian cover that allow for increases in solar radiation;

    c. flow that reduce stream depth, stream velocity, thermal mass, and increases in travel time across the watershed;

    d. nutrient inputs that drive primary productivity, including organic and inorganic species of nitrogen, phosphorous, and dissolved organic carbon; and

    e. seasonal flushing flows that can scour carry-over algae from the previous growing season to "reset" the system.

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[3] Sediment waste discharge sites include areas where anthropogenic activities have resulted in discharges of sediment that make their way to waterbodies. Examples include but are not limited to perched culverts, eroding inboard ditches, streamside features including cutbanks initiated or exacerbated by anthropogenic activities, etc.

16. The Scott River is listed as impaired for biostimulatory conditions pursuant to Section 303(d) of the Clean Water Act (2012 Integrated Report). No TMDL has been adopted for this impairment. This Order serves as an alternative water quality improvement program (Category 5R under the State Water Board's Listing Policy) by requiring management measures that address the primary anthropogenic sources of biostimulatory substances, including nutrient loading from tailwater return flows, animal waste discharge, and degraded riparian function. Factors driving the biostimulatory impairment include anthropogenic changes in channel morphology, riparian cover, flow regime, nutrient inputs, and reduced seasonal flushing flows.

17. In 2012 the Integrated Report identified that, based on a weight of the existing evidence[4], the Middle Mainstem Scott River was impaired for Biostimulatory Conditions from Young's Dam to Boulder Creek in the Scott River Canyon.

18. Water quality monitoring work is underway to confirm this listing. Current preliminary results indicate that this listing is accurate based on nutrient sampling, dissolved oxygen and temperature monitoring, riparian conditions assessments, and observations of algal growth in-stream across multiple water year types.

19. Based on the data collected to date[5], anthropogenic activities that drive this impairment include:

    a. decreased channel complexity in the impaired reach due to legacy management decisions;

    b. ongoing groundwater pumping that both reduces flow and impacts riparian health;

    c. impacts from unrestricted livestock access to tributaries and parts of the Scott mainstem, including inputs of animal waste, increases in bank erosion from bank trampling, decreases in channel complexity from bank trampling, decreases in riparian shade from livestock over grazing;

    d. inputs of irrigation tailwater; and

    e. multi-year drought events driven by anthropogenic climate change that can affect the ability for snowmelt and precipitation-driven flushing flows to exacerbate nuisance algal conditions.

[4] Details of the listing can be viewed here: waterboards.ca.gov/water_issues/programs/tmdl/2020_2022state_ir_reports_revised_final/apx-b/00538.shtml#79258

[5] TOCOME: reference to the technical memo summarizing the preliminary findings to the biostim study.

Other factors may also be affecting biostimulatory conditions in the Scott River, but the factors listed above appear to be most clearly supported by the existing lines of evidence.

20. Climate change models predict decreased snowpack and less frequent storms with higher precipitation intensity, making drought cycles more severe in California. During prolonged drought years with decreased snowpack, flushing flows decrease in magnitude and frequency. During the multi-year drought between October 1, 2019 and September 30, 2022, peak annual flows were measured at 1,690, 1,590, and 911 cubic feet per second (CFS) at the Fort Jones United States Geological Survey flow station, respectively, compared to the average peak annual flows of approximately 7,700 cfs. North Coast Water Board staff observed increasing levels of algae proliferation across each successive year. Peak annual flow in the subsequent water year spanning October 1, 2022 to September 30, 2023 was measured at 3,670 CFS and North Coast Water Board staff observed less algal proliferation.

21. Harmful algal blooms were observed in the Scott River watershed in 2020, 2021, and 2022, with signage posted at Indian Scotty Campground and Jones Beach warning of exposure to cyanotoxin, which could be harmful to human and pet health.

22. The location of the impairment, as well as the discharges and controllable factors that drive the impairment, overlap with land use practices covered by the previous Scott Waiver. There is high certainty that improvements in riparian health, minimizing, controlling, and preventing discharges of tailwater, sediment, and animal waste will improve the TMDL impairment and the biostimulatory conditions impairment. Therefore, it is appropriate for this Order to include conditions to control and minimize discharges and other factors that could contribute to biostimulatory conditions and other impairments.

V. Shasta River Temperature TMDL Findings

23. Multiple factors contribute to the temperature impairments for the Shasta River, including the following five anthropogenically alterable factors described within the Shasta River Temperature TMDL:

    a. stream shade,

    b. tailwater return flows,

    c. flow and surface water diversions,

    d. groundwater accretion/spring inflow, and

    e. Lake Shastina and minor channel impoundments.

24. Anthropogenically-driven impacts to stream shade have generally resulted from unmanaged livestock access to the riparian corridor in these watersheds. The combination of loafing and hoof-action impacts on riparian species roots and livestock consumption of young riparian species has denuded riparian vegetation across the watershed, reducing shade to below site-specific potential effective shade across much of the watershed.

25. Tailwater is the excess water applied to a field that runs off into down-gradient water bodies, and results when excess irrigation water is spread shallowly across a field to facilitate flood irrigation. To ensure sufficient water reaches all parts of the field being irrigated, flood irrigation requires significantly more water to be applied to the field than what is needed to support the transpiration needs of the crop being irrigated. As irrigation water is flooded in a thin sheet across the field, it is exposed to direct solar radiation and can more quickly heat up and equilibrate with atmospheric temperatures. As tailwater is discharged from fields to waterbodies, it can have a significant warming effect on instream temperatures.

26. Surface diversions decrease the volume of water in stream and, thereby, decrease a stream's capacity to assimilate heat. Surface diversions also increase travel time from cold water source areas to downstream habitats, which increases the amount of time water is exposed to solar radiation and atmospheric heating as it moves through the watershed and, ultimately, decreases the extent of cold-water habitat. During the irrigation season, flows in the Shasta River can decrease by over 90% due to surface diversion and groundwater pumping when atmospheric temperatures are highest and days are longest. Average daily surface water demand can range between 248 and 364 cfs during irrigation season[6].

27. Instream groundwater accretion and flow from large, cold-water springs supplies the majority of flow in the Shasta River and the Little Shasta River. Water discharges at high volumes from the Big Springs Complex, a contact zone between a historic lava flow that erupted from Mt. Shasta and the existing soils that covered the valley floor before this eruption. Water also emerges from multiple cold-water springs surrounding Table Rock in the Little Shasta watershed which is currently nearly fully diverted for flood irrigation and stock watering and does not contribute to summertime baseflow. Water conveyed subsurface emerges at these spring complexes at a consistent temperature between 10 ^{o}C and 14 ^{o}C and flow from the Big Springs Complex provides over 70% of the summertime base flow of the Shasta River. The low temperature of this water, combined with the large proportion of the overall summertime baseflow that it provides, supports ideal conditions for Endangered Species Act (ESA) listed Southern Oregon Northern California Coastal (SONCC) Coho Salmon to rear over summer. This water resource also provides a climate resilient foothold for this species as snowpack diminishes in other parts of

[6] Data provided by State Water Resources Control Board staff based on their collation of reported water use from the state eWRIMS database and watermaster reporting.

their native range. Anthropogenic drivers that reduce the flow of cold-water springs include groundwater pumping from areas within the geologic formation that feeds the springs and diversion of spring-fed cold water tributaries.

28. Impoundments across the Shasta River watershed affect instream temperatures by increasing travel time of water through the system, allowing the effects of solar radiation and atmospheric temperatures to be amplified including increased temperatures via direct heating and decreased volume via evaportation. Several impoundments have been removed since the adoption of the Shasta River Temperature TMDL, but many remain including Big Springs Lake, Little Springs Lake, Lake Shastina, a flashboard dam located upstream of Highway A-12, the Kettle Springs impoundment, and the Bridgefield Springs impoundment. Multiple cold-water springs within the Little Shasa River watershed are also impounded for diversion and reduce the stable cold water that used to flow through the Little Shasta, which provided additional habitat for juvenile Salmonids.

VI. Shasta River Dissolved Oxygen TMDL Findings

29. Multiple factors contribute to the dissolved oxygen impairments for the Shasta River, including the following five anthropogenic factors described within the Shasta River Temperature TMDL[7]:

    a. Tailwater return flows,

    b. City of Yreka nonpoint and wastewater infiltration sources[8],

    c. Lake Shastina and minor impoundments,

    d. Decreased riparian shade, and

    e. Decreased flow due to surface diversions and groundwater pumping.

30. The spring source water of the Shasta River that emanates from fractured basalt has relatively high concentrations of total phosphorus and total nitrogen, resulting in overall high level of background biostimulation before any waste discharges occur. With high natural background levels of total phosphorous levels, biostimulation in the Shasta River is not limited by this basic nutrient, unlike most freshwater systems. The high natural background concentrations of phosphorous leave less assimilative capacity in the river for discharges of nutrients relative to other

[7] This summary is based on Chapter 4 of the This summary is based on Chapter 3 of the Staff Report for the Action plan for the Shast River Temperature and Dissolved Oxygen Total Maximum Daily Loads, available at https://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/shasta_river/060707/04shastarivertmdl.pdf

[8] Municipal discharges are covered by other North Coast Water Board and State Water Board permits.

watersheds. As a result, any additional discharges of nutrients from anthropogenic sources result in extensive growth of benthic algae and aquatic vegetation.

31. Tailwater discharged to the Shasta River has been sampled in past North Coast Water Board efforts[9] and results showed average tailwater nutrient concentrations above the average instream nutrient concentrations of the Shasta River mainstem downstream of Dwinnell Dam, indicating tailwater discharges are, categorically, a driver of the dissolved oxygen impairment through introduction of excess nutrients into the Shasta River and its tributaries.

32. Lake Shastina regularly stratifies and becomes anoxic in the hypolimnion (the lower level of the lake), a phenomenon caused by the damming of the Shasta River and impoundment of water behind Dwinnell Dam. Dissolved oxygen concentrations in the Shasta River have been observed to be lower downstream of Lake Shastina than upstream, due to the fact that the outflow of Dwinnell Dam is discharged from the bottom of Lake Shastina where dissolved oxygen levels are lowest in the summer months. Evidence from the TMDL analysis also suggests that Lake Shastina may influence the levels of dissolved oxygen in spring water emanating from Hidden Valley Spring, which when sampled in 2003 had the lowest dissolved oxygen levels of any other sampled springs. Considering the known leaky nature of Lake Shastina and the seasonal fluctuations of Hidden Valley Spring and correlation to the level of Lake Shastina, it’s likely that seepage of anoxic water from Lake Shastina is emerging from Hidden Valley Spring and causing the observed low oxygen levels.

33. Lake Shastina also serves as a phosphorous sink and nitrogen source for the Shasta River. The observed presence of blue green algae that are able to fix atmospheric nitrogen, which then enters into the water column as the algae decomposes, adds nitrogen to the Shasta River[10].

34. Dwinnell Dam also reduces scour from peak flows during the winter rains and spring snow melt, allowing fines to accumulate and increase sediment oxygen demand, reducing dissolved oxygen concentrations. These fine sediments also encourage the growth of rooted aquatic macrophytes, increasing the respiratory oxygen demand in the river.

35. Minor Impoundments have historically been used along the Shasta River and its tributaries to raise the level of the river during irrigation season to facilitate diversion of water. Many of these have been removed and replaced with screened on-stream diversions driven by pumps, but several irrigation impoundments remain in use.

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[9] See Chapter 3 of the Shasta River TMDL Staff Report: https://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/shasta_river/060707/04shastarivertmdl.pdf

[10] Vignola, E. and M. Deas. 2005. Lake Shastina Limnology. Watercourse Engineering, Inc.

These impoundments increase the residence time of water in the system promoting changes in water quality including the settling of particulate matter. The depth of water in these impoundments tends to be shallow, allowing light to penetrate to the bottom of the water body, thus increasing water temperature and providing energy for photosynthesis across the entire watercolumn. The accumulation of fine sediment, particulate matter, low velocity, and light penetration throughout the water column all provide conditions that support extensive growth of rooted aquatic macrophytes and algal growth, increasing the respiratory oxygen demand and sediment oxygen demand, behind these impoundments.

36. Lack of riparian shade contributes to aquatic plant growth by allowing more light to penetrate the water column. Riparian shade effectively blocks light, minimizing the primary energetic source for in-stream photosynthesis and thus minimizing respiratory oxygen demand. Direct solar radiation entering the water column that would otherwise be blocked by riparian shade also increases instream temperatures.

37. Flow can affect dissolved oxygen in multiple ways, including reaeration through changes in velocities and turbulence, water column depth, temperature, and surface films. Higher flows increase velocity, turbulence, and water depth while breaking up surface films that may block the exchange of atmospheric gases with the water column. Higher flows also increase water column depth, increasing the proportion of the water column that is outside the photosynthetically active range. At higher flows, less light is available to aquatic plants, resulting in less fluctuations in dissolved oxygen from photosynthetic respiration. Finally, higher flows can affect dissolved oxygen through changes to water temperature by increasing the thermal mass of the water column. This is particularly notable if the increase in flow is from a cold-water source, as is the case in the Shasta River, with significant portions of unimpaired flow coming from high volume cold-water springs.

VII. Summary of Land Use Practices Driving Watershed Impairments

38. Based on the above findings, the following land use practices that affect riparian shade continue to drive impairments in the Scott and/or Shasta Watersheds:

    a. Riparian grazing conducted for long duration and/or intensity, or in areas where riparian conditions have been degraded and are not showing signs of recovery;

    b. Agricultural practices within the riparian corridor that do not allow for the natural establishment and abundance of native riparian restoration, including but not limited to tillage, road construction and maintenance, poorly designed and maintained road and livestock crossings, physical removal or clearing of woody riparian species, and channel realignment;

c. Groundwater pumping that results in aquifer drawdown below the root zone of woody riparian species at such a rate, frequency or duration that results in the death of riparian vegetation; and

d. Practices that result in ongoing stream bed degradation and incision.

39. Based on the above findings, the following land use practices that affect instream flow continue to drive impairments in the Scott and/or Shasta Watersheds:

a. Surface diversion, especially in tributaries in the Scott where the amount of water diverted is a large proportion of total unimpaired flow;

b. Groundwater pumping from hydrogeologic formations known to supply important cold water spring sources;

c. Groundwater pumping resulting in aquifer drawdown that dewaters areas of cold water accretions, decreases instream flow volumes, or decrease flow velocity and increase surface water travel time through the watershed;

d. Diversion of cold water spring sources that feed areas of known cold water refugia or contribute to instream flow and decrease surface water travel time through the watershed; and

e. In the Shasta, a total of 45 cfs of additional cold water from the Big Springs complex or other cold water sources has yet to be dedicated in stream and protected to the mouth of the Shasta River.

40. Based on the above findings, the following land use practices that affect tailwater and nutrient inputs continue to drive impairments in the Scott and/or Shasta Watersheds.

a. Irrigating more than the evapotranspiration losses and needs of the crop receiving irrigation water.

b. Lack of installation and Insufficient maintenance of berms intended to capture and re-direct irrigation tailwater.

c. Use of flood irrigation in areas with a relatively shallow soil bed above hardpan soils with low permeability. This leads to rapid saturation of the soil bed and more of the applied water running off as shallow surface runoff rather than percolating deeper into the subsurface.

d. Flood irrigating a large volume of water across a field in a short period of time such that much of the applied water results in surface runoff before being able to percolate into the root zone.

e. Concentrating livestock in areas within the riparian corridor of a waterbody, adjacent to a water body, or in an area where precipitation as rain would produce surface runoff into a waterbody without appropriate retention and/or treatment.

f. Riparian grazing for long duration, where livestock are allowed to deposit animal waste directly to surface water, within the wetted area of the stream, or in areas of concentrated surface water that discharges into a waterbody.

g. Constructing or maintaining a livestock loafing or feeding area through which a waterbody flows.

41. Based on the above findings, the following land use practices that affect channel geometry continue to drive impairments in the Scott and/or Shasta Watersheds:

    a. Deep incision and ongoing channel degradation continues in multiple areas unmitigated, including the Middle Mainstem Scott, Moffett Creek, French Creek, Parks Creek, the Little Shasta River, and other tributaries.

    b. Maintenance of historic water course relocation, straightening, and berm construction for agricultural development or flood control.

    c. Placement of large, hardened materials (i.e., “rip-rap”) in an attempt to arrest natural bank erosion. These materials are generally ineffective over the long term for erosion control.

    d. Historic conversion of natural waterways into field drainage ditches to facilitate agricultural development maintained through periodic dredging.

    e. Placement of bridges within flood plains, resulting in concentration of flow which drives significant erosion and/or incision during periods of high flow.

42. Based upon the above findings, Lake Shastina and Dwinnell Dam continue to have an impact on impairments in the Shasta Watershed. These include increasing the residence time of water diverted into the reservoir from the Shasta River and Parks Creek via impoundment, which increases temperature, decreases dissolved oxygen, and has been known to result in the production of unionized ammonia which is known to be toxic to salmonids. Additionally, Dwinnell Dam halts the natural flow of sediment through the Shasta River, impacting the erosion, mobilization, and deposition of sediments downstream of Dwinnell Dam.

43. Montague Water Conservation District has, however, made progress to develop operational controls that minimize these impacts, including:

    a. Delivering cold groundwater pumped from the Flying L pumps to mix with discharges from Dwinnell Dam when the temperature of that discharge reaches 16 ^{o}C.

    b. Implementing seasonal pulse flows when water quality conditions within lake Shastina are appropriate, timed with early spring storm events and/or snowmelt pulses, to mobilize accumulated fine sediments throughout the Shasta River.

Water quality data collected from these events showed turbidity pulses, indicating these pulse flows were effective in mobilizing sediments while temperature, pH, and dissolved oxygen levels were within water quality objectives.

c. Water quality monitoring of the water discharged from Dwinnell for temperature, dissolved oxygen, and pH to actively manage when releases from Dwinnell are appropriate or when flow should come solely from the Flying L pumps and cold water seeps that emerge from the base of Dwinnell Dam. When pH rises above 9, monitoring for unionized ammonia also occurs.

d. Exchanging water that is contractually obligated to be released according to water rights that can no longer be diverted due to the construction of Dwinnell Dam (Prior Rights Agreements) with cold spring water that the holders of the Prior Rights Agreements would otherwise divert such that spring water can remain instream and lower quality water can be used for diversion.

e. Construction of a cold water habitat refuge at the outlet of the Flying L pump pipeline to expand salmonid habitat in the upper Shasta River.

VIII. Temperature Water Quality Benchmarks — Technical, Scientific, and Legal Basis

44. Basin Plan Narrative Temperature Objective. The Basin Plan establishes a narrative water quality objective for temperature providing that the natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated that such alteration does not adversely affect beneficial uses. Secondly, the Basin Plan establishes at no time or place shall the temperature of any COLD water be increased by more than 5°F above natural receiving water temperature. At no time or place shall the temperature of WARM intrastate waters be increased more than 5°F above natural receiving water temperature. The Scott River and Shasta River and their tributaries are designated for beneficial uses including Cold Freshwater Habitat (COLD), Spawning, Reproduction, and/or Early Development (SPWN), Migration of Aquatic Organisms (MIGR), and Rare, Threatened, or Endangered Species (RARE). These uses are dependent upon maintenance of cold water temperatures supporting all life stages of anadromous salmonids — coho salmon (Oncorhynchus kisutch), Chinook salmon (Oncorhynchus tshawytscha), and steelhead trout (Oncorhynchus mykiss) — listed as threatened or endangered under state and/or federal endangered species acts. The narrative objective is the foundational standard from which the TMDL load allocations and this Order's Water Quality Benchmarks are derived.

45. Scott River Temperature TMDL — Tailwater as Controllable Source. The Scott River Temperature TMDL (Basin Plan Table 4-10) is expressed as reduction in solar radiation load necessary to achieve the narrative temperature objective. While primarily shade-based, the TMDL identifies tailwater return flows as a distinct,

controllable source of thermal loading. Table 4-10 requires management measures for irrigated lands including prevention and control of tailwater. The rescinded 2018 Scott Waiver (Order No. R1-2018-0018, Condition 5(k)) required management practices to “minimize, control, and prevent irrigation water or tailwater from reaching surface waters.” Tailwater discharged during the critical summer period is characteristically warmer than ambient receiving water because irrigation water is diverted, applied to fields where it absorbs solar energy, and returned at elevated temperatures. This thermal loading is additive to the shade-based load allocations.

46. Shasta River Temperature and Dissolved Oxygen TMDLs — Tailwater as Separate Source Category. The Shasta River TMDL (Basin Plan Table 4-14) identifies tailwater return flows as a separate source category with its own responsible parties and implementation actions. Table 4-14 directs irrigators to “employ land stewardship and irrigation management practices and activities that minimize, control, and preferably prevent discharges of fine sediment, nutrients and other oxygen consuming materials, and elevated water temperatures from affecting waters of the Shasta River and its tributaries.” The rescinded 2018 Shasta Waiver (Order No. R1-2018-0019) identified “unmitigated tailwater return flows to main stem and tributary reaches, or into springs and their associated wetlands such that elevated surface water temperatures result” as a priority risk factor. The Shasta TMDL Water Quality Compliance Model establishes an instream flow target that requires an additional 45 cfs of dedicated cold water, in addition to baseline flows at the time of analysis, from May 15 through October 15. The interlinked temperature-dissolved oxygen framework — where warm tailwater simultaneously raises temperature and reduces dissolved oxygen carrying capacity while accelerating biochemical oxygen demand — provides direct authority for a tailwater temperature benchmark.

47. Regional Temperature Policy. The North Coast Water Board's Policy for the Implementation of the Water Quality Objectives for Temperature (adopted March 2014) establishes that solar radiation is the dominant driver of elevated stream temperatures and identifies additional controllable factors including warm water discharges such as tailwater. The Policy directs the Board to apply mandatory controls on controllable thermal inputs through all regulatory instruments. Where TMDLs are adopted, the TMDL allocations are the primary mechanism; the Temperature Policy supplements and reinforces them. The Policy independently supports tailwater temperature benchmarks as a translation of the Basin Plan narrative temperature water quality objective — even absent the TMDLs, the Policy's directive to control controllable thermal inputs would require addressing tailwater temperature from irrigated agriculture.

48. How Tailwater Causes Temperature Impairment. Tailwater from irrigated agriculture contributes to temperature impairment through five mechanisms: (a) Direct thermal loading — diverted water applied to fields absorbs solar energy and returns to the

stream at elevated temperatures, most pronounced during the critical June–September period when air temperatures are highest and streamflows lowest; (b) Volume-temperature interaction — thermal impact is a function of both temperature and volume, and during extreme low-flow conditions even modest tailwater volumes significantly alter receiving water temperatures; (c) Spatial concentration (tailwater neighborhoods) — tailwater discharges concentrate along valley-floor reaches where flood irrigation is prevalent, and multiple discharges along the same reach create cumulative thermal loading exceeding what any individual discharge would cause in isolation; (d) Temperature-dissolved oxygen synergy (Shasta River) — warm tailwater reduces dissolved oxygen saturation while accelerating metabolic oxygen demand from organic materials, a pathway specifically addressed by the Shasta TMDL; and (e) Thermal refugia disruption — tailwater near cold water refugia (spring inflows, tributary confluences, deep pools) diminishes the temperature differential that defines the refugium, reducing essential salmonid survival habitat.

49. Seasonal Temperature Benchmark Technical Basis. The Water Quality Benchmarks for temperature are calibrated to the thermal requirements of the most sensitive beneficial uses during each phase of the Irrigation Season. They are based on best professional judgement derived from: (a) U.S. EPA Region 10 Temperature Guidance for Pacific Northwest Anadromous Salmonids (EPA 910-B-03-002, 2003); (b) California Department of Fish and Wildlife Recovery Strategy for California Coho Salmon (CDFG 2004); (c) the Scott River and Shasta River TMDL compliance models; and (d) peer-reviewed literature, including Sullivan et al. (2000), Welsh et al. (2001), and Richter and Kolmes (2005). The resulting seasonal watershed-side benchmarks are: Early Season (April 1 – June 15), 61°F (16.0°C), protecting smolt outmigration and juvenile rearing; Mid-Season (June 16 – August 31), 64°F (17.8°C), protecting oversummer juvenile rearing and adult Chinook holding; and Late Season (September 1 – October 1), 56°F (13.3°C), protecting adult spawning migration and early spawning.

50. Irrigation Season and Biological Calendar Intersection. The Irrigation Season (April 1 – October 1) encompasses three phases corresponding to distinct combinations of irrigation activity and salmonid life history. During the Early phase (April 1 – June 15), irrigation is commencing with moderate tailwater generation while smolt outmigration and juvenile rearing are occurring, presenting moderate thermal risk. During the Mid phase (June 16 – August 31), irrigation is at peak demand with maximum tailwater volumes and temperatures coinciding with oversummer juvenile rearing and adult Chinook migration, presenting very high thermal risk. During the Late phase (September 1 – October 1), irrigation demand is declining with final discharges occurring during spawning migration and early spawning, presenting critical thermal risk. The Late Season warrants the most stringent Irrigation Season benchmark (56°F) because it represents the highest-consequence intersection between active irrigation and salmonid reproduction.

51. Dual Compliance Pathway Justification. The dual pathway structure provides meaningful Enrollee choice while ensuring equivalent water quality outcomes: (a) Pathway 1 eliminates the thermal load entirely, the most direct path to temperature protection; (b) Pathway 2 provides a structured, iterative path with monitoring, benchmarks, and escalating adaptive management; (c) the eight-year schedule is consistent with TMDL implementation timelines and the five-year waiver cycles used under Orders R1-2018-0018 and R1-2018-0019; (d) the structure was expressly anticipated by the 2018 Waivers, which stated the future order may “differ from this Order by incorporating a tiered structure, employing multiple levels of permitting rigor commensurate with the level of discharge or threat of discharge” (Finding 18, both Orders); and (e) Water Quality Benchmarks translate Water Quality Objectives into measurable standards, consistent with the NPS Policy requirement that management measures be verified through monitoring.

52. Point of Compliance Justification. The Point of Compliance is the location at which tailwater discharge compliance with Water Quality Benchmarks is determined. The Point of Compliance is located at the lowest elevation where tailwater discharges from irrigated parcel(s) to perennial streams (from April 1 to October 1) and intermittent streams (From April 1 to June 15). must be monitored at the Point of Compliance. These Points of Compliance must be located on concentrated tailwater flow paths at the outlets of hydrologically-connected tailwater drainage areas.The Point of Compliance at the point of tailwater entry to the receiving waters with COLD Beneficial Uses ensures benchmarks are applied where most relevant to beneficial use protection.

53. Water Quality Benchmarks as Implementation Tools. Water Quality Benchmarks in this Order are not new water quality objectives. The temperature benchmarks are the translation of the existing narrative and numeric objectives — as interpreted through the applicable temperature TMDL load allocations, the Temperature Policy, and peer-reviewed science and literature — into measurable, discharge-specific numeric compliance values. This translation is consistent with the NPS Policy's requirement that management measures be verified through monitoring and with the ESJ Order's precedential requirements for iterative management practice implementation with feedback mechanisms.

54. Tailwater Neighborhoods. In both the Scott and Shasta valleys, tailwater discharges concentrate along specific reaches where flood irrigation is prevalent and the river corridor traverses the valley floor. These clusters — “tailwater neighborhoods” — create cumulative thermal, nutrient, and sediment loading along discrete stream segments. Multiple discharges each incrementally raise temperature, reduce dissolved oxygen, and increase turbidity and biostimulatory substances, with compound effects exceeding any individual discharge's impact. The Monitoring and Reporting Program accounts for tailwater neighborhoods through downstream monitoring stations and Source Determination Reports evaluating cumulative

contributions. The Executive Officer may designate collective Points of Compliance at shared drainage outlets to address neighborhood-scale effects.

55. Temperature Management Practices for Tailwater. Enrollees under Pathway 2 and Enrollees developing Certified Tailwater Discharge Treatment and Control Plans under Tier 2 Adaptive Management may implement the following categories of management practices to reduce tailwater temperature:

    a. irrigation efficiency improvement (conversion to more efficient methods such as flood to sprinkler/LESA/drip, scheduling optimization per National Resources Conservation Service (NRCS) Conservation Practice Standard (CPS) 449, deficit irrigation during peak temperature periods);

    b. tailwater volume reduction (recovery and reuse with capture ponds and pump-back, shortened run lengths, surge irrigation);

    c. thermal attenuation (constructed wetlands or vegetated treatment channels, cooling ponds with delayed release);

    d. conveyance management (shading ditches and channels, piping open conveyances, shortening conveyance distances);

    e. irrigation timing (shifting to nighttime or early morning irrigation to reduce solar heating); discharge timing (releasing tailwater during early morning when receiving water temperatures are lowest); and

    f. cold water blending (blending warm tailwater with cold groundwater, spring water, or stored cold water before discharge).

    These practices are included in the approved management practice menu in Attachment E and may be implemented individually or in combination. Alternative practices achieving equivalent or superior thermal performance may be proposed to and approved by the Executive Officer.

56. Shasta River Reach-Specific Temperature Benchmarks — Master 1 Derivation.

    a. Source and Rationale. The reach-specific tailwater temperature benchmarks for the Shasta River mainstem are derived from the Master 1 maximum modeled temperature values presented in Table 6.6 of Chapter 6 of the Shasta River Temperature TMDL. Table 6.6 presents the maximum temperature predicted by the RMS[11]. model at twelve locations along the Shasta River mainstem — from Dwinnell Dam (RM 42.60) to the Mouth (RM 0.66) — during the August 2002 critical condition simulation period under the Master 1 scenario. The Master 1 maximum represents the single highest instantaneous temperature predicted at each location during the simulation

[11] The Tennessee Valley Authority's River Modeling System (RMS) was the model used to develop the Shasta River temperature TMDL.

— the peak thermal condition the receiving water reaches on the hottest day at each location under conditions of restored shade and controlled tailwater. The Master 1 scenario incorporates: (1) riparian shade to site potential conditions, (2) tailwater causing no receiving water heating, (3) temperatures of Big Springs Creek reduced by 4°C from baseline conditions, and (4) temperatures of Parks Creek reduced by 2°C from baseline conditions. The Master 1 scenario did not include a 45 cfs flow increase from Big Springs Creek which was incorporated in the TMDL model's water quality compliance scenario. Approximately 70 percent of compliance scenario temperature reductions are attributed to Master 1; approximately 30 percent to the flow increase. The twelve Table 6.6 model output locations and their Master 1 maximum modeled temperatures are:

Location	River Mile	Master 1 Maximum (°C)	Master 1 Maximum (°F)	Reduction from Baseline (°C)
Dwinnell Dam	42.6	21.27	70.3	0
Louie Road	33.93	19.48	67.1	-1.61
GID	30.59	15.28	59.5	-3.4
Highway A-12	24.11	18.87	65.9	-3.18
Freeman Lane	19.23	19.41	66.9	-3.01
Montague-Grenada Rd	15.52	19.16	66.5	-3.69
Highway 3	13.16	19.14	66.5	-4.14
Yreka Ager Road	10.91	19.41	66.9	-4.07
Anderson Grade Road	8.03	21.03	69.9	-3.1
Highway 263	7.3	21.24	70.2	-2.95
"Salmon Heaven"	5.6	22	71.6	-2.68
Mouth	0.66	22.67	72.8	-2.79

b. Rationale for Using Maximum Modeled Temperatures. The North Coast Water Board finds that the Master 1 maximum modeled temperatures — rather than a multi-day average such as a 5-day average maximum — are the appropriate basis for the reach-specific tailwater benchmarks for the following reasons:

c. Consistency with the benchmark measurement metric. The Water Quality Benchmarks in this Order are measured as instantaneous maximum temperatures at the Point of Compliance. Using maximum modeled temperatures as the derivation basis provides direct metric consistency — both the benchmark and the compliance measurement reflect peak thermal conditions. If benchmarks were derived from a multi-day average, an operator could comply with the instantaneous benchmark while the averaged thermal condition at the compliance point exceeds the modeled average — a metric mismatch that would undermine the protective intent of the benchmarks;

d. The "no net increase" allocation operates on instantaneous conditions. The TMDL load allocation — "no net increase in receiving water temperature" from tailwater return flows [1] — is not qualified by an averaging period. It applies to the receiving water temperature at the time and place of discharge. The maximum modeled temperature represents the highest receiving water temperature that should exist under Master 1 conditions at each location. Setting the benchmark at that maximum ensures that tailwater does not cause a net increase even during peak thermal conditions on the hottest day of the critical period;

e. Protection during worst-case conditions. Salmonid thermal stress is driven by peak temperatures, not averages. Acute thermal impacts — behavioral avoidance, physiological stress, reduced feeding, disease susceptibility, and mortality — are triggered when temperatures exceed biological thresholds on individual days, regardless of whether the multi-day average is lower. A benchmark based on the maximum ensures protection during the specific hours and days when thermal risk is greatest;

f. Spatial resolution. Table 6.6 provides maximum modeled temperatures at twelve locations along the Shasta River mainstem, compared to three locations in the TMDL's compliance point summary. This spatial resolution allows each reach boundary to be anchored to an actual model output location rather than interpolated between distant points. Twelve data points capture the longitudinal thermal variability driven by spring inputs, tributary influences, shade potential differences, and channel morphology changes — most importantly the dramatic cooling at the GID location (RM 30.59) to 15.28°C (59.5°F), which directly reflects the Big Springs Creek cold water influence.

g. Conservative but achievable benchmarks. The maximum modeled temperature represents the upper bound of the Master 1 thermal regime at each location. On most days during the Irrigation Season, actual receiving water temperatures under Master 1 conditions would be lower than the maximum. Setting the benchmark at the maximum therefore provides an achievable target — owner or operators managing tailwater to match the peak Master 1 temperature will, on most days, discharge tailwater that is at or below the actual receiving water temperature. This provides a practical margin of compliance while still ensuring that tailwater does not cause a net increase during peak conditions;

h. Alignment with critical condition modeling. The Master 1 scenario was modeled under the August 2002 critical condition simulation period — a period during which daily maximum air temperatures consistently exceeded the 16-year average and Shasta River flows ranked 19th lowest of 67 years of record. The maximum modeled temperature from a critical-condition simulation represents the most thermally challenging condition the receiving water is expected to face under Master 1. Benchmarks based on this value are calibrated to worst-case conditions, providing inherent conservatism during more typical years.

i. Longitudinal Thermal Structure Revealed by Table 6.6 The twelve-point spatial resolution of Table 6.6 reveals critical features of the Shasta River's thermal structure under Master 1 conditions that inform the reach-specific benchmarks:

    i. Dwinnell Dam influence (RM 42.60). Master 1 maximum at the dam is 21.27°C (70.3°F) — identical to baseline. The dam is not modified under Master 1, and no temperature reduction occurs at this location. Temperatures cool progressively downstream from the dam as shade improvements take effect;

    ii. Big Springs Creek cooling (RM 30.59 — GID). The GID location shows the most dramatic feature in the longitudinal profile: Master 1 drops to 15.28°C (59.5°F) — a reduction of 3.40°C from baseline and the coldest point on the entire mainstem. This is the direct thermal signature of Big Springs Creek, which delivers spring water at approximately 11–12°C year-round. The GID model output captures the spring-fed thermal regime that is the single most important cold water asset in the Shasta River watershed;

    iii. Post-springs warming (RM 24.11 to RM 10.91). Downstream of GID, Master 1 temperatures rise from 18.87°C at A-12 to 19.41°C at Yreka Ager Road — a gradual 0.54°C warming over approximately 13 river miles as the spring-cooled water absorbs solar energy. The relatively flat thermal profile through this segment reflects the significant shade improvements under Master 1 (transmittance targets as low as 10% near Montague-Grenada Road);

    iv. Lower river heating (RM 10.91 to RM 0.66). Master 1 temperatures rise sharply from 19.41°C at Yreka Ager Road to 22.67°C at the Mouth — a 3.26°C increase over approximately 10 river miles. This acceleration reflects reduced shade effectiveness in wider channel segments, cumulative solar heating, and the absence of significant cold water inputs in the lower valley and canyon. Master 1 temperatures in this segment exceed 21°C (70°F), demonstrating that shade and tailwater management alone are insufficient to achieve compliance in the lower Shasta River without the flow increase.

j. Tailwater Load Allocation. The TMDL tailwater load allocation is "no net increase in receiving water temperature" from tailwater return flows. Benchmarks are set at the Master 1 modeled receiving water temperature for each reach to implement this allocation.

k. Model Output Locations. RMS model output locations used to derive intermediate reach temperatures include: Mouth (RM 0), Hwy 263 (RM ~7.3), Anderson Grade Road (RM ~5), Yreka-Ager Road (RM ~10), Montague-Grenada Road (RM 15.5), Freeman Road (RM ~20), A-12 (RM 24.1), GID/Hueseman diversion (RM ~28), Big Springs Creek (RM ~27), and East Louie Road (RM ~35).

l. Shade Context. The TMDL assigns current and potential riparian reach-average percent solar radiation transmittance targets: Dwinnell Dam to Riverside Road (RM 40.6–39.9): 59% current, 30% potential; Riverside Road to upstream of A-12 (RM 39.9–28.3): 76% current, 50% potential; upstream of A-12 to near DeSoza Lane (RM 28.3–22.0): 95% current, 85% potential; near DeSoza Lane to upstream of Montague-Grenada (RM 22.0–16.1): 89% current, 30% potential; near Montague-Grenada Road (RM 16.1–14.6): 90% current, 10% potential; downstream of Montague-Grenada to Hwy 263 (RM 14.6–7.3): 78% current, 30% potential; and Hwy 263 to mouth (RM 7.3–0): 70–100% current, 30–50% potential.

m. Benchmark Derivation by Reach. The reach-specific Mid-Season benchmarks implement the TMDL's tailwater load allocation — "no net increase in receiving water temperature. The TMDL model assumed that tailwater was at the local river temperature and therefore caused no heating. Under that assumption, the model produced the Master 1 receiving water temperatures. Because the allocation requires that tailwater cause no net increase in temperature, tailwater at the Point of Compliance cannot exceed the Master 1 temperature at that location — if it did, it would warm the receiving water above the modeled condition, violating the allocation.

The benchmarks therefore equal the Master 1 modeled temperature for each reach. This is not an interpretation by analogy — it is the direct, logical consequence of the allocation itself. The TMDL requires that tailwater cannot warm the river; the model shows what the river temperature is when tailwater does not warm it; that temperature is therefore the maximum temperature of a tailwater discharge.

The benchmarks implement the TMDL tailwater load allocation. They do not, by themselves, achieve the full Basin Plan temperature objective. The full Water Quality Compliance Scenario identified in the TMDL as achieving the Basin Plan narrative temperature objective includes not only shade restoration and tailwater management (Master 1) but also the dedicated cold water instream flow increase. Master 1 addresses approximately 70 percent of the modeled temperature reductions; the flow increase addresses approximately 30 percent. Achievement of the Basin Plan objective requires implementation of all TMDL components — shade, tailwater, and flow. This Order regulates shade and tailwater — the controllable land management factors within its scope. The flow component is addressed through the TMDL Action Plan's water use and flow implementation actions (Basin Plan Table 4-14) and through water rights administration under the State Water Board's jurisdiction. This Order does not administer water rights and does not assign responsibility for the flow allocation to agricultural dischargers.

The Mid-Season benchmarks are set at the mid-point of the Master 1 maximum modeled temperature range within each reach as read from the Table 6.6 longitudinal thermal profile. Reaches are defined by grouping segments of the thermal profile with similar slope of temperature change into functional thermal blocks. The simplified 7-reach structure consolidates the 12 Table 6.6 model output locations into operationally manageable compliance segments:

Reach A (RM 42–39, Below Dwinnell): Master 1 maximum temperatures plateau at approximately 70°F through this reach. The dam outfall temperature persists without significant cold water inputs. Mid-Season benchmark: 70°F.

Reach B (RM 38–34, Above Parks Creek): Master 1 maximum temperatures cool from approximately 70°F to 68°F, likely due to groundwater accretion. Mid-point: 69°F. Mid-Season benchmark: 69°F.

Reach C (RM 34–32, Below Parks Creek): Master 1 maximum temperatures decline from approximately 68°F to 64°F as the profile enters the Big Springs influence zone. Parks Creek inflow contributes cooling. Mid-point: 65°F. Mid-Season benchmark: 65°F.

Reach D (RM 32–26, Big Springs Area): This reach spans the entire Big Springs Creek thermal influence — the steep plunge to approximately 60°F at the GID model output location (RM 30.59, Master 1 = 15.28°C / 59.5°F [1]), the thermal trough, and the initial rebound. Master 1 temperatures range from approximately 64°F to 60°F and back to 64°F. Mid-point: 62°F. Mid-Season benchmark: 62°F. This is the most stringent benchmark on the mainstem, directly reflecting the dominant cold water input in the Shasta River system.

Reach E (RM 26–24, Above Highway A-12): Master 1 maximum temperatures rise from approximately 64°F to 66°F as the spring-cooled water continues warming downstream. The Highway A-12 compliance point (RM 24.11) records 18.87°C (65.9°F). Mid-point: 65°F. Mid-Season benchmark: 65°F.

Reach F (RM 24–11, A-12 to Highway 3): Master 1 maximum temperatures are relatively stable through this long mid-valley reach, ranging from approximately 66°F to 67°F. The Montague-Grenada Road compliance point (RM 15.52) records 19.16°C (66.5°F). The flat profile reflects significant shade improvement targets under Master 1. Mid-point: 67°F. Mid-Season benchmark: 67°F.

Reach G (RM 10–8, Yreka-Ager Road): Master 1 maximum temperatures rise from approximately 67°F to 70°F as the river transitions from the valley floor toward the canyon. The Yreka Ager Road model output location (RM 10.91) records 19.41°C

(66.9°F) and the Anderson Grade Road location (RM 8.03) records 21.03°C (69.9°F). Mid-point: 69°F. Mid-Season benchmark: 69°F. No significant irrigated agriculture exists below Anderson Grade Road; reach-specific benchmarks are not established for the canyon reach below RM 8.

Early Season benchmarks (April 1 – June 15) are set 4°F below the Mid-Season benchmark for each reach to protect smolt outmigration and core juvenile rearing during the spring warming period.

Late Season benchmarks (September 1 – October 1) are set 10°F below the Mid-Season benchmark for each reach to protect adult spawning migration and early spawning.

Flow Component Acknowledgment. The remaining approximately 30 percent of temperature reductions require the dedicated cold water instream flow increase addressed through Basin Plan Table 4-14 and State Water Board water rights administration. The North Coast Water Board acknowledges that alternative flow regimes may achieve equivalent temperature improvements, including but not limited to the Parks Creek, Hole in the Ground Creek, and Little Shasta River spring watersheds.

Critical Condition Basis. Master 1 temperatures are modeled under critical conditions — the August 2002 simulation period, during which daily maximum air temperatures consistently exceeded the 16-year average and flows were among the lowest of the 67-year period of record. The benchmarks are, therefore, calibrated to worst-case thermal conditions in the period of record, providing additional thermal buffer during more typical years.

Margin of Safety. The TMDL incorporates conservative assumptions providing a margin of safety: (a) the water quality compliance scenario incorporated temperature reductions from Big Springs Creek and Parks Creek but did not incorporate reductions from Yreka Creek and other small tributaries; (b) topographic shade was not considered in the temperature model and is likely a significant factor in the Shasta canyon; (c) potential stream temperature improvements from reduced sedimentation (increased pool frequency and depth) were not quantified; and (d) the effects of maturing streamside riparian vegetation on microclimate were not accounted for. Each of these unquantified factors tends toward lower actual stream temperatures than modeled, providing additional in-stream thermal capacity.

57. Perennial and Intermittent Stream Applicability for Seasonal Temperature Benchmarks. The seasonal temperature benchmarks apply to tailwater discharges hydrologically connected to perennial (all irrigation season) and intermittent (early irrigation season only) — streams that support Cold Freshwater Habitat (COLD) and/or Spawning, Reproduction, and/or Early Development (SPWN) beneficial uses. This limitation is appropriate because: (a) the Basin Plan narrative temperature objective protects beneficial uses, and COLD and SPWN uses are associated with streams that provide aquatic habitat; and (b) ephemeral streams

typically do not contain natural flows during irrigation season and therefore are not expected to support COLD or SPWN uses during irrigation season.

IX. Biostimulatory Water Quality Benchmarks — Technical, Scientific, and Legal Basis

58. Water Quality Benchmark (Shasta River Tailwater Dissolved Oxygen TMDL). The Shasta River Dissolved Oxygen TMDL establishes a numeric load allocation of 0.85 mg/L Nitrogenous Biochemical Oxygen Demand (NBOD) for tailwater return flows. NBOD is the oxygen consumed during nitrification — the bacterial oxidation of reduced nitrogen compounds (organic nitrogen and ammonium) to nitrite and nitrate. NBOD from tailwater is a significant contributor to dissolved oxygen depression in the Shasta River during the critical summer low-flow period, when elevated water temperatures reduce dissolved oxygen saturation, reduced flows concentrate nutrient loads, and accelerated nitrification rates increase oxygen consumption.

    This Order translates the Shasta River TMDL NBOD allocation into a Total Kjeldahl Nitrogen (TKN) Water Quality Benchmark of 0.20 mg/L for tailwater discharges hydrologically connected to perennial, intermittent, and perennial streams. TKN is the appropriate regulatory metric for implementing the NBOD allocation for the following reasons:

    a. TKN measures the nitrogen pool that exerts NBOD. TKN is the sum of organic nitrogen and ammonium nitrogen — the two reduced nitrogen forms that are converted to nitrate through nitrification, consuming oxygen in the process. TKN captures 100 percent of the nitrogen that will contribute to NBOD in the receiving water. Oxidized forms of nitrogen (nitrate and nitrite), which do not exert NBOD, are excluded from the TKN measurement;

    b. The conversion is stoichiometric. The oxygen demand of nitrification is determined by the balanced chemical equation for the oxidation of ammonium to nitrate ($NH_4^+ + 2O_2 \rightarrow NO_3^- + 2H^+ + H_2O$), which yields a stoichiometric oxygen demand of 4.57 mg O_2 per mg of nitrogen oxidized (Sawyer et al. 2003; Tchobanoglous et al. 2003)[12]. This is a fixed chemical relationship, not an empirical estimate. Applying this factor to the TMDL's NBOD allocation:

       TKN = NBOD / 4.57 = 0.85 / 4.57 = 0.186 mg/L

       The benchmark is set at 0.20 mg/L, rounded up from 0.186 mg/L. This rounding provides a small practical margin that accounts for: (i) analytical variability inherent in the TKN laboratory method (EPA Method 351.2); (ii) the

[12] Tchobanoglous, G., F.L. Burton, and H.D. Stensel. 2003. *Wastewater Engineering: Treatment and Reuse.* 4th Edition (Metcalf & Eddy). McGraw-Hill, New York
Sawyer, C.N., P.L. McCarty, and G.F. Parkin. 2003. *Chemistry for Environmental Engineering and Science.* 5th Edition. McGraw-Hill, New York

fact that not all TKN is fully nitrified within the travel time of the receiving water — some organic nitrogen may not be mineralized to ammonium before the water passes downstream of the impact zone, meaning the actual NBOD exerted is typically less than the theoretical maximum; and (iii) minor variability in the ratio of organic nitrogen to ammonium nitrogen across different agricultural source types;

c. NBOD cannot be directly measured as a practical regulatory metric. Direct measurement of NBOD requires a modified biochemical oxygen demand test with extended incubation periods (20–30 days) and nitrification inhibitor controls. This test is time-consuming, expensive, subject to significant analytical variability depending on sample microbial community and incubation conditions, and impractical for routine agricultural tailwater monitoring. TKN is analyzed by standard EPA Method 351.2, which is widely available at commercial laboratories, produces results within 1–3 days, and has well-established precision and accuracy specifications suitable for regulatory compliance monitoring;

d. TKN is conservative. The 4.57 stoichiometric conversion produces the theoretical maximum NBOD — the oxygen demand that would result if all TKN were fully mineralized to ammonium and completely nitrified to nitrate. In practice, the realized NBOD is typically less than this theoretical maximum. A tailwater discharge meeting the 0.20 mg/L TKN benchmark will therefore exert an actual NBOD at or below the 0.85 mg/L TMDL allocation, with the margin of conservatism increasing as the fraction of organic nitrogen that is not mineralized within the receiving water travel time increases;

e. Consistency with the dissolved oxygen impairment framework. The TKN benchmark operates in conjunction with the Shasta River Temperature Water Quality Benchmarks established in this Order to address the synergistic temperature-dissolved oxygen impairment identified in the Shasta River TMDL. Elevated tailwater temperatures reduce dissolved oxygen saturation while the nitrogen load in tailwater increases NBOD — both mechanisms depress dissolved oxygen simultaneously. Controlling both temperature and TKN in tailwater addresses the two primary controllable factors driving dissolved oxygen impairment from agricultural return flows.

59. Water Quality Benchmark (Scott River Tailwater Biostimulatory Substances). This Order translates the Basin Plan narrative Water Quality Objective for biostimulatory substances into a Total Phosphorus (TP) Water Quality Benchmark, applicable to tailwater discharges hydrologically connected to perennial, intermittent, and perennial streams in the Scott River watershed during the Irrigation Season (April 1 – October 1), as listed in the table below.

Seasonal period	Ambient P75 (mg/L)	Benchmark (mg/L)	Derivation
Early (Apr 1 – Jun 15)	0.015	0.014	Ambient P75 within 0.001 mg/L of the Klamath River TMDL minor-tributary allocation of 0.014 mg/L; set at the reference value.
Mid (Jun 16 – Aug 31)	0.009	0.010	Ambient P75 within 0.001 mg/L of the Klamath River TMDL minor-tributary allocation of 0.014 mg/L; set at the reference value.
Late (Sep 1 – Oct 1)	0.007	0.008	Ambient P75 rounded to the nearest 0.001 mg/L. The observed period maximum of 0.010 mg/L lies more than one increment above; no adjustment applied.

TP is the appropriate regulatory metric for implementing the biostimulatory substances Water Quality Objective in the Scott River watershed, and the benchmark values above are supported, for the following reasons.

a. Impairment and source. The Scott River is listed as impaired for biostimulatory conditions under Section 303(d) of the Clean Water Act (2012 Integrated Report), from Young's Dam to Boulder Creek in the Scott River Canyon. No TMDL has been adopted for this impairment. Nutrient loading from irrigated agricultural operations — including phosphorus delivered in tailwater return flows, animal waste, and fertilizer runoff — is identified as a primary anthropogenic driver of the biostimulatory impairment. Excess phosphorus promotes aquatic plant and algal growth that produces severe diel dissolved oxygen fluctuations and seasonal decomposition pulses that exert substantial carbonaceous biochemical oxygen demand on the receiving water, adversely affecting the COLD and SPWN beneficial uses. Biostimulatory conditions in the Scott River are the product of several interacting factors, including channel morphology, riparian cover, flow regime, water temperature, seasonal flushing flows, and nutrient supply. Of the factors within the scope of a discharge benchmark, nutrient supply is the factor a numeric tailwater benchmark can address. This Order addresses the remaining factors through separate management measures.

b. Legal authority. In the absence of a TMDL-derived numeric allocation, the biostimulatory substances Water Quality Benchmark for the Scott River watershed is established under the authority of the Basin Plan’s narrative water quality objective for biostimulatory substances, which provides that:

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

The benchmark is also supported by the narrative dissolved oxygen objective, which requires that dissolved oxygen concentrations not be depressed below levels necessary to support COLD and SPWN beneficial uses. This Order serves as an alternative water quality improvement program (Category 5R under the State Water Board's Listing Policy) for the Scott River biostimulatory impairment. A narrative objective of this kind requires a quantified endpoint before it can be applied to a discharge, assessed for attainment, or used to evaluate management practice performance. The Water Quality Benchmark supplies that quantified endpoint for tailwater discharges.

c. Phosphorus is the biostimulatory substance of regulatory concern. Paired total nitrogen and total phosphorus measurements in the Scott River establish that algal production in the receiving water is limited by phosphorus. Molar total nitrogen to total phosphorus ratios exceed the Redfield ratio of 16:1 in 93 percent of paired irrigation-season samples, with seasonal median ratios of 45:1 in the early period, 44:1 in the mid period, and 33:1 in the late period. The samples falling below the Redfield ratio are the highest total phosphorus results in the record and reflect discrete phosphorus pulses rather than a change in nitrogen supply. Nitrogen is present in the receiving water at concentrations well in excess of algal demand relative to available phosphorus. A numeric benchmark on nitrogen would therefore not constrain algal production, because nitrogen is not the nutrient limiting growth. A benchmark on phosphorus does constrain production, and phosphorus is accordingly the biostimulatory substance of regulatory concern for purposes of this translation.

d. This determination is consistent with the observation in the Klamath River TMDL staff report that, while short-term nutrient ratios may indicate nitrogen limitation in portions of the mainstem, long-term control of eutrophication in the basin requires reduction of phosphorus loading.

e. Total phosphorus is the appropriate metric. Total phosphorus is selected over dissolved orthophosphate or soluble reactive phosphorus for three reasons:

    i. Total phosphorus captures both dissolved and particulate fractions. Phosphorus sorbed to suspended sediment is not immediately bioavailable but becomes available following deposition and subsequent desorption and mineralization within the channel. Tailwater from flood-irrigated fields carries a substantial particulate fraction, and measurement of the dissolved fraction alone would understate the phosphorus load delivered to the receiving water.

ii. Total phosphorus is the metric used in the reference conditions and allocations against which the benchmark is corroborated, including the U.S. EPA section 304(a) ecoregional reference conditions and the Klamath River TMDL tributary allocations, permitting direct comparison.

iii. Total phosphorus is routinely and reliably measured by approved methods at the concentrations relevant here, and is not subject to the sample handling and holding time sensitivities that affect dissolved fractions.

f. The Water Quality Benchmark is derived from ambient total phosphorus monitoring of the Scott River collected under the Klamath Basin Monitoring Program, Klamath Hydroelectric Settlement Monitoring, at station SC00000_KHSA, Scott River near mouth, Siskiyou County. The station is located downstream of all irrigated agriculture in the watershed and therefore integrates the cumulative contribution of every tailwater return flow in the Scott Valley, together with all other sources reaching the mainstem. The record comprises 95 total phosphorus results collected from May 2009 through December 2016, of which 58 fall within the Irrigation Season and are paired with total nitrogen results. Samples were collected as midchannel grabs at approximately monthly intervals. Total phosphorus was analyzed by Standard Methods 4500-P F with a method detection limit of 0.002 mg/L, and total nitrogen by Standard Methods 4500-N C with a method detection limit of 0.05 mg/L. No irrigation-season result is censored, and no substitution or survival-analysis treatment of non-detects is required.

g. The record spans water years 2009 through 2016 and includes all five water year types — one very wet, one wet, two normal, three dry, and one very dry (critical) — as classified against the record for USGS station 11519500 (Scott River near Fort Jones). Mean daily discharge across those water years ranges from 170 cubic feet per second in water year 2014 to 753 cubic feet per second in water year 2011. The record therefore captures the full range of hydrologic conditions the watershed experiences rather than a single regime.

h. Total phosphorus monitoring conducted from 2021 through 2024 was analyzed by a method achieving a reporting limit of 0.02 mg/L. Because every benchmark value lies at or below that reporting limit, that record cannot resolve ambient total phosphorus within the concentration range the benchmark occupies and is not used in the derivation. The complete dataset, derivation, and supporting analysis are documented in a technical memorandum prepared by North Coast Water Board staff, which is incorporated by reference into this Order.

i. Seasonal periods. Ambient total phosphorus in the Scott River varies systematically through the Irrigation Season, declining as spring runoff recedes, while algal biomass accrues as flow falls and water temperature rises. Mean daily discharge across the record is 822 cubic feet per second in the early period, 152 in the mid period, and 19 in the late period. A single season-wide benchmark would be set too low for the early period and too high for the late period, in the reverse of the pattern of biostimulatory risk, because peak periphyton accrual, minimum flow, and maximum water temperature all occur in the mid and late periods. The benchmark is therefore established separately for three seasonal periods of the Irrigation Season: Early (April 1 – June 15), Mid (June 16 – August 31), and Late (September 1 – October 1). Each measurement is compared to the benchmark applicable to the seasonal period in which the measurement was collected.

j. Derivation method. The benchmark for each seasonal period is derived from the ambient record described in subparagraph (e) as follows:

   i. The benchmark is the 75th percentile of ambient total phosphorus measurements within the seasonal period, rounded to the nearest 0.001 mg/L.

   ii. Where that value falls within one reporting-limit increment (0.001 mg/L) of an independent reference value, the benchmark is set at the independent reference value rather than the percentile alone, so that the benchmark is supported by more than one line of evidence. The independent reference values are the U.S. EPA Aggregate Nutrient Ecoregion II reference condition of 0.010 mg/L, the Klamath River TMDL year-round total phosphorus load allocation for the minor California tributaries to the Klamath River of 0.014 mg/L, and the maximum ambient value observed within the seasonal period.

   iii. No benchmark is set below the practical quantitation level established under subparagraph (k).

k. The 75th percentile is selected because a benchmark set at the ambient upper quartile, is internally consistent: ambient receiving water quality passes the test with margin, while a tailwater discharge materially above ambient does not.

l. Corroboration and alternatives considered. The derived values are corroborated against independent reference conditions and allocations:

   i. U.S. EPA section 304(a) ecoregional reference condition. The reference condition for total phosphorus in rivers and streams of Aggregate Nutrient Ecoregion II (Western Forested Mountains) is 0.010 mg/L. The mid-period ambient 75th percentile equals that value exactly, and it is adopted as the mid-period benchmark.

   ii. Klamath River TMDL tributary allocations. Table 5.16 of the Klamath River TMDL staff report assigns the minor California tributaries to the Klamath River a year-round total phosphorus load allocation of 0.014 mg/L, representing conditions in less-disturbed tributaries of the same ecoregion. The early-period ambient 75th percentile lies within one reporting-limit increment of that value, and the benchmark is set at it. The Scott River watershed allocation of 0.028 mg/L (dry season) and 0.019

mg/L (wet season) provides an upper bound, and all benchmark values fall below it.

iii. Level III Ecoregion 78 reference condition not adopted. The U.S. EPA reference condition for total phosphorus in Level III Ecoregion 78 (Klamath Mountains) is 0.0325 mg/L. That value is not used. It is a 25th percentile of all streams in the subecoregion, employed as a surrogate where no a priori reference population was identified, drawn from a population ranging from 0.00563 to 0.455 mg/L (n = 68). It is more than three times the Aggregate Ecoregion II value and among the highest of the sixteen Level III subecoregions within Ecoregion II. Ecoregion 78 spans the lower Klamath and Trinity mountains and the coastal Klamath foothills, and the Scott Valley floor is not representative of that population. U.S. EPA identifies these values as starting points and directs refinement at smaller geographic scales using local data, which the ambient record permits.

m. Relationship to the Klamath River TMDL. The Klamath River TMDLs assign the Scott River watershed nutrient load allocations addressing dissolved oxygen conditions in the mainstem Klamath River. Those allocations are considered in these findings for corroboration and as an upper bound. They are not the basis for the Water Quality Benchmark and are not a term or condition of this Order. As documented in Chapter 5 of the TMDL staff report, the tributary nutrient allocations were set to ensure attainment of the site-specific dissolved oxygen objective in the mainstem Klamath River in California, and were not derived to address the Scott River's own listing for biostimulatory conditions. Those allocations further apply watershed-wide to all nonpoint sources and incorporate the contribution of natural background, such that a single source category's benchmark set at the full watershed allocation would implicitly assign the entire allocation, natural background included, to that source category.

n. Consistency with the narrative objective and with the Antidegradation Policy. The Water Quality Benchmark is set at concentrations that maintain tailwater at or below the ambient condition of the receiving water in each seasonal period. The receiving water is listed as impaired for biostimulatory conditions and has no demonstrated assimilative capacity for additional phosphorus. Tailwater discharged above the ambient condition of the receiving water would add phosphorus to a phosphorus-limited, impaired system, and would thereby contribute to the aquatic growths causing the impairment. A discharge at or below the Water Quality Benchmark does not promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses, and therefore satisfies the narrative objective.

o. Where tailwater is discharged to an ephemeral stream, or to an intermittent stream that is not flowing at the time of discharge, phosphorus delivered to the channel is not thereby removed from the system. Dissolved phosphorus is conveyed downstream when the channel flows, and particulate phosphorus deposited in the channel bed is stored and mobilized to downstream perennial waters during subsequent flow events. Tailwater discharged to ephemeral and intermittent channels is therefore a contributor of phosphorus to the perennial receiving waters of the Scott River watershed, and the Water Quality Benchmark applies in those channels on that basis.

p. The benchmark is also consistent with State Water Board Resolution No. 68-16 and title 40, Code of Federal Regulations, section 131.12, because it does not authorize a lowering of existing receiving water quality.

q. Analytical requirements. Samples shall be analyzed for total phosphorus as unfiltered, digested total phosphorus by a method achieving a laboratory reporting limit at or below 0.003 mg/L. Standard Methods 4500-P F and U.S. EPA Method 365.1 Revision 2.0 meet this requirement, and the ambient record demonstrates that a method detection limit of 0.002 mg/L is achievable in this watershed. Standard Methods 4500-P B and E as conventionally performed does not meet this requirement, because its reporting limit exceeds every benchmark value. A reporting limit above 0.003 mg/L would render the late-period benchmark unmeasurable.

r. Limitations and reassessment. The following limitations of the analysis are identified for the record:

    i. Derivation from receiving water rather than tailwater. The benchmark is derived from ambient receiving water monitoring and applied to tailwater discharges. No tailwater characterization data are available. The derivation assumes tailwater is held to receiving water quality, which is a conservative assumption and is identified as such.

    ii. The ambient record integrates all sources, not agriculture alone. The measured condition at the monitoring station includes natural background, forestry, roads, grazing, and other contributions in addition to irrigated agriculture.

    iii. The station lies downstream of the listed reach. The record characterizes the integrated watershed signal at the outlet rather than conditions within the reach listed as impaired.

    iv. Sample size by seasonal period. The derivation is applied to seasonal subsets rather than the pooled record, so each benchmark rests on a portion of the dataset. The late period contributes the fewest measurements, although it is also the least variable period in the record.

    v. Nutrient limitation is prevailing but not universal. Four of 58 paired irrigation-season samples fall below the Redfield ratio of 16:1.

    vi. Limits on the period of record. The record does not extend into the 2019–2022 drought sequence during which harmful algal blooms were observed in the watershed, and therefore does not reflect conditions associated with that period.

The Water Quality Benchmark may be reassessed upon accumulation of additional ambient and tailwater monitoring data, and in any event at Order renewal. Reassessment consists of recompiling the ambient record, reapplying the derivation method in subparagraph (g), and comparing the result to the values in the table above.

X. Riparian Zone Findings

60. The term Streamside Area, as used in this Order, describes the area adjacent to surface water bodies where specific management practices shall be implemented to allow for the natural establishment and abundance of native riparian vegetation with the aim of achieving conditions that support beneficial uses, including but not limited to filtration of fine sediments, large woody debris recruitment, flood attenuation, instream and terrestrial habitat development, and site specific adjusted potential effective shade, as described in the Scott and Shasta River TMDLs.

61. The term riparian buffer is a technical term utilized by various entities to describe the area in which riparian function occurs, including but not limited to filtration of fine sediments, large woody debris recruitment, flood attenuation, instream and terrestrial habitat development, and shade.

62. Riparian vegetation provides critical functions for water quality and supports habitat complexity for listed species. These functions include, but are not limited to:

    a. Filtration of fine sediment carried by overland flow;

    b. Capturing and processing nutrients and organic materials within the flood plain;

    c. Shading surface water from direct solar radiation;

    d. Recruiting large woody debris which develops instream habitat roughness and complexity; and

    e. Stabilizing stream banks thus reducing stream bank erosion.

63. A literature review conducted by United States Fish and Wildlife Service (USFWS Literature Review) assessed scientific reports analyzing the effectiveness of different riparian buffer widths and found the following[13]:

    a. The width of a riparian buffer appears to be the most critical variable affecting the capacity of a riparian zone to improve water quality and support stream health.

    b. Several studies indicated a 30-foot vegetated buffer reduced total suspended solid concentrations in surface runoff by 65 to 91 percent, while buffers wider than 30 feet performed slightly better.

[13] USFWS, 2020. Considerations for Riparian Fencing, Planting, and Grazing Management in the Upper Klamath Basin of Oregon.

c. Multiple studies indicated that 30 to60-foot buffers reduced total phosphorous concentrations in surface runoff by 50 and 94 percent.

d. Based on a review of 24 studies, forested buffers of at least 65 feet kept stream temperatures within 2 degrees Celsius of those observed in completely forested stream due to shading. Streams with buffers approximately 100 feet wide showed no increase in temperature.

e. Buffers at least 30 feet wide were likely to improve and protect water quality and increase stream bank stability, but buffers 60 feet and wider were necessary for flood attenuation and provide suitable habitat for terrestrial species.

64. The USFWS Literature Review also reviewed literature that assessed the impacts of riparian grazing, finding that grazing managed in a way that was not consistent with restoration objectives results in the following outcomes:

a. decreased plant density and diversity,

b. decreased bank cover,

c. increased soil disturbance and compaction,

d. increased direct urine and manure inputs,

e. increased disturbance and compaction of streambed and banks,

f. decreased capacity to intercept and retain nutrients and sediment due to decreased riparian and floodplain complexity,

g. decreased bank stability via a decrease in root strength and abundance,

h. decreased stream shading via a reduction in vegetation, and

i. channel widening via increased soil disturbance and reduction in vegetation.

65. The USFWS Literature Review additionally found evidence that livestock exclusion is effective in restoring riparian corridors and provides the most straightforward grazing management option and should be considered if more intensive grazing management, including short-duration, high intensity grazing where livestock are moved aggressively through riparian pastures, is not desired by landowners. However, the USFWS Literature Review also noted that riparian restoration and riparian livestock grazing are not mutually exclusive and carefully managed riparian grazing may have minimal or beneficial effects on riparian corridor function, physical habitat, and stream health, including increasing the capacity for riparian areas to sequester nutrients and controlling the establishment and proliferation of invasive riparian species.

66. The USFWS Literature Review noted that in mixed upland and riparian pastures, utilization of riparian vegetation tends to be disproportionately higher than that of upland vegetation. Some methods to reduce overutilization of riparian vegetation in

mixed pastures include salt placement, off-stream watering, herding, and culling of loitering animals. However, the least labor-intensive method appears to be the establishment of riparian pastures via riparian fencing.

67. Regarding the timing and intensity of riparian grazing, the USFWS Literature Review found that riparian areas that have been subject to grazing should be rested until they reach mid to late seral vegetation[14]. Resting should also occur if the riparian vegetation appears to have a declining trend in riparian species and age class diversity or if the area appears to have lost significant riparian function[15]. Once riparian areas have recovered sufficiently, seasonality is a key factor in determining the timing of grazing. According to the USFWS Literature Review, allowing grazed riparian vegetation to recover during the growing season is essential to restore and maintain riparian function. Early season riparian grazing provides vegetation the opportunity to regrow prior to fall dormancy period. Allowing abundant regrowth in the late summer allows riparian areas to be more effective in trapping sediments mobilized by higher flows in the fall and winter periods, where most precipitation in the Scott and Shasta watersheds occurs and spring when snowmelt dominates flows in the Scott. Per the USFWS Literature Review, late season grazing tends to result in preferential browsing of woody vegetation as grasses and sedges lose palatability. Browse impacting woody species can exacerbate bank erosion, making it inconsistent with restoration-focused riparian management. The USFWS Literature Review recommends retaining riparian stubble heights of greater than 5 inches in the fall to facilitate deposition of sediment and particular nutrient loads and to protect banks from erosion and failure during winter and spring high flows.

68. Another key factor to consider regarding riparian restoration timing is the presence of salmonid redds, especially in areas where spawning has been historically observed. Hoof action in the stream bed can disrupt and limit the viability of Redds,

[14] In riparian areas within the great basin, seral stages differ from those of upland forests and silvicultural stands. Early seral stages in riparian areas are composed of fast-growing grasses and forbs, while mid and late seral stages may include communities of rush and sedge or woody vegetation including riparian forests where soil conditions allow. More information can be found in *Clary WP, Webster BF, Managing grazing of riparian areas in the Intermountain Region. USDA Forest Service General Technical Report INT-263* and *Winward AH. 2000. Monitoring the vegetation resources in riparian areas. Gen. Tech. Rep. RMRSGTR-47. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station*

[15] Functional Conditions Assessment surveys are described in Technical Reference 1737-15 published jointly by the United States Forest Service, Unite States Department of Agriculture, and the Bureau of Land Management, available at https://www.blm.gov/sites/default/files/documents/files/TR_1737-15.pdf

therefore riparian grazing occurring during the spawning incubation period for salmonids can be especially disruptive to aquatic species.

69. Grazing intensity is also explored by the USFWS Literature Review, finding intensity is generally divided into three categories in the literature:

    a. Light intensity (20-30% biomass utilization),

    b. Moderate intensity (40-50% biomass utilization),

    c. High intensity (greater than 50% biomass utilization).

    The USFWS Literature Review found that the literature advises against high intensity grazing if riparian health, stream health, and continued forage production are specific management objectives, as they are in the Scott and Shasta watersheds. Moderate to light intensity grazing can maintain leaf area for continued photosynthesis, increasing the likelihood of survival, recovery, and vitality of riparian species. Monitoring of biomass utilization within riparian pastures ensures vegetation is not repeatedly browsed and can be a useful tool for adjusting grazing intensity, adaptively. Repeat browsing can result in a reduced capacity for vegetative recovery and growth. Adjusting intensity can be an effective way of mitigating the negative impacts of riparian grazing.

70. The USFWS Literature Review found periodic pasture resting via rotation (known as rest-rotation)[16] of cattle across three delineated riparian pastures was a commonly recommended practice. In this approach, one pasture is rested for the entire grazing season while the other two are grazed in an appropriate timing and intensity to allow for riparian health and function to be maintained or, if needed, enhanced. This approach has been observed to facilitate the establishment of the full annual suite of vegetation life history stages over subsequent years and allows for rest during an entire growing season for each pasture once every three years.

71. Other localized factors, including but not limited to pasture and bank slope, waterways conveying irrigation tailwater, local geomorphic conditions, and seasonal flow patterns can also be important variables to consider when planning appropriate site-specific riparian grazing and riparian buffer width.

XI. Core Regulatory Findings

A. Policy for Implementation and Enforcement of Nonpoint Source Pollution Control Program

72. In 2004, the State Water Board adopted the Policy for Implementation and Enforcement of Nonpoint Source Pollution Control Program (Nonpoint Source Policy). The Nonpoint Source Policy requires nonpoint source discharges of waste

[16] Article describing rest-rotation is available for download at https://repository.arizona.edu/handle/10150/640424

to be regulated by waste discharge requirements, waivers of waste discharge requirements, or Basin Plan prohibitions to ensure compliance with North Coast Water Board water quality control plans.

73. The Nonpoint Source Policy states that implementation programs for nonpoint source pollution control must include five key elements:

    a. Key Element 1: A nonpoint source control implementation program's ultimate purpose shall be explicitly stated. Implementation programs must, at a minimum, address nonpoint source pollution in a manner that achieves and maintains water quality objectives and beneficial uses, including any applicable antidegradation requirements.

    b. Key Element 2: A nonpoint source control implementation program shall include a description of management practices and other program elements that are expected to be implemented to ensure attainment of the implementation program's stated purpose(s), the process to be used to select or develop management practices, and the process to be used to ensure and verify proper management practice implementation. The Regional Water Quality Control Board must be able to determine that there is a high likelihood that the program will attain water quality requirements. This will include consideration of the management practices to be used and the process for ensuring their proper implementation.

    c. Key Element 3: Where the Regional Water Quality Control Board determines it is necessary to allow time to achieve water quality requirements the nonpoint source control implementation program shall include a specific time schedule and corresponding quantifiable milestones designed to measure progress toward reaching the specified requirements.

    d. Key Element 4: A nonpoint source control implementation program shall include sufficient feedback mechanisms so that the Regional Water Quality Control Board, dischargers, and the public can determine whether the program is achieving its stated purpose(s) or whether additional or different management practices or other actions are required.

    e. Key Element 5: Each Regional Water Quality Control Board shall make clear, in advance, the potential consequences for failure to achieve a nonpoint source control implementation program's stated purpose.

74. As stated in the Order, the purpose of the Order is to address discharges of waste to waters of the state from certain activities in the Scott and Shasta Watersheds to ensure conformance with California's water quality laws and specific impairments in each water shed that are driven by these activities. The Order implements the Key Elements of the Nonpoint Source Policy, where applicable, by requiring:

a. control and treatment of sediment and nutrient sources, riparian protection measures to affect site specific effective shade, irrigation efficiency measures to affect that volume of groundwater accreted in stream or produced by known spring sources, and tailwater discharge control measures across the Scott and Shasta Watersheds by ensuring implementation of effective management measures and a monitoring program that provides critical information to both dischargers and to the North Coast Water Board;

b. a Monitoring and Reporting Program that is intended to provide the North Coast Water Board, communities of interest, and dischargers information on the varied activities covered under the Order and establishes feedback mechanisms—such as BMP implementation monitoring, effectiveness monitoring, in-channel monitoring, and reporting—to ensure that protective measures are implemented and successful;

c. a time schedule with quantifiable milestones to achieve compliance with water quality goals of the Order, including but not limited to Receiving Water Limitations and TMDL Requirements; and

d. Order and Monitoring and Reporting conditions using clear language that outline the enforceability of the requirements and the regulatory and enforcement capability of the North Coast Water Board.

B. Statement of Policy with Respect to Maintaining High Quality of Waters in California

75. In 1968, the State Water Board adopted[17] the Statement of Policy with Respect to Maintaining High Quality of Waters in California, Resolution No. 68-16 (Antidegradation Policy)[18]. The Antidegradation Policy requires whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality must be maintained, unless it can be demonstrated to the North Coast Water Board that the change is consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial uses of such water, and will not result in water quality less than that prescribed in the policies. The

[17] Section 131.12 of the U.S. EPA's Water Quality Standards regulations includes the "federal antidegradation policy" which emphasizes protection of instream beneficial uses, especially protection of aquatic organisms, and required each state's water quality standards to include a policy consistent with the federal antidegradation policy. The State Antidegradation Policy is deemed to incorporate the Federal Antidegradation Policy where the federal policy applies under federal law. (State Water Board Order WQ 86-17.)

[18] The Antidegradation Policy: https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/1968/rs68_016.pdf.

Antidegradation Policy further requires that discharges comply with waste discharge requirements that will result in the best practicable treatment or control of the discharge necessary to assure that pollution or nuisance will not occur and that the highest water quality, consistent with the maximum benefit to the people of the state, will be maintained.

High quality waters are those surface waters or areas of groundwater that have a baseline water quality better than required by water quality control plans and policies. This determination is made on a waterbody-by-waterbody and constituent-by-constituent basis[19].

The Order is consistent with the Antidegradation Policy because implementing the conditions of the Order will result in a net benefit to water quality. The Order contains conditions that require agricultural dischargers to implement management practices for new and existing activities, provide riparian and shade protections and enhancements, address controllable sediment and nutrient discharge sources, and implement management practices that support increased cold water spring flow and instream cold water accretions. Effective implementation of management practices and on-the-ground prescriptions coupled with monitoring of their effectiveness will result in the best practicable treatment or control of the discharge, assure that pollution or nuisance will not occur, and that the highest water quality, consistent with maximum benefit to the people of the state, is maintained.

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[19] In the context of diffuse discharges regulated by a general order, the State Water Board provided the following guidance on determinations of whether a discharge impacts high quality waters:

“When assessing baseline water quality for a general order, we find a general review and analysis of readily available data is sufficient…Regional Water Boards should not delay the implementation of a regulatory program in order to conduct a comprehensive baseline assessment and analysis—especially where, as here, the general order imposes essentially the same iterative approach for management practices and other requirements regardless of whether or not the receiving water is high quality.”

In the Matter of Review of Waste Discharge Requirements General Order No. R5- 2012-0116 for Growers Within the Eastern San Joaquin River Watershed that are Members of the Third-Party Group, SWRCB Order No 2018-0002 (2018): https://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2018/wqo2018_0002_with_data_fig1_2_appendix_a.pdf.

This Order requires that discharges of waste from irrigated lands shall not cause surface water or groundwater to be degraded, exceed water quality objectives, unreasonably affect beneficial uses of water, or cause a condition of pollution or nuisance. Monitoring and Reporting is required for plans required by this order to assess the effectiveness of the management practices applied by those plans. Additional watershed-scale monitoring will be conducted by the North Coast Board and partners within the watershed to evaluate whether the physical, chemical, and biological conditions of a waterbody are supporting beneficial uses and land use activities are sufficiently protective of water quality and if conditions within the watershed are improving, remaining stable, or degrading. Robust and sustained water quality monitoring programs can also provide insights into watershed impairments and whether a waterbody is suitable for listing or delisting under Section 303(d) of the Clean Water Act. The effectiveness of management measures will be evaluated through required monitoring and reporting. Management measures and monitoring may be modified as data are assessed and reported and whenever site evaluations show that measures need to be improved to meet water quality standards.

76. Maximum Benefit to the People of the State — Economic Significance. The North Coast Water Board finds that any limited degradation that may occur in the Scott and Shasta Watersheds even following implementation of all applicable management practices designed to control discharges is to the maximum benefit of the people of the State. The Board has considered the social and economic significance of agriculture in the Scott and Shasta and the important role that Irrigated Lands provide in economic value and support to local communities. The agricultural industry is an important economic sector in Siskiyou County which, in addition to gross farm income, provides local employment opportunities, and added economic value through supporting industries. Coupled with the environmental and water quality benefits that will result from implementation of the conditions in this Order, maintaining agriculture in Siskiyou County is consistent with the maximum benefit of the people of the state to prevent a loss of jobs and adverse impacts to local communities. Even where there is limited degradation of high-quality groundwater, this Order sets protection of water quality objectives as the floor to any degradation, ensuring that drinking water beneficial uses are protected.

C. East San Joaquin Precedential Order

77. The State Water Board Irrigated Lands Regulatory Program sets forth precedential requirements for all Regional Irrigated Lands in DWQ 2018-0002 In the Matter of Review of Waste Discharge Requirements General Order No. R5-2012-0116 for Growers Within the Eastern San Joaquin River Watershed (ESJ Order).

78. Irrigated Lands in the Scott River and Shasta River Watersheds are irrigated agricultural lands and therefore, Enrollees regulated under this Order are part of the State and Regional Water Board Irrigated Lands Regulatory Program and subject to

the ESJ Order requirements that the State Water Board designated as precedential. This Order is consistent with the precedential ESJ Order requirements by including conditions related to grower outreach events, farm evaluations, sediment and erosion controls, irrigation and nitrogen management, record keeping, and groundwater quality monitoring for Enrollees and approved Coalitions. Additionally, this Order requires monitoring and reporting to verify and provide feedback on the degree and effectiveness of implementation of these precedential requirements.

79. Specifically, this Order implements ESJ Order requirements through: (1) irrigation and nutrient management practices; (2) Drinking Water Supply Well Monitoring; (3) Representative Groundwater Monitoring; and (4) Outreach and Education.

80. Sediment and Erosion Control — Precedential Requirement. The East San Joaquin Precedential Order states that “the requirement for implementation of sediment and erosion control practices by Irrigated Lands with the potential to cause erosion and discharge sediment that may degrade surface waters shall be precedential for irrigated lands regulatory programs statewide; however, the regional water boards shall continue to have discretion as to how these practices are documented and reported.” This Order is consistent with this precedential requirement by requiring all Enrollees to implement sediment and erosion control management practices on Farm Areas and applicable agricultural infrastructure, documented in the Farm Evaluation and reported annually.

81. Third-Party Coalition Framework. Consistent with the East San Joaquin Precedential Order's continued support for third-party (Coalition) approaches, this Order authorizes a Coalition to serve as the third-party intermediary between the North Coast Water Board and the Enrollees, performing the core functions the East San Joaquin Precedential Order recognizes as appropriate to that role — including fee collection and remittance, grower outreach, data management, and submittal of surface water quality data to CEDEN and groundwater quality data to GeoTracker. Consistent with the precedential direction that growers retain the option not to participate in a third party, this Order allows growers to enroll individually. This Order also preserves the data-transparency commitments the East San Joaquin Precedential Order made precedential. The Order tailors the scale of the Coalition's required qualifications to a program spanning approximately 650 participants, consistent with the East San Joaquin Precedential Order's recognition that those aspects only precedential for full third-party programs serving large regional coalitions do not apply to programs structured around a more limited set of third-party functions.

<u>High and Low Groundwater Vulnerability Areas</u>

82. Groundwater Basin Prioritization Context. The North Coast Water Board adopted the Groundwater Basin Evaluation and Prioritization Resolution No. R1-2021-0006, which identifies priority groundwater basins having a relatively high threat from salts

and nutrients that would benefit from salt and nutrient management planning. The Scott River Valley Groundwater Basin is categorized as a Priority 2 basin, and the Shasta Valley Groundwater Basin is categorized as a Priority 3 basin. Priority 1 through Priority 3 designations reflect the potential threat from multiple salt and nutrient sources combined — including on-site wastewater treatment systems, recycled water, dairies, and irrigated agriculture — rather than demonstrated agricultural nitrogen contamination alone. The 2021 Staff Report supporting the Resolution acknowledged that “insufficient groundwater data is available to determine where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor.”

83. 2026 Five-Year Update Findings. In March 2026, the North Coast Water Board completed the Five-Year Update to Resolution R1-2021-0006. The Five-Year Update concluded that no changes in conditions warrant reprioritization of any North Coast groundwater basin. Nitrate concentrations across all North Coast basins with monitoring data remained well below the Maximum Contaminant Level (MCL) of 10 mg/L nitrate+nitrite as N. A weak increasing nitrate trend observed in Shasta Valley (Spearman's $\rho=0.15$) was attributed to changes in the monitoring network rather than to emerging contamination from irrigated agriculture. Groundwater storage in Scott Valley and Shasta Valley basins remained stable through Water Year 2025.

84. Direct Groundwater Sampling Evidence. The 2021 Surface Water Ambient Monitoring Program (SWAMP) sampling documented in the Scott and Shasta Valley Groundwater Quality Characterization: 2021 SWAMP Monitoring Summary further supports the finding that irrigated agricultural operations regulated by this Order are not causing or contributing to widespread groundwater nitrate impacts. In Scott Valley (28 wells sampled), nitrate-nitrogen concentrations ranged from non-detect to 6.5 mg/L; most sampled wells were below 3 mg/L; and the maximum sampled concentration is 35% below the MCL. In Shasta Valley (16 wells sampled), nitrate-nitrogen concentrations ranged from 0.32 to 3.9 mg/L; the maximum sampled concentration is less than 40% of the MCL.

85. Vulnerability Framework. The East San Joaquin Precedential Order allows for risk-based designations, such as high and low vulnerability groundwater areas, to inform differentiation and prioritization of requirements. The East San Joaquin Precedential Order defines high vulnerability areas as “those areas where the Executive Officer determines that irrigated agriculture may be causing or contributing to exceedances of water quality objectives or a trend of degradation of groundwater that may threaten applicable basin plan beneficial uses.” The East San Joaquin Precedential Order recognizes that implementation approaches may need to be adapted to specific conditions and grants regional water boards “considerable discretion to design reasonable frameworks for differentiation and prioritization,” as well as discretion in defining geographic areas and determining appropriate methodologies.

86. Vulnerability Area Determination. Based on the evidence described above, the North Coast Water Board determines that there are no geographic areas regulated by this Order that the North Coast Water Board is currently designated as a high vulnerability area for the purposes of the East San Joaquin Precedential Order's requirements. Ambient nitrate concentrations in Scott Valley and Shasta Valley groundwater remain well below the MCL, with maximum sampled concentrations at approximately 65% of the MCL in Scott Valley and less than 40% of the MCL in Shasta Valley. No trend of groundwater degradation attributable to irrigated agriculture regulated by this Order has been established. The Priority 2 designation for Scott River Valley and the Priority 3 designation for Shasta Valley under Resolution No. R1-2021-0006 reflect potential threats from multiple sources combined and do not establish agricultural nitrogen impacts as a demonstrated cause of groundwater contamination. The March 2026 Five-Year Update confirmed that no reprioritization is warranted. The determination that there are no high vulnerability groundwater areas means that this Order does not require certification of Irrigation and Nutrient Management Plans or the establishment of Groundwater Protection Formulas at this time. Based on data collected under this Order, the North Coast Water Board may revisit its determination that no areas covered by this Order should be designated as high vulnerability. Such data may include Representative Groundwater Monitoring, Drinking Water Well sampling, and Enrollee nitrogen application practices reported through the annual Farm Evaluation.

87. Alternative Nitrogen Reporting Framework. The East San Joaquin Precedential Order provides that alternative approaches to Nitrogen Applied and Removed reporting may be applied where growers (1) operate in areas with evidence of no or very limited nitrogen impacts, (2) have minimal nitrogen inputs, and (3) have difficulty measuring yield. Evidence of no or very limited nitrogen impacts is provided by the 2021 SWAMP characterization and the 2026 Five-Year Update. Minimal nitrogen inputs are characteristic of the predominantly irrigated pasture, grain, alfalfa, and grass hay operations regulated by this Order: alfalfa is a nitrogen-fixing legume requiring no supplemental nitrogen under normal conditions; non-fertilized irrigated pasture receives no external nitrogen inputs and is already exempt from INMP requirements in the Central Valley Region; and the 2022 NECWA/UC Davis survey of the analogous Pit River subwatershed (74% response rate) found that 67% of irrigated pasture growers and 64% of alfalfa growers apply zero nitrogen, with grass hay application rates reported well below agronomic potential. The Second Agricultural Expert Panel Draft Final Report (June 2026)[20]

[20] The State Water Board convened the Second Statewide Agricultural Expert Panel in 2025 and charged it with nine nitrogen-related questions revisiting the approaches adopted in the Eastern San Joaquin Order (WQ 2018-0002) and Order WQ 2023-0081. The Panel's draft report, released March 30, 2026, found that available data support

identified alfalfa and non-fertilized pasture as candidates for significantly reduced ILRP reporting and specifically noted that alternative approaches “make most sense” for intermountain permanent crops with low-nitrogen rotations in the North Coast and Lahontan Water Boards. Difficulty measuring yield is inherent in grazed irrigated pasture and in operations combining grazing, hay production, and intermittent cropping across the same acreage — challenges explicitly acknowledged in Footnote 33 of Order WQ 2023-0081.

88. Implementation Consequence. Accordingly, this Order does not require: (i) certification of Irrigation and Nutrient Management Plans; (ii) establishment of Groundwater Protection Formulas, Values, or Targets; or (iii) adaptive management actions triggered by groundwater vulnerability status. Enrollees shall report Nitrogen Applied in accordance with Attachment A: Monitoring and Reporting Program, and are not required to report Nitrogen Removed. The North Coast Water Board will re-evaluate this determination based on Representative Groundwater Monitoring data, Drinking Water Supply Well monitoring data, and any new information regarding nitrogen inputs from operations regulated by this Order.

XII. Cost Considerations

89. Authority and Approach. Water Code section 13241 requires the North Coast Water Board to consider certain factors, including economic considerations, in adopting water quality objectives. Water Code section 13263 requires the North Coast Water Board to take into consideration the provisions of Water Code section 13241 in adopting waste discharge requirements. The following findings discuss the anticipated cost of compliance with this Order. Several assumptions were required for these analyses, and there are inherent limitations and uncertainties discussed below.

90. Prior Cost Consideration in Related Actions. The North Coast Water Board previously considered costs and economics associated with related regulatory actions in the Scott and Shasta River watersheds, including the 2018 Scott and Shasta Conditional Waivers (Orders R1-2018-0018 and R1-2018-0019), the short-term renewals in 2023 and 2025, and the Basin Plan Amendments adopting the Scott River Sediment and Temperature TMDLs (2005) and the Shasta River

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numeric crop-specific nitrogen targets or limits in some regions while others need more time to assess groundwater risk, and recommended region-specific flexibility and standardized reporting protocols; the Panel approved its final report at its June 5, 2026 plenary and presented it to the State Water Board on June 16, 2026. The State Water Board and the nine regional water boards will use the report to guide potential future updates to the Irrigated Lands Regulatory Program; the precedential requirements of the Eastern San Joaquin Order remain in effect unless and until the State Water Board acts on those recommendations.

Temperature and Dissolved Oxygen TMDLs (2006). The cost analyses supporting those actions inform the analysis of this Order.

91. Categories of Costs Considered. The North Coast Water Board has considered costs in the following categories: (a) administrative and permitting fees, including State Water Board fees and Coalition membership fees where applicable; (b) planning and reporting costs, including Farm Evaluations, Certified Tailwater Elimination Plans, Certified Tailwater Discharge Treatment and Control Plans, Grazing and Riparian Management Plans , and annual reports; (c) monitoring costs, including continuous logger deployment and maintenance, grab sample collection, laboratory analysis, and QA/QC; (d) management practice implementation costs, including riparian fencing, off-channel stock water systems, tailwater capture and reuse, thermal attenuation infrastructure, and irrigation efficiency improvements; and (e) foregone opportunity costs associated with land taken out of production or with reduced irrigation intensity in critical seasonal periods.

92. Cost-Benefit Reasoning. The North Coast Water Board finds that the anticipated benefits of this Order — including protection of listed anadromous salmonid populations under state and federal endangered species acts, restoration of temperature and dissolved oxygen regimes necessary to support cold freshwater habitat, reduction of sediment and nutrient loading to designated beneficial uses, protection of drinking water beneficial uses, and progress toward attainment of the Scott River and Shasta River TMDLs — bear a reasonable relationship to the anticipated costs of compliance. Continued failure to attain applicable water quality objectives would carry substantial ongoing costs to the affected communities, including loss of commercial and sport fishing values, degradation of tribal cultural resources, and increased vulnerability of drinking water supplies. The costs of this Order are moderated by the mechanisms described in the preceding finding, by the phased eight-year compliance schedule, and by the availability of state, federal, and non-governmental funding sources that support voluntary and required management practices in the Scott and Shasta watersheds.

Cost of Compliance with the Order

93. Cost of Compliance Overview. The cost of compliance with the Order for Enrollees in the North Coast Region under existing conditions includes the costs associated with any management practices they may need to implement pursuant to Order requirements, State Water Board fees, and monitoring and reporting costs. These costs are described further below.

<u>State Water Board Fees</u>

94. State Water Board Fee Schedule. The State Water Board sets the fee schedule for agricultural and Irrigated Lands Regulatory Programs throughout the state, as specified in California Code of Regulations, title 23, section 2200.6. Enrollees must pay the State Water Board fees on an annual basis for all enrolled irrigated parcels.

Although the State Water Board fees may change from year to year, the fee categories/schedule for the 2025-2026 fiscal year[21] are as follows:

a. If an Enrollee is a member of a group that has been approved by the North Coast Water Board or the Executive Officer to manage fee collection and payment (i.e., Coalition), the annual fee shall be $1.50 per acre.

b. If an Enrollee is not a member of an approved Coalition, the annual fee shall be a base fee plus an acreage-based fee, as set in the State Water Board fee schedule.

95. Coalition Enrollment. In Regions that have implemented Irrigated Lands Orders with Third-Party Programs or Grower Coalitions, the majority of Enrollees have elected to enroll through those entities. Coalitions manage fee collection, outreach, education, monitoring, and reporting on behalf of their members, which typically reduces the per-Enrollee compliance cost relative to individual enrollment.

Compliance with Water Quality Protection Requirements

96. Management Practice Implementation. All Enrollees must comply with requirements to implement and adapt management practices, including sediment and erosion control minimum management practices, tailwater controls, and Riparian Zone setbacks. This Order provides Enrollees with a compliance schedule to complete implementation of required management practices.

97. Additional Management Practices. Enrollees may be required to implement improved or additional management practices as necessary and to report on the water quality-related outcomes of their management practice implementation. Enrollees must ultimately implement management practices that result in compliance with the Order.

98. Existing Practice Implementation. Management practices associated with irrigation, nutrient and pesticide use, and sediment and erosion control are already being implemented by many Enrollees. This may be due to requirements imposed by other regulatory agencies, through longstanding voluntary conservation programs, or as a result of individual land management ethics.

99. Direct Net Cost Benefits. Implementation of management practices may also have direct net cost benefits to an agricultural operation (e.g., irrigation and nutrient management can result in less fertilizer costs and reduced water use).

100. NRCS Standard Management Practices. The Natural Resources Conservation Service (NRCS) has developed standard agricultural management practices to

[21] FY 2025-26 Water Quality Fee Schedule: https://www.waterboards.ca.gov/resources/fees/stakeholder/docs/2025/fy2526-wq-feeschedule.pdf

address irrigation and nutrient management, pesticide management, and sediment and erosion control, some of which are described below. Estimated costs of implementation, as reported by the U.S. Department of Agriculture NRCS and adjusted by North Coast Water Board staff for anticipated scenarios, are summarized in Table 1.

a) Conservation Cover (NRCS 327) — involves establishing and maintaining a permanent vegetated cover on lands that are either not currently in use or lands currently in production that would be taken out of production. Costs range approximately \$200 to \$300 per acre.

b) Contour Buffer Strips (NRCS 332) — involves establishing narrow strips of permanent, herbaceous vegetated cover around hill slopes, alternated down the slope with wider cropped strips farmed on the contour. Costs range approximately \$300 to \$400 per acre.

c) Cover Crop (NRCS 340) — involves planting grasses, legumes, and/or forbs for seasonal vegetated cover. May be implemented to reduce erosion, maintain or increase soil health and organic matter, or capture nutrients. Costs range approximately \$100 to \$300 per acre.

d) Filter Strip (NRCS 393) — involves establishing a strip or area of herbaceous vegetation that removes contaminants from overland flow. Costs range approximately \$200 to \$300 per acre.

e) Integrated Pest Management (NRCS 595) — involves implementing a site-specific combination of pest prevention, avoidance, monitoring, and suppression strategies. Costs range approximately \$50 to \$100 per acre.

f) Center Pivot Irrigation (NRCS 442) — involves implementation of a low-pressure center pivot irrigation system that provides for high efficiency (>85%) application (e.g., as drops, tiny streams, or miniature spray through emitters or applicators). The irrigation system has a coefficient of uniformity above 85% and irrigation water is efficiently applied to maintain adequate soil water for the desired level of plant growth. Field runoff is eliminated. Costs range between \$130,000 to \$160,000 for a typical system irrigating a 160-acre field.

g) Nutrient Management (NRCS 590) — involves managing the amount, source, placement, and timing of plant nutrients and soil amendments. Costs range approximately \$10 to \$320 per acre.

h) Riparian Vegetation Buffer (NRCS 391) — involves establishment of an area of predominantly trees and/or shrubs adjacent to and up-gradient from waterbodies. Costs vary based on planting method; foregone income considered where land is taken out of production. Costs range approximately \$3,000 to \$5,500 per acre.

i) Tailwater Control Basin (NRCS 447) - involves constructing a basin with an engineered outlet, formed by excavating a dugout, constructing an embankment, or a combination of both. The purpose of the tailwater control basin is to capture and detain/retain tailwater for a sufficient length of time to allow it to cool and/or infiltrate to groundwater. Costs are estimated between $50,000 to $60,000 per basin.

j) Tailwater Recovery System — involves ditches, retention ponds, water pumps, piping, and generators to capture tailwater at the foot of a sloped field and pump it back to the head of the field for re-use. Costs vary widely from $350 to $1,000 per irrigated acre.

k) Tailwater Treatment Wetlands (NRCS 656) — involves constructing wetlands to treat nutrient-rich tailwater before it enters surface waters. Costs range approximately $400 to $3,000 per irrigated acre.

101. These potential costs were considered when the water quality protection requirements were developed for the Order.

Table B.1: Estimated Costs of Management Practices/Scenarios for Water Quality Protection

Management Practice	Scenario Size	Unit Cost	Total Cost (low)	Total Cost (High)
Conservation Cover (327)	50 acres	$200-$300/acre	$10,000	$15,000
Contour Buffer Strip (332)	1 acre	$300-$400/acre	$300	$400
Cover Crop (340)	40 acres	$100-$300/acre	$4,000	$12,000
Filter Strip (393)	1 acre	$200-$300/acre	$200	$300
Integrated Pest Management (IPM) program (595)	40 acres	$50-$100/acre	$2000	$4,000
Center Pivot with Low Pressure Drop Sprinklers (442)	1,300 linear feet	$100-$120/linear foot	$130,000	$156,000
Nutrient Management (590)	40 acres	$10-$320/acre	$400	$12,800

Riparian Vegetation Buffer (391)	1.5 acres	$3,000-$5,000/acre	$4,500	$7,500
Tailwater Retention/Detention Basin (447)	25,000 cu. yd. basin	$2.0-$2.5/cu. yd.	$50,500	$62,000
Tailwater Recovery and Reuse System (447,607,553)	25 irrigated acres	$300-$400/acre	$75,000	$100,000
Tailwater Treatment Wetlands (656)	1 acre	$15,000-$20,000/acre	$15,000	$20,000

Compliance with Agricultural Road Storm-Proofing Requirements

102.Storm-Proofing Compliance. Enrollees with Appurtenant Agricultural Roads must comply with requirements to implement road storm-proofing management practices. Existing Irrigated Lands are provided with a compliance schedule five (5) years from the date of the Order) to complete implementation.

103.Storm-Proofing Maintenance. All storm-proofing management practices on Appurtenant Agricultural Road networks shall be properly designed, installed, maintained, and promptly repaired. Maintenance shall include periodic inspection following qualifying storm events.

104.Existing Road Practices. Management practices associated with road storm-proofing are already being implemented by many Enrollees, due to requirements imposed by other regulatory agencies (e.g., County grading and drainage requirements), voluntary conservation programs, or land management ethics.

105.Road Practice Cost Benefits. Implementation of road storm-proofing management practices may also have direct net cost benefits to an agricultural operation (e.g., reduced road maintenance costs).

106.NRCS Road Practice Standards. The NRCS has developed standard management practices for agricultural road sediment, erosion, and drainage control, some of which are described below. Estimated costs are summarized in Table 2.

a) Rolling Dips — shallow, rounded dip in the road where road grade reverses for a short distance and surface runoff is directed to the outside or inside of the road. Primarily used on gravel-surfaced, out-sloped roads. Costs approximately $10 to $20 per linear foot.

b) Critical Dips — a dip in the roadbed at a culverted stream crossing, preferably at the down-road hinge line of the fill, that prevents stream diversion. Costs approximately $10 to $20 per linear foot.

c) Out-Sloping — converting an in-sloped road to an out-sloped road, or excavating the fill along the outside of the road and grading it against the cut-bank. Costs approximately $3 to $30 per linear foot.

107. These potential costs were considered when the Appurtenant Agricultural Road storm-proofing requirements were developed for the Order.

Table B.2: Estimated Costs of Management Practices/Scenarios for Road Storm-Proofing

Management Practice	Scenario Size	Unit Cost	Total Cost (Low)	Total Cost (High)
Rolling Dip	1,000 feet	$10–$20/ft	$10,000	$20,000
Critical Dip	1,000 feet	$10–$20/ft	$10,000	$20,000
Road Out-Sloping	5,000 feet	$3–$30/ft	$15,000	$150,000
Ditch Relief Culvert	20 feet	$75–$200/ft	$1,500	$4,000
Debris Deflector	Each	$300–$1,200	$300	$1,200
Stream Crossing Rock Armor	100 tons	$200–$400/ton	$20,000	$40,000

Monitoring and Reporting

108. All Enrollees are required to conduct monitoring and reporting either individually or as part of a Coalition effort. All Enrollees are required to report management practice implementation annually in their Farm Evaluation. Refer to Attachment A: Monitoring and Reporting Program for monitoring and reporting requirements and Tables B.3-B.4 for estimated costs.

Table B.3: Estimated Cost of Required Monitoring

Required Monitoring	Unit Size	Cost per Sampling Event (Analytical + Materials and Labor) per unit
Representative Groundwater Monitoring	Per well	$300

Drinking Water Well Sampling	Per well	$150

Table B.3 estimates the cost of Required Monitoring (Representative Groundwater Monitoring and Drinking Water Supply Well Sampling) on a per well basis. Each Enrollee must sample all Drinking Water Supply wells that are on an enrolled parcel for nitrate annually for three years, after which, frequency may be reduced to once every five years. Individual Enrollees must propose Representative Groundwater wells for monitoring. For Enrollees in a Coalition, the Coalition may submit a Representative Groundwater Monitoring network in accordance with Section II.A of Attachment A: Monitoring and Reporting Program. Once approved by the Executive Officer, the Coalition may monitor Representative Groundwater wells in this network on behalf of its Enrollee members. Assuming 55,000 acres may ultimately be enrolled through a Coalition, and assuming 10 representative wells across both groundwater basins, the estimated cost per acre for Representative Groundwater Monitoring for Enrollees in a Coalition is **$0.05/irrigated acre.**

Table B.4: Estimated Cost of Conditional Monitoring

Required Monitoring	**Unit Size**	**Cost per Sampling Event* (Analytical + Materials and Labor) per unit**
Riparian Photo-Point Monitoring	Per Grazing Event	$200
Tailwater Monitoring (continuous temperature monitoring)	Point of Compliance	$1,000 *cost estimate for temperature monitoring is calculated over the Irrigation Season rather than for a single irrigation set.
Tailwater Monitoring (TKN or TP grab samples)	Point of Compliance	$250

Table IB.4 estimates the unit cost of Conditional Monitoring. Conditional Monitoring consists of (1) Riparian Photo-Point Monitoring, applicable to Enrollees electing to develop and implement a Riparian Grazing Plan; and (2) Tailwater Monitoring, applicable to an Enrollee or group of Enrollees who elect Pathway 2 (Tailwater Discharge Treatment and Control) as the compliance pathway for tailwater discharges under Section II.E of the Order. The conditions that trigger each form of conditional monitoring are described in Section II.E of the Order. Refer to Section III of Attachment A: Monitoring and Reporting Program for detail on frequency of monitoring.

Technical Reports and Planning Documents

109) As part of Order compliance, Individual Enrollees and Coalitions on behalf of their enrolled members are required to submit an Annual Compliance Report which includes annual management practice reporting and annual water quality monitoring results. For Enrollees with parcels in the Tailwater Adaptive Management Program, the Order requires additional planning documents such as Certified Tailwater Treatment and Control Plans and Certified Tailwater Elimination Plans. Enrollees may also elect to develop and implement Grazing and Riparian Management Plans in lieu of meeting certain livestock grazing requirements in Streamside Areas. Cost estimates of Technical Reports and Planning Documents are provided below:

a) Representative Groundwater Monitoring Workplan (Individual): Individual Enrollees shall submit a Water Quality Monitoring Workplan (Workplan) to the Executive Officer describing how they will implement the water quality monitoring and reporting requirements of this Order as detailed in Attachment A. Estimated cost (one-time): $1,000–$2,000.

b) Representative Groundwater Monitoring Workplan (Coalition): The Coalition shall submit a Workplan to the Executive Officer for approval that proposes a groundwater trend monitoring network, and describes how the Coalition will meet all group monitoring requirements on behalf of Enrollees. Estimated cost (one-time): $25,000–$50,000.

c) Annual Farm Evaluation: inventories the management practices currently implemented on all enrolled parcels, documents compliance with this Order, and identifies changes in operations or management from prior years. Estimated annual cost is $250 for Individual Enrollees and $20,000 for the Coalition on behalf of its enrolled members.

b) Annual Monitoring Report: presents monitoring data collected pursuant to this Order during the prior calendar year, including associated analyses and any Source Determination Reports required under Attachment A: MRP. Estimated annual cost is $1,000 for Individual Enrollees and $20,000 for the Coalition on behalf of its enrolled members.

c) Grazing and Riparian Management Plan: Enrollees electing to developing a GRMP in lieu of meeting certain livestock grazing requirements in Streamside Areas shall develop and implement a Grazing and Riparian Management Plan certified by a Qualified Professional. Estimated cost (per GRMP): $3,000–$8,000.

d) Certified Tailwater Elimination Plan or Certified Tailwater Discharge Treatment and Control Plan (Pathway 1 or Tier 2 Pathway 2 Enrollees): Enrollees with tailwater discharges electing Pathway 1 or triggering Tier 2 adaptive management shall develop the applicable Plan certified by a Qualified Professional. Estimated cost (per Plan): $5,000–$15,000.