Attachment A-5

Salinity Management to Provide Reasonable Protection of AGR Beneficial Uses in Groundwater (AGR Policy)

1.0 Problem Statement

The Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (SRSJR Basin Plan) and the Water Quality Control Plan for the Tulare Lake Basin (TLB Basin Plan) ("Basin Plans") establish regulations for salinity management to protect the Agricultural Supply (AGR) beneficial use in groundwater. The AGR beneficial use was designed to protect both crop irrigation and livestock watering and has been designated in the majority of surface and groundwater throughout the Central Valley. Although the objectives to protect the beneficial use are narrative, there is currently no guidance on how to interpret the narrative objective in a manner that accounts for local and regional differences. As a default, a conservative approach is typically applied that ensures protection of the most sensitive crop in all locations at all times, even though individual crop and livestock sensitivity to salinity varies widely and potential impacts can be mitigated through management activities. The purpose of this policy is twofold: (1) to recommend modifications to the Basin Plans to clarify how salinity will be managed within each groundwater basin and subbasin to provide the appropriate level of protection of the AGR beneficial use and establish procedures to minimize degradation; and (2) where needed and where feasible, to reduce salt loading to achieve balance and ensure long-term protection of the AGR use.

1.1 Existing Regulatory Requirements

AGR Beneficial Use

The Central Valley Water Quality Control Board (Central Valley Water Board) defines the AGR beneficial use in its Basin Plans as follows:

- SRSJR Basin Plan:[1] "*Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing.*"
- TLB Basin Plan:[2] "*Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.*"

[1] Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (SRSJR Basin Plan). Fourth Edition. Central Valley Water Quality Control Board. Revised October 2011. Pg. II-1.00.

[2] Water Quality Control Plan for the Tulare Lake Bain (TLB Basin Plan). Second Edition. Central Valley Water Quality Control Board. Revised October 2011. Pg. II-1.

One difference exists between the definitions – the inclusion of the phrase "(including leaching of salts)" in the SRSJR Basin Plan.

The SRSJR and TLB Basin Plans consider AGR to be a presumptive beneficial use applicable to all waters. Specifically, *"Unless otherwise designated by the Regional Water Board, all ground waters of the Region are considered suitable or potentially suitable, at a minimum, for agricultural supply (AGR)…"*[3]

The Basin Plans establish criteria for making exceptions to the presumptive application of the AGR beneficial use. Of relevance to salt management is the potential application of the following exception: "*there is pollution, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for agricultural use using either BMPs* [Best Management Practices] *or best economically achievable treatment practices."*[4]

Water Quality Objectives

The SRSJR Basin Plan does not establish explicit numeric water quality objectives for salinity in groundwater for the protection of the AGR beneficial use. Instead, this Basin Plan relies on the following narrative water quality objective to protect AGR:[5] *"Ground waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses."*

The TLB Basin Plan includes the same narrative water quality objective as the SRSJR Basin Plan, as described in the previous paragraph.[6] In addition, the TLB Basin Plan establishes a policy that allows for controlling the rate of increase of salinity ("managed degradation") by regulating both the maximum increase in salinity concentrations attributable to consumptive use ("*maximum EC shall not exceed the quality of the source water plus 500 µmhos/cm*")[7] and the maximum average annual increase in groundwater salinity on a basin-specific basis:[8]

> *"All ground waters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use and management of water resources.*
>
> *No proven means exist at present that will allow ongoing human activity in the Basin and maintain ground water salinity at current levels throughout the Basin. Accordingly, the water quality objectives for ground water salinity control the rate of increase.*
>
> *The maximum average annual increase in salinity measured as electrical conductivity shall not exceed the values specified in Table III-4 for each hydrographic unit shown on Figure III-1.*

[3] SRSJR Basin Plan, Pg. II-3.00; TLB Basin Plan, Pg. II-2.
[4] SRSJR Basin Plan, Pg. II-3.00; TLB Basin Plan, Pg. II-3.
[5] SRSJR Basin Plan, Pg. III-10.00
[6] TLB Basin Plan, Pg. III-7.
[7] TLB Basin Plan, Pg. IV-11
[8] TLB Basin Plan, Pg. III-8 (see TLB Basin Plan for referenced table and figure)

The average annual increase in electrical conductivity will be determined from monitoring data by calculation of a cumulative average annual increase over a 5-year period."

The maximum average increase in electrical conductivity (EC) allowed varies by hydrographic unit, ranging from 1 µS/cm to 6 µS/cm in the Westside (North and South) and Tule River and Poso hydrographic units, respectively.[9]

As noted above, the TLB Basin Plan allowed for managed degradation by regulating the maximum average annual increase in groundwater salinity on a basin-specific basis. The Basin Plan assumed that average annual increase would be determined from monitoring data using the prescribed method. However, a data monitoring network was never developed as planned and the allowable rate of increase of salt incorporated into the regulation has not been implemented as intended, although it appears that the rate of degradation generally followed what was intended.[10]

Basin Plan Implementation

In accordance with Basin Plan policies, Central Valley Water Board staff typically follow the *Policy for Application of Water Quality Objectives* to evaluate compliance with narrative water quality objectives, which means interpreting the narrative objective with relevant numerical criteria and guidelines. Central Valley Water Board staff generally rely on the assumption that Total Dissolved Solids (TDS) concentrations < 450 mg/L and EC concentrations < 700 µS/cm would protect both salt sensitive crops and livestock and not adversely affect the AGR beneficial use. These values are based on guidelines originally published by Ayers and Westcot (1985).[11] They have been used to translate the narrative objective into numeric criteria to establish numeric effluent limits in Waste Discharge Requirements (WDRs), and/or to determine compliance with receiving water limitations, and/or Conditional Waiver conditions issued by the Central Valley Water Board.[12] This approach was challenged by the City of Woodland whereby the State Water Board Order repealed the EC effluent limitation in the City's permit and amended the permit to include a study requirement for the City to conduct a "site-specific study that assess influence of soil chemistry climatic conditions, rainfall and flooding, and background water quality on EC requirements for irrigation waters diverted from Tule Canal downstream of Woodland's discharge."[13] Since then, the Central Valley Water Board has also allowed the development of site-specific water quality criteria, where appropriate.

Central Valley Water Board staffs have historically evaluated compliance with water quality objectives at First Encountered Groundwater, which is normally measured at the top of the saturated zone or the

---

[9] TLB Basin Plan, Pg. III-8, Table III-4

[10] Central Valley Water Board Staff, personal communication, Executive Committee Policy Meeting

[11] Ayers, R.S. and D.W. Westcot. 1985. *Water Quality for Agriculture*. Food and Agricultural Organization (FAO), Irrigation and Drainage Paper 29 Rev. 1, FAO, United Nations, Rome, 174 p.

[12] The original purpose for Ayers and Westcot (1985), which was published for the United Nations FAO, was to provide support to agricultural areas with limited irrigation technology and salt management capabilities. The guidelines state (Section 1.4): "The guidelines are practical and have been used successfully in general irrigated agriculture for evaluation of the common constituents in surface water, groundwater, drainage water, sewage effluent and wastewater. They are based on certain assumptions which are given immediately following the table: "*These assumptions must be clearly understood but should not become rigid prerequisites. A modified set of alternative guidelines can be prepared if actual conditions of use differ greatly from those assumed."* (Emphasis added).

[13] State Water Board Water Quality Order WQO 2004-0010, pg. 18.

shallowest groundwater as a conservative means of protecting the remaining saturated zone. More specifically, when developing WDRs/Conditional Waivers (and determining compliance therewith), current Central Valley Water Board practice is to evaluate the potential near and long-term impacts from a discharge on the First Encountered Groundwater, regardless of whether that shallow groundwater layer is or has the potential to be utilized for the AGR beneficial use (i.e. for irrigation or stock watering).

For selected areas, the TLB Basin Plan has established specific salinity management requirements for protection of groundwater used as an agricultural supply from land application of wastewater effluent. For example, three classes of irrigation water have been defined for the underlying groundwater in the White Wolf Subarea.[14,15] Class I irrigation water (or groundwater) has EC < 1,000 µS/cm; Class II irrigation water has EC of 1,000 µS/cm up to 3,000 µS/cm, and Class III irrigation water has EC > 3,000 µS/cm.

In addition, the TLB Basin Plan includes the following policy statement regarding regional management of salt:[16]

> *Degradation of ground water in the Tulare Lake Basin by salts is unavoidable without a plan for removing salts from the Basin. A valleywide drain to carry salts out of the valley remains the best technical solution to the water quality problems of the Tulare Lake Basin. The drain would carry wastewater generated by municipal, industrial, and agricultural activities, high in salt and unfit for reuse. The only other solution is to manage the rate of degradation by minimizing the salt loads to the ground water body…The Regional Water Board supports construction of a valleywide drain to remove salt-laden wastewater from the Basin under the following conditions:*
>
> - *All toxicants would be reduced to a level which would not harm beneficial uses of receiving water.*
> - *The discharge would be governed by specific discharge and receiving water limits in an NPDES permit.*
> - *Long-term continuous biological monitoring would be required.*

The SRSJR Basin Plan includes similar language regarding the management of salts within the region,[17] and while both Basin Plans advocate for the construction of a valleywide drain to move salt out of the Central Valley, a drain that fully serves that purpose has not been constructed.

1.2 Challenges with Application of Existing Basin Plan Language

The regional economy depends on efficient use and reuse of water (including, e.g., treated domestic wastewater effluent, agricultural tailwater, harvested stormwater) to maximize agricultural production and minimize water waste. The current practice of relying on conservative salinity thresholds to protect the AGR beneficial use undermines this principle. It also jeopardizes the

[14] TLB Basin Plan, Pg. IV-11.
[15] White Wolf Subarea consists of 64,000 acres within the Central Valley floor at the southern tip of the Tulare Lake Basin, about 20 miles south of Bakersfield, CA.
[16] TLB Basin Plan, Pg. IV-5-6
[17] SRSJR Basin Plan, Pg. IV-15.00

agricultural industry's ability to grow a variety of different crops with widely varying salt tolerances by reusing water many times. In addition, focusing only on salinity concentration to evaluate beneficial use protection and potential for water quality degradation may impede statewide efforts to increase use of recycled water and water conservation through more efficient irrigation.[18] Accordingly, sound resource management should consider both concentration and mass when evaluating and regulating salinity effects on groundwater.

To achieve the goals of the Recycled Water Policy and establish a sound approach to water resource management, including during periods of water shortage in California, and to develop a regulatory program that maintains the Central Valley's agricultural economy, while appropriately protecting beneficial uses, the following concerns regarding the current regulatory approach require consideration:

- The fact that all ground waters in the Central Valley are considered "suitable or potentially suitable" for AGR, as is current practice, does not mean that all surface and subsurface water quality is, or should be, capable of sustaining maximum yield for every agricultural crop or for providing a stock watering source. It is well-established that the sensitivity of crops to salt varies widely.[19, 20] Moreover, the source of water for crop irrigation may or may not be local. In fact, imported surface water is often used to produce crops that would not be commercially viable if forced to rely on native or local groundwater as the sole source of irrigation supply.

- As noted above, Ayers and Westcot (1985) is currently the primary source for translating the narrative objective into numeric compliance thresholds. However, its recommended salinity guideline for "Unrestricted Use" (< 700 µS/cm EC) has been misinterpreted and applied in a manner inconsistent with the author's conclusions.[21] Some salinity impacts can be mitigated by modern irrigation strategies without unreasonably affecting the AGR beneficial use. Local conditions such as soil chemistry, climatic conditions, rainfall and flooding, and background water quality, also play a role.

- Evaluating compliance with salinity standards at First Encountered Groundwater does not adequately consider the availability of assimilative capacity in the groundwater to mitigate the potential for adverse effects on AGR groundwater uses downgradient of the discharge. Similarly, the characteristics of First Encountered Groundwater do not reflect the actual water that is being used for agricultural purposes.

- It is often impossible to comply with the 700 µS/cm EC threshold even after implementing effective management practices. For example, if an agricultural operator irrigates with high quality imported water (EC = 150 µS/cm) and the leaching fraction is assumed to be 15%, then salinity in the leachate will concentrate more than six-fold (EC = 1,000 µS/cm). Given the

[18] State Water Board Recycled Water Policy, Resolution 2009-0011, adopted February 3, 2009, as amended by Resolution 2013-003, adopted January 22, 2013.

[19] Final Draft *Salinity Effects on Agricultural Irrigation-Related Uses of Water*. CV-SALTS White Paper; http://www.cvsalinity.org/index.php/docs/agendas-notes-and-materials/meeting-materials/1043-cv-salts-agr-white-paper-v2081012/file.html.

[20] See for example Figure 4c in: *Task 5.1 and 5.2 – Develop Map Layers and Identify Crop Sensitivity Zone, Final Report*, prepared for CV-SALTS by Larry Walker Associates, Inc., April 2014.

[21] Dennis Westcot, CV-SALTS Executive Policy Committee meeting discussions.

average salinity of available water supplies, there is no feasible or practicable means of meeting the 700 µS/cm EC threshold at First Encountered Groundwater.

- Irrigation practices designed to move salts past the root zone are considered an integral part of the protection of the AGR beneficial use (e.g., as noted in the SRSJR Basin Plan definition for AGR). Efficient irrigation naturally increases the concentration of salts in the leachate. Therefore, some water quality degradation will be the inevitable and unavoidable result of crop irrigation even when using effective management practices. Regardless, irrigation water is the largest single source of additional salt loads to ground waters in the Central Valley. Therefore, it is appropriate to require irrigators to implement effective management practices to minimize salt loading (e.g., mass) to the vadose zone when and where reasonably possible.
- The "Controllable Water Quality Factors" policy limits the Central Valley Water Board's ability to allow further degradation where uncontrollable factors have already resulted in water quality objectives being exceeded.[22]
- The necessity to comply with state water use goals established during times of water shortage caused by drought may limit the feasibility to implement effective management practices that reduce the concentration of salt in discharges to a waterbody.[23]

Given the existing regulatory requirements and the challenges identified above with regard to protection of the AGR beneficial use in groundwater, CV-SALTS seeks to establish a salt management approach through the SNMP that:

- Provides "reasonable protection" for all existing and probable future AGR uses in the Central Valley in a manner consistent with the criteria described in §13000 and §13241 of the California Water Code.
- Preserves the economic viability of the broader agricultural industry in the Central Valley while minimizing and/or mitigating the potential for significant adverse effects on salt-sensitive crops when and where such crops are grown.
- Recognizes the unique characteristics of the AGR beneficial use. Like MUN, it is distinguished from other in stream beneficial uses such as REC-1 and WARM in that it is an "off-stream use" of water and users of the water may have the ability to adapt to changing environmental conditions, in this case through crop selection and/or irrigation practices.
- Is consistent with statewide policies designed to encourage increased water conservation, reuse of water from agricultural return flows, use of reclaimed/treated municipal wastewater, and stormwater harvesting.

[22] SJSRB Basin Plan, p. III-2.00.

[23] For example, January 17, 2014 State of Emergency issued by Governor Brown, and subsequent actions to address water shortages caused by extended drought conditions (April 25, 2014 [proclamation of continued state of emergency]; December 22, 2014 [Executive Order B-28-14]; April 1, 2015 [Executive Order B-29-15]; and November 13, 2015 [Executive Order B-36-15]).

- Is implemented through an objective, transparent and consistent process to evaluate the real-world probability for the occurrence of adverse effects resulting from increasing salinity loads in groundwater.
- Is consistent with the Central Valley SNMP management goals, where reasonable and feasible.

2.0 Proposed Regulatory Approach to Manage Salinity to Protect the AGR Beneficial Use

CV-SALTS has developed a proposed regulatory approach that is consistent with the approach described above and addresses the existing regulatory challenges, also described above. The approach, which is described in Section 2.2, is based on the findings and governing principles described below.

2.1 Findings and Governing Principles

The proposed regulatory approach to manage salinity to protect the AGR beneficial use is based on the following findings and governing principles:

- This approach applies exclusively to managing salinity in groundwater. In this regard, the policy determinations made in the course of protecting groundwater for the AGR use may influence similar decisions related to protecting surface water quality for AGR uses but do not override numeric water quality objectives or other plans or policies intended to address salt and water supply, such as the Bay-Delta Plan,[24] nor does this proposed policy prohibit changes to the AGR objectives herein or in other plans and policies to be made in the future.
- The proposed approach for managing salinity in groundwater must be implemented in a manner consistent with the State Antidegradation Policy (i.e., Resolution No. 68-16), as applicable,[25] and/or any other applicable state groundwater policy.
- Establishing more flexible salinity standards for the AGR use in groundwater does not waive the legal obligation to comply with more stringent salinity standards, where such standards apply to protect other beneficial uses as designated in the Basin Plans (e.g., municipal and domestic supply [MUN], industrial service supply [IND], industrial process supply [PRO]).
- The applicability of AGR as an existing use in a groundwater basin or subbasin or other area is a site-specific or water body-specific determination based on water quality or physical characteristics. Where existing characteristics severely limit a use, e.g., the salinity exceeds safe thresholds for use of the water for crop irrigation or stock watering, the rare, exceptional, or very temporary use of that water as an agricultural water supply, e.g., during a water shortage when the normal water supply is temporarily interrupted, does not require a finding that AGR is an

[24] Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, State Water Board, December 13, 2006.

[25] State Water Board Resolution 68-16. *Statement of Policy with Respect to Maintaining High Quality of Waters in California* (Antidegradation Policy)

existing use in the groundwater. This conclusion is based on the very limited actual "use" of the water body as an agricultural water supply.

- The Central Valley Water Board retains the authority and the discretion to establish appropriate WDRs/Waivers, effluent limits, or receiving water limitations.
- No proven means exist at present that will allow ongoing human activity in the Central Valley Region and maintain salinity levels throughout every groundwater basin.[26] Therefore, in lieu of using a numeric water quality objective for salinity in groundwaters designated AGR, the primary focus shall be on minimizing water quality degradation in a manner consistent with the statewide Antidegradation Policy. Specifically,
  - Lowering water quality cannot unreasonably affect present and anticipated beneficial uses;[27]
  - Lowering water quality must be consistent with "maximum benefit" to the people of California. Consideration of "maximum benefit" as part of the antidegradation review process incorporates a more holistic assessment of both the costs and benefits of increasing salinity in groundwater.
  - The Antidegradation Policy requires those who discharge or propose to discharge a waste to a high quality water to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.
- A long-standing regulatory presumption associated with water quality standards exists in that adopting or applying water quality objectives to protect the most sensitive species or sub-population will also protect other less sensitive species and the general population. This presumptive approach is fundamental to the adoption of numeric objectives to protect aquatic life, wildlife or human health. However, the applicability of this approach to the protection of the AGR use is impractical. While aquatic life or wildlife, may not be able to adapt to changing water quality in the short term, agriculture can adapt to stressors that impact the use, including climate change and economic condition. Moreover, agriculture may be able to quickly make use of new technologies and practices designed to benefit agriculture.
- Salinity and local soil and hydrological conditions vary from one location to another in the Central Valley; as such, there should not be an expectation that any crop may be grown in any place at any time. Furthermore, while it is true that conservative salinity water quality objectives will protect the theoretical yields of both salt-sensitive and salt-tolerant crops, the cost of managing salinity to protect the most salt-sensitive crops, irrespective of where such crops are actually or are likely to be grown, may alter the production costs and economic viability of many other crops currently being cultivated. If the result is a net loss of commercial production in the area of concern, then the AGR use has been adversely affected despite the original regulatory intent to provide increased use protection.

[26] TLB Basin Plan, Pg. III-8.
[27] See: *Questions and Answers for State Water Resources Control Board Resolution No. 68-16*; February 16, 1995.

- It is difficult to establish a single (or basin specific) numeric water quality objective for salinity in ground waters designated AGR to protect crop irrigation, given the enormous number of relevant factors that may affect crop production and the complex interrelationships among these factors. Therefore, it is appropriate to continue relying on a narrative water quality objective to protect the AGR use from excessive salinity. This approach provides greater flexibility and allows for consideration of a wide range of site-specific conditions when translating the narrative objective into reasonable limitations (e.g., effluent limits, receiving water limits) for salinity. This approach also allows for consideration of crop management techniques that maximize the reuse of water by using the water on a range of crops with varying salt tolerances. Accordingly, translating the narrative objective into reasonable limitations for salinity for inclusion in a WDR/Waiver should consider the following:[28]

    - The salinity guidelines recommended by Ayers & Westcot (1985) are best employed as thresholds to trigger more detailed water quality analysis rather than as direct translators of the current narrative objective for chemical constituents. While salinity concentrations < 700 µS/cm EC (450 mg/L TDS) are presumed to protect nearly all crops and livestock, salinity concentrations > 700 µS/cm EC do not render water quality "unsuitable" for the AGR use. Also, there are cases where this threshold may not be protective, such as where rice is being irrigated with groundwater.

    - Groundwater salinity in the range between 700 - 1,500 µS/cm EC (450 - 1,000 mg/L TDS) remains suitable for all but the most salt-sensitive crops but may result in agricultural operators needing to increase the leaching fraction to maintain maximum yields, depending on the local conditions, crop and the level of salinity in the irrigation water. This is not an unusual management practice amongst agricultural operators, in order to assure the most efficient use and reuse of available water supplies. However, the ability to increase leaching rates depends on an adequate supply of acceptable-quality water at a reasonable cost.

    - Groundwater salinity in the range between 1,500 - 3,000 µS/cm EC (1,000 - 2,000 mg/L TDS), while generally not suitable for irrigating some salt-sensitive crops, remains suitable for irrigating many salt tolerant crops.[29] Where existing groundwater quality is in this range, it may be appropriate to consider sub-categorizing the AGR use to reflect this existing limitation.

    - At groundwater salinities > 3,000 µS/cm EC (2,000 mg/L TDS), existing groundwater quality is generally not suitable for irrigating all but the most salt-tolerant crops.

- The AGR beneficial use also provides for the protection of ground waters used as a stock watering source. While sensitivity to salt varies considerably among types of stock animals (e.g., poultry, cattle, or swine), animal life stage (young vs. adult), or whether an animal is pregnant or lactating,

---

[28] Ayers, R.S. and D.W. Westcot. 1985. *Water Quality for Agriculture*. Food and Agricultural Organization (FAO), Irrigation and Drainage Paper 29 Rev. 1, FAO, United Nations, Rome, 174 p.; and Final Draft *Salinity Effects on Agricultural Irrigation-Related Uses of Water*. CV-SALTS White Paper; http://www.cvsalinity.org/index.php/docs/agendas-notes-and-materials/meeting-materials/1043-cv-salts-agr-white-paper-v2081012/file.html.

[29] See for example Figure 4c in: *Task 5.1 and 5.2 – Develop Map Layers and Identify Crop Sensitivity Zone, Final Report*, prepared for CV-SALTS by Larry Walker Associates and others, April 2014.

at groundwater salinities < 7,500 µS/cm EC (5,000 mg/L TDS), existing groundwater quality is generally suitable to support some level of stock watering.[30]

- The volume and quality of water available for irrigation varies greatly from year to year and even from month to month. Also, crop sensitivity varies according to growth stage of the particular crop (i.e., the time of year). Consequently, it is appropriate for the Central Valley Water Board to take these factors into account when developing limitations and/or permit provisions related to salinity to protect the AGR use in ground waters. In particular, additional flexibility should be allowed during drought conditions when reduced availability of high quality surface waters may necessitate temporary reliance on alternate water supplies with higher salinity to meet irrigation requirements.

- It is reasonable to employ long-term averaging periods, e.g., use of annual averages or longer rather than monthly or quarterly averages, when developing limitations and/or provisions related to salinity in groundwater. For example, the salt load currently existing in the vadose zone is typically unknown, but this load can impact the quality of the underlying groundwater over many years. In addition, the time required for recharge water to transit the vadose zone and return to use as groundwater at a nearby agriculture water supply well can be significant. Therefore, shorter averaging periods are considered generally unnecessary for managing salinity in groundwater.

- Preserving and protecting the AGR use for commercial agriculture will necessitate a large-scale coordinated effort to implement a sustainable salt management program. For example, findings from the CV-SALTS Strategic Salinity Alternatives Land and Transportation Study (SSALTS) confirm existing statements in the Basin Plans that a "*valleywide drain to carry salts out of the valley remains the best technical solution to the water quality problems"* in the Central Valley. Specifically, SSALTS recommends the construction of a regulated brine line to transport salts out of the Central Valley (in particular the lower Central Valley) to an ocean discharge.[31]

- Where significant salinity water quality concerns exist, future WDRs/Conditional Waivers will require a genuine long-term (> 20 years) commitment to execute a regional salt management program. Accordingly, CV-SALTS has developed a recommended phased Salinity Management Strategy (Attachment A-3) to better define the best approaches for salt management on a regional basis taking into account variability in salinity concerns across hydrologic regions. Findings from the strategy's Phase I activities (Prioritization and Optimization Study) will provide the foundation for a long-term salinity management program.

---

[30] Requirements for protection of stock watering based on findings contained in: (a) *Salt and Nutrients: Literature Review for Stock Drinking Water Final Report*. Prepared for CV-SALTS by Kennedy-Jenks, May 20, 2013; (b) *External Peer Review of a Proposed Basin Plan Amendment to Address Beneficial Uses for Groundwater at the Royal Mountain Mine Site, Calaveras County*. Memorandum from Kerry Rood (Utah State University) to Gerald Bowes (Manager Cal/EPA Scientific Peer Review Program). November 23, 2012.

[31] CV-SALTS, *Strategic Salinity Alternatives Land and Transportation Study, Final Phase 2 Report: Development of Potential Salt Management Strategies*, prepared by CDM Smith, October 1, 2014.

2.2 Proposed Framework for Protection of AGR

Given the findings and governing principles described above, CV-SALTS proposes to interpret the narrative salinity water quality objective for the protection of the AGR beneficial use as described in the sections below.

2.2.1 Default Approach - Assign Groundwater Basins to AGR Classes Based on Existing Ambient Water Quality Conditions

As a default, it is recommended that the Central Valley Water Board assign AGR classes to groundwater basins and subbasins based on existing ambient water quality in the production zone of the basin or subbasin. Assignment of groundwater basins and subbasins into an AGR Class does not establish numeric water quality objectives. Instead, the establishment of AGR classes is intended to provide a default basis for translating the existing narrative water quality objective to support management of salt through WDRs/Conditional Waivers.

To recognize the significant variability in salinity concentrations in groundwater across the Central Valley, as a default groundwater basins or subbasins will be classified into one of four AGR Classes based on the existing volume-weighted average salinity concentration in the production zone of that basin or subbasin.[32] SNMP Section 3 provides the most recent calculation of existing ambient TDS water quality in the Central Valley by groundwater basin/subbasin.[33]

When establishing an AGR Class for each groundwater basin/subbasin, if there are any situations where the ambient TDS water quality in the basin/subbasin is close to the upper threshold of the range for the AGR Class, the Central Valley Water Board has the discretion to assign the basin/subbasin to the next higher AGR Class. Once a groundwater basin or subbasin is given an AGR classification, salinity shall be managed within the range established for that class. The four AGR Classes, the range of TDS values (with comparable EC values) applicable to each class for interpreting the narrative salinity objective using this default methodology, and information regarding the use of the water as an agricultural supply within each AGR Class is described as follows:[34, 35]

- ***AGR Class 1***: EC < 1,000 µS/cm (TDS < 600 mg/L). Groundwater quality in the production zone that may be used as an agricultural water supply is generally suitable for irrigating all crops and all stock watering. This presumption is rebuttable on a case-by-case basis with the burden of proof falling on those claiming that EC/TDS levels at or below 1,000 µS/cm EC or 600 mg/L TDS do not

[32] The volume-weighted average existing ambient quality of the production zone expressed as TDS is determined using the procedures described in Section 3of the SNMP.

[33] The basis for these findings is the CV-SALTS study: *Updated Groundwater Quality Analysis for the Central Valley* (2016). As part of the analysis EC values were converted to TDS and analyzed as TDS.

[34] Ranges for protection of crop irrigation based on findings contained in Final Draft *Salinity Effects on Agricultural Irrigation-Related Uses of Water*. CV-SALTS White Paper; http://www.cvsalinity.org/index.php/docs/agendas-notes-and-materials/meeting-materials/1043-cv-salts-agr-white-paper-v2081012/file.html.

[35] Requirements for protection of stock watering based on findings contained in: (a) *Salt and Nutrients: Literature Review for Stock Drinking Water Final Report*. Prepared for CV-SALTS by Kennedy-Jenks, May 20, 2013; (b) *External Peer Review of a Proposed Basin Plan Amendment to Address Beneficial Uses for Groundwater at the Royal Mountain Mine Site, Calaveras County*. Memorandum from Kerry Rood (Utah State University) to Gerald Bowes (Manager Cal/EPA Scientific Peer Review Program). November 23, 2012.

provide reasonable protection of existing AGR uses and that a site-specific TDS value should be established.

- ***AGR Class 2***: 1,000 µS/cm < EC < 3,000 µS/cm (600 mg/L < TDS < 2,000 mg/L). Groundwater quality in the production zone that may be used as an agricultural water supply is generally acceptable for stock watering and for irrigating most salt-tolerant crops; it is not generally suitable for irrigating many salt-sensitive crops, *except* as a temporary, short-term alternative when higher quality water supplies are not readily available.
- ***AGR Class 3***: 3,000 µS/cm < EC < 7,500 µS/cm (2,000 mg/L < TDS < 5,000 mg/L). Groundwater quality in the production zone that may be used as an agricultural water supply is generally acceptable for stock watering but is not generally suitable for irrigating all but the most salt-tolerant crops, *except* as a temporary, short-term alternative when higher water quality water supplies are not readily available.
- ***AGR Class 4***: EC > 7,500 µS/cm (TDS > 5,000 mg/L). Groundwater quality in the production zone that is not suitable for either stock watering or crop irrigation AGR uses unless blended with lower salinity water. Areas within this classification should be considered for AGR de-designation.

As noted above, the default assignment of a groundwater basin or subbasin to an AGR Class is based on a volume-weighted average of salinity concentrations in the production zone. Accordingly, there likely will be exceptions where localized water quality data from within a classified basin or subbasin may indicate higher or lower EC/TDS concentrations than the default thresholds of the class assigned to the waterbody. When issuing WDRs/Conditional Waivers this potential for localized variability in existing quality will be managed through either the application of the State Antidegradation Policy and the requirements of the Central Valley SNMP or potentially through development of site-specific objectives.

2.2.2 Site-Specific Approach

Each AGR classification described in Section 2.1.1 is rebuttable on a case-by-case basis, with the burden of proof falling on the discharger claiming that the specified EC/TDS limits do not provide reasonable protection of existing AGR uses, or (alternatively) that the limits are unnecessarily stringent and higher values should be applied to all or some groundwaters in the area, and that site-specific EC/TDS values should be established. Where such analyses are performed by groups representing water users in a defined area are found to be sound and approved by the Central Valley Water Board, the resulting limits would take precedence over the limits prescribed in the default classification assigned to that area.

3.0 Recommended Next Steps

It is recommended that the proposed assignment of the default AGR threshold classes for EC/TDS be deferred at this time to provide opportunity to consider the findings from implementation of the Phase I of the Salinity Management Strategy (see Attachment A-3 and SNMP Section 4.3.3.2). If the recommended AGR classes and their threshold ranges contained herein remain appropriate based on Phase I findings, the inclusion of these AGR Classes and the assignment of classes to groundwater basins/subbasin will be considered through a future Basin Plan amendment process. In the interim

salinity will be managed through the Interim Salinity Permitting Approach recommended by the Salinity Management Strategy (see Attachment A-3 and SNMP Section 4.3.3.3).