12/4/07 Bd. Mtg.
Water Recycling Policy
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Jeanine Townsend, Acting Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Comment Letter Concerning the Water Recycling Policy

This comment letter on the proposed Water Recycling Policy is submitted on behalf of the Clean Water Coalition of Northern Sonoma County. The purpose of the Coalition is to ensure that water infrastructure projects protect and preserve the natural resources, agriculture, and scenic character of Northern Sonoma County.

Clean Water Coalition member organizations include the Alexander Valley Association, Dry Creek Valley Association, the Russian Riverkeeper, Soda Rock Neighborhood Association and the Westside Association to Save Agriculture. These associations represent residents and property and business owners in rural Northern Sonoma County, with essentially all the members of the associations reliant on wells for domestic and agricultural purposes. The Dry Creek and Russian River Valleys are also the source of drinking water for local cities (Geyserville, Healdsburg and Windsor), as well as the drinking water aquifer for the over 600,000 customers of the Sonoma County Water Agency.

Political and economic driving forces for growth in utilization of treated wastewater in recycle projects are inexorable. We agree, in principle, with the values of water recycle projects. However, the potential for such projects to cause degradation of valuable agricultural soils and groundwater aquifers is large, serious, and potentially irreversible. Therefore, strict requirements for quality of treated wastewater used in reclamation projects are essential.

The potential for degradation of critical resources is highly dependent on specific conditions at the reuse site. Critical factors include the geology, soils and hydrology at the project site, quality of the groundwater, volume and distribution of recycled water, and quality of recycled water. Given the appropriateness of reuse projects can vary greatly, a standard, statewide recycle policy must be strict enough to protect water quality in the most critical cases. The policy must include the flexibility and requirement to evaluate each project on its specifics and that evaluation must be based on comprehensive data to support approval.

The draft policy does not meet these requirements. The draft policy is especially deficient in its ability to protect groundwater from contamination by recycled water irrigation projects, especially contamination by resistant microorganisms, soluble metals, and soluble organics.

The Clean Water Coalition of Northern Sonoma County is particularly versed in issue of protection of groundwater in the most critical cases. Our sensitivity is based on the proposed North Sonoma County Ag Reuse Project (NSCARP), for which a draft Environmental Impact Report (DEIR) was published by the Sonoma County Water Agency in March, 2007. This project involves the potential use of recycled wastewater from the Santa Rosa Subregional Reclamation System for agricultural water applications including irrigation and springtime frost (and heat) protection on 21,000 acres in the Alexander, Dry Creek and Russian River Valleys. These valleys contain primarily sandy, gravelly alluvial deposit soils overlaying shallow, high quality groundwater aquifers. Protection of these resources is critical to the future of the Russian River watershed. These valleys also include salmon-spawning creeks, with the added concern of surface water contamination from overflow or use of wastewater for springtime frost protection.

Our analysis of the DEIR concludes that it lacks the site=specific and technical analyses needed to support its prediction that NSCARP will result in less-than-significant impacts to local water resources. In fact, an independent Hydrogeologic Study commissioned by the Alexander Valley Association and the Soda Rock Neighborhood Association concludes that "water quality impacts to local groundwater supplies as a result of NSCARP would significantly violate non-degradation policies at both the State and Federal levels". A copy of this study, Potential Water Quality Impacts Associated with the Implementation of the North County Agricultural Reuse Project in the Alexander Valley, by Nicholas M. Johnson, PhD, RG, Chg, May17, 2007, is enclosed and included by reference.

Likewise, the proposed draft Water Recycling Policy would fail to protect the high quality, shallow groundwater aquifers of the Northern Sonoma County agricultural valleys from contamination as a result of NSCARP or other irrigation recycle projects. The draft policy does not include the requirement to evaluate the site-specific impacts of a particular project based on comprehensive data. And, the draft policy is deficient in its ability to protect groundwater from recycled water irrigation projects, especially contamination by resistant microorganisms, soluble metals, and soluble organics.

Our specific comments on certain numbered sections of the draft policy follow in the attached document. (References are to policy numbers under "whereas" and "Therefore be it resolved".)

In summary, we find this draft Water Recycling Policy deficient in primarily two areas. First, it does not require analysis of specific conditions for each project, including especially, comprehensive geology and hydrology studies and extensive analysis of wastewater quality including soluble organics of potential concern. Second, the wastewater quality requirements for protection of groundwater from contamination by irrigation recycle projects are inadequate. Since irrigation recycle projects in the most critical areas have potential to contaminate groundwater similar to that of groundwater recharge recycle projects, the wastewater quality requirements should be based upon those in the CDPH draft regulation for groundwater recharge recycle projects.

The objective of a standard recycle policy is laudable. However, the results from a poorly drafted policy could be serious and irreversible. Strengthen the policy to protect California's water quality for generations to come.

Respectfully Submitted,

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Attachment: Comments on Certain Numbered Sections of the Draft Policy.

Enclosures:
1. Potential Water Quality Impacts Associated with the Implementation of the North County Agricultural Reuse Project in the Alexander Valley, Nicholas M. Johnson, PhD, RG, Chg, May 17, 2007.
2. Groundwater Recharge Reuse Draft Regulation, California Department of Public Health, January 4, 2007.

Attachment: Comments on Certain numbered Sections of the Draft Policy

"Whereas"

1 through 3- We agree with the principals of values of reuse. It is also true that co=location of source and use, as in urban reuse, is often the most energy efficient.

2 – The surface water contamination and other impacts of wastewater delivery system failures due to earthquakes or levee breaks is far greater than imported freshwater supplies.

4= This section downplays the need for analysis based on individual conditions. These differences in conditions (geology, soils, depth to groundwater, etc) and ability to contaminate groundwater are real and not "due to differing interpretations of similar requirements in the Regional Water Quality Control Board's Water Quality Control Plans". Political and economic driving forces must not be allowed to drive approval of projects which have the potential to irreversibly contaminate groundwater.

5 through 8- These sections focus exclusively on salts as potential contaminants. They ignore, as does the rest of the draft policy, soluble metals and organics which have the potential to cause more serious impacts. Soluble metals and organics can also be "persistent and difficult to remove". They also are "concentrated in the percolate" and eventually leach to groundwater, under some conditions rapidly.

9, 11, 12, and 24- These sections describe reasonable methods available to mitigate contamination by salts. They ignore soluble metals and organics which have the potential to cause more serious impacts and are more difficult to mitigate. In addition, they appear to presume effective Regional Board enforcement within agricultural operations which does not always occur for a variety of reasons.
These sections do not address known projects to use wastewater for springtime frost protection when the soils are already saturated. Nor do these sections address contamination of surface water.

10- Title 22 does not ensure "proper disinfection of recycled water". It depends on simple marker organisms and does not address development of resistant organisms or the ability of organisms to regenerate upon storage. Disinfection by UV irradiation is being shown to be especially short lived. Many reuse projects are finding that they need to disinfect in storage and/or prior to use in addition to in the treatment plant. The draft policy does not address this issue.

13- This conclusion is misguided. Irrigation projects using recycled water do not "generally pose a threat to water quality similar to irrigation projects using surface water or groundwater." As stated in #16, the threat depends on the specific contaminants in the recycled water source, relative to existing conditions of surface and groundwater. And, in general, levels of contaminants are significantly higher in recycled water. And, in highly porous alluvial soils with shallow groundwater aquifers, percolation of contaminants can be rapid. The policy must require analysis of specific conditions for each project.

14 through 16- We, in general, agree. However, we believe that MCL's and other recommendations provided by California Department of Public Health (CDPH) should be considered for all reuse projects not only groundwater recharge reuse projects and that the Regional Board may need to establish limitations for contaminants for which the CDPH has not established an MCL. In fact, we believe that the most critical irrigation reuse projects should be treated as though they are, indeed, groundwater recharge reuse projects. Under certain specific conditions, such as very shallow alluvial soils with no ability to attenuate salts, metals or organics and shallow, high quality groundwater aquifers, the contaminants flow to groundwater much like in a groundwater recharge reuse project. The policy must require analysis of specific conditions for each project.

17- We, in general, agree. However, these conclusions must be based on specific technical studies. Some soils, such as sandy, gravelly alluvial deposits, attenuate few contaminants, resulting in a direct discharge to groundwater. We refer to the Alexander Valley study as an example (Potential Water Quality Impacts Associated with the Implementation of the North County Agricultural Reuse Project in the Alexander Valley, Nicholas M. Johnson, PhD, RG, Chg, May 17, 2007). The policy must require analysis of specific conditions for each project.

18- We, in general, agree. Under certain conditions, irrigation reuse projects could also "change the geochemical equilibrium in an aquifer".

22 and 23- The Antidegradation policies, Federal and State, and the Basin Plans are critical to protection of groundwater from reuse projects. Findings that degradation of high quality waters is "consistent with maximum benefit to the people of the state" must be based on sound data and made with reticence. Irreversible degradation of high quality groundwater aquifers may have higher long term cost than restraints on development.

25- We agree that the role of CDPH is critical to groundwater recharge projects. We refer to the Groundwater Recharge Reuse Draft Regulation (intended to become integrated into Title 22, Division 4, Chapter 3 of the California Code of Regulations) published by the CDPH in January, 2007. This draft regulation does contain the specifics necessary to protect groundwater from contamination by nutrients, salts, soluble metals and soluble organics during groundwater. (A copy of this draft regulation is enclosed and included by reference.) We believe that this draft regulation should be the model for any policy to protect groundwater from contamination by any reuse project including all irrigation reuse projects. Deviation from the requirements for recycled water quality contained therein should be the result of exemption based on specific project data.

26- We agree with the principals of value of reuse. However, the statement that these values "outweigh the costs associated with lowering of water quality by a recycled water irrigation project", even as subsequently modified with best practicable technology and failure to cause a violation of a water quality objective, is dangerous. This appears to be a blanket finding relative to the Antidegradation policy.

"Therefore Be it Resolved"

6- A lot of damage can be done to groundwater aquifers between now and 2018. Dischargers should be required to be moving toward reasonably anticipated limits for salts.

7- This section is at the heart of our concerns. These requirements are insufficient to protect groundwater from contamination from recycled water irrigation projects, especially contamination from by resistant organisms, organism regeneration, soluble metals, and soluble organics with human health and environmental impacts at low concentration. Some of the Regional Boards have already regulated beyond these requirements in conjunction with Reclamation provisions in NPDES permits. For example, Order No. R1-2006-0045, issued to the Santa Rosa Subregional Reclamation System, requires wastewater used in any reuse project to meet all the effluent limitations required for discharge into surface waters including the limits required by the California Toxics Rule and the Basin Plan. The wastewater must not leave the recycle use area in the form of surface runoff, shall not cause the degradation of any water supply, and shall not cause or contribute to a statistically significant degradation of groundwater quality. In addition groundwater quality studies are required under storage and reuse areas sufficient to ensure that groundwater degradation is not occurring. We believe that the requirements for recycle water quality contained in the CDPH draft regulation for Groundwater Recharge Reuse should be the model for requirements for recycle water quality for any reuse projects.

8-We, in general, agree. However, the applicant should be required to provide data that demonstrates that specific conditions mitigate against contamination of surface or groundwater. This should not be a conclusion by default. The policy must require analysis of specific conditions for each project.

9- We, in general, agree. However, nitrate contamination must be controlled below human health impact limits as per CDPH draft regulations for Groundwater Recharge Projects. High nitrate levels in groundwater will become a problem based on cumulative impacts of agricultural practices, past and future, high nutrient levels in some recycled water and concentration of nutrients in percolate.

10 through 15- These policies provide reasonable regulation for groundwater recharge reuse projects. They should be reviewed to ensure that they cover all the requirements contained in the CDPH draft regulation for Groundwater Recharge Reuse. In addition, since the most critical irrigation reuse projects have similar potential to contaminate groundwater they should apply to all reuse projects.

16- This policy contains inadequate requirements for quality of recycled water for irrigation reuse projects. Unless these requirements are significantly strengthened, this is an unacceptable blanket finding concerning compliance with the Antidegradation Policy.

17 and 18- We, in general, agree. Liability for contamination of groundwater should rest with the discharger for all reuse projects. These liability provisions should be included in any reclamation requirements as well as in groundwater recharge requirements.

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Potential Water Quality Impacts Associated with the Implementation of the North County Agricultural Reuse Project (NSCARP) in the Alexander Valley

An Analysis Funded Jointly by
Soda Rock Neighborhood Association
Alexander Valley Association

Prepared by
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Subject: Comments regarding March 2007 *Draft North Sonoma County Agricultural Reuse Project EIR/EIS,* prepared for Sonoma County Water Agency and U.S. Bureau of Reclamation

This letter provides comments on the March 2007 *Draft North Sonoma County Agricultural Reuse Project* [NSCARP] *EIR/EIS,* prepared for Sonoma County Water Agency (SCWA) and U.S. Bureau of Reclamation. It consists of two parts: 1) chapter-by-chapter comments and 2) an independent analysis of potential NSCARP impacts. Where applicable, this review and analysis focuses on potential water quality impacts in the Soda Rock area of southern Alexander Valley (Figures 1 and 2), for which I obtained site-specific information (e.g., well logs and water quality records; Tables 1 through 3). The conclusions are broadly applicable to similar areas of Alexander Valley.

Part 1
Comments on draft EIR/EIS

The draft EIR/EIS and its supporting documents provide little or no analysis of potential water-quality impacts relevant to existing residential and agricultural groundwater uses in Alexander Valley. As such, this review includes comments on general aspects of the draft EIR/EIS that appear related to this deficiency.

Chapter 1, Purpose and Need for the NSCARP

p. 1-3, Project Needs: The two stated needs for the project are:

1) Federal and state regulatory agencies have "expressed concerns" regarding potential impacts to fisheries resources and habitats within the Russian River and its tributaries, such that there is a need to allow water to remain in the Russian River system and its tributaries to improve habitat.
2) There is a need for infrastructure to store and distribute recycled water produced by various entities.

Neither of these project drivers are adequately explained or documented by the draft EIR/EIS. No estimate is provided for the amount or type of stream flow augmentation that may be needed to address habitat concerns. No analysis is provided to explain why local water supplies need to be augmented with recycled water. Without these explanations, the draft EIR/EIS provides an inadequate context for defining project alternatives and evaluating potential impacts.

p. 1-3, Project Purposes/Objectives: Five bulleted "purposes/objectives" are listed for the project. The first, third, and fifth are essentially redundant, i.e., that recycled water will augment irrigation water supplies and help offset the use of other water sources. The third listed purpose, "provide an environmentally responsible, long-term method of recycled water use," suggests that the project justifies itself. The second listed reason, "reduce discharges from local wastewater treatment plants to local waterways," reflects the long-standing difficulty of achieving regulatory compliance for municipal wastewater releases to the Russian River.

Despite years of study and effort, a comprehensive regional solution for municipal wastewater disposal has not been achieved. Thus, this would seem to be the primary driver behind NSCARP. However, the draft EIR/EIS does not document the history or nature of this underlying project justification. Unlike the rather speculative and poorly defined aquatic habitat issue, the issue of municipal wastewater disposal could be fully explained and quantified as a justification for the project.

p. 1-2, Project Alternatives: The evaluated project alternatives do not address alternative means for municipal wastewater disposal, nor do they address alternative means for augmenting aquatic habitat (e.g., reducing diversions through reduced water use). Other than the no-project alternative, the proposed project alternatives are simply subsets of the overall NSCARP project. The project alternatives are defined and evaluated only by their capacity to use recycled water, which is simply a form of project self-justification.

p. 1-5, Need for the Project: The use of recycled water elsewhere in California is touted as a project justification. Although SCWA "believes the use of recycled water…would benefit fisheries in the Russian River watershed", no analysis is provided to support this belief or quantify this potential benefit. This potential benefit is defined simply as "more operational flexibility."

The introduction of the draft EIR/EIS states categorically that NSCARP "would not result in additional water being available for other uses because existing reservoir storage capacity, water rights, and flow requirements would not change." A detailed explanation for this assurance is not provided or discussed elsewhere in the draft EIR/EIS. If existing water rights are not being fully exercised due to current periodic supply and/or demand limitations, then it seems that increased water use could occur as a result of NSCARP. Additionally, some of the parcels proposed for recycled-water irrigation are not presently irrigated (see p. 3.8-33, last full ¶), and thus represent a potential for increased water use.

It should be noted that SCWA plays several roles in regard to NSCARP: project applicant; EIR/EIS author; lead environmental agency; and both regional water purveyor and wastewater disposer.

Chapter 2, Project Description

p. 2-8, Current Land Uses, Alexander Valley: Residential parcels are not acknowledged as a type of land use within Alexander Valley; the only types of land use identified are agricultural. Thus, this portion of the draft EIR/EIS implicitly excludes consideration of potential impacts to the rural residents of Alexander Valley.[1]

p. 2-9, Water Sources for Current Land Uses: The listed types of water use are "municipal, industrial, and agricultural"; rural residential use is not acknowledged. The current types of water sources within the project area are listed, but "the contribution from each of these sources has not been quantified" as part of the draft EIR/EIS. It seems highly unreasonable that the project is

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[1] The existence of small water systems in the project area is briefly acknowledged in Section 3.12.1 (pp. 3.12-1 to -2).

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justified by a purported need for additional water supplies, yet the nature of the existing water supply is left uncharacterized.

p. 2-10, Total Available Supply of Recycled Water to NSCARP – Future Supply: Compared to the poorly defined need for water, the draft EIR/EIS does detail the capacity of NSCARP to dispose of recycled water. The initial supply of recycled wastewater is expected to be about 7,200 acre-feet/yr (ac-ft/yr). However, by 2020 an estimated 8,500 ac-ft/yr of additional recycled water will require disposal. The draft EIR/EIS states that NSCARP will be able to handle a large portion of this increase (about 5,800 ac-ft/yr), given its expected capacity of 13,000 ac-ft/yr. This aspect of the project description is consistent with its justification in terms of wastewater disposal.

p. 2-11, Potential Users of Recycled Water – Agricultural: The proposed project assumes that 21,500 acres of agricultural lands could use recycled water for agricultural purposes, of which 31 percent are within Alexander Valley (Table 2-4), requiring about 4,600 ac-ft of local seasonal storage (Table 2-5). Given NSCARP's planned total storage and delivery of 13,000 ac-ft/yr (p. 2-10), this amounts to an average application rate of 0.6 ft/yr (7 inches/year). In part 2 of this letter I estimate that vineyards require about 14 inches/year (in/yr) of irrigation in southern Alexander Valley. Thus, the proposed acreage appears to be more than adequate for the expected supply of recycled water.

Two vineyard and winery groups have "expressed interest" in participating in NSCARP. However, the draft EIR/EIS does not characterize their potential use or need for recycled water.[2] The draft EIR/EIS does not explain or evaluate the expected incentive for agriculture to use recycled water, and thus creates some uncertainty whether or not the project is justified by the need for additional water supply.

p. 2-12, Potential Users of Recycled Water – Environmental: The draft EIR/EIS does not quantify or describe in detail the potential environmental benefits of NSCARP, despite this being a primary justification for the project. However, a rough estimate is possible from the provided information. The NSCARP yield of 13,000 ac-ft/yr is equivalent to a continuous flow of 18 cubic feet per second (cfs). According to Table 2-1 of the draft EIR/EIS, annual minimum monthly flows average 187 cfs for the Russian River at Healdsburg (11,300 ac-ft/month) and 81 cfs for Dry Creek below Warm Springs Dam (4,900 ac-ft/month). Thus, the average yield of NSCARP would represent either about 10 percent of the river's average dry season flow or roughly 20 percent of Dry Creek's average dry season flow. The draft EIR/EIS does not characterize the implementation or potential significance of such concepts.

p. 2-13, Basis for Alternatives: The criteria used by SCWA to screen potential NSCARP alternatives are consistent with an assumption that recycled water needs to be used, with a condition that it not be discharged directly to the Russian River or its tributaries. Alternatives are not defined more broadly and do not consider alternate means for achieving the stated project objectives, i.e., enhance aquatic habitat, ensure long-term sustainable water supplies, and comply with regulations limiting wastewater discharge to the Russian River.

p. 2-17, Preferred Alternative: The preferred, "environmentally superior" project is the entire NSCARP as originally proposed, consistent with the self-justifying nature of the project's stated need and purpose.

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[2] Note that water use by wineries generates an additional wastewater stream.

p. 2-19, 1st ¶, last sentence: The draft EIR/EIS contains insufficient analysis to support or elaborate on the vague claim that NSCARP will provide "an opportunity for better management of regional water resources."

pp. 2-47 to -48, Section 2.2.2, Alternative 1 – No Project: The rationale given for rejecting the no-project alternative exemplifies a sense of NSCARP's self-justification: "The concern is that the projected supply of [recycled] water would be greater than the projected demands… [and this] would result in greater demand for [other] recycled water disposal options." This statement demonstrates that other recycled water disposal options should be considered among the project alternatives.

Section 3.8, Environmental Issues, Hydrology and Water Quality

p. 3.8-2, Physical Setting, Regional Groundwater: The draft EIR/EIS makes the following statements regarding groundwater conditions in the project area:

- "Groundwater recharge in the study area generally occurs in upland areas adjacent to groundwater basins." However, such upland recharge may be limited by relatively low bedrock permeability in some areas, such as serpentine, graywake, basalt, siltstone, and shale along the southern margin of Alexander Valley (Figure 3).
- "Groundwater discharge occurs mostly along the major trunk streams." Where upland recharge is limited, however, the groundwater recharge needed to replenish pumped alluvial aquifers probably derives from percolation along the Russian River. A recent study of Alexander Valley groundwater by the United States Geological Survey (USGS) concluded that groundwater quality is influenced significantly by percolation from the river: the "similarity in ionic composition [between groundwater and the river] suggests that recharge to most wells, particularly wells that are less than 200 ft total depth and perforated in Quaternary alluvial deposits, may be a combination of infiltration from precipitation and seepage from the Russian River and its tributaries" (Metzger and others, 2006, p. 50).[3] Of the 12 completed wells in the Soda Rock area reviewed for this memorandum, the average depth is only 110 ft, ranging from 50 to 240 ft.
- "There is a potential increase for groundwater levels throughout the groundwater basins." This seems to say that there is sufficient aquifer capacity for increased groundwater levels as a result of reduced pumping and reduced diversions. This has not been demonstrated on a site-specific basis. Areas with shallow water levels probably exist where irrigation with imported recycled water could cause groundwater to rise to problematic levels (e.g., causing root rot, unwanted seepage, etc.).

pp. 3.8-3 to -4, Alexander Valley Groundwater Basin: The draft EIR/EIS does not reference the detailed study of Alexander Valley published by the USGS in 2006 (Metzger and others), nor does it otherwise benefit from the 25 years of groundwater level and quality data evaluated by that study.

p. 3.8-17 to 3.8-19, Table 3.8-2, Santa Rosa's Recycled Water Quality Summary: The table is missing a recycled water nitrate concentration. Table 3.12-1 (p. 3.12-2) provides a water quality summary for this same source of recycled water and includes nitrate concentration data. The nitrate concentrations of samples collected and analyzed in 2002 averaged 7.3 milligrams per liter (reported

[3] Although SCWA was a cooperating agency for the 2006 USGS study, the draft EIR/EIS does not acknowledge that study or incorporate its findings.

as nitrogen [mg/L-N]), and ranged up to 16 mg/L-N.[4] The maximum contaminant level (MCL) for nitrate in drinking water is 10 mg/L-N.

p. 3.8-23, 3rd ¶, Antidegradation Policies: The draft EIR/EIS cites the following portion of the State's non-degradation water quality policy: "Some degradation of water quality may be considered acceptable if it can be demonstrated that the NSCARP would… 'not unreasonably affect present and anticipated beneficial uses of such water'." However, the draft EIR/EIS does not acknowledge the dependence of rural residents on groundwater for their domestic water supply, and thus does not acknowledge or evaluate NSCARP's potential impact on this beneficial water use.

p. 3.8-23, 4th ¶: The draft EIR/EIS paraphrases an aspect of State policy relating to water reclamation projects: "[I]n no case may increases in chemical concentrations cause adverse impacts to groundwater resources. Nitrate levels in excess of the maximum contaminant limit for drinking water would be considered an adverse effect."[5] As discussed and analyzed later in this letter, irrigation typically results in an increased concentration of dissolved minerals in water percolating below the root zone. Thus, the quality of groundwater recharge resulting from recycled water use is generally worse than the initial quality of the recycled water. This compounds the impact to groundwater where already impacted by existing agricultural practices (e.g., fertilizers).

p. 3.8-28, CEQA Thresholds of Significance Criteria, no. 11, "Contaminate a public water supply." The groundwater supply serving the rural residential population in Alexander Valley constitutes a public water supply, as should be noted by the draft EIR/EIS.

p. 3.8-28, Alternative 1 – No Project/Action: The draft EIR/EIS rejects the no-project alternative because "there would be no offset of instream and groundwater sources with recycled water." However, the provided project background and description do not adequately establish or articulate the need for additional water, or quantify the benefit of recycled-water use in regard to such a need.

p. 3.8-33, last full ¶, Impact HWQ-4: The draft EIR/EIS states that "agricultural irrigation [using recycled water] could result in minor increases in the salinity of groundwater… Based on the quality of the recycled water, the potential for changes in salinity is minor and would not be expected to impair the beneficial uses of groundwater." The draft EIR/EIS does not provide the analysis needed to support this conclusion. Notably, the draft EIR/EIS lacks an appendix of hydrologic analysis.

Table 2 (attached) summarizes water quality data available for the Alexander Valley Acres Mutual Water Company, the City of Santa Rosa's municipal water, and three potential sources of NSCARP recycled water. The recycled water has a total dissolved mineral (or "solids") concentration (TDS) about three times greater than either the City water or the Alexander Valley groundwater, and approaches the recommended drinking water standard of 500 mg/L. When used for irrigation, the mineral concentration increases in the reduced volume of water that percolates below the root zone (i.e., some of the water is lost to crop evapotranspiration, whereas most of the minerals remain). Thus, there is a potential to impact the receiving groundwater with recharge derived from recycled

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[4] Nitrate, NO_3, is typically expressed in terms of the molecular weight of only its nitrogen component. Dividing by 4.43 converts from a nitrate concentration (mg/L-NO_3) to an equivalent nitrogen concentration (mg/L-N).

[5] Note that the sentence following this in the draft EIR/EIS is irrelevant; none of the waters in question have salinities approaching 3,000 mg/L.

water that exceeds drinking water standards. A detailed assessment of this impact, as demonstrated in part 2 of this letter, should be included in the draft EIR/EIS.

In this same paragraph, the draft EIR/EIS goes on to state: "Nitrate levels in recycled water, applied in accordance with accepted irrigation practices, are below the nitrate requirements of crops. Therefore, nitrate in recycled water would be almost entirely taken up by vegetation with minimal migration beyond the root zone." However, groundwater nitrate concentrations in southern Alexander Valley appear to be already elevated, possibly as a result of agricultural practices. As presented in the attached Table 2, nitrate concentrations as high as 2.7 mg/L-N have been detected, whereas naturally occurring nitrate concentrations are typically <1 mg/L. The NSCARP project description does not include a plan for regulating fertilizer use in order to prevent further excess nitrate loading on groundwater. There is a significant potential for irrigation with high-nitrate recycled water to further degrade domestic groundwater supplies already impacted by agriculture. Some degree of soil flushing is always necessary to prevent salt build-up in soil. The draft EIR/EIS lacks the soil water and nitrogen mass balance analyses needed to effectively evaluate this potentially significant impact.

The recent USGS study identified the potential cause-and-effect relationship between irrigation practices and the quality of Alexander Valley groundwater: "Water samples collected from several wells over a number of years suggest a progressive change in water chemistry over time. Samples spanning more than 30 years from two wells in the Lytton and Jimtown area show a trend towards higher ionic concentrations and increasing concentrations of particular constituents such as sulfate. These water-quality changes may be attributed to natural processes… or to anthropogenic impacts, such as changes in land use or irrigation practices" (Metzger and others, 2006, p. 50). The draft EIR/EIS does not make use of this 30-year data record or the findings of the USGS study.

Given that wastewater disposal is one underlying objective of NSCARP, the draft EIR/EIS should address measures needed to regulate the use and application of recycled water so as to prevent excess mineral and contaminant loading to groundwater.

pp. 3.8-33 to -34, Impact HWQ-4 (continued): The draft EIR/EIS acknowledges that "recycled water stored in the reservoirs could infiltrate into the groundwater and result in a degradation of groundwater quality and alteration in groundwater flows. The reservoirs would be compacted at the bottom and lined using a clay liner, if required. The clay lining would have a low permeability allowing for only minor infiltration of stored water to maximize the efficiency of the reservoir and prevent degradation of ground water… The amount of recycled water that might infiltrate to subsurface levels and affect the groundwater flow patterns should be negligible, particularly when compared to the overall groundwater in the NSCARP area." For a project-level EIR/EIS, this draft lacks the detailed and site-specific analyses needed to support such conclusions. The reservoir areas would be relatively large and it may be difficult or infeasible to construct adequate liners and guarantee minimal leakage. The bedrock geology of the proposed reservoir sites in the Soda Rock area includes serpentine, metagraywake, basalt, and conglomerate. Some of these rock types may be expected to have low permeabilities that may indeed retard leakage. However, site-specific evaluations are needed. The area bedrock is highly faulted and fractured, which may create pathways of preferential groundwater flow. Given that wastewater disposal is an underlying objective of NSCARP, there may be some incentive to overlook excessive reservoir leakage.

p. 3.8-34, Mitigation Measure HWQ-4: As stated in the draft EIR/EIS, this mitigation measure would implement a groundwater monitoring program *after* construction of NSCARP to help detect groundwater contamination caused by reservoir leakage. However, such a monitoring program is needed to evaluate potentially adverse trends in groundwater quality, not just maximum contaminant level (MCL) thresholds, and thus should be installed and operated *prior* to implementing NSCARP in order to establish baseline conditions. Furthermore, a groundwater monitoring program also is needed for areas using recycled water for irrigation, given the potential for the water quality impacts discussed above. Because this is a project-level EIR/EIS, it should present the designs for such monitoring systems as needed to protect groundwater from excess chemical loads associated with irrigation and reservoir leakage.

As an additional mitigation measure, the draft EIR/EIS should require a program to manage and regulate agricultural practices in order to prevent the excessive application of either recycled water or fertilizers. Some of these concerns may be addressed by mitigation measure PUB-7 (p. 3.12-20). Even then, water-quality impacts could occur because of the concentration of dissolved minerals that occurs as a result of irrigation, evapotranspiration, and soil-water flushing.

p. 3.8-36, Impact HWQ-7: As a beneficial impact, the draft EIR/EIS states that NSCARP "would increase summer flows in the tributaries of the Russian River… help maintain storage levels in Lake[s] Mendocino and Sonoma… provide more operational flexibility for SCWA… [and] not result in additional water being available for other uses because existing reservoir storage capacity and water right flow requirements would not change." The draft EIR/EIS lacks the analysis needed to quantify these potential benefits and demonstrate their feasibility and significance, particularly in light of the potential adverse water-quality impacts that may occur.

p. 3.8-36, Impact HWQ-8: The draft EIR/EIS acknowledges that groundwater mounding may occur as a result of using imported recycled water. Without explanation, it concludes that there is a low probability of adverse impacts associated with this mounding. On the contrary, site-specific assessments are needed to evaluate potential problematic high groundwater levels resulting from irrigation with imported recycled water.

p. 3.8-37, Impact HWQ-9, 1st discussion ¶: The discussion states that "any indirect discharge from agricultural irrigation with recycled water would be minimized because the application rate would be limited to the equivalent crop demand." The problems and uncertainties associated with this conclusion include: a) who would determine suitable application rates and how would they be enforced?, b) most of the dissolved mineral load would not be taken up by plants, but instead would percolate to groundwater in an even more concentrated form, and c) some flushing of the soil zone is always needed to prevent excess soil salinity.

The document's following paragraph appears to confuse potential impacts associated with reservoir spills versus reservoir seepage, and thus does not adequately address either.

Section 3.12, Environmental Issues, Public Health and Safety

pp. 3.12-1 to -2, Physical Setting, Water Use: Here the draft EIR/EIS acknowledges that small multi-user water systems exist in portions of the project area. However, the EIR lacks any detailed inventory, description, or mapping of such systems, especially in reference to potential NSCARP impacts. Furthermore, the existence of single-residence water systems is not acknowledged.

p. 3.12-3, Table 3.12-2, Summary of Chemical Constituents Detected in Recycled Water: There is an apparent discrepancy between the provided recycled water nitrate concentrations given "as nitrate" versus "as nitrogen." The provided values reflect either conversion or typographical errors, or differences in the data sets summarized.

pp. 3.12-9 to -11, re: Potential contaminants in recycled water: The draft EIR/EIS provides a reasonable summary of contaminants in recycled water with the potential to impact human health, e.g., disinfection byproducts (e.g., trihalomethanes), endocrine disrupting compounds (EDC's), xenobiotics (see also the discussion accompanying Impact PUB-10, pp. 3.12-21 to -24). The risk of many of these contaminants to human health and the environment remains uncertain. As explained by the draft EIR/EIS, disinfection byproducts are less of a concern for Santa Rosa's recycled water now that UV has replaced chlorination as the method of disinfection. However, this method of treatment is not claimed for NSCARP's other expected sources of recycled water.

p. 3.12-19 to -20, Impact PUB-7: The draft EIR/EIS erroneously equates NSCARP's use of tertiary treated wastewater with the absence of potential adverse water quality impacts. Although the California Department of Health Services (DHS) qualifies the project's proposed recycled water for the highest allowable uses, this does not ensure the absence of potential impacts or diminish the need for a technical analysis of potential impacts. The draft EIR/EIS does not acknowledge that more advanced treatment methods (e.g., reverse osmosis) can provide recycled water of significantly higher quality, as has been proposed for Livermore Valley recycling projects. Also, the degree to which the proposed methods of treatment will address the uncertainties posed by various emerging contaminants (e.g., EDC's and xenobiotics) is not specified.

The draft EIR/EIS does acknowledge that "irrigation with recycled water could contribute to loading of specific constituents to groundwater supplies in the vicinity of irrigation sites." The draft EIR/EIS expects that soil processes such as adsorption and filtration will sufficiently mitigate these potential impacts. However, processes such as adsorption and filtration can be ineffective in the highly permeable river alluvium that underlies much of the project area.

The draft EIR/EIS cites a previous study that assessed the risk to human health from recycled water use similar to the proposed project (Parsons Engineering Science, 2003). It concluded that irrigation of agricultural land with recycled water would not present a health risk. My review of this document did not reveal either the soil-water and chemical mass balances or fate-and-transport analyses needed to support this claim. The exposure pathways that need to be evaluated to address potential water quality impacts to domestic groundwater supplies include: 1) the transport of contaminants to groundwater in percolating recharge derived from recycled water irrigation, 2) the discharge of groundwater adversely impacted by recycled water use into the Russian River upstream of the Soda Rock area, followed by the percolation of this impacted water into the aquifer in the vicinity of Soda Rock in response to pumping-induced gradients, and 3) plumes of recycled water originating from reservoir seepage.

Chapter 4, Cumulative Impacts

pp. 4-13, Hydrology/Water Quality: The draft EIR/EIS states that "Implementation of the NSCARP has the potential to degrade groundwater quality." However, as discussed in this memorandum, the scope and level of analysis provided by the draft EIR/EIS does not provide adequate confidence that these impacts will be mitigated to less than significant levels.

Part 2
Independent Impact Analysis

As discussed in part 1 of this letter, the draft EIR/EIS lacks the site-specific and technical analyses needed to support its prediction that NSCARP will result in less-than-significant impacts to local water resources. Part 2 of this letter presents an independent analysis of potential water quality impacts associated with the implementation of NSCARP in Alexander Valley (Figure 1). This analysis is directed particularly at the Soda Rock area along the valley's southeastern margin (Figure 2), for which existing groundwater users provided me with site-specific information. The conclusions are broadly applicable to similar areas of Alexander Valley, however.

NSCARP

As described in its draft EIR/EIS, NSCARP would convey, store, and distribute recycled water across a large area between Santa Rosa and Cloverdale. In the Alexander Valley area, nearly 11,000 acres could be irrigated (Figure 1). Most of this area is currently irrigated with groundwater and/or river diversions, and some of the proposed area currently is not irrigated.

NSCARP also proposes 1,820 acre-feet (ac-ft) of reservoir storage for recycled water in the hills southeast of Soda Rock (Figures 1 and 2).

The recycled water will be disinfected but contain a dissolved mineral content about three or more times greater than Santa Rosa city water, the Russian River, or some local groundwater (Table 2). Some recycled water quality parameters will approach and/or exceed drinking water standards (e.g., nitrate, nitrite, copper, zinc, total minerals). Additionally, relatively high levels of various unregulated contaminants are indicated by the elevated concentration of total organic carbon in the recycled water.

Local Groundwater Conditions

Figure 3 is a geologic map of southeastern Alexander Valley. The valley's alluvial fill forms the area's principal groundwater aquifer. The alluvium has a maximum thickness of 150 ft. Its gravel zones yield up to 1,000 gallons per minute (gpm) to shallow area wells.

The Glen Ellen Formation (also referred to as the Wilson Grove Formation) underlies portions of the valley and bounding hills and serves as a deeper aquifer zone for some area wells.

Other aquifer zones occur in weathered volcanic rock beneath the hillslopes immediately southwest of Alexander Valley.

Table 3 summarizes information for 13 area wells. Most of the wells on the valley floor are less than 100 ft deep, whereas wells in the adjacent hills range between about 100 to 250 ft deep.

A recent study by the United States Geological Survey (USGS) investigated groundwater conditions in Alexander Valley (Metzger and others, 2006). Figures 4 and 5 provide the study's plots of groundwater levels and electrical conductivity[6] in southeastern Alexander Valley. The study concluded the following:

- Groundwater quality is influenced significantly by percolation from the river. The "similarity in ionic composition [between groundwater and the river] suggests that recharge to most wells,

[6] An indirect indication of total dissolved mineral concentration.

particularly wells that are less than 200 ft total depth and perforated in Quaternary alluvial deposits, may be a combination of infiltration from precipitation and seepage from the Russian River and its tributaries" (p. 50).

- A potential cause-and-effect relationship exists between irrigation practices and the quality of Alexander Valley groundwater. "Water samples collected from several wells over a number of years suggest a progressive change in water chemistry over time. Samples spanning more than 30 years from two wells in the Lytton and Jimtown area show a trend towards higher ionic concentrations and increasing concentrations of particular constituents such as sulfate. These water-quality changes may be attributed to natural processes...or to anthropogenic impacts, such as changes in land use or irrigation practices" (p. 50).

Thus, groundwater is already influenced by the Russian River and local agricultural practices, both of which would be significantly altered by NSCARP. As stated previously in part 1 of this letter, the draft EIR/EIS did not incorporate any of the findings of the recent USGS study.

Estimated Soil-Water Balance for Native and Irrigated Conditions

Tables 4 and 5 present estimated soil-water balances for native and irrigated conditions, respectively, in southeastern Alexander Valley. These results are summarized by the flow chart diagrams in Figure 6.

Under native conditions, mean annual rainfall of approximately 42 inches per year (in/yr) contributes to 22 in/yr of evapotranspiration and 20 in/yr of total unit streamflow (Table 4 and Figure 6a). This value of unit streamflow is consistent with the regional precipitation-streamflow relation presented in Figure 7. Total streamflow consists of both storm runoff (estimated to be 13 in/yr) and baseflow derived from groundwater recharge and discharge (estimated at 7 in/yr).

The average annual evapotranspiration of area vineyards is estimated to be 35 in/yr, requiring 14 in/yr irrigation (Table 5 and Figure 6b).[7] The groundwater pumped for irrigation derives from an estimated 7 in/yr of average annual recharge and 7 in/yr seasonal withdrawal of groundwater storage. This seasonal decline in groundwater storage is evident from the seasonal fluctuations in the groundwater levels shown in the hydrographs plotted in Figure 4. These seasonal declines in groundwater storage are replenished by percolation along the Russian River, as indicated by the seasonal downstream loss of Russian River flow between Cloverdale and Healdsburg (Figures 8 and 9).

Instead of pumping groundwater, NSCARP would use 14 in/yr of recycled water imported from outside Alexander Valley to irrigate area vineyards (Figure 6c). In this case groundwater levels would increase, resulting in increased groundwater discharge to the Russian River and little or no seasonal percolation of river water into the aquifer.

Potential Water Quality Impacts

Under current conditions, rainfall recharge (which has a TDS concentration of nearly 0 mg/L) and irrigation with groundwater results in groundwater TDS concentrations ranging from about 70 to 250 mg/L. It is reasonable to anticipate that much greater concentrations of minerals will accumulate in groundwater as a result of irrigation using recycled water.

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[7] Similar to the previous estimates of others, e.g., California Department of Water Resources, 1986.

Although most of the recycled water used for irrigation would be lost to evapotranspiration, most of the minerals and other chemicals dissolved in the recycled water would remain in the soil and dissolve into percolating rainfall recharge during the wet season. Because the estimated rate of recharge (7 in/yr) is only half the rate of recycled water irrigation, the resulting concentration of minerals and chemicals in the recharge water would be at least twice that of the recycled water.

Existing groundwater has an average TDS concentration of about 150 milligrams per liter (mg/L) (Table 1; Figure 17), whereas the recycled water TDS averages about 450 mg/L (Table 2). Dissolving the recycled-water mineral load into groundwater recharge percolating to the water table would result in a TDS concentration of more than 1,000 mg/L (i.e., [2 × 450 mg/L] + 150 mg/L). This would exceed both recommended and enforceable drinking water standards for TDS (500 and 1,000 mg/L, respectively; Table 2), and thus constitute significant groundwater quality degradation.

Similarly, existing groundwater has a nitrate (as nitrogen) concentration averaging less than 2 mg/L-N (Table 1), whereas recycled water has a nitrate concentration averaging more than 7 mg/L-N. Dissolving the recycled water nitrate load into groundwater recharge could result in a concentration of more than 15 mg/L-N, exceeding the nitrate drinking water MCL of 10 mg/L-N. Depending on the extent to which vineyard fertilizer use is modified, some of this nitrate could be taken up by plants.

Other elevated constituents of recycled water that could become concentrated in groundwater recharge in excess of water quality standards include boron (a concern for plants), copper, iron, lead, thallium, and zinc (Table 2). Additionally, various other regulated and unregulated (i.e., emerging) contaminants found in recycled water would pass into the groundwater supply at relatively high concentrations. The highly permeable gravels of the Alexander Valley alluvial aquifer have low adsorption and attenuation capacities that would not remove metals and/or other contaminants to the degree assumed by the draft EIR/EIS.

Groundwater recharge impacted by recycled water irrigation would gradually replace the existing groundwater storage. The increased recharge resulting from recycled water use would exceed the average rate of river percolation indicated by the plot in Figure 9. Thus, compared to current conditions, percolation of low-mineral river water into the aquifer would significantly diminish. Depending on the contribution of other sources of recharge (e.g., native recharge on watershed hillslopes), the recycled water could fully impact a shallow alluvial aquifer within as little as two decades (assuming a 50-ft thick aquifer with 20 percent porosity, and 7 in/yr of recharge impacted by recycled water). A lower degree of impact could be noticed much sooner.

Eventually, NSCARP's entire recycled-water mineral load would constantly discharge into the Russian River flowing through Alexander Valley. Diluting this mineral load into dry-season river flows averaging about 200 cubic feet per second (cfs) would result in roughly a 50 mg/L increase in river TDS. During drought or other proposed river-management conditions when flows decline even further, the impact would be significantly greater. Furthermore, the City of Santa Rosa is considering a project to release recycled water directly into the Russian River in southern Alexander Valley. To the extent that some wells adjacent to the river would continue to draw some of their yield from the river, the groundwater recharge derived from the river would be of worse quality than at present.

Another source of mineral loading from recycled water would be leakage from the proposed NSCARP reservoirs. As shown in Figure 3, the proposed reservoir sites overlie a heavily faulted area. Bedrock fractures associated with this faulting could contribute to significant and difficult to control reservoir leakage. This leakage would create a plume of highly mineralized water that would further impact downgradient wells.

Conclusions

This letter's review and analysis of potential NSCARP impacts strongly refutes the draft EIR/EIS conclusions that potential water quality impacts (i.e., HWQ-4 & -9 and PUB-7) are expected to be less than significant. The draft EIR/EIS fails to demonstrate a fundamental understanding of soil-water processes that concentrate chemical constituents in percolating water derived from irrigation.

Compared to the existing water resources of Alexander Valley, the recycled water provided for irrigation by NSCARP would contain significantly elevated concentrations of total minerals, nitrate, some metals, and other contaminants. As demonstrated by the analysis presented above, concentrations of these elevated water quality constituents would then approximately double in the groundwater recharge percolating down to the water table. Furthermore, increased rates of areal recharge as a result of irrigating with imported recycled water would reduce the periodic contribution of good quality recharge from the Russian River. Over time, the quality of local groundwater supplies would become significantly impacted, exceeding both recommended and enforceable water-quality standards, and significantly impacting existing beneficial uses of water. Significant increases in groundwater TDS and nitrate, resulting in concentrations greater than 1,000 and 10 mg/L, respectively, cannot be construed as "minor." Furthermore, presently unregulated, emerging contaminants could become problematic. The existing beneficial use of potable groundwater for residential water supplies – a use that is unacknowledged by the draft EIR/EIS – could become significantly limited in some areas. Based on the review and analysis presented in this letter, it is my opinion that potential water quality impacts to local groundwater supplies as a result of NSCARP would significantly violate non-degradation policies at both State and Federal levels.

Given the potential for significant water quality impacts, the limited monitoring program that the draft EIR/EIS proposes as a mitigation measure is inappropriate and inadequate. Potentially significant impacts cannot be mitigated by monitoring alone.

Lastly, the draft EIR/EIS fails to adequately consider potential cumulative impacts to water quality as a result of NSCARP and other recycled water projects proposed by the City of Santa Rosa. Recycled water has the potential to adversely impact the quality of local groundwater supplies in several ways, including a) deep percolation from irrigation, b) leakage from reservoirs, and c) both direct and indirect discharge into the river followed by percolation back into groundwater.

Thank you for the opportunity to provide these comments and this independent impact analysis regarding NSCARP and its draft EIR/EIS.

Sincerely,

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Constituent	Units	Sample Date								Avg*	Min	Max
		Jan-70	Mar-81	Sep-82	Dec-94	Oct-97	Dec-99 Oct-01	Nov-04	Aug-05 Oct-06 Nov-06			
Aluminum	ug/l				76	<50		<50		42	<50	76
Antimony	ug/l				<6	<6		<6		3	<6	
Arsenic	ug/l		<5		<2	<2		<2		1.4	<2	
Asbestos	MFL				<0.2	<0.2		<0.2		0.1	<0.2	
Barium	ug/l		110		205	180		<100		136	<100	205
Beryllium	ug/l				<1	<1		<1		0.5	<1	
Bicarbonate (HCO3)	mg/l	60		150	161					124	60	161
Cadmium	ug/l		<1		<1	<1		<1		0.5	<1	
Calcium	mg/l	18		27	26			18		22	18	27
Carbonate Alkalinity	mg/l				<1			<1		0.5	<1	
Chloride	mg/l	9.2		3.1	8.1			5.5		6.5	3.1	9.2
Chromium	ug/l		<5		<10	<10	1.3			3.5	1.3	
Color	units			5	<3			3		3.2	<3	5
Copper	ug/l			<50	<50	<50		<50			<50	
Fluoride (F)	mg/l	<0.02			0.1	0.1		0.32		0.1	<0.02	0.32
Foaming Agents (MBAS)	mg/l				<.02			<.05		0.02	<.02	
Hydroxide Alkalinity	mg/l				<1			<1		0.5	<1	
Iron	mg/l	0.33		<0.1	<0.1			<0.1		0.1	<0.1	0.33
Lead	ug/l		<10		<5	<5					<5	
Magnesium	mg/l	6.3		11	18			18		13	6.3	18
Manganese	mg/l	<0.05		<0.05	<0.03			<0.02			<0.02	
Mercury	mg/l		<1		<0.2	<1		<1			<0.2	
Nickel	ug/l				<10	<10		<10			<10	
Nitrate (as N)	mg/l	0.25	1.2		2.7	1.5			1.6	1.4	1.1	2.7
Nitrite (as N)	mg/l				<0.4	<0.4		<0.4		0.2	<0.4	
Odor Threshold @ 60 C	units			1.0	<1			<1		0.7	<1	1.0
pH	units	9.1		7.5	7.0			7.4		7.8	7.0	9.1
Potassium	mg/l				0.9					0.9		
Radioactivity-gross alpha	pC/l				1.0		0.73		0.61	0.8	0.61	1.0
Radium 228	pC/l								0.1	0.1		
Selenium	ug/l		<5		<2	<5		<5			<2	
Silver	ug/l		<1		<10			<10			<1	
Sodium	mg/l			7.0	10.6	9.9		10		9.4	7.0	10.6
Specific Conductance	µS/cm	220		280	310			280		273	220	310
Sulfate	mg/l	13		13	17			15		15	13	17
Thallium	ug/l				<1	<1		<1			<1	
Total Alkalinity	mg/l	66		120	132			120		109	66	132
Total Dissolved Solids	mg/l	120		76	187			150		133	76	187
Hardness (as CaCO3)	mg/l	70		110	140	160		120		120	70	160
Turbidity	JTU/NTU	<5		0.13	0.28		0.37	0.12		0.2	0.12	0.37
Zinc	ug/l			70	69			<50		55	<50	70

*Averages computed by substituting one-half the detection limit for non-detected values.

Table 1
Alexander Valley Acres Mutual Water Company Water Quality Test Results

Constituent	Units	Alexander Valley Acres Mutual Water Co. 1970-2006[a]			1951-1966 Russian River at Healdsburg[b]			Santa Rosa City Water 2005 Report[c]			Recycled Water: Santa Rosa 2002[d]			Recycled Water: ALWSZ 2005 sample[d]	Recycled Water: Windsor 2005 sample[d]	California Title 22 Drinking Water Standard	
		Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Mean	Med	Max			Primary	Secondary[e]
1,4 Dichlorobenzene	µg/L	ND						ND			0.34	ND	0.6			5	
Aluminum	µg/L	42	<50	76				ND			32	20	150			1,000	50 - 200
Amonia	mg/L-N							ND			0.6/2.6	-	12			-	
Antimony	µg/L	3	<6					ND								6	
Arsenic	µg/L	1.4	<2					ND			1.8	ND	3			50	
Barium	µg/L	136	<100	205				ND			0.02		0.11			1,000	
Beryllium	µg/L	0.5	<1					ND								4	
Boron	µg/L				613	0	4,300	235	0	300	470		600			1,000[f]	
Cadium	µg/L	0.5	<1					ND			0.2	ND				5	
Calcium	mg/L	22	18	27				-								-	
Chloride	mg/L	6.5	3.1	9.2				8.6	5.1	24				123	90	-	250 500 600
Chlorine	mg/L							0.51	0.01	0.99	0.11					4	
Chromium	µg/L	3.5	<5	5				ND			0.92	ND				50	
Color	units	3.2	<3	5				0.27	0	3						-	15
Copper	mg/L		<50					1.9	0	9.8	**8.6**	**9.5**	**14**			1[f]	1
Cyanide	µg/L							ND			4.4	3	16			150	
Endosulfan II	µg/L							ND			0.03	ND	0.08			-	
Fluoride	mg/L	0.13	<0.02	0.32				0.13	0	0.19	0.2		0.2			2	2
Gamma-BHC	µg/L							ND			0.02	ND	0.02			-	
Halocetic acids	µg/L							3.1	1.6	4.1						60	
Hardness	mg/L	120	70	160				98	41	143				138	140	-	
Iron	mg/L	0.12	<0.1	0.33	0.01	0	0.03	<0.1						0.1	<0.1	-	0.3
Lead	µg/L		<5					ND			1.9	ND	5.8			15[g]	
Lindane	µg/L							ND			0.02		0.02			0.2	
Magnesium	mg/L	13	6.3	18				-								-	
Manganese	mg/L		<0.02					0.01	0	0.075						-	0.05
Mercury	µg/L		<0.2					ND			0.09	ND				2	
Nickel	µg/L		<10					ND			3.4	ND	7.3			100	
Nitrate	mg/L-N	1.4	1.1	2.7	0.17	0.00	0.54	ND			**7.3**		**16**	**7.5**	**6.8**	10	
Nitrite	mg/L-N	0.2	<0.4					ND			0.18		**2.3**			1	
Odor- threshold	units	0.67	<1	1				<1								-	3
pH	units	7.8	7.0	9.1				7.9	6.9	8.7	7.4		6.0/8.2	7.8	7.7	-	6.5-8.5
Potassium	mg/L	0.9						-								-	
Rad.-gross alpha	pCi/L	0.78	0.61	1.0				0.17	0	3.5	0.98	0.15	2.9			15	
Rad.-gross beta	pCi/L							ND			10.4	10.4	10.9			50	
Radium 228	pCi/L	0.1						-								5	
Selenium	µg/L		<2													50	
Silver	µg/L		<1					ND			0.25	ND				-	100
Sodium	mg/L	9.4	7.0	10.6				15.2	7.7	40				67	100	-	
Specific conductance	µS/cm	273	220	310	244	90	344	257	240	300	**707**		**942**			-	900 1,600 2,200
Sulfate	mg/L	15	13	17	11	3	15	10.5	2.6	16				34	65	-	250 500 600
Thallium	µg/L		<1					ND			1.1	ND				-	2
Total coliform	MPN/100 ml	0						0.8% positive				<2	240	<2	<2	5% positive	
Total dissolved solids	mg/L	133	76	187	149	99	179	149	120	200	**432**		**528**	**442**	**420**	-	500 1,000 1,500
Total radon	pCi/L							165	118	340						-	
Trihalomethanes	µg/L							21	17	24						80	
Turbidity	NTU	0.23	0.12	0.37				0.17	0	0.42	0.51		2.6			-	5
Vanadium	µg/L							0.28	0	4						50[d]	
Zinc	µg/L	55	<50	70				ND			**27**	**29**	**35**			-	5

Multiple values where more than one set of statistics reported.

[a]Source: see Table 1.

[b]Source: USGS (http://nwis.waterdata.usgs.gov/ca/nwis/qw)

[c]Source: Santa Rosa Utilities Update, Special Edition, April 2006

[d]Source: draft NSCARP EIR/EIS Tables 3.8-2, 3.12-1, and 3.12-2.

[e]Three values represent "Recommended," "Upper," and "Short Term."

[f]Notification level. Boron >2,000 µg/L toxic to most plants.

[g]90th percentile.

Table 2

Water-Quality Comparison of Potable and Recycled Water Supplies

General Location*	Aquifer Type	Year Con-struct-ed	Well Type	Screened Interval (ft bgs)		Initial Depth to Water (ft bgs)	Initial Satur-ated Thick-ness (ft)	Tested Yield (gpm)	Test Dura-tion (hrs)	Depth to Water at End of Test (ft bgs)	Draw-down (ft)	Specific Capa-city (gpm/ft)	Estimated Aquifer Trans-missiv-ity (ft^2/day)	Estimated Aquifer Hydraulic Conduc-tivity (ft/day)
Valley floor between river and West Soda Rock Lane	Alluvium and Glen Ellen Formation (?)	1991	Irrigation	20	100	16	84	900					high	high
		1969	Mutual**	27	47	14	33	150	2	14	small	high	high	high
		1994	Mutual**	60	90	20	70	25	4	80	60	0.4	84	1.2
		?	Irrigation		80			500					high	high
		1993	Irrigation	14	57	15	42	60	1	15	small	high	high	high
		1978	Residential	35	55	30	25	40	1	40	10	4	802	32
		1976	Residential & Irrigation	40	160	40	120	70		42	2	35	7,019	58
East of river		1972	Irrigation	20	54	17	37							
Hillslope southwest of West Soda Rock Lane	Weathered & fractured bedrock	1980	Residential	180	240	230	10	8		240	10	0.8	160	
		1988	Residential	33	113	28	85	200	4	105	77	2.6	521	6.1
		1990	Residential	58	138	22	116	25	4	120	98	0.3	51	0.4
	Weathered volcanic bedrock	1977	Residential & Irrigation	167	187	160	27	20	4	185	25	0.8	160	
		1976	Residential	34	82	12	70	40	1.5	45	33	1.2	243	3.5

* Within groups listed in order of increasing distance downstream along West Soda Rock Lane.
** Alexander Valley Acres Mutual Water Company
bgs below ground surface
gpm gallons per minute

Table 3
Summary of Available Well Logs, Lower Alexander Valley

Water Balance Parameter		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
	(inches)												
a. Healdsburg Precipitation	8.9	7.4	5.5	2.6	1.1	0.3	0.0	0.1	0.4	2.2	5.3	8.2	42.0
b. Reference Evapotranspiration (ETo)	1.1	1.7	3.1	4.5	5.9	6.6	7.0	6.2	4.8	3.3	1.7	0.9	46.7
c. Precipitation minus Potential ET	7.8	5.7	2.4	-1.9	-4.8	-6.3	-6.9	-6.1	-4.4	-1.0	3.7	7.2	-4.7
d. Change in Soil Moisture	0.0	0.0	0.0	-1.9	-4.8	-0.3	0.0	0.0	0.0	0.0	3.7	3.3	
e. Remaining Soil Moisture	7.0	7.0	7.0	5.1	0.3	0.0	0.0	0.0	0.0	0.0	3.7	7.0	
f. Actual ET	1.1	1.7	3.1	4.5	5.9	0.6	0.0	0.1	0.4	2.2	1.7	0.9	22.2
g. Precipitation Surplus (Runoff plus Recharge)	7.8	5.7	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	19.8

Row Notes:

a. Healdsburg average precipitation, 1971-2000 (http://www.wrcc.dri.edu/summary/climsmnca.html).

b. Average of CIMIS zones 5 and 8 (www.dla.water.ca.gov/cimis).

c. Assumes native vegetation has a crop coefficient of 1.0, i.e., potential ET equals ETo.

d. Assumes available soil moisture depleted at rate needed to satisfy ET; precipitation in excess of ET replenishes soil moisture up to capac

e. Assumes soil with moderate to high available water capacity.

f. Equals ETo satisfied by precipitation and/or change in soil moisture.

g. Precipitation not needed for ET or replenishment of soil moisture.

Table 4

Estimated Alexander Valley Monthly Soil Water Balance for Native, Non-Irrigated Conditions

	Water Balance Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
a.	Healdsburg Mean Temperature (°F)	48.3	52.2	54.9	59.2	64.8	69.9	72.2	71.2	68.6	62.6	53.7	48.0	60.5
	Degrees over 50 °F	0.0	2.2	4.9	9.2	14.8	19.9	22.2	21.2	18.6	12.6	3.7	0.0	
b.	End-of-Month Cumulative Degree-Days (°F)	Vines Dormant			202	661	1,258	1,946	2,604	3,162	3,552	Vines Dormant		
c.	Estimated Vineyard Crop Coefficient **Kc**				0.15	0.21	0.39	0.55	0.66	0.71	0.73			3.4
								(inches)						
d.	Healdsburg Mean Precipitation	8.9	7.4	5.5	2.6	1.1	0.3	0.0	0.1	0.4	2.2	5.3	8.2	42.0
e.	CIMIS Zones 5 & 8 avg Reference Evapotranspiration (**ETo**)	1.1	1.7	3.1	4.5	5.9	6.6	7.0	6.2	4.8	3.3	1.7	0.9	46.7
f.	Assumed Vineyard Potential ET (**ETc** = ETo · Kc)	Vines Dormant			0.7	1.3	2.6	3.9	4.1	3.4	2.4	Vines Dormant		18.2
g.	Direct Precip. Available to Vines (assume 50%)				1.3	0.6	0.2	0.0	0.1	0.2	1.1			3.4
h.	Direct Precipitation Used by Vines				0.7	0.6	0.2	0.0	0.1	0.2	1.1			2.8
i.	Vineyard ETc Deficit				0.0	-0.7	-2.4	-3.8	-4.0	-3.2	-1.3			-15.4
j.	Direct Precipitation Not Used by Vines	8.9	7.4	5.5	1.9	0.6	0.2	0.0	0.1	0.2	1.1	5.3	8.2	39.2
k.	Dormant/Bare Soil Potential Evap. (assume 80% of ETo)	0.9	1.3	2.5	3.6	4.7	5.3	5.6	5.0	3.8	2.6	1.3	0.7	37.3
l.	Dormant/Bare Soil Evaporation Deficit	0.0	0.0	0.0	-1.7	-4.2	-5.1	-5.6	-4.9	-3.7	-1.5	0.0	0.0	-26.6
m.	Change in Soil Moisture	0.0	0.0	0.0	-1.7	-4.9	-0.4	0.0	0.0	0.0	0.0	4.0	3.0	
n.	Remaining Soil Moisture	7.0	7.0	7.0	5.3	0.4	0.0	0.0	0.0	0.0	0.0	4.0	7.0	
o.	**Vineyard Required Applied Water**	0.0	0.0	0.0	0.0	0.0	2.0	3.8	4.0	3.2	1.3	0.0	0.0	**14.3**
p.	Fallow/Bare Soil Actual ET	0.9	1.3	2.5	3.6	4.7	0.2	0.0	0.1	0.2	1.1	1.3	0.7	16.6
q.	Total ET	0.9	1.3	2.5	4.3	6.0	2.7	3.9	4.1	3.6	3.5	1.3	0.7	34.8
r.	Precipitation Surplus (Runoff plus Recharge)	8.0	6.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	21.5

Row Notes:

a. http://www.wrcc.dri.edu/summary/climsmnca.html.
b. Running sum of average daily temperature degrees (°F) above 50 °F.
c. For VSP trellis with 7-ft row spacings; adopted from Williams (2000), adjusted for estimated degree-days (Fig. 10). Assumes bud-break in early April and harvest in late September.
d. http://www.wrcc.dri.edu/summary/climsmnca.html.
e. California Irrigation Management Information System (CIMIS), average of Zones 5 and 8.
f. Assumes no deficit irrigation.
g. L. Williams/UC Kearney Agricultural Center, 2001, personal communication.
h. Portion of 50% direct precipitation needed to help satisfy vineyard ETc; lesser of rows (f) and (g).
i. Vineyard ETc not satisfied by direct precipitation; row (h) minus row (f).
j. Row (d) minus row (h).
k. Alternate assumption is 50% of ETo.
l. Dormant/bare soil potential evaporation not satisfied by direct precipitation; row (j) minus row (k).
m. Available soil moisture needed to satisfy vineyard ETc deficit; any remaining soil moisture satisfies dormant/bare soil potential evaporation deficit. Precipitation in excess of total ET replenishes soil moisture up to capacity.
n. Assumes soil with moderate to high available water capacity.
o. Vineyard ETc not satisfied by direct precipitation or soil moisture.
p. Portion of potential dormant/bare soil evaporation satisfied by available precipitation and soil moisture.
q. Vineyard ETc plus dormant/bare soil actual evaporation; row (f) plus row (p).
r. Precipitation not needed for ET or replenishment of soil moisture.

Table 5

Estimated Alexander Valley Monthly Soil Water Balance for Irrigated Vineyards

Stream	USGS Station No.	Gaged Drainage Area (mi^2)	Period of Record	No. of Whole WYs	% of Avg.	Avg Streamflow (ac-ft/yr)		Avg. Unit Streamflow (in/yr)			Average Watershed Precipitation (in/yr)			Plotted Values (in/yr) (Figure)		Remarks
						Gaged	Ad-justed	Gaged	Ad-justed	Rantz (1968)	Rantz (1968)	Rantz Map	NRCS Map	Precip-itation	Stream-flow	
1 Napa River near St. Helena	11456000	81.4	Oct-29 - Sep-32 Oct-39 - Sep-94 Oct-94 - Jan-96	58 partial	100%	67,255	68,373	15.49	15.75	14.5	43			43	15.75	Some regulation by Kimball Res. (344 ac-ft) since 1939 and Bell Canyon Res. (2,530 ac-ft) since 1959; diversions to irrigate approx. 1,500 ac.
2 Conn Ck near St. Helena	11456500	55.4	Oct-30 - Sep-59 Oct-70 - Sep-75	35	84% (1930-45 only)	24,571	29,267	8.32	9.91	8.4	37			31	9.91	Regulated by Lake Hennessey (31,000 ac-ft) since Dec-1945; diversions by City Napa since 1948.
3 Dry Creek near Napa	11457000	17.4	Apr-51 - Sep-66	15	94%	14,225	15,078	15.33	16.25	14.0	44			44	16.25	No regulation; several small diversions for irrigation.
4 Sonoma Ck at Agua Caliente	11458500	58.4	Mar-55 - Sep-81	26	94%	50,562	53,853	16.23	17.29	13.2	45			45	17.29	No regulation; diversions for irrigation of approximately 2,000 ac.
5 Petaluma River at Petaluma	11459000	30.9	Oct-48 - Sep-63	15	96%	12,318	12,805	7.47	7.77	7.0	31	26.41	29.53	28.70	7.62	No regulation or diversion.
6 Novato Ck at Novato	11459500	17.6	Oct-46 - Sep-98	52	100%	10,827	10,827	11.53	11.53	9.0	30	28.43	36.17	31.53	11.52	Regulated by Stafford Lake since 1951 (4,500 ac-ft); diversions into Lake from Russina River and out of Lake for municipal supply.
7 Corte Madera Ck at Ross	11460000	18.1	Apr-51 - Sep-93	42	99%	19,703	19,988	20.41	20.71	17.8	40	49.31	42.24	43.85	20.56	Regulated slightly by Phoenix Lake (612 ac-ft); MMWD diversions.
8 Arroyo Corte Madera at Mill Valley	11460100	4.69	Oct-65 - Sep-73 Jun-75 Sep-86	19	121%	5,790	4,795	23.15	19.17			37.73	39.27	39.27	19.17	No regulation or diversions.
9 Morses Ck at Bolinas	11460160	0.7	Jun-67 - Sep-69	2	125%	486	388	13.02	10.39			30.19	32.97	31.58	10.39	No regulation; small diversions for irrigation of 30 ac and domestic use.
10 Pine Ck at Bolinas	11460170	7.83	Jun-67 - Sep-70	3	147%	9,940	6,770	23.80	16.21			33.28	35.38	35.38	16.21	No regulation; some diversions for domestic use.
11 San Geronimo Ck at WTP		3.3	Oct-79 - Sep-82*	3	141%	5,875	4,154	33.38	23.60			51.55	44.38	47.97	23.60	No regulation or diversions.
12 San Geronimo Ck at Lagunitas Road		8.7	Oct-79 - Sep-99*	19	122%	12,883	10,573	27.77	22.79			52.54	42.45	47.49	22.79	
13 Lagunitas Ck at SP Taylor State Pk	11460400	34.3	Oct-79 - Sep-82* Jan-83 - Sep-98	18	103%	33,771	32,637	18.46	17.84	19.4	48	48.97	42.04	46.34	18.46	Regulated by Kent Lake (16,680 ac-ft), Alpine Lake (8,890 ac-ft), and smaller Bon Tempe and Lagunitas Lakes; MMWD diversions.
14 Devils Gulch at SFD Hwy		2.3	Oct-79 - Sep-82*	3	141%	4,432	3,134	36.13	25.55			47.41	37.87	47.41	25.55	No regulation or diversions.
15 Arroyo Nicasio near Pt Reyes Sta	11460500	36.6	Oct-53 - Sep-60	7	103%	29,409	28,501	15.07	14.60	14.0	38	37.60	41.58	37.80	14.83	Small diversions for irrigation.
16 Lagunitas Ck near Pt Reyes Sta	11460600	81.7	Oct-74 - Sep-98	24	106%	68,467	64,655	15.71	14.84			42.84	40.90	42.84	15.71	Regulated as at SPTSP plus Nicasio Res. (22,450 ac-ft).
17 Walker Ck near Marshall	11460750	37.1	Oct-83 - Sep-98	15	96%	25,799	26,907	13.04	13.60	15.7	40	38.07	41.34	39.80	13.60	Regulation and diversions from Soulajule Reservoir (10,570 ac-ft) since 1979.
18 Walker Ck near Tomales	11460800	40.1	Jul-59 - Sep-84	25	113%	38,051	33,821	17.79	15.81			38.21	41.04	39.62	15.81	
19 Salmon Ck at Bodega	11460920	15.7	Aug-62 - Sep-75	13	101%	17,899	17,765	21.38	21.22			40.33	44.03	44.03	21.22	
20 Big Sulphur Ck near Cloverdale	11463200	85.5	Jul-57 - Sep-72 Aug-89 - Sep-99	15 low flow	105%	138,818	132,399	30.44	29.03	28.7	52			52	29.03	Diversions for irrigation and geothermal recharge; no flows greater than 200 cfs computed since 1989.
21 Maacama Ck near Kellogg	11463900	43.4	Jan-61 - Sep-81	20	89%	59,080	66,147	25.52	28.58	25.4	56			56	28.58	No regulation or diverson upstream of station.
22 Franz Creek near Kellogg	11463940	15.7	Oct-63 - Sep-68	5	79%	16,993	21,611	20.29	25.81	16.0	42			42	20.29	
23 Dry Ck near Cloverdale	11464500	87.8	Oct-41 - Sep-80	39	101%	116,628	115,334	24.91	24.63	23.5	50			50	24.77	No regulation or diversion upstream of station.
24 Santa Rosa Creek near Santa Rosa	11465800	12.5	Aug-59 - Sep-70	11	88%	13,867	15,733	20.80	23.60	19.4	48			48	23.60	

(*MMWD records)

Notes:

USGS records unless otherwise noted (http://nwis.waterdata.usgs.gov/ca/nwis/sw).

Annual record for Napa River near St. Helena extended to 1930-1998 by correlation with Conn and Novato Creeks.

Novato Creek adjusted for reported diversions.

Conn Creek post-reservoir flows omitted from average.

Lagunitas (both stations) and Walker (Marshall) Creeks unadjusted for major diversions.

Napa, Dry, Nicassio, Morses, Corte Madera, and Big Sulphur unadjusted for minor diversions.

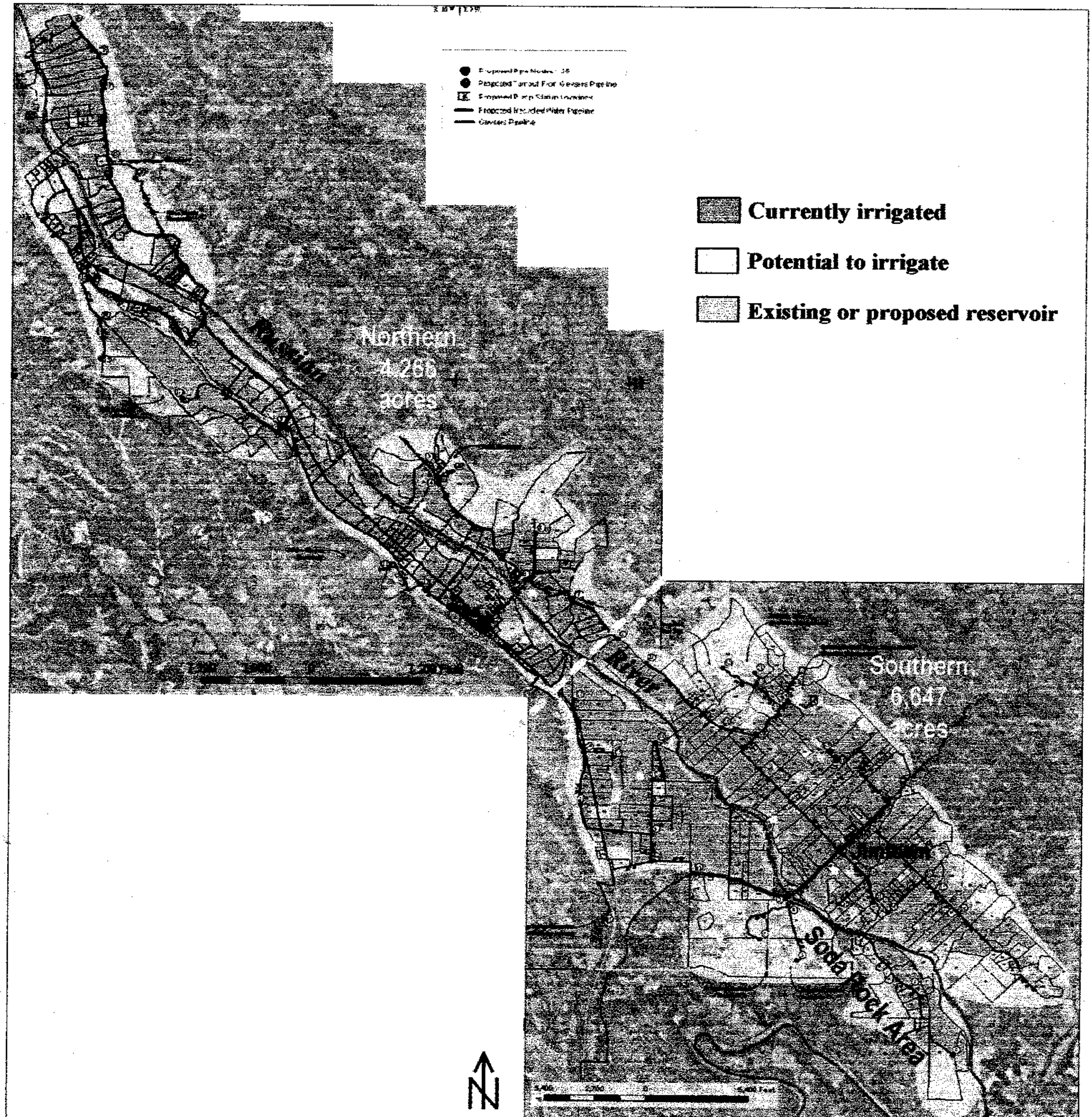
Percent of long-term average estimated from Novato Creek and Napa River records.

Precipitation values are (1) as reported by Rantz (1968, 1974), (2) measured off of Rantz (1968) map, and (3) measured off of NRCS map (Daly and Taylor, 1998).

This table is referenced by Figure 7.

Table 6

Average Streamflow and Precipitation of Selected Gaged Watersheds in the North Bay Region



Adopted from March 2007 NSCARP draft EIR/EIS

Figure 1
Land Proposed for NSCARP Irrigation, Alexander Valley

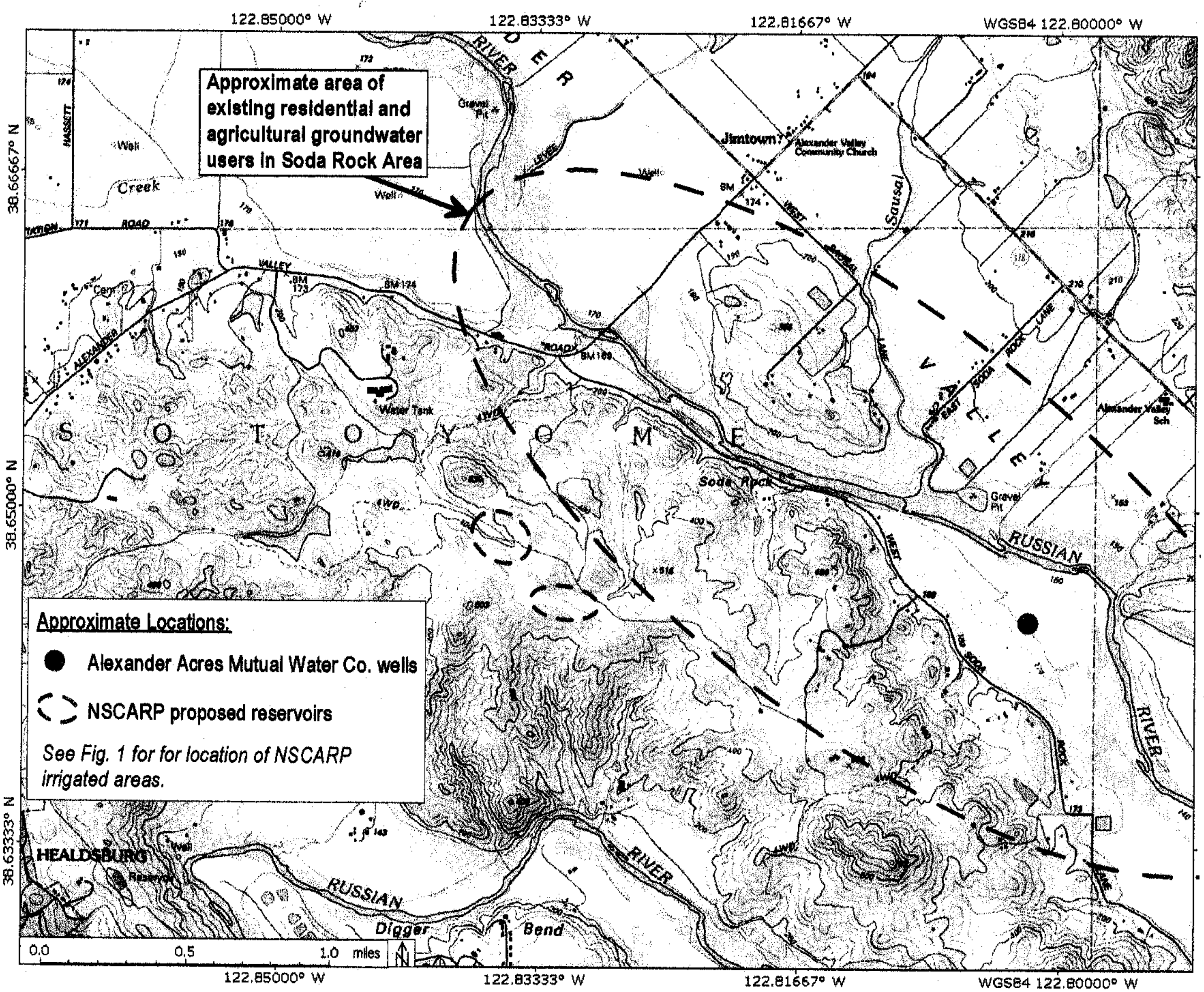


Figure 2. Southeastern Alexander Valley and Soda Rock Area

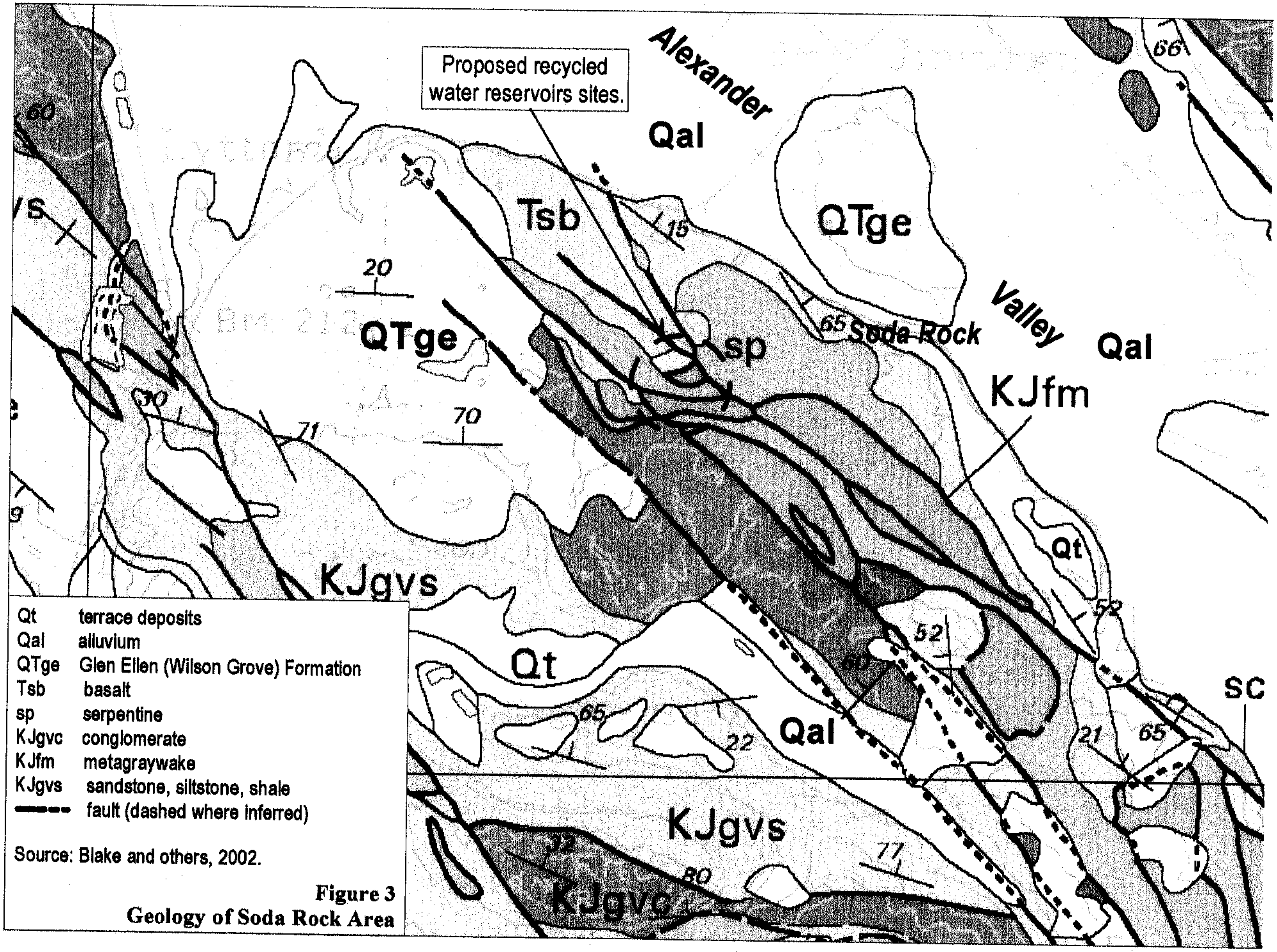
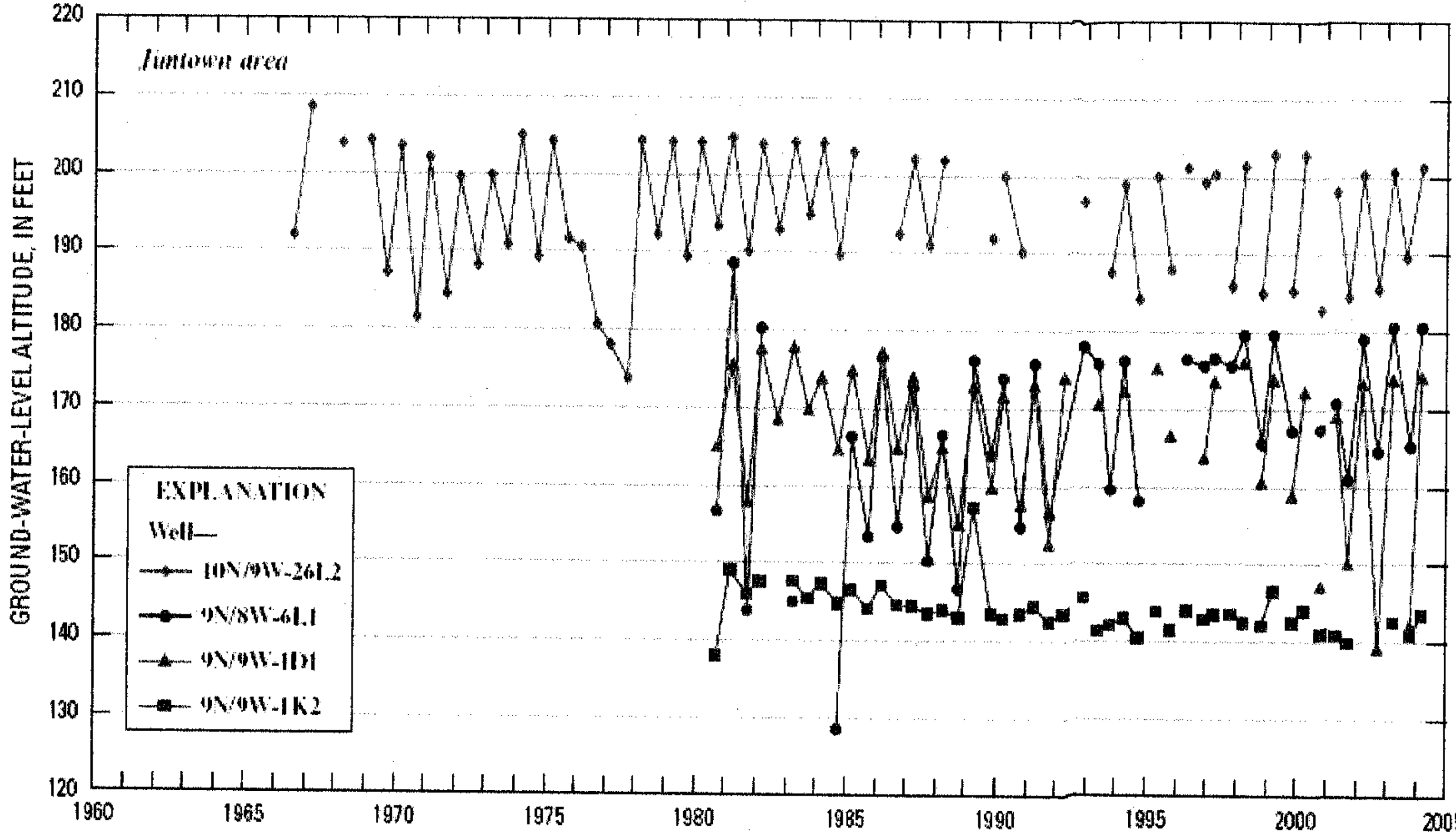
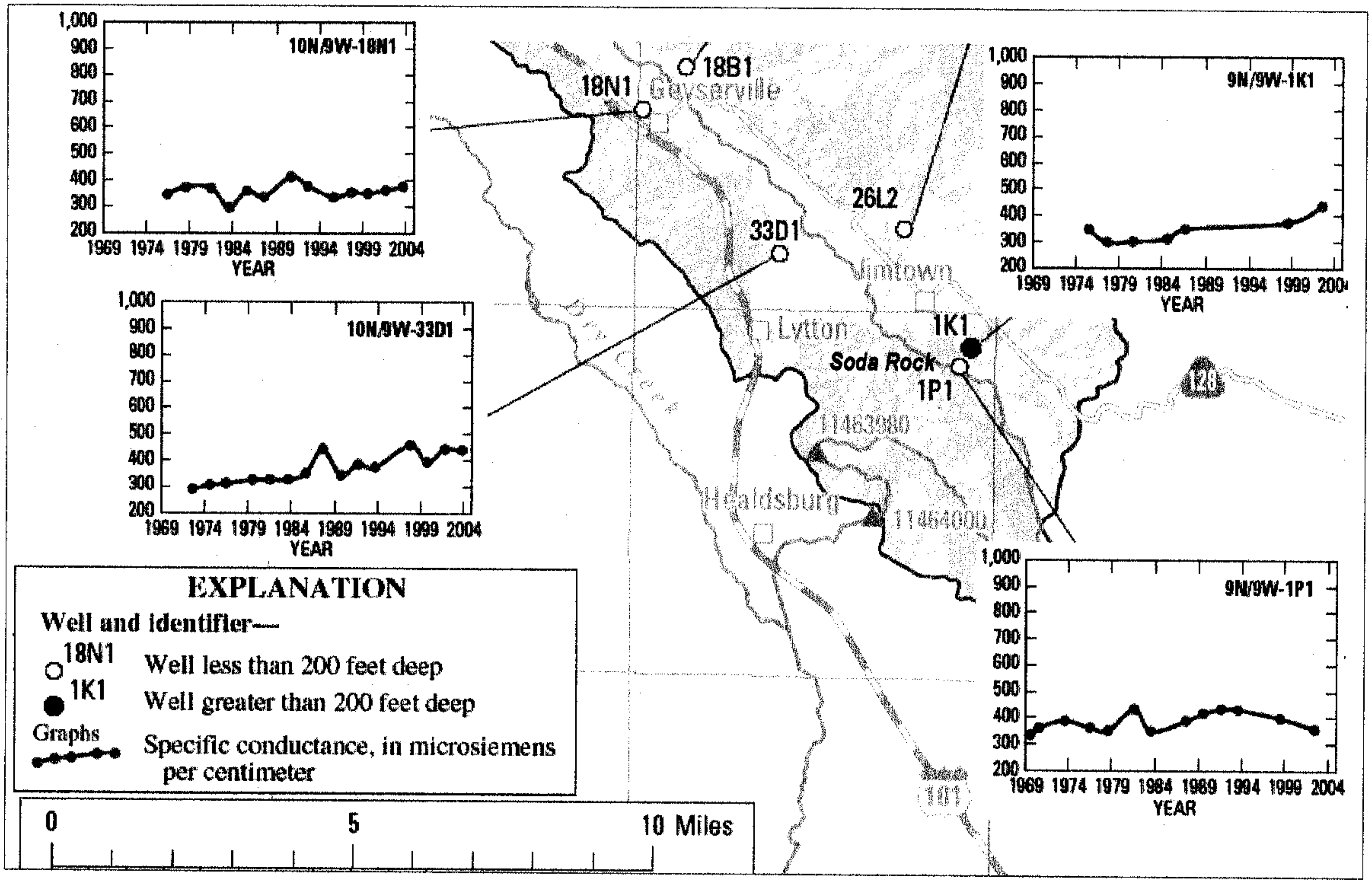


Figure 3
Geology of Soda Rock Area



Source: Metzger and others, 2006

Figure 4
Groundwater Level Hydrographs for Selected Wells in the Jimtown Area

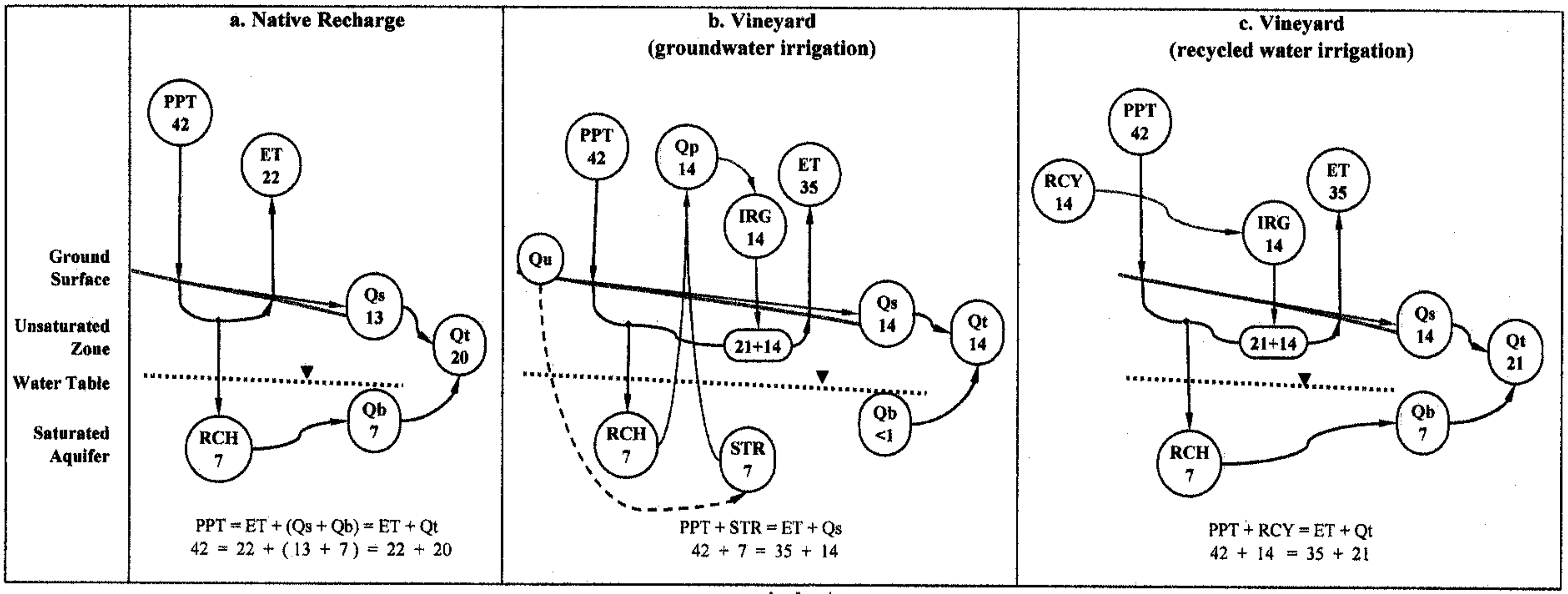


Source: Metzger and others, 2006

TDS may be estimated roughly as 0.6 x electrical conductivity.

Figure 5

Electrical Conductance of Goundwater for Selected Wells in Alexander Valley



inches/year

PPT	Precipitation		Qs	Storm Runoff		IRG	Irrigation
ET	Evapotranspiration		Qb	Stream Baseflow		STR	Withdrawl from Groundwater Storage
RCH	Groundwater Recharge		Qt	Total streamflow		RCY	Imported Recycled Water
			Qp	Well Pumpage			
			Qu	Upstream percolation and/or other regional recharge that replenishes groundwater storage.			

Assumes no net loss from irrigation inefficiencies.
Assumed total streamflow split between storm runoff and baseflow.
See Tables 4 and 5 for water balance calculations.

Figure 6
Estimated Average Annual Water Balance for Native and Irrigated Conditions

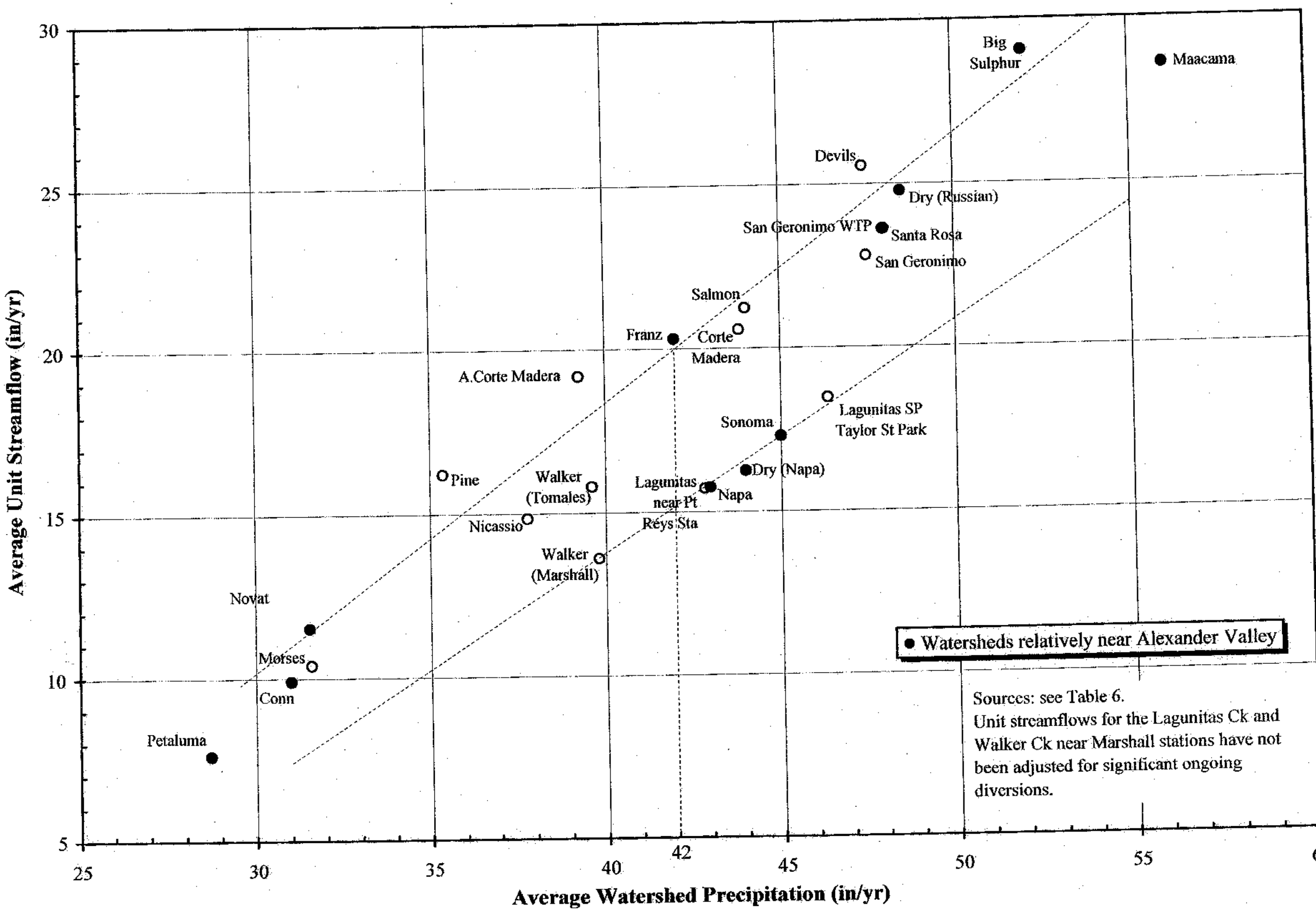


Figure 7

Estimated Precipitation-Unit Streamflow Relation for North Bay Region

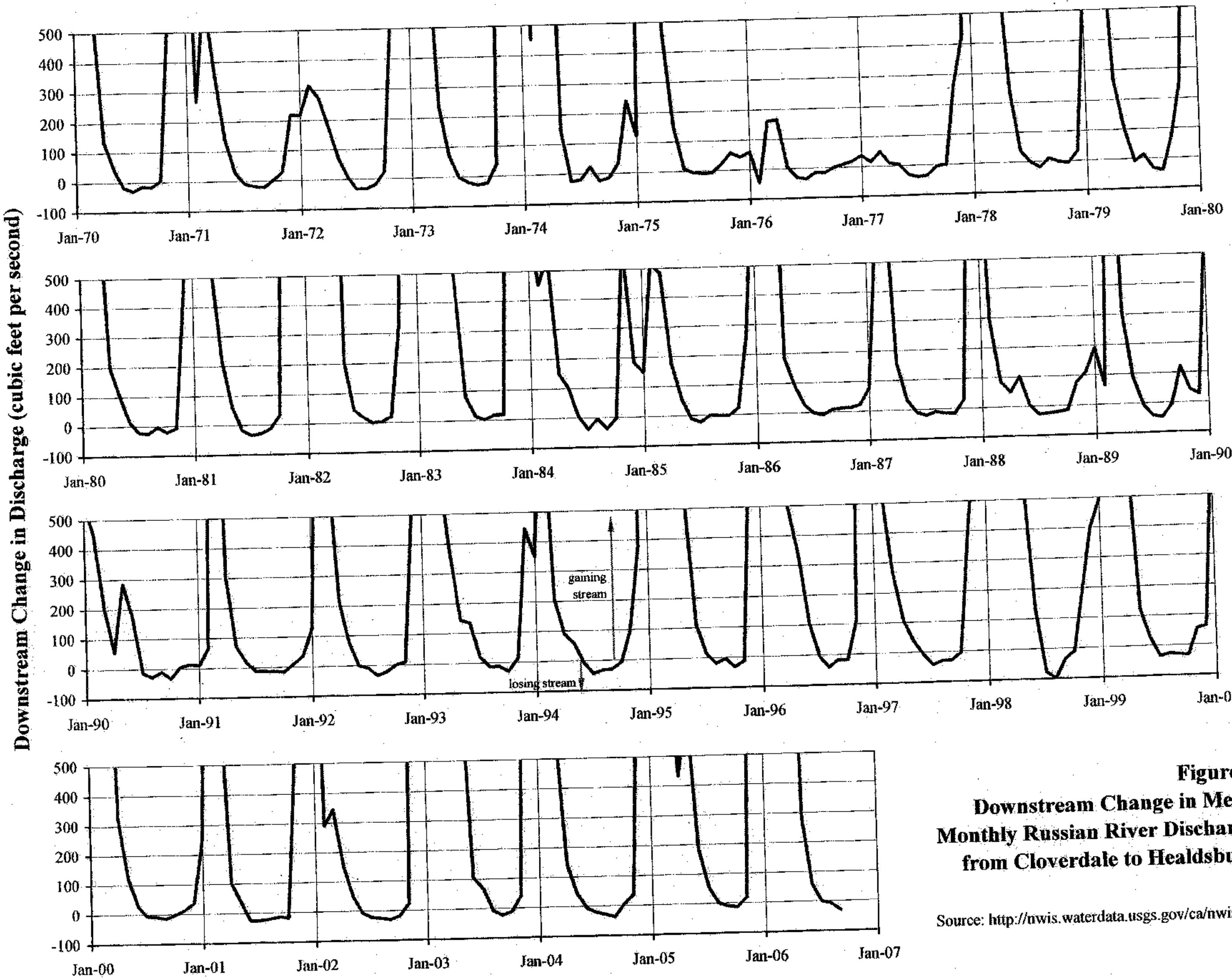


Figure 8
Downstream Change in Mean Monthly Russian River Discharge from Cloverdale to Healdsburg

Source: http://nwis.waterdata.usgs.gov/ca/nwis/sw

NM Johnson

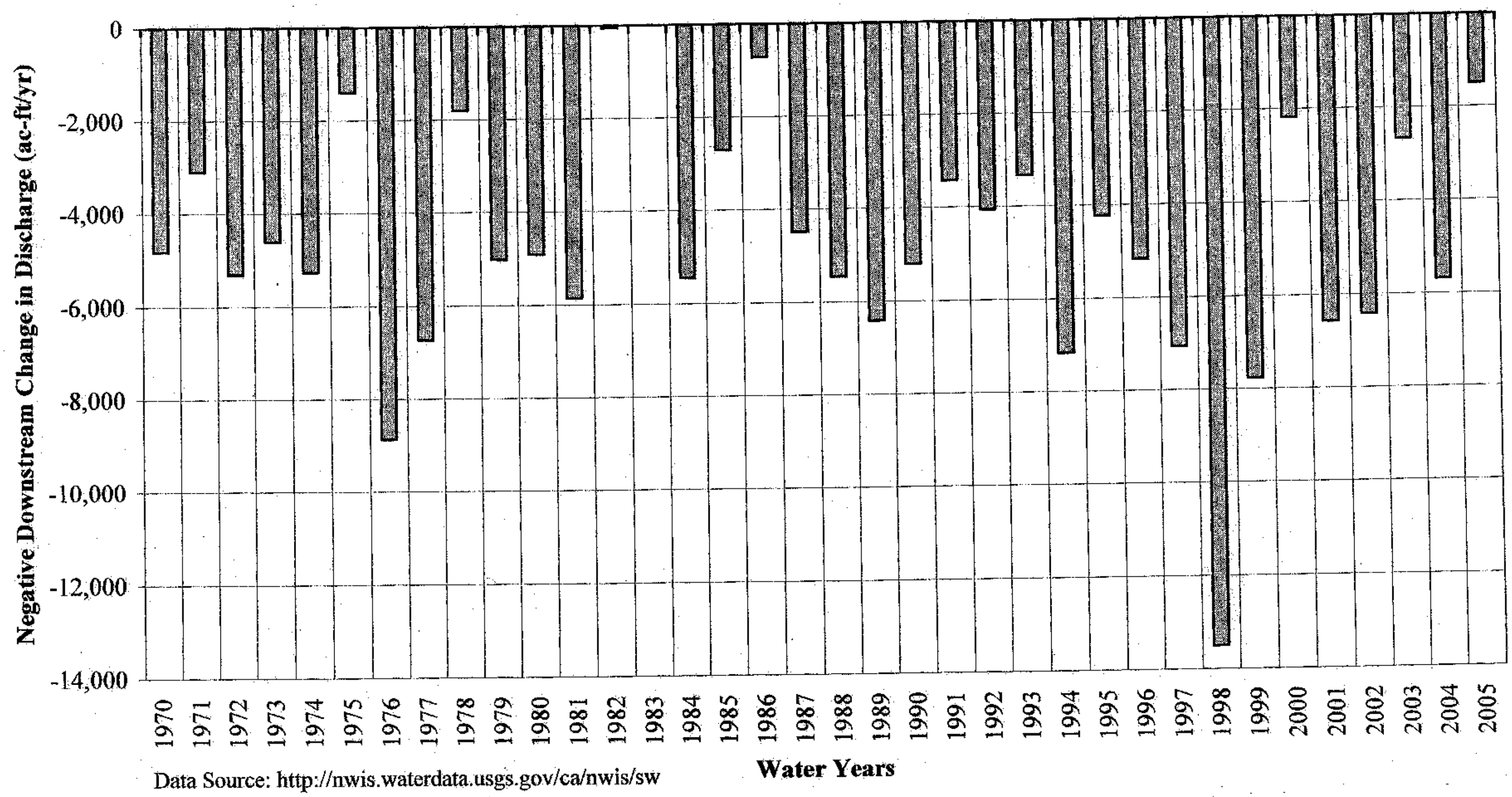
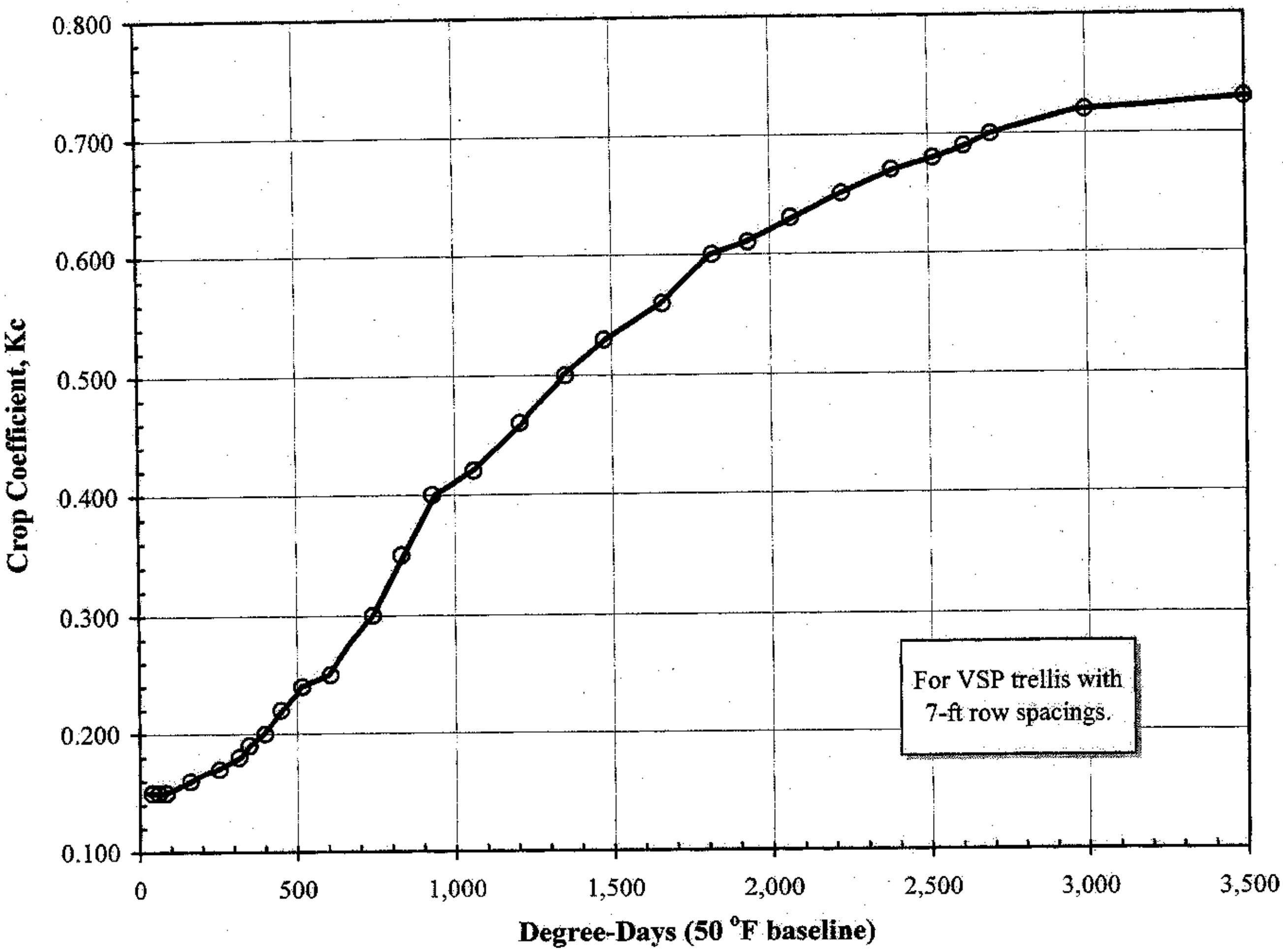


Figure 9

Annual Sum of Negative Monthly Downstream Changes in Russian River Discharge from Cloverdale to Healdsburg

NM Johnson



Adopted from Williams, 2000.
This figure is referenced by

Figure 10
Vineyard Crop Coefficients as a Function of Degree-Days

This draft reflects the California Department of Health Services (CDHS) Drinking Water Program's current thinking on the regulation of recharge of groundwater with recycled water.

Any informal comments you might have on this draft can be emailed to Jeff Stone, at jstone1@dhs.ca.gov

Title 22, CALIFORNIA CODE OF REGULATIONS

DIVISION 4. ENVIRONMENTAL HEALTH

CHAPTER 3. RECYCLING CRITERIA

January 4, 2007

ARTICLE 1. DEFINITIONS

Section 60301.080. 24-hour Composite Sample.

"24-hour composite sample" means a combination of no fewer than eight individual samples obtained at equal time intervals during a 24-hour period, such that the volume of each individual sample is proportional to the flow at the time of sampling.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.120. Aquifer.

"Aquifer" means a geologic formation, group of formations, or portion of a formation capable of yielding groundwater to wells or springs.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.190. Diluent Water.

"Diluent water" means water other than treated wastewater that actively or passively is used to dilute treated wastewater in a groundwater recharge reuse project.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.370. Groundwater.

"Groundwater" means water below the land surface in a saturated zone.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.380. Groundwater Basin.

"Groundwater basin" means an aquifer or a stacked series of aquifers with reasonably well-defined boundaries.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.390. Groundwater Recharge Reuse Project

"Groundwater recharge reuse project (GRRP)" means a project that uses recycled water and has been planned and is operated for the purpose of recharging a groundwater basin designated in the Water Quality Control Plan [defined in Water Code section 13050(j)] for use as a source of domestic water supply, and that has been identified as a GRRP by a RWQCB.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Sections 13520, 13521, and 13050(j), Water Code.

Section 60301.610. Mound.

"Mound" means a localized temporary elevation in a water table that builds up as a result of the localized downward percolation of waters that have been discharged to a spreading area.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.670. Project Sponsor.

"Project sponsor" means any agency that receives water recycling requirements for a GRRP from a RWQCB and is, in whole or part, responsible for the GRRP meeting the requirements of this Chapter.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.680. Public Water System.

"Public Water System" has the same meaning as defined in section 116275(h) of the Health and Safety Code.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 116275(h), Health and Safety Code.

Section 60301.690. Recycled Water.

"Recycled water" has the same meaning as defined in subdivision (n) of section 13050 of the Water Code.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13050, Water Code.

Section 60301.705. Recycled Water Contribution (RWC).

"Recycled water contribution (RWC)" means the quantity of recycled water applied at the GRRP spreading area or subsurface injection facility divided by the sum of the recycled water applied at the GRRP spreading area or subsurface injection facility and diluent water meeting the requirements of section 60320.035.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.770. RWQCB.

"RWQCB" means Regional Water Quality Control Board.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.780. Saturated Zone.

"Saturated zone" means an underground region in which all interstices in and between natural geologic materials are filled with water.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.810. Spreading Area.

"Spreading area" means an area where water is applied to the land surface for purposes of recharging the groundwater.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.840. Subsurface Injection.

"Subsurface injection" means the application of water to the groundwater basin by the controlled insertion of water below the ground surface.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.850. Surface Spreading.

"Surface spreading" means the controlled application of water to the spreading area resulting in the recharge of a groundwater basin.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.860. Total Nitrogen.

"Total nitrogen" means the sum of concentrations of nitrogen in ammonia, nitrite, nitrate, and organic nitrogen-containing compounds, expressed as nitrogen.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60301.870. Total Organic Carbon (TOC).

"Total organic carbon (TOC)" means the concentration of organic carbon present in water that is able to be oxidized to carbon dioxide.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

ARTICLE 5.1. GROUNDWATER RECHARGE

~~Section 60320. Groundwater Recharge.~~

~~(a) Reclaimed water used for groundwater recharge of domestic water supply aquifers by surface spreading shall be at all times of a quality that fully protects public health. The State Department of Health Services' recommendations to the Regional Water Quality Control Boards for proposed groundwater recharge projects and for expansion of existing projects will be made on an individual case basis where the use of reclaimed water involves a potential risk to public health.~~

~~(b) The State Department of Health Services' recommendations will be based on all relevant aspects of each project, including the following factors: treatment provided; effluent quality and quantity; spreading area operations; soil characteristics; hydrogeology; residence time; and distance to withdrawal.~~

~~(c) The State Department of Health Services will hold a public hearing prior to making the final determination regarding the public health aspects of each groundwater recharge project. Final recommendations will be submitted to the Regional Water Quality Control Board in an expeditious manner.~~

Note: ~~Authority cited: Section 208, Health and Safety Code; and Section 13521, Water Code. Reference: Sections 13520 and 13521, Water Code.~~

Section 60320. General Requirements.

(a) All recycled water used for a GRRP shall be from a wastewater management agency that:

(1) administers an industrial pretreatment and pollutant source control program;

(2) implements and maintains a source control program that includes at a minimum:

(A) an assessment of the fate of Department-specified contaminants through the wastewater and recycled water treatment systems,

(B) contaminant source investigations and contaminant monitoring that focus on Department-specified contaminants,

(C) an outreach program to industrial, commercial, and residential communities within the sewage collection agency's service area for the purpose of managing and minimizing the discharge of contaminants of concern at the source, and

(D) an up-to-date inventory of contaminants discharged into the wastewater collection system so that new contaminants of concern can be readily evaluated.

(3) is compliant with the effluent limits established by the Department and/or RWQCB for each Department-specified contaminant.

(b) Prior to operation for new GRRPs, or during the first year of operation after [*insert effective date*] for existing GRRPs, each GRRP shall have a Department approved plan that provides an alternative source of domestic water supply, or a Department approved treatment mechanism, to any user of a producing drinking water source that, as a result of the GRRP;

(1) violates California drinking water standards,

(2) has been degraded to the degree that it is no longer a safe source of drinking water, or

(3) receives water that fails to meet the requirements in sections 60320.010(c), (d), or (e).

(c) A public hearing for each GRRP shall be held prior to the Department submitting its recommendations for the initial permit to the RWQCB and any time an increase in maximum RWC has been proposed but not addressed in a prior public hearing. Prior to the public hearing, the project sponsor shall provide the Department, for review and approval, the information the project sponsor intends to present at the hearing and on the Internet. Following the Department's approval of the information, the project sponsor shall:

(1) Place the information on the Internet and in a repository that provides at least thirty days of public access to the information prior to the public hearing, and

(2) Prior to placing the information in the repository, notify the public of;

(A) the location and hours of operation of the repository,

(B) the Internet address where the information may be viewed,

(C) the purpose of the repository and public hearing,

(D) the manner in which the public can provide comments, and

(E) the date, time, and location of the public hearing.

(d) Unless directed otherwise by the Department, the public notification made pursuant to subsection (c)(2) shall be by one or more of the following methods delivered in a manner to reach persons whose source of drinking water may be impacted by the GRRP:

(1) Local newspaper(s) publication

(2) Mailed or direct delivery of a newsletter

(3) Conspicuously placed statement in water bills

(4) Television and/or radio

(e) Each GRRP shall maintain, and make available for Department and/or RWQCB review when requested, an operations plan that describes the operations, maintenance, and monitoring performed to meet the requirements of this chapter. The project sponsor is responsible for ensuring that the operations plan is, at all times, representative of the current operations, maintenance, and monitoring of the GRRP.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.010. Control of Pathogenic Microorganisms.

(a) For each GRRP, the wastewater to be used as recycled water shall be treated to meet the following:

(1) The definition of filtered wastewater, pursuant to section 60301.320; and

(2) The definition of disinfected tertiary recycled water, pursuant to Section 60301.230.

(b) If the recycled water being used for surface spreading or subsurface injection has not been treated to meet the criteria in sections 60301.230 and 60301.320, pursuant to section 60321 (Sampling and Analysis), the GRRP shall:

(1) Suspend surface spreading or subsurface injection of the recycled water until the criteria are met; and

(2) Inform the Department and the RWQCB in the next monthly report.

(c) For a surface spreading project, all the recycled water shall be retained underground for a minimum of six months prior to extraction for use as a drinking water supply, and shall not be extracted within 500 feet of any GRRP surface spreading area.

(d) For a subsurface injection project, all the recycled water shall be retained underground for a minimum of twelve months prior to extraction for use as a drinking water supply, and shall not be extracted within 2000 feet of any GRRP subsurface injection well.

(e) To reduce the distance in subsection 60320.010(c) or (d), the project sponsor shall demonstrate to the Department and RWQCB that the required retention time can be achieved at the proposed reduced distance and that the requirements of Section 60320.070 (a) can be met.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.020. Control of Nitrogen Compounds.

To demonstrate control of the nitrogen compounds in the recycled water, the project sponsor shall meet the requirements of one of the methods set forth in subsections (a), (b), or (c). (These requirements are summarized in a table at the end of this document, see ENDNOTE 7)

(a) Method 1:

(1) Each week, at least three days apart as specified in an operations plan, two samples (grab or 24-hour composite) of recycled water, or the blend of recycled water and diluent water, prior to surface spreading or subsurface injection, shall be collected. Vadose zone or mound monitoring shall be

representative of the recycled water and diluent water applied at the GRRP subsurface injection facility or throughout the spreading area and shall be performed prior to the water reaching the regional groundwater table.

(2) Samples collected pursuant to subsection (a)(1) shall be analyzed for total nitrogen, with the laboratory being required to complete each analysis within 72 hours and report the result to the project sponsor within the same 72 hours if the result of any single sample exceeds 5 mg/L.

(A) If the average of two consecutive samples exceeds 5 mg/L total nitrogen, the cause shall be investigated, appropriate actions to reduce the total nitrogen levels shall be taken, and the Department and the RWQCB shall be notified within 48 hours of being notified by the laboratory.

(B) If the average of all samples collected during any consecutive four weeks exceeds 5 mg/l, or if more than 25 percent of the samples collected in any two-week period exceed a total nitrogen concentration of 10 mg/L, the surface spreading or subsurface injection of recycled water shall be suspended. Surface spreading or subsurface injection shall not resume until appropriate corrections are made to reduce total nitrogen levels to below 5 mg/l.

(b) Method 2:

(1) At a frequency approved by the Department and specified in the operations plan prepared pursuant to Section 60320(e):

(A) samples shall be collected and analyzed for dissolved oxygen (DO) in the groundwater.

(B) samples (grab or 24-hour composite) of the recycled water or the blend of recycled water and diluent water shall be collected and analyzed for total nitrogen, nitrate, nitrite, ammonia, organic nitrogen, DO, and BOD. The samples shall be collected:

(i) prior to subsurface injection or surface spreading, or
(ii) from within a vadose zone or mound prior to reaching the ground water table.

(2) The laboratory shall be required to complete each analysis in (b)(1) within 72 hours and the shall report the result(s) to the project sponsor within the same 72 hours if:

(A) the total nitrogen exceeds 10 mg/L, or

(B) the concentration of any constituent exceeds the respective limit identified in the engineering report.

(3) If the average of two consecutive samples exceeds 10 mg/L total nitrogen or a limit identified in the engineering report for another constituent, the cause shall be investigated, appropriate actions to meet the limit(s) shall be taken, the Department and the RWQCB shall be notified within 24 hours of being notified by the laboratory, and surface spreading or subsurface injection of recycled water shall be suspended until an average of two consecutive samples meets the limit(s).

(c) Method 3:

(1) In the engineering report prepared pursuant to section 60323, evidence shall be provided that:

(A) it is possible to track the movement of water from the GRRP surface spreading or subsurface injection facility to the downgradient extraction point(s) and

(B) surface spreading or subsurface injection has not resulted in, and would not result in, an exceedance of the nitrate or nitrite MCLs at any downgradient extraction point(s). At a minimum, the evidence shall consist of at least 10 years of the most recent data in which the nitrogen concentration was at least 75 percent of anticipated and historical maximum nitrogen concentrations.

(2) At the frequency specified in the operations plan prepared pursuant to subsection 60320(e), two grab samples of groundwater at each sampling location downgradient of the GRRP spreading area or subsurface injection facility shall be collected and analyzed for nitrite and nitrate. The laboratory shall be required to complete each analysis within 72 hours and shall report any result exceeding the nitrate or nitrite MCL to the project sponsor within the same 72 hours.

(A) If the average of two consecutive samples exceeds an MCL at any sampling location, the Department and RWQCB shall be notified and, unless the GRRP demonstrates to the Department and RWQCB that the groundwater no longer exceeds the MCL, the surface spreading or subsurface injection of recycled water shall be suspended.

(d) The GRRP may apply for reduced total nitrogen or nitrate/nitrite monitoring if all results for the previous two years did not exceed;

(1) 5 mg/L total nitrogen and one-half the nitrate and nitrite MCL for Method 1, or

(2) 10 mg/L total nitrogen and one-half the nitrate and nitrite MCL for Method 2.

(e) If a GRRP implementing reduced monitoring pursuant to subsection (d) exceeds the total nitrogen, nitrate, or nitrite concentrations in (d)(1) or (d)(2), the GRRP shall revert to the monitoring for total nitrogen, nitrate, and nitrite pursuant to subsections (a) or (b).

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.030. Control of Regulated Chemicals and Physical Characteristics.

(a) The recycled water shall be in compliance with the following:

(1) Primary maximum contaminant levels specified in chapter 15: Inorganic chemicals in table 64431-A (except for nitrogen compounds); radionuclides in sections 64442 and 64443; and organic chemicals in table 64444-A (See Endnote 1)

(2) MCLs for disinfection byproducts in section 64533, chapter 15.5;

(3) Action levels in section 64678 for lead (0.015 mg/L) and copper (1.3 mg/L); and

(4) Secondary MCLs for the constituents and characteristics in tables 64449-A and B ("Upper" levels), chapter 15, with the exception of color.

(b) Quarterly, during the same month (first, second, or third) of each quarter as specified in the GRRP's operations plan, the GRRP shall collect grab samples representative of the applied recycled water to determine compliance with paragraphs (a)(1), (2), and (3). The GRRP shall determine compliance on the basis of a running quarterly average, calculated each calendar quarter using the previous four quarters of data. If the recycled water is out of compliance, the GRRP shall implement corrective actions and, in the next quarterly report to RWQCB with a copy provided to the Department, describe the reason(s) for the non-compliance and the corrective actions taken.

(c) Each year, the GRRP shall collect a representative grab sample of the recycled water to determine compliance with paragraph (a)(4) of this section. If the single sample result or average of samples collected during the year exceeds a secondary MCL, the GRRP shall inform the Department and RWQCB and describe in the next monthly report the cause of the exceedance(s) and the corrective actions taken.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.035. Diluent Water Requirements.

To be credited with diluent water to be used in calculating an RWC to meet the requirements of section 60320.041, the project sponsor shall:

(a) Monitor the diluent water quarterly for nitrate and nitrite and, within 48 hours of being informed by the laboratory of a nitrate or nitrite result exceeding an MCL, collect a confirmation sample. If the average of the two samples is greater than an MCL;

(1) notify the Department and the RWQCB within 48 hours of receiving the confirmation sample result,

(2) investigate the cause(s) and implement corrective actions, and

(3) each week, collect and analyze two grab samples at least three days apart as specified in an operations plan. If the average of the results for a two-week period exceeds the MCL, surface spreading or subsurface injection of the diluent water shall be suspended until corrective actions are made. Quarterly monitoring may resume if four consecutive results are below the MCL.

(b) Implement a Department-approved water quality monitoring plan for the purpose of demonstrating that the diluent water meets the water quality requirements in subsections 60320.030(a) and 60320.047(a)(1)(A). The plan shall also include actions to be taken in the event of non-compliance with a water quality requirement.

(c) Conduct a source water evaluation of the diluent water for Department review and approval that includes, but is not limited to:

(1) a description of the source of the diluent water,
(2) delineation of the origin and extent of the diluent water,
(3) the susceptibility of the diluent water to contamination,
(4) the identification of known or potential contaminants, and
(5) an inventory of the potential sources of diluent water contamination.

(d) Develop a plan that provides a means for accurately determining the volume of diluent water to be credited, including consideration of any temporal variations, and demonstrates that the diluent water will be applied in a manner such that temporal variations in the diluent water volume will not lead to an exceedance of the maximum RWC. The plan shall be submitted to the Department for review and approval and be conducted at the frequency specified in the engineering report prepared pursuant to section 60323.

(e) Ensure the diluent water is distributed in a manner such that the maximum RWC will not be exceeded.

(f) For historical credit, not to exceed 60 months;

(1) demonstrate that the diluent water has met the nitrate and nitrite MCLs and the water quality requirements in sections 60320.030(a) and 60320.047(a)(1)(A),

(2) provide evidence that the quantity of diluent water has been accurately determined and was distributed such that the proposed or permitted maximum RWC would not have been exceeded, and

(3) conduct a source water evaluation of the diluent water pursuant to subsection (c).

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.041. Recycled Water Contribution (RWC) Requirements

(a) Each month, for each spreading area or subsurface injection facility recharged by the GRRP, the GRRP shall calculate its running monthly average (RMA) RWC based on the total volume of the recycled water and diluent water for the preceding 60 calendar months. For GRRPs in operation less than 60 months, calculation of the RMA RWC shall commence after 30 months of operation, based on the total volume of the recycled water and diluent water for the preceding months.

(b) The GRRP's RMA RWC, as determined in (a), shall not exceed the maximum RWC specified by the Department and/or RWQCB.

(c) The initial maximum RWC will be based on the Department's review of the engineering report and information obtained as a result of the public hearing, but shall not exceed 0.20 for surface spreading projects or 0.50 for subsurface injection projects.

(d) A GRRP may increase its maximum RWC, provided that:

(1) the increase has been approved by the Department and RWQCB,

(2) for the previous 52 consecutive weeks, the TOC 20-week running average has not exceeded the following:

$$TOC_{max} = \frac{0.5 mg/L}{RWC_{proposed}},$$

Where,
$RWC_{proposed}$ is the proposed maximum RWC

(3) the GRRP has received a permit from the RWQCB that allows operation of the GRRP at the increased maximum RWC, and

(4) the GRRP meets the requirements in subsections (e) and (f).

(e) Prior to operating a GRRP in any of the RWC ranges in Table 60320.041, the GRRP shall meet the corresponding requirements in Table 60320.041 sequentially, beginning with the range of the approved initial maximum RWC. The approval in subsection (d)(1) will be based on the Department's and the RWQCB's review of the information submitted pursuant to the corresponding RWC range in Table 60320.041 and the GRRP's history of compliance with this chapter.

Table 60320.041

GRRP RWC Operating Range Requirements For Operating Ranges A through D, where $A = 0.20 \le RWC < 0.35$ $B = 0.35 \le RWC < 0.50$ $C = 0.50 \le RWC < 0.75$ $D = 0.75 \le RWC \le 1.00$	**RWC Operating Range**			
	A	B	C	D
1. Provide documentation that a monitoring well located between the GRRP and a drinking water well has received recharge water from the GRRP for at least six months such that: A. the fraction of recycled water of GRRP origin in the groundwater at a monitoring well equals a value of at least 0.60 multiplied by $RWC_{proposed}$ and, B. the GRRP recharge water is present in a monitoring well	✓	✓	✓	✓

located in each aquifer intended to convey such water to drinking water wells.				
2. The extracted groundwater meets all drinking water standards and the requirements of section 60320.020 (Control of Nitrogen Compounds).	✓	✓	✓	✓
3. Provide a proposal to the Department prepared and signed by an engineer registered in California and experienced in the fields of wastewater treatment and public water supply. The proposal shall include:		✓	✓	✓
A. GRRP operations, monitoring, and compliance data;		✓	✓	✓
B. A demonstration that includes physical evidence that recharge water having a minimum RWC of 0.4 has been applied at the GRRP such that at least one monitoring well has received the 0.4 RWC recharge water for at least one year and the GRRP has a history of compliance with its maximum RWC limit(s);			✓	
C. A demonstration that includes physical evidence that recharge water having a minimum RWC of 0.7 has been applied at the GRRP such that at least one monitoring well has received the 0.7 RWC recharge water for at least one year and the GRRP has a history of compliance with its maximum RWC limit(s);				✓
D. A demonstration that the water collected at the monitoring wells used in the demonstration in (3)(B) and/or (3)(C) meets all the primary drinking water maximum contaminant levels;			✓	✓
E. Validation of appropriate construction and siting of monitoring wells pursuant to section 60320.070.		✓	✓	✓
F. A scientific peer review by an advisory panel that includes, as a minimum, a toxicologist, a registered engineering geologist or hydrogeologist, an engineer registered in California and experienced in the fields of wastewater treatment and public water supply, a microbiologist, and a chemist.			✓	✓
G. Submittal of an updated engineering report and operations plan.	✓	✓	✓	✓
4. Provide reverse osmosis treatment as well as subsequent advanced oxidation treatment such that, at minimum, a 1.2 log NDMA reduction and 0.5 log 1,4-dioxane reduction is achieved.[1]			✓	✓
5. Analyze the recycled water for tentatively identified compounds (TIC) and report the results to the Department. Every year thereafter, the GRRP shall have a TIC analysis performed on the recycled water.			✓	✓

1. The log reduction achieved shall be demonstrated with N-nitrosodimethlyamine (NDMA) and 1,4-dioxane post-treatment concentrations that are no greater than 0.01 μg/L and 3.0 μg/L, respectively.

(f) If the RMA RWC exceeds its maximum RWC, the GRRP shall:

a. Notify the Department and RWQCB in writing within 7 days of exceedance and,

b. Within 60 days, implement corrective action(s) and submit a report to the Department and RWQCB describing the reason(s) for the exceedance and the corrective action(s) taken to avoid future exceedances.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.045. Total Organic Carbon Requirements

(a) For each spreading area or subsurface injection facility recharged by the GRRP, the GRRP shall monitor TOC as follows:

(1) For filtered wastewater, unless subsequently treated with reverse osmosis, two 24-hour composite samples a week, taken at least three days apart. Based on the Department's review of the previous 12 months' results, with approval from the Department, monitoring may be reduced to one 24-hour composite sample each week, and

(2) For recycled water, at least one 24-hour composite sample each week prior to recharge, or

(3) For recycled water in a vadose zone or mound, at least one sample each week in a manner yielding TOC values representative of the recycled water TOC after soil treatment and not influenced by diluent water as determined by:

(A) measuring undiluted percolating recycled water,

(B) measuring diluted percolating recycled water and adjusting the value for the diluent water effect, or

(C) using recharge demonstration studies to develop a soil treatment factor that can be applied weekly to recycled water measurements leaving the treatment plant.

(b) Grab samples may be taken in lieu of the 24-hour composite samples required in subsection (a) if:

(1) the GRRP demonstrates that a grab sample is representative of the water quality throughout a 24-hour period, or

(2) the entire recycled water stream has been treated by reverse osmosis

(c) All samples shall be analyzed for TOC by a laboratory certified by the Department to perform TOC analyses using a method designated by the Department.

(d) Analytical results of the monitoring performed pursuant to subsection (a) shall not exceed the following TOC limits:

(1) For filtered wastewater, 16 mg/L, based on:

(A) two consecutive samples and

(B) the average of the last four results and,

(2) Except as provided in subsection (e), for recycled water or vadose zone or mound monitoring, with RWC determined pursuant to section 60320.041(a),

$$TOC_{max} = \frac{0.5 mg/L}{RWC}$$, based on:

(A) a 20-week running average of all TOC results and
(B) the average of the last four results.

(e) The TOC_{max} limit specified in subsection (d)(2) may be increased if:

(1) The increased TOC_{max} limit is approved by the Department and RWQCB,

(2) The GRRP has been in operation for the most recent ten consecutive years,

(3) The project sponsor submits a proposal to the Department prepared and signed by an engineer registered in California and experienced in the fields of wastewater treatment and public water supply. The proposal shall include the following, based on the most recent ten consecutive years of operation:

(A) GRRP operations, monitoring, and compliance data;

(B) Evidence that the GRRP has a history of compliance with the condition of their RWQCB permit;

(C) Evidence that the water collected at all downgradient drinking water wells and monitoring wells impacted by the GRRP has met all the primary drinking water standards for the parameters specified pursuant to section 60320.070(b)(2);

(D) Analytical or treatment studies requested by the Department to make the determination in subsection (C);

(E) Validation of appropriate construction and siting of monitoring wells pursuant to section 60320.070;

(F) A study defining the water quality changes, including organic carbon characterization, as a result of the impact of the GRRP;

(G) A health effects study, including an exposure assessment, approved by an independent scientific peer review advisory panel that includes, as a minimum; a toxicologist, an engineering geologist or hydrogeologist registered in California, an engineer registered in California and experienced in the fields of wastewater treatment and public water supply, a microbiologist, and a chemist, and

(4) The GRRP analyzes its recycled water every five years for tentatively identified compounds (TIC) and reports the result to the Department.

(f) If the GRRP exceeds the limit in (d)(1)(A), (d)(2)(A), or its approved increased TOC_{max} limit obtained pursuant to subsection (e) based on a 20-week running average, the GRRP shall:

(1) immediately suspend the addition of recycled water until at least two consecutive results, 3 days apart, are less than the limit,

(2) notify the Department and RWQCB within 7 days of suspension,

(3) revert back to the semi-weekly monitoring in (a)(1), if the GRRP had been approved for reduced monitoring, and

(4) within 60 days, submit a report to the Department and RWQCB describing the reasons for the exceedance and the corrective actions to avoid future exceedances. At a minimum, the corrective actions shall include:

(A) a reduction of RWC sufficient to comply with the limit, and/or

(B) the treatment of the filtered wastewater with reverse osmosis.

(g) If the GRRP exceeds the limit in (d)(1)(B), (d)(2)(B), or its approved increased TOC_{max} limit obtained pursuant to subsection (e) based on the last four results, the GRRP shall, within 60 days, submit a report to the Department and RWQCB describing the reasons for the exceedance and the corrective actions taken to avoid future exceedances.

(h) To use one or more wastewater constituents in lieu of TOC, approval from the Department shall be obtained. At a minimum, the constituent(s) used in lieu of TOC shall:

(1) Be quantifiable in the wastewater, recycled water, groundwater, and throughout the treatment processes,

(2) Have identifiable treatment performance standards as protective of public health as the TOC standards in this Chapter.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.047. Additional Constituent Monitoring

(a) The GRRP shall conduct the following monitoring and report any detections to the Department and the RWQCB in the next monthly report:

(1) Each quarter, the GRRP shall sample and analyze the recycled water for:

(A) Unregulated chemicals in table 64450, chapter 15;

(B) Priority Toxic Pollutants [chemicals listed in the Water Quality Standards, Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California, and 40 CFR Part 131, Federal Register 65(97), May 18, 2000, p. 31682];

(C) Chemicals with state notification levels that the Department has specified (see Endnote 3), based on a review of the GRRP engineering report and the affected groundwater basin(s); and

(D) Other chemicals that the Department has specified (See Endnote 4), based on a review of the GRRP engineering report and the affected groundwater basin(s).

(2) Based on the Department's review of the results of the monitoring in (1), with Department approval, the GRRP may reduce monitoring for the constituents in this section to once each year.

(3) Annually, the GRRP shall monitor the recycled water for pharmaceuticals, endocrine disrupting chemicals, and other indicators of the presence of municipal wastewater as specified by the Department (See Endnote 5), based on a review of the GRRP engineering report and the affected groundwater basin(s).

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.065. Operation Optimization.

(a) During the first year of operation for new GRRP's, or during the first year of operation after the effective date of this section for existing GRRP's, and at all times thereafter, all treatment processes shall be operated in a manner providing optimal reduction of all contaminants including:

(1) microbial contaminants,
(2) regulated contaminants identified in Section 60320.030, and
(3) nonregulated contaminants identified in Section 60320.047.

(b) Within six months of optimizing treatment processes pursuant to (a) and anytime thereafter operations are optimized resulting in a change in operation, each GRRP shall update their operations plan to include such changes in operational procedures and submit the operations plan to the Department for review.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.070. Monitoring Between GRRP and Downgradient Drinking Water Supply Wells.

(a) Prior to operating a GRRP, each GRRP shall site and construct monitoring wells, as follows:

(1) At a location between one and three months travel time from the surface spreading or subsurface injection area,

(2) At an additional point or points between the surface spreading or subsurface injection area and the nearest downgradient domestic water supply well, and

(3) Such that samples can be obtained independently from each aquifer potentially conveying the water that was recharged by the GRRP.

(b) Monitoring shall be conducted as follows:

(1) Two samples prior to GRRP operation and at least one sample each quarter thereafter, shall be collected at each monitoring well;

(2) Each sample shall be analyzed for TOC, total nitrogen, nitrate, nitrite, the constituents in tables 64449-A and B of section 64449, total coliform bacteria,

and any water quality constituents specified by the Department based on the results of the recycled water monitoring conducted pursuant to this chapter; and

(c) Analytical results of monitoring performed pursuant to paragraph (b) shall be reported to the Department and the RWQCB by the GRRP, as follows:

(1) For all chemical analyses completed in a calendar month, no later than the end of the following month using the Electronic Deliverable Format as defined in The Electronic Deliverable Format (EDF) Version 1.2i Guidelines & Restrictions dated April 2001 and Data Dictionary dated April 2001.

(2) For any results exceeding an MCL or at anytime coliform bacteria are present, within 48 hours of receiving the results.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

Section 60320.090. Annual and Five-Year Reporting.

(a) By March 1 of each year, the project sponsor shall provide a report to the RWQCB, the Department, and all public water systems having downgradient sources potentially affected by the GRRP. The report shall be prepared by an engineer registered in California and experienced in the fields of wastewater treatment and public water supply. Based on the previous calendar year's operation, the report shall include the following:

(1) A summary of compliance with the applicable monitoring requirements and criteria of this Chapter;

(2) For any violations of this Chapter;

(A) the date, duration, and nature of the violation

(B) a summary of any corrective actions and/or suspensions of surface spreading or subsurface injection of recycled water resulting from a violation

(C) if uncorrected, a schedule for and summary of all remedial actions

(3) Any detections of monitored constituents and any observed trends in the monitoring wells,

(4) Information pertaining to the vertical and horizontal migration of the recycled/diluent water plume,

(5) A description of any changes in the operation of any unit processes or facilities, and

(6) A description of any anticipated changes, along with an evaluation of the expected impact of the changes on subsequent unit processes.

(b) Every five years from the date of the initial approval the engineering report required pursuant to section 60323, the project sponsor shall update the report to address any project changes and submit the report to the RWQCB and the Department. The update shall include, but not be limited to:

(1) Anticipated RWC increases, a description of how the RWC requirements in section 60320.041 will be met, and the expected impact the increase will have on the GRRP's ability to meet the requirements of this Chapter,

(2) Evidence that the minimum retention time requirements in subsection 60320.010(c) or (d) have been met, and

(3) A description of any inconsistencies between previous groundwater model predictions and the observed and/or measured values, as well as a description of how subsequent predictions will be accurately determined.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

ARTICLE 7. ENGINEERING REPORT AND OPERATIONAL REQUIREMENTS

Section 60323. Engineering Report

(a) No person shall produce or supply ~~reclaimed~~ recycled water for direct reuse from a ~~proposed~~ water reclamation plant ~~unless he files~~ without ~~an~~ Department approved engineering report.

(b) The report shall be prepared by a properly qualified engineer registered in California and experienced in the field of wastewater treatment, and shall contain a description of the design of the proposed reclamation system. The report shall clearly indicate the means for compliance with these regulations and any other features specified by the regulatory agency.

(c) The report shall contain a contingency plan which will assure that no untreated or inadequately treated wastewater will be delivered to the use area.

NOTE: Authority cited: Section 100275, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

ENDNOTES *[These endnotes are not part of the draft regulations, but are included to provide readers with additional information and guidance about the intended application of the draft regulations, and the specific contaminants that are or may be involved.]*

ENDNOTE 1. New Regulated Contaminants.

New state and federal MCLs will be added as they are adopted (e.g., perchlorate, chromium-6)

ENDNOTE 2. Analytical Methods for Unregulated Chemicals.

GRRPs should select methods for nonregulated chemicals according to the following approach:

- *Use drinking water methods, if available.*
- *Use CDHS-recommended methods for chemicals in subsection (f) (e.g., 1,2,3-TCP).*
- *If there is no DHS-recommended drinking water method for a chemical, and more than a single EPA-approved method is available, use the most sensitive of the EPA-approved methods (e.g., nitrosamines).*
- *If there is no EPA-approved method for a chemical, and more than one method is available from the scientific literature (e.g., peer-reviewed journals), after consultation with DHS, use the most sensitive method.*
- *If no approved method is available for a specific chemical, the GRRP's laboratory may develop or use its own methods and should provide the analytical methods to CDHS for review. Those methods may be used until CDHS-recommended or EPA-approved methods are available.*
- *If the only method available for a chemical is for wastewater analysis (e.g., a chemical listed as a priority pollutant only),sample and analyze for that chemical in the treated wastewater immediately prior to reverse osmosis treatment to increase the likelihood of detection. Use this approach until the GRRP's laboratory develops a method for the chemical in drinking water, or until a CDHS-recommended or EPA-approved drinking water method is available.*

ENDNOTE 3. Selected chemicals with CDHS advisory levels for possible analysis.

These chemicals are selected from CDHS' chemicals with notification levels; chemicals already included in analysis required under subsections (f)(1)(A) or (B) are not included here. These chemicals have either been detected at least once in drinking water supplies, or if not detected, they are of interest for some specific reason [e.g., formaldehyde is of interest because in may be a byproduct of certain treatment processes]. They: include n-butylbenzene, sec-butylbenzene, tert-butylbenzene, carbon disulfide, chlorate, 2-chlorotoluene, 1,4-dioxane, formaldehyde, isopropylbenzene, n-propylbenzene, 1,2,4 -trimethylbenzene, and 1,3,5-trimethylbenzene. They also include certain nitrosamines, discussed in Endnote 4.

ENDNOTE 4. Additional chemicals for analysis

Diazinon has been moved from the list of chemicals with notification levels to the list of archived advisory levels. Nevertheless, CDHS continues to include analysis for diazinon in this section. Monitoring for nitrosoamines also continues, because of the CDHS' experience with N-nitrosodimethylamine (NDMA) and other nitrosamines. For example, NDMA has been introduced into groundwater via a recycled water recharge project. CDHS has established notification levels for NDMA, N-nitrosodiethylamine (NDEA), and N-nitrosodi-n-propylamine (NDPA). NDMA and NDPA are priority pollutants, along with another nitrosamine, N-nitrosodiphenylamine. Nitrosamines with EPA methods for drinking water are NDEA, NDMA, NDPA, N-Nitrosdi-n-buylamine (NDBA), N-Nitrosomethylethylamine (NMEA), N-Nitrosopiperidine (NPIP), and N-Nitrospyrrolidine (NYPR).

ENDNOTE 5. Endocrine disrupting and other chemicals.

CDHS has specified the following endocrine disrupting chemicals, pharmaceuticals, personal care products, and other "indicator" chemicals for monitoring:

- *Hormones: Ethinyl estradiol, 17-B estradiol, estrone*
- *"Industrial" endocrine disruptors: bisphenol A, nonylphenol and nonylphenol polyethoxylate, octylphenol and octylphenol polyethoxylate, polybrominated diphenyl ethers.*
- *Pharmaceuticals and others substances: acetaminophen, amoxicillin, azithromycin, caffeine, carbamazepine, ciprofloxacin, ethylenediamine tetra-acetic acid (EDTA), gemfibrozil, ibuprofen, iodinated contrast media, lipitor, methadone, morphine, salicylic acid, and triclosan.*

These samples are being collected for information purposes; there are no standards for the contaminants listed below and no standards are anticipated at this time and analytical methods may not be widely available (See Endnote 2).

Some interested parties have asked for some clarification of what would happen if any of these contaminants are found. In response, we offer this: Monitoring for these chemicals is viewed as a diligent way of assessing and verifying recycled water quality characteristics, which can be useful in addressing issues of public perception about the safety of recharge projects. Further, should there be a positive finding, the recharge agency and CDHS can give the result due consideration as to whether it is of concern or not. Just what such consideration might entail would depend on what is known and what is not known about the *particular chemical, including its potential health effects at the given concentration, the source of the chemical, as well as possible means of better control to limit its presence, treatment strategies if necessary, and other appropriate actions.*

Again, we stress that such monitoring is not for compliance purposes, but for informational use only.

The specific contaminants targeted for monitoring may vary among GRPPs, depending on their individual engineering reports and characteristics of their groundwater basins. If a GRPP has additional reports for its own project using prior data that address chemicals identified in these Endnotes, or reports for its own project using data on other chemicals addressing the effectiveness of the treatment processes in limiting the release of endocrine disruptor, pharmaceuticals, or personal care chemicals into recharge water, those reports should be made available to CDHS to assist in developing a list of chemicals that would build upon or supplement the already available information. A GRPP that has little monitoring information should plan on collecting more analytical data related to endocrine disrupting chemicals, pharmaceuticals, personal care products and other indicator chemicals in its recharge water. A GRRP that can demonstrate a history sampling, analysis, and related research—as well as an on-going program of monitoring and research—on endocrine disrupting chemicals, pharmaceuticals and personal care products, or other indicator chemicals in its recharge water will likely have fewer contaminants specified by CDHS for analysis under this section.

GRPPs will not be required to conduct an ongoing monitoring program for contaminants under this section, unless good indicator chemicals can be identified through this monitoring. Depending on the results of analyses and other information discussed above, required monitoring may be of short duration (e.g., twice a year for two or three years). If good indicator chemicals can be identified, requirements for their monitoring will be considered. This notwithstanding, CDHS recommends an ongoing monitoring program for these types of chemicals.

ENDNOTE 6. Advanced oxidation treatment

The current draft proposes establishing log reduction of targeted chemicals rather than specifying a specific treatment scheme and/or dosage for achieving advanced oxidation. However, CDHS is considering how to implement a requirement for achieving advanced oxidation that would be effective. CDHS continues to seek ideas on how this should be regulated.

ENDNOTE 7. Table summarizing text of Section 60320.020 (Control of Nitrogen Compounds)*

	Method 1	Method 2	Method 3
Compliance point and monitoring	• Recycled water, or a blend of recycled water and diluent water, in or above the mound • Samples analyzed for total nitrogen • Reduced monitoring available	• Recycled water or a blend of recycled water and diluent water either: - prior to surface spreading or subsurface injection, or - from within a mound or vadose zone prior to reaching the GW table • Samples analyzed for total nitrogen, nitrate, nitrite, ammonia, organic nitrogen, DO, and BOD • Reduced monitoring available	• Groundwater downgradient of the recharge area • Samples analyzed for nitrate and nitrite
Standard(s)	• 5 mg/L total N as an average • 10 mg/L total N as a maximum frequency	• 10 mg/L total nitrogen or • Limits established in the engineering report for other constituent	MCLs for nitrate and nitrite
Frequency of sampling	2 per week	As established by the Department and specified in the operations plan	• Specified in the engineering report and operations plan. • Relatively frequent monitoring at locations between the recharge area and down gradient domestic wells is required.
Consequence of failure	• Investigate, correct and notify if the average of two consecutive samples >5 mg/L • Suspend recharge of recycled water if the 4-week average of all samples >5 mg/L <u>or</u> if more than 25% of samples collected in any two week period exceed 10 mg/L.	• Investigate, correct and notify based on an average of two consecutive samples over the total nitrogen standard or standard for another constituent. • Suspend surface spreading and subsurface injection of recycled water until the average of two consecutive samples meets all limits	• Notify the Department and RWQCB. • Suspend surface spreading and subsurface injection unless demonstrated that the groundwater no longer exceeds the MCLs.
Rationale	Method 1 relies on such a low limit for the total N in the recycled water that the chance that the NO_2 or NO_3 MCL could be exceeded is minute.	Method 2 relies on: 1. A low enough limit for the total N in the recycled water that the chance that a NO_2 or NO_3 MCL could be exceeded is low, combined with 2. A set of limits determined for the specific GRRP and explained in the Engineering Report for nitrite, organic nitrogen and /or ammonia necessary to limit oxidation to NO_2 or NO_3, and some set of minimum levels for an excess DO over BOD requirement in the recycled water and/or a DO requirement in the groundwater as necessary to prevent reduction of NO_3 to NO_2	Method 3 relies on: 1. A demonstration that historic recharge with water containing comparable levels of nitrogen has not caused a problem, 2. Evidence that recharge water can be tracked and monitored throughout the flow path, and 3. Monitoring to show that the MCLs in for NO2 and NO3 are met in the groundwater.

*Note: This table provides a *summary* of the regulatory requirements and is not intended to be comprehensive.