# ECO:LOGIC

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Salinity-1/31/06
Workshop

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Ms. Selica Potter
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-0100

**RE: SALINITY ISSUES IN THE CENTRAL VALLEY**

By way of introduction, the ECO:LOGIC Engineering senior staff has specialized only in water and wastewater engineering in the Central Valley for over 30 years. Members of the firm have focused almost entirely on wastewater permitting in that time, and consequently have completed many salinity degradation analyses related to municipal, industrial, and agricultural activities. Based on our experience, we request the following items pertaining to salinity regulation:

- Use of the term "excess load" when developing regulatory practice.
- Equitable financing of salt reduction technologies that reflect State-wide benefit of salinity reduction.
- Clarification of the current discrepancy between the Water Code Section 13523 requirement to issue water reclamation requirements for water which is used or proposed to be used as reclaimed water and the Regional Board's practice of instead issuing WDRs to avoid permitting salinity degradation resulting from reclamation.
- Clarification of how the "quality of water available" is used when setting salinity regulatory restrictions and the provision of extended time schedules to facilitate improvements in warranted situations.
- Clarification of what constitutes "background" groundwater salinity from a degradation assessment and regulation perspective.
- A more public process in determining the need and extent of salinity regulation.

Justification for each of the requests is provided in the sections that follow.

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## SALT LOAD, SALT CONCENTRATION, AND EXCESS SALT LOAD

The salt problem should not be discussed in terms of load (lb or lb/day) because the term is often inapplicable. As an example, a huge load of salt exists in Lake Tahoe and a portion of that load moves down the Truckee River each day. In both cases the salt is dissolved in a sufficiently large volume of water that salinity (e.g., total dissolved solids) is not problematic. Concentration, not load, is the water quality issue.

For our analyses of salinity, salinity degradation, and potential salinity pollution credit trading, we propose the consideration of concentration and a term we call "excess load" which is defined as follows:

*Excess Load = (Salinity – WQO) x Volume x 8.345*

*Where:* *Excess Load is the mass (in lb) of salt that is problematic (i.e., over the WQO).*

*Salinity is the TDFS (total dissolved fixed solids) concentration (in mg/L) of the water medium.*

*WQO is the salinity water quality objective (in mg/L). A typical WQO for salinity used in Region 5 to protect agriculture is 450 mg/L as total dissolved solids.*

*Volume is the amount of water medium (in millions of gallons [MG]) in which the salt is dissolved.*

*8.345 is the factor converting the unconventional mass unit ( MG x mg/L) to the conventional mass unit( lb).*

As an example of how we propose to use this term within analysis, consider that adding a new salt "load" to a salinity-impaired water resource is not necessarily a bad thing if it increases water quantity where a shortage exists (typical in California) and does not cause an exceedance of water quality objectives (e.g., adding Lake Tahoe quality water to the southern Delta would solve a multitude of problems even though the Lake Tahoe quality water does contain a salt load, but not an "excess load" as defined by the foregoing equation). However, adding a new "excess load" of salt to a salinity-impaired resource would either exacerbate or contribute to maintenance of a problematic condition.

## CONSERVATION, DEGRADATION, AND GROWTH

The State mandate for water conservation to meet growing water demands is, in essence, a State mandate to increase salinity degradation because the State provided little to no guidance on how to reduce the municipal, industrial, and agricultural salt load in proportion to the reduction in water use resulting from conservation. By way of example, 3,500 lb of salt in 1.0 MG of wastewater has a salinity of 419 mg/L. There is no "excess load" of salt and this wastewater cannot cause or contribute to maintenance of an exceedance of a 450 mg/L salinity WQO.

Therefore, discharging this waste to any water cannot cause or contribute to maintenance of a water "quality" impaired condition, but would improve a water "quantity" impaired condition.

If by water conservation measures, the volume of wastewater in this example is reduced to 0.9 MG, then the salinity associated with the 3,500 lb load increases to 466 mg/L. As a result of conservation, this wastewater now has an excess load of salt of 120 lb. This wastewater can cause or contribute to maintenance of a WQO exceedance.

The greater the water conservation, the greater the "excess load," and the greater the potential for the resulting wastewater to cause degradation. Water conservation by cities, industry, and agriculture generally results in increased salinity degradation and pollution (i.e., exceedance of a WQO). Growth facilitated by the water resource generated by conservation adds further to the salinity problem created by water conservation. Thus, water conservation tends to cause salinity degradation by two mechanisms: salinity concentration and facilitated growth.

Options to mitigate salinity degradation include:

- Desalination by membrane technology (e.g., electrodialysis reversed, reverse osmosis) with the brine disposal costs associated with these membrane processes.
- Evaporation processes with the brine disposal costs associated with the residual salt.
- Export to the ocean with any associated environmental impacts.

Growth (with its associated benefits and salinity degradation) facilitated by the availability of a water supply created by conservation may be in a different part of California from where the water conservation (and associated salinity degradation) occurred. As an example, water conservation in the Central Valley may facilitate growth in Southern California. Burdening individual localities with the costs associated with salt-removal treatment due only to their location to facilitate State-wide growth is inequitable. Regulation of salt should be accompanied by funding for salt-removal treatment processes (construction and operation) via the State income tax to distribute both the benefits and costs equitably.

## DEGRADATION, RECLAMATION, AND THE WATER CODE

The Water Code and Basin Plan strongly encourage reclamation, which primarily involves irrigation of crops and landscaping. The Water Code encouragement is based on serving/facilitating growth in freshwater-quantity limited California. The Basin Plan encouragement appears to be based primarily on the Water Code.

Reclaimed water is almost always more saline than other sources of irrigation water available (e.g., the potable water supply otherwise used to irrigate parks, school yards, etc.). Irrigation is the main cause of salinity degradation (via evapotranspirative concentration) in the Central

Valley. Replacing an irrigation water supply with a more saline reclaimed water supply virtually always increases the "excess salt load" to the underlying groundwater, and therefore, increases degradation of underlying groundwater. Using reclaimed water to irrigate land that was not irrigated historically virtually always causes salinity degradation of groundwater, too, except in alkali soil and similar situations. So, like conservation, reclamation facilitates State growth at the expense of either causing salinity degradation, or constructing and operating desalination facilities, evaporation facilities, and/or export pipelines.

The intent of the legislature regarding salinity degradation resulting from reclamation is clear as spelled out in California Water Code Sections 13523 and 13523.5. Water Code Section 13523 states:

> *"Each regional board . . . shall . . . prescribe water reclamation requirements for water which is used or proposed to be used as reclaimed water."*

Water Code Section 13523.5 states:

> *"A Regional Board may not deny issuance of water reclamation requirements to a project which violates only a salinity standard in the basin plan."*

Per statute, salinity degradation resulting from reclamation is to be permitted. However, the "Attwater Opinion" of 1985 states that Section 13523.5 does not apply to waste discharge requirements, and is often cited by Regional Board staff when denying preparation of permits that allow for groundwater degradation resulting from reclamation because of their practice to include reclamation requirements within waste discharge requirements (WDRs). It is requested that the practice of issuing WDRs in lieu of water reclamation requirements cease, or findings be placed in WDRs that explain how this practice complies with Section 13523.

## DEGRADATION FROM AGRICULTURE

Agriculture is the largest cause of salinity degradation in the Central Valley. It dissolves more natural soil minerals than any other human activity, uses the largest amount of salt-based chemicals in an uncontained manner, and causes the largest water loss to the atmosphere (via evapotranspiration) which leaves the water's natural salt as a residue in the soil to be leached to groundwater and/or surface water. To control salinity degradation by agriculture is to control agriculture. Options include:

- Setting a 450 mg/L (or background concentration) vadose zone/leaching fraction salinity standard for agriculture to protect agricultural beneficial uses. Both background or a 450 mg/l vadose zone salinity standard will effectively terminate California agriculture.

- Setting a vadose zone/leaching fraction standard higher than 450 mg/L or background quality. The level set will determine:
  - The level of pollution that is "acceptable".
  - The amount of agriculture to remain in production based on water quality, water availability, soil characteristics, the type of crop grown, and the value of the crop grown.
- Exempting agriculture from regulation.

To date, the last option has been implemented because agriculture was considered to be essential to the prosperity of California, including consideration of the degradation agriculture causes. The exemption will need to be repealed if the current salt degradation problem is to be addressed in more than a token manner.

**CITY OF BURBANK V. STATE BOARD**

In the April 2005 California Supreme Court opinion in the subject case, the opinion cites Water Code Section 13241 relative to the "factors to be considered by a regional board in establishing water quality objectives". One factor to be considered is "the quality of water available". This is an important concept in regulating groundwater salinity degradation in a situation-specific, equitable manner.

The Fresno office of Region 5 historically established that water supply EC plus 500 µS/cm was an acceptable level of degradation by municipal use. A small rural community overlying 1,000 µS/cm groundwater would be allowed to apply 1,500 µS/cm effluent to the land with the resulting degradation/pollution being acceptable. This practice was reasonable insofar as the small rural community has a right to exist, which includes reasonable sewer and water fees.

The groundwater supplies of a number of Valley communities have a elevated salt concentrations due to their geographic location. The high concentrations of salt in the water supply translate directly into elevated concentrations of salinity in the treated effluent. When the source of salt is documented from the water supply, source control efforts potentially could consist of conversion to an alternate water supply with lower concentrations of salt. This solution is also extremely costly (like salt removal treatment with brine disposal). Further, implementation of an alternative water supply can be complicated by water right/transfer issues and infrastructure constraints associated with transitioning from a water distribution system designed for numerous input sources (e.g., wells) to one served by a central source (e.g., surface water treatment plant).

When considering salinity limits for municipalities, long-term compliance schedules are necessary to allow communities to develop revenue streams and/or acquire alternate water supplies. It is unreasonable to expect that community growth should cease until it can afford salt removal treatment given the precedence of the State in not only tolerating salinity degradation

(e.g., Water Code Section 13525.5) but also historically encouraging it (e.g., its reclamation and water conservation policies).

## FINANCING SALINITY CONTROL

As stated previously, salinity control is most equitably financed by the collection of fees from State taxpayers rather than from individual localities. Additionally, those Californians benefiting from Region 5 water quality control plans, including exporters, should contribute to the maintenance of water quality in Region 5. A surcharge on water exported from Region 5 would appear to be an equitable approach. Water removed from high on the watershed (e.g., from Hetch Hetchy) would have higher surcharges per unit volume because these waters are removed before they can contribute to reducing salinity in the Central Valley.

## PUBLIC OUTREACH

The first step to controlling (or not controlling) salinity degradation in a manner fair and equitable is to educate the public as to the nature of the problem, what is causing the problem, and what are the options (including costs and effects, positive and negative) of stabilizing or reversing the degradation. The people of California are going to pay for any "fixes" monetarily and/or with lost jobs due to a slow down in the State's economy. In theory, these same Californians are the beneficiaries of these "fixes" (a cleaner, more sustainable environment and lifestyle). Therefore, the public needs to be engaged on the topic via the common media (TV, radio, newspapers). Groups for and against salinity regulation will fund their own special interest media campaigns.

An outcome of the public education process should be guidance to the State Board and Regional Boards from either the legislature or ballot propositions as to what, if anything, is to be done. If the public desires salinity degradation control, then the next step is to determine how current salinity degradation is to be regulated. Salinity degradation is caused mostly by agriculture. Point sources (such as water use and wastewater discharges from municipalities) are a secondary factor, but generally are more able financially to address salinity degradation than agriculture. The logic of regulating the point sources, first, expecting that a cost-effective technology applicable to agriculture will be developed appears flawed because of the fundamental energy requirements associated with separating salt from water. Even if municipalities can afford the technology, agriculture may not as long as agricultural products grown without such regulation are allowed in the California market.

The issue of salinity degradation control is as political and complex as the issues of how many people should live in California without further significant deterioration of quality of life, how much should food cost (and where should it come from), how much should people pay for sewer service (and how are the poor to afford this service), and overall, should the foregoing decisions

be driven by market forces (including litigation) or centralized governmental planning. To this most complex matter, we respectfully submit these comments.

Sincerely,

**ECO:LOGIC Engineering**

Richard E. Stowell, P.E., Ph.D.
Principal

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# Facsimile

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cc: COMMENT LETTER - 1/31/06 BOARD WORKSHOP ON SALINITY

☐ Urgent ☐ For Review ☐ Please Comment ☐ As Requested ☐ Please Reply ☐ Originals Will Follow By Mail

•Comments:

These comments were also submitted via email.

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