California Environmental Protection Agency

REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

AN AMENDMENT TO THE CALIFORNIA REGIONAL WATER QUALITY CONTROL PLAN FOR THE COLORADO RIVER BASIN REGIONAL WATER QUALITY CONTROL BOARD TO REVISE INDICATOR BACTERIA USED TO DEMONSTRATE COMPLIANCE WITH THE BACTERIA WATER QUALITY OBJECTIVES FOR THE COACHELLA VALLEY STORM WATER CHANNEL

STAFF REPORT

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State of California
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REGIONAL WATER QUALITY CONTROL BOARD
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I. SUMMARY

The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board, Colorado River Basin Region (Regional Water Board), designates beneficial uses for waters within the Region, prescribes water quality objectives for the reasonable protection of those designated beneficial uses, and describes an implementation plan to achieve those water quality objectives. One of the waters for which beneficial uses and water quality objectives have been established is the Coachella Valley Storm Water Channel (CVSC). In relevant part, among the beneficial uses designated for CVSC in the Basin Plan is REC-1, 'Water Contact Recreation." (Basin Plan, p. 2-9, Table 2-3)

To ensure human health is protected when the public engages in REC-1 uses in the CVSC, the Basin Plan prescribes bacterial limits using bacterial indicators. The Basin Plan currently prescribes three bacterial indicators for the CVSC: E. coli, enterococci, and fecal coliform. Because the use of all three indicators is not necessary, is contrary to United Stated Environmental Protection Agency (USEPA) recommendations, and may lead to erroneous results regarding whether the REC-1 beneficial uses of the CVSC are being reasonably protected, the Colorado River Basin Regional Water Quality Control Board (Regional Water Board) proposes to amend the Basin Plan to remove the bacterial indicators of enterococci and fecal coliforms. The bacterial indicator of E. coli and the previously prescribed limits for that indicator would be retained in the Basin Plan as the best indicator to evaluate risk of human illness due to exposure to pathogens.

II. BACKGROUND

The CVSC is located in Coachella Valley in Riverside County, California. The Valley is largely agricultural using groundwater, and water from the Colorado River delivered by the Coachella Canal via the All-American Canal, for crop irrigation. CVSC is an engineered extension of the Whitewater River that functions as a conveyance channel for: (a) irrigation return flows, (b) treated wastewater from three permitted municipal wastewater treatment plants, (c) wastewater discharged from one permitted fish farm, and (d) urban and runoff. The channel approximates 17 miles in length, extending from the City of La Quinta to the north shore of the Salton Sea. The floor of the channel is unlined however the sides are lined with cement to facilitate flow and reduce erosion. Average annual flows in CVSC are decreasing due to changes in agricultural practices, and suburban development. The CVSC and its tributary drains provide habitat for a variety of wildlife including migratory songbirds, waterfowl, coyotes, raccoons, and rodents.

Although recreation in the storm water channel is prohibited by the Coachella Valley Water District (CVWD), people are known to recreate in and around the channel. Because the CVSC is a "water of the United States," it is subject to the

requirements of the federal Clean Water Act (33 U.S. C. § 1251 et seq.) and USEPA implementing regulations. These regulations specify in pertinent part that states must specify appropriate water uses to be achieved and protected taking into consideration, among other things, recreation in and on the water. (40 CFR 131.10(a).) Moreover, the regulations provide that states may not remove designated uses that are existing uses. (40 CFR 131.10(h).) "Existing uses" are defined as those uses actually attained in the water body on or after November 28, 1975. (40 CFR 131.3(e).) An unauthorized use of a water body does not affect the "existing use" designation of the water body.

The Salton Sea has its own beneficial uses (BU's) such as aquaculture, warm freshwater habitat, wildlife habitat, preservation of rare, threatened, or endangered species, potential industrial service supply, and finally, water contact recreation and non-contact water recreation. Among other water sources, the Salton Sea receives water directly from the CVSC. USEPA regulations require states to take into consideration the water quality standards of downstream waters when designating uses of an upstream water body and the appropriate criteria to protect those uses to ensure that the upstream water quality standards provide for the attainment and maintenance of the water quality standards of the downstream waters. (40 CFR 131.10(b).) Because the Salton Sea is not impaired by bacteria, the numeric limits established for the CVSC are not expected to impact the beneficial uses designated for the Salton Sea.

Water quality objectives, as defined in the California Water Code (CWC) Section 13050(h), are:

> *Limits or levels of water quality constituents or characteristics established for the reasonable protection of beneficial uses or the prevention of nuisance within a specific area.*

Water quality objectives for a given constituent/characteristic are determined by the designated beneficial uses for that water body. Water quality objectives for bacteria consider the degree of risk from human exposure (e.g., immersion vs. incidental contact), epidemiological research, and use of indicator organism characteristics, since it is not feasible or reasonable to test for all potential pathogenic organisms. Hence, bacteria objectives will differ for water bodies with different beneficial uses.

Designated beneficial uses for CVSC include contact recreation (REC-I), defined in the Basin Plan as:

> *Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, white water activities, fishing and use of natural hot springs*.

To protect the REC-I beneficial use, the Basin Plan currently requires analysis for three indicator bacteria: E. coli, enterococcus, and fecal coliforms. This Basin Plan amendment will revise bacteria objectives in CVSC to reflect those specified in *Ambient Water Quality Criteria for Bacteria – 1986* (USEPA, 1986), which designates E. coli as the sole indicator bacterium for protecting the REC-I beneficial use for fresh waters. Enterococcus is recommended for saline water, but may also be used for fresh water (USEPA, 1986).

II. RATIONALE FOR BASIN PLAN AMENDMENT

In March 1999, USEPA stated in *Action Plan for Beaches and Recreational Waters*:

> …*Where a state does not amend its water quality standards to include the 1986 criteria, USEPA will act under Section 303(c) of the Clean Water Act to promulgate the criteria with the goal of assuring that the 1986 criteria apply in all states (USEPA, 1999)*.

Nevertheless, the USEPA is no longer encouraging states to replace fecal coliforms with the 1986 criteria because USEPA is moving forward to develop new criteria. In the meantime, USEPA will continue to support states that choose to pursue the old criteria, since E. coli/enterococcus are more scientifically defensible than fecal coliform criteria. More specifically, USEPA has determined that for fresh recreational waters, E. coli and enterococcus equally demonstrate a greater correlation between bacterial densities and gastrointestinal illnesses in humans than do fecal coliforms (USEPA, 1986).

The water quality standards outlined in the Basin Plan are the cornerstone of all activities of the Regional Water Board, and thus, need to rely on the best science available to protect water quality and beneficial uses. Water quality standards are defined as "provisions of State or Federal law which consist of a designated use or uses for the waters of the United States and water quality criteria for such waters based upon such uses." (40 CFR 131.3(i).) Water quality standards must also include a statewide anti-degradation policy consistent with the federal policy. (40 CFR 131.6(d).) In California, designated uses are called beneficial uses, and water quality criteria are called water quality objectives.

The proposed Basin Plan amendment recommends revising only the water quality objectives for bacterial indicators for CVSC, and not the beneficial uses of CVSC. The bacteria objectives proposed for CVSC are based on research sponsored or conducted by the USEPA, which in its 1986 paper referenced above, provides updated information on the most reliable "indicators" for predicting the presence of disease-causing organisms, and correlating these indicators to swimming-related illness rates in humans.

Although indicator organisms may not cause illness, they are associated with fecal contamination, and have characteristics that allow them to be good

predictors of pathogens in water bodies. Pathogens are disease-causing microorganisms that include viruses, protozoa, and bacteria, many of which cannot be measured directly. Water bodies may contain a large variety of pathogens, making measurement impractical even if techniques were available to detect all pathogens of concern. As a result, indicator organisms are used to predict health risks from pathogens present in water bodies.

The CVSC is on the federal Clean Water Act (CWA), Section 303(d) List of impaired surface water bodies for impairment by pathogens. On May 16, 2007, the Regional Water Board held a Public Hearing and adopted a Total Maximum Daily Load (TMDL) Basin Plan Amendment for Bacteria Indicators in CVSC. A few days prior to the Public Hearing, staff from the Regional Water Board, USEPA, and State Water Resources Control Board (SWRCB) agreed on proceeding with the TMDL using only E. coli as the best bacterial indicator for CVSC. Further, and in order for USEPA to approve the TMDL, USEPA requested that:

1- The draft TMDL resolution be revised to recognize the limitations of having three indicator organisms per pathogen;
2- The TMDL Implementation Plan include a directive for Regional Water Board staff to prepare an amendment to the Basin Plan that rectifies those limitations and clarifies which indicators apply where and, as necessary, to develop site specific objectives; and
3- Additional rationale be provided for the record to support the use of only E. coli for the CVSC as opposed to the use of all three indicators for the New River Bacteria Indicator TMDL.

A USEPA representative attended the May 16, 2007 Public Hearing and affirmed support for both the TMDL Basin Plan Amendment and the Regional Water Board's request for amending the Basin Plan to use only E. coli as the sole bacteria indicator for the CVSC.

III. PROPOSED CHANGES TO COACHELLA VALLEY STORM WATER CHANNEL WATER QUALITY OBJECTIVES

A. Current Objectives

Bacterial objectives in the current Basin Plan that protect the REC-1 (water contact) and REC-2 (non-water contact) beneficial uses are described below. As the Basin Plan explains, "Although the objectives are expressed as fecal coliforms, E. coli, and enterococci bacteria, they address pathogenic microorganisms in general (e.g., bacteria, viruses, and fungi)." (Basin Plan, Chapter 3, Section II.I, p. 3-3.)

> Based on a statistically sufficient number of samples, (generally not less than five samples equally spaced over a 30-day period), the

geometric mean of the indicated bacterial densities should not exceed one or the other of the following:

	REC 1	REC 2
E. coli	126 per 100 ml	630 per 100 ml
Enterococci	33 per 100 ml	165 per 100 ml

Nor shall any sample exceed the following maximum allowables:

	REC 1	REC 2
E. coli	400 per 100 ml	2000 per 100 ml
Enterococci	100 per 100 ml	500 per 100 ml

(Basin Plan, Chapter 3, Section II.I, p. 3-3.)

The current Basin Plan objective for fecal coliforms is specified as follows:

> In addition to the objectives above, in waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200 per 100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400 per 100 ml.
>
> (*Id.*)

B. History of Current Objectives:

The current fecal coliform objectives for waters designated REC-1 are based on a series of epidemiological studies conducted by the United States Public Health Service in the late 1940's / early 1950's, summarized by Stevenson (1953). These studies show a statistically significant increase in illness rates in individuals that swim in water with an average total coliform density of 2,300 organisms per 100 ml when compared to individuals swimming in water with an average total coliform density of 43 organisms per 100 ml. This total coliform index was translated into a fecal coliform index by using the ratio of fecal coliforms to total coliforms at one of the original study sites. Total coliform was translated to fecal coliform because fecal coliform is a better indicator of fecal contamination, and more stable than total coliform. Based on this ratio, it was assumed that statistically significant swimming-associated gastrointestinal illness will be observed at fecal coliform levels equal to or greater than 400 organisms per 100 ml. The National Technical Advisory Committee (NTAC) of the U.S. Department of the Interior, which oversaw these initial epidemiological studies in 1968, found a detectable risk unacceptable. As a result, it proposed a density of 200 fecal coliforms per 100 ml as the water quality criterion to be met (200 was considered one-half the density at which a health risk occurred) (NTAC, 1968). The NTAC further recommended that not more than 10 percent of the samples

should exceed 400 fecal coliforms per 100 ml. The NTAC's fecal coliform criterion was again recommended by USEPA in 1976 for recreational waters (USEPA, 2007).

C. Justification for Revised Objectives

Preferred Indicator: The revised objectives are based on scientific studies sponsored by USEPA (USEPA, 1986) that correlate illness rates with bacterial indicator densities in recreational waters. These studies allow the most appropriate indicator to be selected for site-specific local conditions. The studies found that enterococcus and *E. coli* are the indicators most strongly correlated with gastroenteritis, whereas total coliform and fecal coliform only weakly correlate with gastroenteritis. USEPA also found that while enterococcus was more reliable than E. coli in "saline" waters, E. coli and enterococcus were equally efficient indicators for "fresh" waters.

This amendment requires analysis for E. coli rather than enterococcus, even though both indicators are "equally efficient" for fresh water. There is no disadvantage in using E. coli over enterococcus from a salinity perspective, given that CVSC is not a saline water body. Nevertheless, it has been Regional Water Board staff's experience that laboratory testing for E. coli is more commonly conducted than testing for enterococcus. In addition, epidemiological studies sponsored by the USEPA determined that E. coli is the most reliable indicator bacteria for protecting human health since it is more specifically intestinal in origin. These two factors militate in favor of selecting E. coli as the more appropriate bacterial indicator.

Numerical Limits: The USEPA has defined numerical targets for bacterial densities based on a recommended risk level of eight illnesses per 1,000 swimmers (or 0.8%) for heavily used beaches. For less frequently used beaches, USEPA recommends an acceptable risk level up to one percent, or ten illnesses per 1,000 swimmers. These numerical targets are based on frequency of recreational use, and are separated into three categories: (1) moderate full body contact recreation, (2) lightly used full body contact recreation, and (3) infrequently used full body contact recreation.

The USEPA risk limits based on frequency of use are outlined in the table below:

Table 1: **USEPA Recommended REC-1 Fresh Water Criteria for Bacteriological Densities**

Risk Level (%)	Indicator	Geometric Mean Density (Per 100ml)	Single Sample Maximum Allowable Density (per 100ml)		
			Moderate Full-body Contact (82nd	Lightly Used Full-body Contact (90th	Infrequently Used Full-body Contact (95th

			percentile)	percentile)	percentile)
0.8	E. coli	126	299	409	576
1.0	E. coli	206	489	668	940

Source: USEPA, Ambient Water Quality Criteria for Bacteria-1986

Numerical limits were established by the USEPA for both a single sample maximum (SSM), and a Geometric Mean (GM). A percentile, as depicted in table 1, is a confidence interval used to assess risk with an estimate of certainty. For example, an 82nd percentile confidence limit as listed in the "moderate full-body contact" column of table 1 means that 82% of the time, results are expected to fall within the established limits, while 18% of the time, sample results are expected to exceed the given value.

Except for beach notification and closure decisions, the GM is the more relevant value for CVSC to ensure appropriate actions are taken to protect and improve water quality. It is a more reliable measure because it is less subject to random variation, and is more directly linked to the underlying studies on which the 1986 bacteria criteria were based.

Although the GM is the more relevant value for CVSC, the SSM may still serve a useful function for the CVSC. The SSM helps identify episodes of pollution, which may be especially useful in waters like the CVSC that are prone to short-term spikes in bacteria concentrations. The SSM was initially developed as a statistical construction to allow decision makers to make informed decisions to open or close beaches based on small data sets, and were not designed to provide a further reduction in the design illness level provided for by the GM criterion. While the SSM may give states the ability to make water body assessments when water body data are limited, the USEPA cautions that "using the SSMs as values not to be surpassed for all Clean Water Act applications, even when the data set is large, could impart a level of protection much more stringent than intended by the 1986 bacteria criteria document." (USEPA, 2006)

IV. ALTERNATIVES

This section of the Staff Report describes three alternatives, including the proposed Basin Plan Amendment. Alternatives must be considered in any proposed Basin Plan amendment in accordance with the State's certification of the Basin Planning process as meeting the requirements under the California Environmental Quality Act (see Section VI of the Staff Report for further details).

A. *No action.*

If the Regional Water Board does not adopt revised standards consistent with USEPA's recommendations, the goals of the Basin Plan amendment may still be achieved by a similar statewide amendment currently being developed by the State Water Board. As proposed in early drafts, the adoption of the State Water Board amendment will make bacteria objectives for all fresh REC-1 water bodies within the Region, including the CVSC, consistent with USEPA guidance.

B. *Adopt USEPA criteria to replace the current bacteria objectives for a 17- mile section of the Coachella Valley Storm Water Channel only.*

By adopting the proposed revisions to bacteria objectives for a specific portion of the CVSC, the Regional Water Board will make bacteria objectives for a 17-mile stretch of the CVSC consistent with current USEPA guidance. Should the proposed amendment currently under development by the State Water Board be adopted, the amendment to the Basin Plan for the Colorado River Basin Region could be redundant if the State Water Board's amendment is identical to the Regional Water Board's. If the State Water Board's amendment is different, the Regional Water Board may need to amend its Basin Plan again to be consistent with the State Water Board's amendment.

C. *Adopt USEPA criteria to replace the current bacteria objectives for all REC-1 fresh water bodies within the Region, not just the CVSC.*

By adopting the USEPA criteria for all REC-1 fresh water bodies in the Colorado River Basin Region, not just the CVSC, bacterial objectives for REC-1 fresh waters within the Region, including the CVSC, will be consistent with USEPA guidance. Should the proposed amendment currently pursued by the State Water Board be adopted, the Basin Plan amendment for the Colorado River Basin Region could be redundant, or require revision to be consistent with State rulings.

V. RECOMMENDED ALTERNATIVE

Regional Water Board staff recommends proceeding with Alternative B: adopt current USEPA criteria to replace the Regional Water Board's three bacterial objectives for the CVSC with only one bacterial objective—E. coli. Implementing this alternative will require revising Chapter 3 of the Basin Plan, *Water Quality Objectives*, by adding a new section E to Section III, "Specific Surface Water Objectives." The new section E would be titled *Coachella Valley Storm Water Channel*. The following is the proposed Basin Plan language for this new section:

E. *COACHELLA VALLEY STORM WATER CHANNEL*

The following bacterial objectives apply to a limited section of the Coachella Valley Storm Water Channel (CVSC) where perennial flow exists; specifically, that part of the channel that begins at the Valley Sanitary District Waste Water Treatment Plant in the City of Coachella and extends to the south for approximately 17 miles, where it discharges into the Salton Sea at its northern shore. The bacterial water quality objectives for this stretch of the CVSC are reasonably expected to protect human health against gastro-intestinal illness caused by exposure to pathogenic organisms present in surface waters. This conclusion is based on epidemiological studies sponsored by the USEPA, which determined that E. coli is the most reliable indicator bacteria for protecting human health since it is more specifically intestinal in origin. Bacteria water quality objectives for the CVSC using E. coli as the sole bacterial indicator are described below.

Based on a minimum of five samples equally spaced over a 30 day period, the geometric mean of E. coli densities must not exceed the following:

	REC 1	*REC 2*
E. coli	*126 MPN[1] per 100 ml*	*630 MPN per 100 ml*

Nor shall any single sample exceed the following:

	REC 1	*REC 2*
E. coli	*400 MPN[1] per 100 ml*	*2000 MPN per 100 ml*

[1] MPN represents "Most Probable Number", which is defined as an index of the number of bacteria that, more probably than any other number, will give the results shown by the laboratory examination (APHA, 2005).

VI. OTHER CONSIDERATIONS

The Secretary of Natural Resources has certified the basin planning process as meeting the requirements of Public Resources Code section 21080.5 of the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). (CEQA Guidelines, tit. 14, § 15251(g); Cal. Code Regs., tit. 23, § 3782.) Based on the Secretary's certification, the basin planning process is exempt from certain environmental review requirements of CEQA, including preparation of an Initial Study, Negative Declaration, and Environmental Impact Report. Therefore,

the Staff Report, proposed Basin Plan amendment, and Environmental Checklist (described below) are considered substitute environmental documents that may be relied on in lieu of an Initial Study, Negative Declaration, and Environmental Impact Report.

These documents satisfy the documentation requirements prescribed in the California Code of Regulations, Title 23, Section 3777(a), for certified exempt programs. In pertinent part, this regulation states that any plan proposed for board approval or adoption must be accompanied by a completed environmental checklist and a written report that contains (1) a brief description of the proposed activity; (2) reasonable alternatives to the proposed activity; and (3) mitigation measures to minimize any significant adverse environmental impacts of the proposed activity. The Environmental Checklist (attached to this Staff Report) concludes that no significant adverse impacts to the environment will be caused by the adoption and implementation of this Basin Plan amendment.

The bacterial indicators of E. coli and enterococcus are equally efficient as bacterial indicators in fresh water. However, E.coli is more widely used by states as the water quality objective to protect the REC-1 beneficial use in the CVSC. In addition, as previously mentioned, USEPA determined that E. coli is the most reliable indicator for protecting human health since it is more specifically intestinal in origin. Therefore, E. coli was viewed as a more desirable indicator for the CVSC.

VII. RECOMMENDATION

Regional Water Board staff recommends that the Regional Water Board adopt the proposed Basin Plan amendment for the CVSC.

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