APPENDIX B. US EPA GUIDANCE FOR RECREATIONAL WATERS AND BEACHES

This section provides guidance from the United States Environmental Protection Agency, which released a planning document for beaches and recreational waters, *Action Plan for Beaches and Recreational Waters* (US EPA, 1999). US EPA also held regional conferences in 1999 on beach programs, and published the conference proceedings (US EPA, 2000).

B.1 THE FEDERAL WATER QUALITY CRITERION FOR RECREATIONAL WATERS

The federal water quality criterion for recreational waters was established in 1968 by the Department of the Interior's National Technical Advisory Committee (NTAC, 1968). This criterion was recommended again by the US EPA in 1976 and 1986 (EPA, 1976, 1986). This criterion is as follows:

Fecal coliforms should be used as the indicator organism for evaluating the microbiological suitability of recreation waters. As determined by multiple-tube fermentation or membrane filter procedures and based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content of primary contact recreation waters shall not exceed a log mean of 200 per 100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400 per 100 ml.

The value of 400 fecal coliforms per 100 ml was derived from a concentration of 2300 total coliforms per 100 ml, which corresponded to the density at which a statistically significant increase in swimming-associated gastrointestinal illness was observed. Fecal coliforms comprised about 18 percent of the total coliforms.

B.2 MARINE WATERS

The US EPA evaluated health effects of microbiological contamination on recreational use of marine waters (Cabelli, 1983). Subsequently it published guidance on water quality for recreational use in *Ambient Water Quality Criteria for Bacteria - 1986* (US EPA, 1986).

EPA's guidance for marine recreational waters is based upon an "Acceptable Swimming Associated Gastroenteritis Rate" of 19 cases/1000 swimmers. Its steady state geometric mean indicator density at the acceptable rate is 35 enterococci per 100 ml. The rate of 19 cases of illness per 1000 swimmers is estimated to result from exposures to waters containing bacteria using the fecal coliform indicator group at the maximum geometric mean of 200 per 100 ml.

EPA's criterion (US EPA, 1986) for bathing (full body contact) recreational waters for marine water is as follows:

Based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period), the geometric mean of the enterococci densities should not exceed 35 per 100 ml.

No sample should exceed a one-sided confidence limit (CL), using the following as guidance:

Designated bathing beach area	upper 75% CL
Moderate full body contact recreation	upper 82% CL
Lightly used full body contact recreation	upper 90% CL
Infrequently used full body contact recreation	upper 95% CL

based on a site-specific log standard deviation, or if site data are insufficient to establish a log standard deviation, then using 0.7 as the log standard deviation.
From the EPA's guidance document, single sample limits (in enterococci per 100 ml.) are:

Designated bathing beach area	= 104 enterococci per 100 ml.
Moderate full body contact recreation	= 124 enterococci per 100 ml.
Lightly used full body contact recreation	= 276 enterococci per 100 ml.
Infrequently used full body contact recreation	= 500 enterococci per 100 ml.

The above recommendations notwithstanding, the US EPA did not recommend a change in the stringency of its bacterial criteria for recreational waters, finding that such a change did not appear warranted until more information on the new indicators was accumulated.

B.3 FRESH WATER

The US EPA evaluated health effects of microbiological contamination on recreational use of fresh waters (Dufour, 1984). Subsequently it published guidance on water quality for fresh water recreational use (US EPA, 1986).

EPA's guidance for fresh recreational waters is based upon an "Acceptable Swimming Associated Gastroenteritis Rate" of 8 cases/1000 swimmers at a steady state geometric mean indicator density of 33 enterococci per 100 ml or 126 *E. coli* per 100 ml. The rate of 8 cases of illness per 1000 swimmers is estimated to result from exposures to waters containing bacteria using the fecal coliform indicator group at the maximum geometric mean of 200 per 100 ml.

EPA's criterion for bathing (full body contact) recreational waters for fresh water is as follows (US EPA, 1986):

Based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period), the geometric mean of the enterococci densities should not exceed one or the other of the following (Note that only one indicator should be used. The regulatory agency should select the appropriate indicator for its conditions.):

E. coli, at a concentration of 126 per 100 ml., or
enterococci, at a concentration of 33 per 100 ml.

No sample should exceed a one-sided confidence limit (CL), using the following as guidance:

Designated bathing beach area	upper 75% CL
Moderate full body contact recreation	upper 82% CL
Lightly used full body contact recreation	upper 90% CL
Infrequently used full body contact recreation	upper 95% CL

based on a site-specific log standard deviation, or if site data are insufficient to establish a log standard deviation, then using 0.4 as the log standard deviation.
From the EPA's guidance document, the single sample limits (in *E. coli* per 100 ml., or in enterococci per 100 ml.) are:

Designated bathing beach area	= 235 *E. coli* per 100 ml., or 61 enterococci per 100 ml.
Moderate full body contact recreation	= 298 *E. coli* per 100 ml., or 89 enterococci per 100 ml.
Lightly used full body contact recreation	= 406 *E. coli* per 100 ml., or 108 enterococci per 100 ml.
Infrequently used full body contact recreation	= 576 *E. coli* per 100 ml., or 151 enterococci per 100 ml.

As mentioned above, the US EPA did not recommend a change in the stringency of its bacterial criteria for recreational waters, finding that such a change did not appear warranted until more information on the new indicators was accumulated.

B.3.1 Specific Standards Set by US EPA for Colville Indian Reservation, Washington.

The US EPA (40 Code of Federal Regulations 131.35) has established fresh (surface) water quality criteria for several classes of water, as follows:

Class I (Extraordinary), including these designated uses: Water supply (domestic, industrial, agricultural); stock watering; fish and shellfish—migration, rearing, spawning, and harvesting, of salmonids and other fish; wildlife habitat; ceremonial and religious water use; recreation (primary contact recreation, sport fishing, boating and aesthetic enjoyment); and commerce and navigation.

For Class I water the bacteriological criteria are: The geometric mean of the enterococci bacteria densities in samples taken over a 30-day period shall not exceed 8 per 100 ml, nor shall any single sample exceed an enterococci density of 35 per 100 milliliters. This limits are calculated as the geometric mean of the collected samples approximately equally spaced over a 30-day period.

Class II (Excellent), including these designated uses: Water supply (domestic, industrial, agricultural); stock watering; fish and shellfish—migration, rearing, spawning, and harvesting, of salmonids and other fish, and crayfish rearing, spawning and harvesting; wildlife habitat; ceremonial and religious water use; recreation (primary contact recreation, sport fishing, boating and aesthetic enjoyment); and commerce and navigation.

For Class II water the bacteriological criteria are: The geometric mean of the enterococci bacteria densities in samples taken over a 30-day period shall not exceed 16 per 100 ml, nor shall any single sample exceed an enterococci density of 75 per 100 milliliters. This limits are calculated as the geometric mean of the collected samples approximately equally spaced over a 30-day period.

Class III (Good), including these designated uses: Water supply (industrial, agricultural); stock watering; fish and shellfish—migration, rearing, spawning, and harvesting, of salmonids and other fish, and crayfish rearing, spawning and harvesting; wildlife habitat; recreation (secondary contact recreation, sport fishing, boating and aesthetic enjoyment); and commerce and navigation.

For Class III water the bacteriological criteria are: The geometric mean of the enterococci bacteria densities in samples taken over a 30-day period shall not exceed 33 per 100 ml, nor shall any single sample exceed an enterococci density of 150 per 100 milliliters. This limits are calculated as the geometric mean of the collected samples approximately equally spaced over a 30-day period.

Class IV (Fair), including these designated uses: Water supply (industrial); stock watering; fish migration of salmonids and other fish; recreation (secondary contact recreation, sport fishing, boating and aesthetic enjoyment); and commerce and navigation.

For Class IV water no bacteriological criteria are identified. No streams are identified as Class IV.

Lake Class, including these designated uses: Water supply (domestic, industrial, agricultural); stock watering; fish and shellfish—migration, rearing, spawning, and harvesting, of salmonids and other fish, and crayfish rearing, spawning, and harvesting; wildlife habitat; ceremonial and religious water use; recreation (primary contact

recreation, sport fishing, boating and aesthetic enjoyment); and commerce and navigation.

For Lake Class water the bacteriological criteria are: The geometric mean of the enterococci bacteria densities in samples taken over a 30-day period shall not exceed 33 per 100 ml, nor shall any single sample exceed an enterococci density of 150 per 100 milliliters. This limits are calculated as the geometric mean of the collected samples approximately equally spaced over a 30-day period.

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REFERENCES

See http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Beaches.aspx