Regulations for Ocean Beaches and Ocean Water-Contact Sports Areas Pursuant to AB 411— Statement of Reasons

The following text, which describes and explains the regulations required by Health and Safety Code §115880 (Assembly Bill 411, Statutes of 1997, Chapter 765), is from the regulations' Statement of Reasons filed with the Office of Administrative Law in July 1999.

Title 17, California Code of Regulations

Group 10. Sanitation, Healthfulness and Safety of Public Beaches and Ocean Water- Contact Sports Areas

Article 2. Definitions. 7956. Storm Drain Defined

This section defines the term "storm drain." Health & Safety Code 115880(c)(4)(B) refers to storm drains in the criteria of beaches that are subject to Department regulations, i.e., "The beach is located on an area adjacent to a storm drain that flows in the summer." Such a definition is necessary, since the term "storm drain" is vague.

The Department defines a storm drain as a conveyance through which water flows onto or adjacent to a public beach or into an ocean water-contact sports area, and includes rivers, creeks, and streams, whether they are in man-made channels or in natural channels. The Department included both man-made and natural channels in this definition, since water in either of them can be subject to microbiological contamination.

Article 4. Healthfulness.

7958. Bacteriological Standards

Section 7958(a), prior to the regulation adopted by emergency, established numeric standards for total coliform bacteria only. Section 7958(b), prior to the emergency regulation, cited the American Public Health Association's methods that are to be used in meeting the microbiological standards. Both have been deleted and replaced with new language. Section 7958(a) now includes numeric standards for three bacterial indicators, and Section 7958(b) now addresses requirements for laboratories and their methods by referring to contemporary certification requirements.

Health and Safety Code Section 115880(c)(2) requires the establishment of protective minimum standards for total coliform, fecal coliform, and enterococci bacteria.

Section 7958(a) in the emergency regulation provides numeric standards for total coliform bacteria, fecal coliform bacteria and enterococcus bacteria. These bacterial organisms are good indicators of microbiological contamination and are used by health authorities as surrogates for disease-causing organisms that are likely to be present in sewage, but are difficult to analyze for directly.

Section 7958(a)(1) establishes four numeric standards, two for total coliform bacteria, and one each for fecal coliform bacteria and enterococcus bacteria. Section 7558(a)(2) establishes three numerical standards, one each for total coliform bacteria, fecal coliform bacteria, and enterococcus bacteria.

Total coliform bacteria

The Department's regulation includes a single sample standard of 10,000 total coliforms per 100 milliliters and a 30-day average (mean of the logarithms of the results of at least five weekly samples over the prior 30 days) of 1,000 total coliforms per 100 milliliters.

The numeric standards for total coliform are numerically identical to the previous standard and derived from earlier standards that sought to protect the public from the health threats from exposure to sewage contamination. However, there are slight changes in the additional requirements that accompany the numeric standards in the existing regulations.

The numeric standards are derived from studies in the 1940's and 1950's by the US Public Health Service, as summarized by the US EPA (1986). Studies of fresh- and saltwater (of bathers and bathing waters in Lake Michigan, the Ohio River, and Long Island Sound) investigated illness (gastrointestinal illness, respiratory, skin irritation) as it related to the concentration of total coliform bacteria. Among the studies at Lake Michigan, no excess illnesses were found in swimmers at beaches with median coliforms densities of 91 and 180 per 100 milliliters compared to illnesses in the total study population. A second method of analysis compared the illness observed following three days of high coliform density with that observed following three days of low coliform density. There was a significantly greater rate of illness when the geometric mean coliform density was 2,300 coliforms per 100 milliliters when compared to those who swam when the density was 43 coliforms per 100 milliliters, but there was no difference when densities compared were 732 versus 32 coliforms per 100 milliliters.
Data from the Ohio River showed increased rates of gastrointestinal illness in swimmers in water with a median coliform density of 2,300 coliforms per 100 milliliters.

Two marine bathing beach studies showed no association between illness and swimming in water containing 398 and 815 coliforms per 100 milliliters.

These data support the standards for total coliforms. The standard is numerically the same as the previous standard that was replaced by the emergency regulation, 1,000 coliforms per 100 milliliters for the average total coliform concentration. The emergency regulation uses the mean of the logarithms of not less than five previous weekly samples from the prior 30 days, whereas the prior regulation used a standard of not to exceed 20 percent of the samples in the

prior 30 days.

This 1,000-organism value is less than the concentration of 2,300 coliforms per 100 milliliters, which was shown to be related to gastrointestinal illness in freshwater areas. Saltwater concentrations approaching this value (815 coliforms per 100 milliliters) were not shown to be associated with illness.

The single sample standard of 10,000 total coliform bacteria per 100 milliliter serves to limit exposures to potential disease-causing organisms by providing an overall ceiling for the total coliform concentration. Without a single-value ceiling, very high concentrations could occasionally occur in between very low values, and the 30-day standard could still be met. However, because the very high concentrations could be indicative of the presence of potential pathogens at the time of the sampling, it is important that a single standard be present.

The single sample level of 10,000 total coliforms per 100 milliliter level is reasonable, based on an epidemiological study of approximately 15,000 swimmers in Santa Monica Bay (Haile, et al., 1996; SMBRP, 1996) at beaches affected by storm drains.
Investigators found that exposures to levels greater than 10,000 total coliforms per 100 milliliters were related to a 200 percent increase in the risk of skin rash.

The single sample level of 10,000 total coliforms per 100 milliliter level is numerically the same as the previous regulation. The current regulation, however, no longer requires verification by a repeat sample within 48 hours. When the Department first proposed removing the requirement for verification of a result that is above the standard, some local environmental health officials questioned the value of this change. They pointed out that repeat sampling is often used to confirm that samples elevated above standards are not the result of laboratory error. However, in the Department’s view, because of the relationship of elevated indicator organisms and the potential for the presence of pathogens, corrective action should be taken when results show levels of indicators that are above the standard. In addition, because of the time required to obtain analytical results (up to two or three days), verification samples could delay action by the local health officer considerably. The weekly testing required by Health and Safety Code Section 155880 for certain beaches provides a "verification" sample for the sample taken a week earlier.

An additional single sample value for total coliforms is used. This value is 1,000 total coliforms per 100 milliliters, if the ratio of fecal/total coliforms is greater than 0.1.

The Santa Monica Bay investigators found that the ratio of total to fecal coliforms was related to an increase in illness. Illness included significant respiratory disease (SRD), with symptoms of fever and nasal congestion, fever and sore throat, and cough with sputum, and also included highly credible gastrointestinal illness (HCGI). HCGI was defined as HCGI-1 (vomiting, diarrhea and fever, stomach pain and fever) and HCGI-2 (vomiting and fever).

The investigators found the number of cases of swimmers near storm drains increased as the ratio of total/fecal coliforms decreased below 10, i.e., when the fecal coliforms represented a larger proportion of the total coliforms, the risk increased. The highest numbers of cases of illness occurred when the ratio was 2, with SRD at about 220 excess cases per 10,000 swimmers at that ratio (excess refers to the number of cases expected among controls, those who swam 400 or more yards away from storm drains), HCGI-1 at about 170 per 10,000, and HCGI-2 at about 110 per 10,000, when total coliforms exceeded 1,000 per 100 ml.

Additional analyses of the data from the Santa Monica Bay study compared the risk of illness among swimmers in water at different total/fecal ratios and at two levels of total coliform bacteria, 5,000 per 100 ml. and 1,000 per ml. (Haile and Witte, undated). At a total coliform count greater than 5,000 per ml., a total/fecal ratio of 10 (one-tenth of the total coliforms are fecal) was related to risks of 107-657 per 10,000 swimmers for eight different effects (fever, eye discomfort, ear discomfort, skin rash, nausea, diarrhea, stomach pain, runny nose). At a total coliform count greater than 1,000 per 100 ml., a total/fecal ratio of 10 was related to risks of 117-281 per 10,000 swimmers for three different effects (chills, nausea, diarrhea).

The Department incorporated the ratio of the two coliform indicator organisms into the standards to be used. However, the regulations use an inverted ratio (fecal/total instead of total/fecal, as used in the Santa Monica Bay study) to express the relative concentrations, so that exceeding the ratio of 0.1 would indicate a health concern.

The results of the Santa Monica Bay study showed that the ratio of total to fecal coliforms was more predictive of illness than the enterococcus concentration.

The 30-day average value for total coliform bacteria of 1,000 per 100 milliliters of water, replaces the old standard of not to exceed 1,000 per 100 milliliters of water in 20% of samples taken in a 30-period. For all practical purposes, the two standards are the same, since one sample of five taken in a 30-day period is 20 % of the samples. Using the mean of the logarithms of the results may result in fewer findings of levels higher than the not to exceed 1,000 total coliform standard, but interpreting their analyses will be consistent with the expanded number of indicator organisms, which are to be used in determining whether beach closure or other restrictions are needed. Further, even if the log mean results in fewer findings greater than the 1,000 total coliform value, the single sample value that is associated with an increased fecal/total coliform ratio in Section 7658(a)(1), if exceeded, could, prompt a requirement for beach posting.

In addition to consistency with Department regulations for total coliforms that existed prior to the emergency regulation, the standard of 10,000 total coliforms per 100 ml for a single sample and 1,000 total coliforms per 100 ml for a 30-day

average are consistent with the water contact standards of the California Ocean Plan of the State Water Resources Control Board (1997).

Fecal coliform bacteria

The Department's regulation includes a single sample standard of 400 fecal coliforms per 100 milliliters, and a 30-day average (mean of the logarithms of the results of at least five weekly samples over the prior 30 days) of 200 total coliforms per 100 milliliters.

The numeric standard for fecal coliform is derived from studies used for the total coliform standard from the Ohio River study mentioned in the previous section. Fecal coliforms are considered to be more specific to the presence of feces and less subject to variation than total coliforms (which are greatly influenced by storm water runoff). About 18 percent of the coliforms in the Ohio River study were found to be fecal coliforms. This 18 percent proportion was used to determine that the concentration of 2,300 coliforms per 100 milliliters that was associated with gastrointestinal illness was equivalent to about 400 fecal coliforms (2,300 x 0.18) (USEPA, 1986). As described by USEPA (1986), the National Technical Advisory Committee (NTAC) of the Department of Interior, the agency that made recommendations about recreational water at that time, felt that a detectable increase in disease was unacceptable. Therefore, one-half of the density at which a health risk occurred, or 200 fecal coliforms, was proposed. The NTAC also suggested that the use of the water should not cause a detectable health effect more than 10 percent of the time. It proposed that no more of than 10 percent of the total samples during any monthly period should exceed 400 per 100 milliliters.

The standards of 400 fecal coliforms per 100 ml for a single sample and 200 fecal coliforms per 100 ml for a 30-day average are consistent with the water contact standards of the California Ocean Plan of the State Water Resources Control Board (1997), and with guidance issued by the US EPA (1986). The numeric standards for fecal coliforms are numerically identical to the levels of these other agencies. However, as with the total coliforms, there are slight changes in the application of the numeric standards. The State Water Resources Control Board's Ocean Plan (1997) uses a fecal coliform density of 200 per 100 milliliters, based on the geometric mean of not less than 5 samples for any 30-day period, and a density of 400 coliform bacteria per 100 milliliters that is not to be exceeded by more than 10 percent of the total samples during any 60- day period. US EPA guidance (1986) recommends that 400 fecal coliforms not be exceeded by more than 10 percent of the total samples during any 30-day period.

The single sample level of 400 fecal coliforms per 100 milliliter level is reasonable, based on the epidemiological study in Santa Monica Bay (Haile, et al., 1996; SMBRP, 1996) at beaches affected by storm drains. Investigators found that exposures to levels greater than 400 total coliforms per 100 milliliters were related to an 88 percent increase in the risk of skin rash.

Enterococcus bacteria

The Department's regulations include a single sample standard of 104 enterococcus bacteria per 100 milliliters, and a 30-day average (mean of the logarithms of the results of at least five weekly samples over the prior 30 days) of 35 enterococcus bacteria per 100 milliliters.

In the 1970s, the USEPA performed epidemiological studies at several beaches in the United States (Cabelli, 1983). From these studies of approximately 27,000 bathers in New York, Louisiana, and Massachusetts, the author concluded that concentrations of enterococcus bacteria were the best indicator organism for the prediction of human illness associated with recreational bathing. For example, for total highly credible gastrointestinal symptoms (vomiting, diarrhea, or stomach ache or nausea with fever), the mean enterococcus density had correlation coefficients of 0.75 - 0.96, compared to
0.12 - 0.46 for total coliform bacterial and minus 0.01 - 0.51 for fecal coliforms. For total gastrointestinal symptoms, the mean enterococcus density had correlation coefficients of
0.81 - 0.84, compared to 0.12 - 0.46 for total coliform bacterial and 0.01 - 0.36 for fecal coliforms. From these studies, a recommended health effects criterion for marine recreation waters was described by the equation, log X = 0.0456Y + 0.677. The report by Cabelli was used by the US EPA (1986) to estimate that exposures to water at the fecal coliform standard of 200 per 100 milliliters, containing enterococcus bacteria at an average concentration of 35 per 100 milliliters, would result in 19 cases of effects (such as gastrointestinal illness or other effects) per 1,000 people so exposed. An average of 35 per 100 milliliters was considered to pose the same risk as a single exposure to 104 enterococcus bacteria per 100 milliliters.

The Santa Monica Bay study found concentrations of enterococcus greater than the single sample level (that study used 106 enterococci as the reference point instead of
104) to show an increase in gastrointestinal effects. The investigators found a 323 percent increased in diarrhea with blood, and a 44 percent increase in vomiting and fever associated with exceeding the enterococcus value.

The enterococcus standards, in concert with those for total coliforms and fecal coliforms and the ratio of the two coliforms, represent a spectrum of indicator organisms that provides for the protection of public health.

The standards of 104 enterococcus bacteria per 100 ml for a single sample and 35 enterococcus bacteria per 100 ml for a 30-day average are values that are derived from USEPA guidance (1986). The California Ocean Plan of the State Water Resources Control Board (1997) also requires monitoring for enterococcus, and requires a survey to determine if a discharger is responsible for the contamination when the 30-day average (geometric mean) enterococcus level exceeds 24 per 100 ml (or 12 per 100 ml for a six- month period).

Other microbiological indicators

Health and Safety Code Subsections 155880(c)(1) and (2) direct the Department's regulations to require testing for other microbiological indicators and to establish standards for them, if alternative indicators are as protective of public health as total coliform, fecal coliform, and enterococci bacteria. Although research is being performed within the scientific community with regard to health risks from the recreational marine waters and on "better" indicators of disease-causing organisms, available scientific studies and the weight of the evidence do not suggest that alternatives that are as protective are yet identified. However, the Department will continue to follow developments in research on other potential indicators of disease associated with marine water exposures.

Single sample and 30-day averages

One of the points of discussion in early meetings the Department had with local environmental health officials centered on the value of single most recent samples and 30-day averages of concentrations of microbiological indicator organisms to local health officers in determining whether beaches should posted, closed, or otherwise restricted. Many of California's local environmental health officers indicated that they find the most recent of single samples taken weekly to be more helpful than the average (mean of the logarithms) of five weekly samples over a 30-day period, which is also used in analyzing monitoring data. The single most recent sample enables a more prompt response to elevated levels. As a result, the regulation does not utilize the 30-day averages as triggers for beach posting, as discussed below in Section 7961. However, the 30-day averages are used for determining whether a beach should be restricted as to its use, or whether it should be closed, either partially or entirely. The 30-day average of monitoring data may also be of value in providing information that may be of value in identifying sources of microbiological contamination, and in identifying areas of chronic contamination. Since the weekly collection of data enables 30-day averages to be calculated easily, the average values can readily be evaluated by local agencies.

Laboratory analyses

Section 7658(c) requires that samples are to be submitted to laboratories certified in microbiology by the Environmental Laboratory Accreditation Program (ELAP) of the Department. The ELAP certification addresses methods to be used in bacteriological analyses. The laboratory accreditation process assures that laboratories meet certain standards with regard to laboratory procedures and practices. The competence that is demonstrated by the accreditation process gives users of data from laboratory analysis confidence in the accuracy and validity of the data. The use of prescribed methods that are part of the certification process of the laboratory adds to the confidence in the laboratory results and their interpretation.

Section 7961. Public Beaches Visited by More than 50,000 People Annually and Adjacent to Storm Drains

Section 7961(a) requires that waters adjacent to public beaches be sampled weekly from April1 through October 31 of each year if the beach is visited by more than 50,000 people annually and if this beach is located on an area adjacent to a storm drain that flows in the summer. Health and Safety Code Section 115880(c)(4) requires that the regulations include the requirement for weekly testing of beaches that are visited by more than 50,000 people annually and that are located on an area adjacent to a storm drain that flows in the summer. As a result, this part of the regulation duplicates the statutory requirement, contrary to the Administrative Procedure Act's nonduplication standard. However, given the statutory requirement and the opportunity to focus the regulation on the specific public beaches that are subject to these regulations, such duplication is reasonable.

Health and Safety Code Section 115880(c)(3) requires that the Department's regulations establish protocols for monitoring site locations and monitoring frequency, based on risks to public health.

Section 7961(b) covers the location of the sampling. In developing this regulation, the Department considered proposing specific locations for sampling at public beaches and areas adjacent to storm drains. However, such specificity was not included for several reasons. First, California's many beaches differ in terms of their size, shape, use patterns, and the extent to which they are affected by storm drains. Second, the size and flow patterns of storm drains varies from beach to beach. Third, the proximity of recreational use to storm drains may also vary from beach to beach. For these reasons, the Department believes that local health officers have site-specific knowledge about beaches, storm drains, and recreational use that is useful in addressing concerns about localized contamination that may be associated with storm drains. It is appropriate that the sampling locations be established by the local health officer, who will be able to include them in the weekly sampling areas of public beaches. It is obvious and need not be mentioned in the regulation that sampling of waters adjacent to public beaches includes areas used by the recreating public.

Sampling sites need to provide data for water that is affected by a storm drain, as well as water that is not affected by a storm drain, so that the extent of storm drain influence can be determined. The regulation points out that such waters affected by storm drains should be included in the weekly sampling. The exact location of sampling with respect to the storm drain waters must be left to the local health officer, because the area influenced by storm drain waters depends on a number of site-specific variables, including the volume and rate of flow of water from the storm drain, the nature of the receiving coastal area, the influence of currents, tides, and other natural conditions.

The regulation also includes appropriate sampling depths for waters adjacent to

public beaches. It states that samples should be taken from just below the water surface, in ankle- to knee-depth water, approximately 4- to 24- inches deep. This depth of sampling is appropriate and representative of exposures to water at public beaches, particularly for children who would be wading and playing in shallow waters. This depth also provides for consistency of sampling among various individuals and programs.

Posting beaches, closing and reopening beaches

Health and Safety Code Section 115880(c)(3) requires that the Department's regulations establish protocols for making decisions regarding public notification of health hazards, including, but not limited to the posting, closing, and reopening of public beaches.

Section 7961(c) requires, for beaches subject to Health and Safety Code Section 115880, that the local health officer post a public beach pursuant to Health and Safety Code Section 115915 whenever any of the four standards in Section 7958(b) are exceeded. Because each of the standards is protective of public health, exceedance of any of them is reasonable to require posting for the protection of public health.

Section 7961(c) also requires that the local health officer utilize the standards of Sections 7958(a)(1) and 7958(a)(2) to determine whether it is necessary to close or otherwise restrict use of a public beach with elevated levels of microbiological indicators. Although the single sample standard is to be used for purposes of posting, the longer- term (30-day average) samples will provide additional information to the local health officer that will be helpful in identifying possible additional actions (closure or use restriction). For example, the longer term results may help the local health officer identify a specific area of a public beach that may warrant long-term permanent posting or closure (e.g., an area affected by a storm drain that always exceeds standards).

Response to sewage spills

Section 7961(d) includes regulations that apply to known releases of untreated sewage into waters adjacent to a public beach. Since sewage releases are likely to contain disease-causing organisms, the regulation requires the local health officer to immediately post the beach, and to close the beach (or parts of it) or otherwise restrict its use by the public. Posting, and closure or restrictions are required to continue until the source of the known sewage release is eliminated. This requirement ensures that exposures to sewage by water contact will not occur.

The local health officer is also required to sample the affected waters and test them for total coliform bacteria, fecal coliform bacteria and enterococcus, and to use the standards of 7958(a)(1) for those indicator organisms to determine whether posting, restriction, and/or closure of the beach should continue. Such

testing will also enable the local health officer to make decisions about whether the area that is posted and closed or restricted can be reduced in size, allowing beach users to use portions of the public beach that no longer pose a risk of exposure to microbiological contamination.

Section 7962. Duties Imposed on a Local Public Officer or Agency

Health and Safety Code Sections 115880(h), 115885(g), and 115915(c) provide limits on the mandates of any duty imposed upon a local public officer or agency by these regulations. Pursuant to those sections, such a duty shall be mandatory only during a fiscal year in which the Legislature has appropriated sufficient funds in the annual Budget Act or otherwise for local agencies to cover the costs to those agencies associated with performance of these duties.

This part of the regulation duplicates statutory language, contrary to the Administrative Procedure Act's nonduplication standard. However, given the statutory requirement for development of regulations and the opportunity to focus the regulation on the specific public beaches that are subject to these regulations, and the budgetary limitations that dictate whether the regulations are to be implemented by local health officers, such duplication is reasonable.

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