

Appendix E

Comment Letters Received

by February 29, 2016

TABLE OF CONTENTS

Comment Letter Received	Page No:
1. City of San Mateo	E-1
2. Lennar Urban	E-5
3. San Francisco Baykeeper	E-9
4. San Francisco Public Utilities Commission	E-12
5. State of California Department of Parks and Recreation	E-19
 Scientific Peer Review Comments	
Dr. Patricia Holden, Professor of Environmental Microbiology, Univ. of California at Santa Barbara	E-21
Dr. Peter Strom, Professor, Depart. of Environmental Science, Rutgers University	E-24

This page intentionally left blank



DEPARTMENT OF PUBLIC WORKS
Brad B. Underwood, P.E., L.S., Director

330 W 20th Avenue
San Mateo, CA 94403-1338
Telephone: (650) 522 -7300
Fax: (650) 522-7301
www.cityofsanmateo.org

February 29, 2016

Jan O'Hara
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Via Email to: Janet.O'Hara@waterboards.ca.gov

Subject: City of San Mateo Comments Regarding Staff Report and Proposed Basin Plan Amendment - Total Maximum Daily Load for Bacteria in San Francisco Bay Beaches

Dear Ms. O'Hara:

The City of San Mateo appreciates the opportunity to make formal comment on the Staff Report and Proposed Basin Plan Amendment (BPA) - Total Maximum Daily Load for Bacteria in San Francisco Bay Beaches. Marina Lagoon is a very different kind of water body than the open bay. Unlike the open bay, Marina Lagoon is enclosed, receives most of its water from a neighboring slough, is insulated from tidal stage height variation, has mudflats and organic rich bottom sediments, has seasonal infestations of aquatic weeds, and an approximately 6-day residence time during dry weather. Background bacteria abundances, substrata and conditions for persistence and in-situ growth, flushing rates, and other factors that affect bacteria abundance in Marina Lagoon will be dissimilar from those that affect bacteria abundances and patterns in the five open-water beaches currently included in the TMDL project (Aquatic Park, Candlestick Point, Crissy Field Beach, China Camp, and McNears Beach). Based on these conditions, and other considerations as described below, please find the following comments to the proposed BPA.

Comments:

1. The proposed BPA does not take into account natural or "environmental" sources of enterococci, which may be found in a variety of habitats, such as ambient waters, aquatic and terrestrial vegetation, beach sand, soil, and sediment. Not all enterococcus species are specific to fecal matter (see [this paper Byappanahalli et al. 2012](#), also one 2006/2007 [enterococcus speciation study](#) conducted by Orange County found that 42-54% of enterococcus isolated from urban runoff, bays and the ocean are *E. casseliflavus* and *E. mundtii*, plant-associated species.) and that, even if the enterococcus species is of fecal origin, it could come from wildlife. **The City requests that the BPA include consideration of natural/environmental sources of enterococci.**

2. On page 2 of the Regulatory Background, your staff report states “A TMDL is defined as the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background such that the capacity of the water body to assimilate pollutant loads (the loading capacity) is not exceeded. The TMDL must take into account seasonal variations and include a margin of safety to address uncertainty in the analysis.” In addition, Section 8.5 states that “Recreational uses of San Francisco Bay beaches are most prevalent in the summer, but can also occur year-round. Therefore, we are not proposing seasonal variation to the TMDLs and load allocations.” It should be noted that the Marina Lagoon is primarily a flood control channel, which is lowered from summer levels by 3 feet in elevation during the winter to allow for stormwater runoff. For this reason, the Beaches at Marina Lagoon received significantly less recreational swimming during the winter months. The City strongly feels there should be different dry and wet weather allocations, which are provided in other Region’s bacteria TMDLs, but not (so far) in Region 2. **The City requests and supports calculation of appropriate dry- and wet-weather allocations be considered in section 8.2.**
3. The entire Belmont Slough drains into the Marina Lagoon, which is a separate watershed that the City does not have any control over. The majority of Belmont Slough is developed and surrounded by residential and commercial properties and drainage within the City of Foster City and Belmont. The Cities of Foster City and Belmont are subject to the Municipal Regional Stormwater Permit Municipal Regional Stormwater NPDES permit (MRP) (R2-2015-0049). Belmont Slough has at its entrance near Bair Island State Marine Park and Redwood Shores Marine Park, which is a very large natural wildlife preserve, which contains a very large bird and wildlife population. As the inlet to Marina Lagoon has had very high pathogen concentrations, it would appear that this large wildlife area essentially drains at least partially through tidal flux, into and through the marina lagoon.

In addition, Section 8.3 Proposed Load and Wasteload Allocations states:

“it is the responsibility of individual facility or property owners within a given source category to meet these allocations. In other words, individual facilities and property owners shall not discharge or release a load of pollution that will increase the density of fecal coliforms in the downstream portion of the nearest water body above the proposed load allocations assigned to that source type. This allocation scheme assumes that the concentration of FIB upstream from the discharge point is not in excess of the assigned load allocations.”

This is another inherent flaw in the incorporation of Marina Lagoon in the Bay Beaches TMDL. No other beach has an entire other jurisdiction’s watershed draining into their beach, with poor water quality and zero control. The Belmont Slough has the potential to contain all of the sources of pathogens listed in section 8.3.

The City requests that the Cities of Foster City, Belmont and the Belmont Slough be listed as additional urban runoff and wildlife sources in section 7.3.4.

4. Item 2a and 4 of the Marina Lagoon Beaches Implementation Plan proposes, “*2a. Comply with Cease and Desist Order No. R2-2009-0020 (CDO) and any future amendments. In next annual report, submit enhancements to the Sewer System Management Plan that prioritize sewer system inspections and repairs in areas within ¼ mile of beach to the extent possible within the framework of the CDO. Include a diagram of prioritized infrastructure and time schedule.*

Complete inspections and repairs in prioritized area(s).”

The City would prefer to keep language/terminology and regulatory requirements consistent. The proposed language confuses requirements listed in CDO Order No. R2-2009-0020, which requires annual progress

reporting regarding capacity assessment and infrastructure renewal projects, and the SSO Statewide Permit Order No. 2006-0003 DWQ, which requires development of an SSMP. The City therefore recommends the following language in place of the above proposed language:

2a. Comply with Cease and Desist Order No. R2-2009-0020 (CDO) and any future amendments. In next annual CDO report, submit enhancements to the Infrastructure Renewal and Capacity Assurance Plans that prioritize sewer system inspections and repairs in areas within ¼ mile of beach to the extent possible within the framework of the CDO. Include a diagram of prioritized infrastructure and time schedule.

Complete inspections and repairs in prioritized area(s).

Similarly, Item 4 is already being conducted at a larger scale. The city recommends removing item 4 under the Sanitary Sewer Collection System, as there are already control mechanisms to ensure that the sewer system is being evaluated and prioritized. If Item 4 under the Sanitary Sewer Collection System is kept, the timeframes for completing sanitary sewer repairs and replacements should be flexible and self-implementing. The schedule for repairs is driven by inspections, studies, and other condition based priorities, some of which are outside of the Cities potential to control. Minimally revise the language to:

If targets not met, submit enhanced Infrastructure Renewal and Capacity Assurance Plans that prioritize sewer system inspections and repairs in areas within ½ mile of a beach or otherwise connected to the beach . Include a diagram of prioritized infrastructure, a time schedule for implementing short- and long-term plans, and, as necessary, a schedule for developing the funds needed for the capital improvement plan.

Complete inspections and repairs in prioritized area(s) per the schedule developed by the City and per the CDO.

5. Item 2b. within the Sanitary Sewer Collection System section of the Implementation Plan requires the City of investigate the feasibility of diverting stormwater and dry weather urban runoff to the City of San Mateo Wastewater Treatment Plant. The City submitted a sanitary sewer master plan in conjunction with CDO requirements, which provides significant commitments over the next 10-20 years for infrastructure repair, renewal, capacity assurance for wet weather flows, and close to one billion dollars in capital costs. The proposed requirement introduces a significant change to the master planning efforts, and at this time it is not feasible to introduce this plan of action. **The City requests that item 2b be removed from the implementation plan.**
6. Item 5 within the Sanitary Sewer Collection System section of the Implementation Plan requires the City to establish and implement a private lateral replacement program if private laterals are a likely source of bacteria to the beach. As described in section 10.2.4, the City already has a private lateral replacement program. This voluntary cost sharing program paid out \$424,433 in fiscal year 15/16 and replaced 113 cleanouts and 7,449 linear feet of private laterals within the City. The City is budgeting \$500,000 for fiscal year 15/16 for the continuation of this program. The City's position is that the existing cost sharing program is sufficient; it provides a valuable service to the community and protects the entire watershed including Marina Lagoon. **The City requests that item 5 be removed from the implementation plan, as we already have an adequate private lateral program.**
7. The City is subject to a number of regulatory requirements that are anticipated to result in improvement of water quality within Marina Lagoon specifically for pathogens. In particular, Cease and Desist Order No. R2-2009-0020 (CDO), SSO Statewide Permit Order No. 2006-0003 DWQ, and Municipal Regional Stormwater Permit Order No. Order No. R2-2015-0049. Therefore, a TMDL alternative or single

regulatory action could reasonably be considered. Additionally, and in consideration of the first six comments and issues with the proposed TMDL, the City requests the following:

Request: Delay the TMDL but (1) move forward with requiring implementation of cost-effective measures to control anthropogenic sources (e.g., inspection and repair of the sanitary sewers, review of existing stormwater BMPs); (2) continue beach monitoring; (3) form a regional workgroup (ideally through the RMP) to develop and implement a regional source identification plan.

Please let me know if you have any questions regarding these comments, or if a meeting is desired.

Sincerely,



Sarah Scheidt
Regulatory Compliance Manager
City of San Mateo, Environmental Services Division
2050 Detroit Drive
San Mateo, CA 94494
650-522-7385 – office
650-201-4451 – cell

Copy:

Brad Underwood, Director of Public Works, bunderwood@cityofsanmateo.org
Caio Arellano, Assistant City Attorney, carellano@cityofsanmateo.org
Cathi Zammit, Engineering Manager, czammit@cityofsanmateo.org

Submitted Electronically via Email

Date: 26 February 2016

To: Jan O' Hara, San Francisco Bay Regional Water Quality Control Board

From: Therese A. Brekke, Director of Planning, Lennar Urban

Copies to: Bronson Johnson, Mark Luckhardt, Jeff Martin, Lennar Urban
Amy Chastain, Lori Regler PUC
Marc Bruner, Perkins Coie

Subject: Comments on Draft Staff Report for Proposed Basin Plan Amendment, Total Maximum Daily Load (TMDL) for Bacteria at San Francisco Bay Beaches

Lennar Urban is the Master Developer of three urban renewal projects in the San Francisco Bay Area. These are The San Francisco Shipyard (former Hunters Point US Navy Shipyard), Candlestick Point (former Candlestick Park football and baseball stadium), and Treasure Island (former US Navy Facility). We have had an opportunity to review the Draft Staff Report for the Proposed Basin Plan amendment and offer the following comments for your consideration:

COMMENT: DISCUSSION OF EXISTING URBAN RUNOFF WATER QUALITY FOR CANDLESTICK POINT

With respect to urban runoff at Candlestick Point being a source of fecal indicator bacteria (FIB) and pathogens¹, the draft TDML states:

- (1) Water quality samples collected by the SFPUC from the separate stormwater drainage network at Candlestick Point in 2003 and 2013 (before the stadium was demolished) had concentrations of Enterococcus and E.coli concentrations significantly less than water quality standards, although total coliform concentrations were greater than the water quality standard.
- (2) A study conducted by Boehm Research Group at Stanford University (Boehm, 2012) evaluated two water samples from the storm drain outfall at Windsurfer Circle. The samples were analyzed for FIB and a microbial source tracking technique for human fecal markers. Although the Enterococcus concentrations were above the single

¹ Fecal indicator bacteria include Enterococcus and *E. coli* and are themselves not illness-causing, but rather are often associated with human fecal contamination as well as other ubiquitous environmental sources, and they are the basis for the state and federal recreational water quality criteria and objectives. Pathogens are currently-unregulated microorganisms (bacteria, protozoa, and viruses) that are illness-causing and are derived from human fecal contamination.

sample maximum objective, the human fecal material marker was not detected in either sample.

These data suggest a lack of correlation between the quality of MS4 discharges at Candlestick Point and exceedances of the Enterococcus water quality objective in the receiving water (beach surfzone), and a lack of evidence of human fecal contamination in the MS4 discharges, which is the primary focus of control efforts in the TMDL.

Beach water quality studies conducted in southern California found no correlation between illness rates and indicator bacteria concentrations (Colford et. al 2005, Griffith 2011). In addition, studies have also found that Enterococcus originates in plants and kelp (Moore et. al 2007, and Imamura et. al 2011). These data, combined with recent USEPA recreational risk assessments (Soller et. al 2010, Schoen et. al 2011), suggest that currently there is not enough conclusive evidence to support the numeric target for Enterococcus in the TMDL for urban runoff-impacted (or non-human fecal-impacted) receiving waters. Instead of a TMDL, a more effective action would be to develop a site-specific recreational objective, or a Basin Plan Amendment to permit a natural source exclusion or microbial risk-based alternative compliance pathway.

In light of existing monitoring studies that show inconclusive correlations linking MS4 discharges to water quality objective exceedances resulting from fecal contamination, we request that the Water Board delay the adoption of the TMDL until additional data can be collected to support a strong correlation that would warrant the required TMDL Implementation Plans. Additional time could also potentially allow for information from the statewide bacteria objectives update to be incorporated into the TMDL; the draft objectives are expected to be due out for public comment in March 2016. Specific consideration should be given to the relatively low risk of illicit discharge contamination impacting MS4 discharges originating from a redeveloped area with new sanitary and stormwater drainage infrastructure that incorporates pollutant-specific BMPs, per the Phase II Small MS4 General Permit requirements (Order No. 2013-0001 DWQ).

Lennar Urban's redevelopment of Candlestick Point supports new separate stormwater drainage and sewer infrastructure. This will reduce the amount of urban runoff contributing to sanitary sewer overflows that are the result of the combined sewer system. It will also significantly minimize the potential illicit sanitary connections and leaks to the storm drain system. In addition, Lennar Urban's redevelopment of Candlestick Point will conform to the San Francisco Design Guidelines and will implement BMPs aimed at eliminating potential sources of bacteria (such as pet waste) by effectively removing bacteria from runoff using vegetated treatment systems. A modern redevelopment project with a comprehensive suite of pollutant-specific structural and institutional BMPs is not expected to be a source of human fecal contamination.

COMMENT: COMPLIANCE TIMEFRAME EXTENSION

We would like to request an extension for the compliance timeframe for Implementing Parties to submit a BMP plan to address reducing discharges of bacteria from MS4s. We request that the current timeframe of 6 months be extended to three years from the effective date of the TMDL. This would provide an appropriate period of time for Implementing Parties to test BMPs to evaluate if the infrastructure meets the objectives of the TMDL.

COMMENT: ADAPTIVE IMPLEMENTATION

The TMDL includes a provision to evaluate new and relevant information at six-year intervals, and will consider a Basin Plan amendment that reflects any necessary modifications to the targets, load and wasteload allocations, or implementation plans. We request that a specific date be set in the TMDL implementation plan for a reopener, with that date to occur in no longer than four years from the effective date of the TMDL. The TMDL reopener purpose would be to evaluate new relevant information, which may include:

- Approval of a natural source exclusion² or similar Basin Plan amendment within the San Francisco Bay Region;
- Approval of the statewide bacteria objectives update (which is expected in late 2016); or
- Data from relevant special studies, such as regional or discharger-specific microbial source tracking investigations, quantitative microbial risk assessments, and/or epidemiology studies.

REFERENCES

Boehm, 2012. *Re: SIPP update*. Stanford University. Email to MKellogg, SFPUC. March 23, 2012.

² The Los Angeles region has amended its Basin Plan to allow for a natural source exclusion. The Final Staff Report for the bacteria TMDL for the Santa Clara River (July 8, 2010) (http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/78_New/revised/Final%20Staff%20Report-SCR%20Bacteria%20TMDL.pdf) states: Under the natural sources exclusion implementation procedure, after all anthropogenic sources of bacteria have been controlled such that they do not cause or contribute to an exceedance of the single sample objectives and natural sources have been identified and quantified, a certain frequency of exceedance of the single sample objectives shall be permitted based on the residual exceedance frequency in the specific water body. The residual exceedance frequency shall define the background level of exceedance due to natural sources.

Colford, J.M., Wade, T.J., Schiff, K.C., Wright, C., Griffith, J.F., Sandhu, S.K., and S.B. Weisberg, 2005. "Recreational water contact and illness in Mission Bay, California." Technical Report 449, Southern California Coastal Water Research Project.

Griffith, J.F., 2011. "Preliminary Findings: Doheny State Beach Epidemiology Study." SCCWRP Symposium. January 25.

Moore, D., Guzman, J., Hannah, P., Getrich, M., and C. McGee, 2007. "Does Enterococcus indicate fecal contamination? The presence of plant-associated Enterococcus in Southern California recreational waters." Coastal Conference Presentation. County of Orange County.

Imamura, G.J., Thompson, R.S., Boehm, A.B., and J.A. Jay, 2011. "Wrack promotes the persistence of fecal indicator bacteria in marine sands and seawater." FEMS Microbiology Ecology 77(1).

* * * * *

February 29, 2016

Jan O'Hara

San Francisco Bay Regional Water Quality Control Board

1515 Clay Street, Suite 1400

Oakland, CA 94612

sent via electronic mail: johara@waterboards.ca.gov

Re: San Francisco Baykeeper comments on the proposed Total Maximum Daily Load (TMDL) and Implementation Plan for Bacteria at Impaired San Francisco Bay Beaches

Dear Ms. Ohara,

On behalf of San Francisco Baykeeper and our over 3,000 members, we respectfully submit these comments on the proposed Basin Plan amendment "Establishing a Total Maximum Daily Load and Implementation Plan for Bacteria at Impaired San Francisco Bay Beaches" ("Bacteria TMDL").

Baykeeper is primarily concerned that the proposed Implementation and Monitoring program for the Bacteria TMDL lacks specificity, generally follows a status quo approach, and is insufficient to determine the effectiveness of implementation actions or whether allocations are met, in conflict with minimum TMDL requirements established in EPA guidance for TMDL development.¹

For example, Table 10.1 of the Bacteria TMDL establishes the general elements for implementation plans to achieve water quality standards. Elements presented to address bacteria loading from sanitary sewer collection systems and urban runoff call for the mere submission of vaguely-specified assessment and implementation plans by the regulated entities. If implementation of those plans, which are not subject to public review or even approval by the Executive Officer, is unsuccessful within five (5) years, yet another plan, generally identical in nature to the prior plan, shall be generated – and there are no specifications for what that plan should entail or consider. Nor are there any consequences, in the likely event that implementation of the plan fails to meet load and wasteload allocations for bacteria to San Francisco Bay beaches within any specified timeline.

This pattern of assigning responsibility for the development of implementation and monitoring programs to regulated entities, and the pursuit of decadal plan-development processes, has been demonstrated in a number of TMDLs and NPDES permits approved in recent years by the San Francisco Bay Regional Water Quality Control Board. This is a source of concern for Baykeeper and other observers.

¹ U.S. EPA, Draft Guidance for Water Quality-based Decisions: The TMDL Process (2nd Edition), EPA 841-D-99-001 (August 1999) (hereinafter, "1999 TMDL Guidance"). Available at <http://nepis.epa.gov/Exe/ZyPDF.cgi/P1007N47.PDF?Dockey=P1007N47.PDF>

Implementation Plan Elements Insufficient to Ensure Achievement of Wasteload Allocations

Implementation Plan Elements of the Bacteria TMDL do not demonstrate knowledge of industry practices to prioritize sanitary system rehabilitation, do not follow US EPA guidance for implementing bacteria TMDLs, and are inconsistent with bacteria TMDLs approved in other regions of California.

For example, to address bacteria loading from sewer collection systems, Table 10.1 indicates implementation measures should concentrate on sewer improvements within 0.25 miles of the beaches in question. And if such measures are not successful within 5 years, the radius in which sewer implementation measures shall be focused on shall expanded to 0.5 miles. The justification or rationale for this requirement is not provided.

Specifications for the prioritization of sewer infrastructure rehabilitation, based on an arbitrary distance from the beach, also does not recognize national and international standards for assessing and prioritizing the rehabilitation of underground utilities. The industry standard, Pipeline Assessment and Certification Program (PACP), is not cited in the TMDL as a means to grade and prioritize the remediation, upgrade or replacement of sewerage infrastructure, for example. Nor is there any discussion of potential strategies for addressing sewer exfiltration, which is a likely concern given the age of and composition of many of the pipes in our seismically active region.

Additionally, according to the 1999 TMDL Guidance, "[t]o be effective in improving water quality, a TMDL must be more than an estimation of necessary pollutant reductions; it must be implemented."² Accordingly, a TMDL must include an implementation plan "that explains the techniques that will be used to the meet the load reductions identified."³ Specifically, the implementation plan must include a "description of the implementation actions and/or management measures required to implement the allocations contained in the TMDL, along with a description of the effectiveness of these actions and/or measures in achieving the required pollutant load or reductions."⁴ The proposed Bacteria TMDL simply does not satisfy the stated purpose or the minimum requirements of TMDL implementation plans.. We respectfully request for staff to conduct the requisite analysis necessary to present the minimum elements necessary for any TMDL submitted to EPA, established by EPA guidance.

Bacteria TMDL Fails to Require Monitoring for Effectiveness of Load Reduction Actions

While Section 10.1.6 of the Bacteria TMDL Staff Report is titled 'Monitor for Effectiveness of Load Reduction Actions' this section merely summarizes existing monitoring activities and summarizes conceptual options for monitoring in the future. The Bacteria TMDL does not call for any monitoring from stormwater agencies, in conflict with bacteria TMDLs and stormwater NPDES permits throughout the Los Angeles, Santa Ana and San Diego regions. Nor does the Bacteria TMDL request refinement of bacteria source identification through, for example, methods described in *The California Microbial Source Identification Manual: A Tiered*

² Id. at 1-10

³ Id.

⁴ Id. at 3-22.

*Approach to Identifying Fecal Pollution Sources to Beaches.*⁵ In fact, the only optional monitoring presented in this section deals with considerations for entities seeking a natural source exclusion, rather than requesting monitoring data specific to the regulated entity and their discharges of concern.

Section 7.2.5.8 of the Draft Basin Plan Amendment for the Bacteria TMDL states the “[i]mplementing parties are responsible for developing and implementing a monitoring plan sufficient to assess compliance with the numeric targets at the beaches”. This is in conflict with EPA guidance, which requires all TMDL submittals to include a monitoring or modeling plan “designed to determine the effectiveness of the implementation actions and to help determine whether allocations are met.”⁶

Here, the Regional Board attempts to delegate its duty to describe specific measures that will be taken to reduce pollutant loads to the sources themselves. It provides that the source of bacteria discharges, such as municipal stormwater entities and sanitary sewer collection system authorities, will develop plans to describe BMPs and other measures for implementation. The duty to develop these plans, for inclusion in TMDLs, however, rests on the Regional Board. We respectfully request that staff develop implementation and monitoring plans sufficient to meet the requisite standards established in EPA guidance.

Bacteria pollution is often overlooked in San Francisco Bay, due in part to the perception REC1 exposure is limited to so-called fringe activities like kite boarding or open water swimming. In fact, San Francisco Bay is a world class destination for such activities and all forms of board sports, sailing, swimming and other recreational activities throughout the year. Some of the urban beaches addressed in this TMDL are among the only high quality resources for board sport enthusiasts and the Regional Board should use this Bacteria TMDL as a means to enhance water-oriented recreation, in general. Technical guidance and numerous bacteria TMDLs exist from which to provide useful examples for implementation and monitoring strategies aimed at urban beach settings. We hope that staff and members of the Board amend the draft Bacteria TMDL to introduce enforceable implementation and monitoring guidelines that will ensure attainment of water quality standards within a defined time period.

Sincerely,



Ian Wren
Staff Scientist, San Francisco Baykeeper

Erica A. Maharg
Staff Attorney, San Francisco Baykeeper

⁵ Griffith JF, Layton BA, Boehm AB, Holden PA, Jay JA, Hagedorn C, and McGee CD and Weisberg SB. 2013. *The California Microbial Source Identification Manual: A Tiered Approach to Identifying Fecal Pollution Sources to Beaches*. Prepared for the Southern California Coastal Water Research Project. Available at www.waterboards.ca.gov/water_issues/programs/beaches/cbi_projects/docs/sipp_manual.pdf

⁶ 1999 TMDL Guidance at 3-23.

February 29, 2016

Dr. Terry Young, Chair
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612
Via electronic mail: johara@waterboards.ca.gov

RE: Total Maximum Daily Load for Bacteria at San Francisco Bay Beaches, Draft Staff Report for Proposed Basin Plan Amendment

Dear Dr. Young,

The San Francisco Public Utilities Commission (SFPUC) appreciates the opportunity to comment on the draft Basin Plan Amendment (BPA) Establishing a Total Maximum Daily Load (TMDL) and Implementation Plan for Bacteria at Impaired San Francisco Bay Beaches. We also thank staff for keeping us regularly informed of the TMDL status, and for their efforts to engage and solicit input from many stakeholders.

Three of the six beaches addressed by this TMDL are in San Francisco. Consequently, it has the potential to have significant implications for the City. The SFPUC is very much concerned that the TMDL numeric target and the wasteload allocation (WLA) for urban runoff are likely unattainable due to non-controllable sources. Without a defined path to identifying the contribution from non-human sources, or clearly outlining the limits of stormwater BMPs, this TMDL could result in the expenditure of significant resources without producing measureable water quality benefits.

The SFPUC requests that the Regional Board postpone adoption of this TMDL until an approach for identifying and addressing natural or background sources in the Bay is developed. In the interim, we support moving forward with implementation of cost-effective measures to identify anthropogenic sources, continued beach monitoring, and development and implementation of a regional source identification plan to better characterize sources of fecal indicator bacteria (FIB) and target future implementation measures. Proceeding with implementation of these measures without a TMDL will ensure that progress is made in addressing fecal indicator bacteria exceedances, but will prevent the need for future Basin Plan amendments if non-controllable sources are identified as significant contributors to impairment.

This approach may also help harmonize this effort with the State Water Board's anticipated adoption of statewide water quality objectives for bacteria. Our understanding is that the State Water Board expects to adopt objectives in 2016 and may include implementation guidance on addressing natural sources, mixing zones, and even seasonal modifications to the recreational beneficial use. These and other

Edwin M. Lee
Mayor

Francesca Vietor
President

Anson Moran
Vice President

Ann Moller Caen
Commissioner

Vince Courtney
Commissioner

Ike Kwon
Commissioner

Harlan L. Kelly, Jr.
General Manager



potential measures should be assessed for use in this TMDL and incorporated where appropriate. Our specific concerns and requests are described in more detail below.

1. The BPA should more specifically address environmental sources of enterococcus.

Although the United States Environmental Protection Agency (USEPA) recommends the use of enterococcus as an indicator of marine water quality, it is an imperfect indicator. Not all enterococcus are indicators of fecal contamination because not all enterococcus are specific to vertebrate intestinal tracts. For example, multiple studies have identified that plant-associated species of enterococcus can be the most prevalent enterococcus in beach samples.¹ One 2006/2007 enterococcus speciation study conducted by Orange County at six ocean sites found that 42 percent of enterococcus species identified were plant-associated. Other studies have found enterococcus in storm drains or seawrack.² Even if enterococcus in receiving waters are of fecal origin, the current EPA approved culture-based method does not distinguish between human and other animal sources and the risk to humans from exposure to pathogens associated with animal feces is not well understood or characterized.

Recent monitoring conducted by the SFPUC indicates that non-human sources of enterococcus may be significantly contributing to the observed frequency of water quality objective exceedances at some locations. In 2014 the SFPUC analyzed shoreline samples collected as part of the SFPUC's routine beach monitoring program for enterococcus using the culture-based EPA Method 1609.1, and for the presence of the human-associated HF183 Taqman marker³ using quantitative polymerase chain reaction (qPCR). The results of this study for the beaches subject to this TMDL are summarized in an attachment to these comments.

The results show that, at the Candlestick beaches, cultured enterococcus concentrations were often elevated even when HF183 results were below the method level of quantification. For example, 38 out of 88 samples (43 percent) collected at Sunnydale Cove exceeded 104 MPN/100 mL. 68 of those 88 samples were also analyzed for the presence of HF183. Of those 68 samples, only 7 (10 percent) had levels of HF183 above the method level of quantification. In other words, the majority of elevated levels at these beaches may not be from humans or vertebrate animals. As currently

¹ See, e.g., Ferguson, D., *Comparison of Enterococcus Species Diversity in Marine Water and Wastewater Using Enterolert and EPA Method 1600*, J. Environ. & Public Health; 2013(10):848049 (June 2013). Byappanahallia, M., *Enterococci in the Environment*, Microbiol Mol Biol Rev.; 76(4): 685–706 (December 2012). Moore, D., *Does Enterococcus Indicate Fecal Contamination? Presence of Plant Presence of Plant-Associated Enterococcus in Southern California Recreational Waters*, Orange County Presentation (October 24, 2007).

² See, e.g., Derry, C., *Regrowth of enterococci indicator in an open recycled-water impoundment*; Sci Total Environ.; 468-469:63-7 (Jan 2014); Ferguson, D., *Natural Sources and Regrowth of Enterococcus in Coastal Environments*, Southern California Coastal Research Project presentation.

³ The HF183 Taqman marker is the recommended starting point for detecting human fecal material because it provides the best combination of sensitivity and specificity. However, it has been shown to occasionally detect with chicken or dog feces. The California Microbial Source Identification Manual: A Tiered Approach to Identifying Fecal Pollution Sources to Beaches, Southern California Coastal Research Project, Technical Report 804 (December 2013). The SFPUC is investigating conducting similar studies with HumM2, less sensitive but more specific marker.

structured, the process for using this type of information to inform management decisions is unclear.

In the past decade, technological advances in detecting microorganisms have outpaced regulations. The ability to identify sources of enterococcus – environmental, non-human fecal, and plant-associated species – has further highlighted the limitations of relying on FIB for human health protection. Considering that high enterococcus concentrations may be caused by non-human sources, we are especially concerned that the TMDL target may be unattainable even if all human sources are controlled. Adoption of this TMDL is premature without further investigating and identifying the sources and relative contributions of enterococcus at the impaired beaches.

The draft BPA notes that environmental sources may be contributing to water quality objective exceedances,⁴ but places the onus on stakeholders undertake “adaptive implementation at beaches where numeric targets are not met after fully addressing anthropogenic and controllable sources.”⁵ This implies that the City will be required to address the non-anthropogenic sources using some “adaptive implementation” approaches. It is unclear, however, how stakeholders could demonstrate that all anthropogenic sources are being controlled or what quantity and type of data would be needed to demonstrate that non-controllable sources of enterococcus (e.g., plant or wildlife) are causing or contributing to impairment, even assuming the City could be deemed responsible for those sources. As currently structured, the TMDL will require stakeholders to meet performance targets that very well may be unachievable due to natural sources. This problem is compounded by the likelihood that the TMDL targets cannot be adjusted at a later date because of concerns over “backsliding” or perceived health risk.

The SFPUC requests that the Regional Board delay adopting this BPA until more data can be collected to better ascertain the relative contribution of non-human sources of enterococcus and to develop a natural source exclusion approach, if a TMDL is still warranted. Adopting the BPA without recognizing the likely contribution of uncontrollable sources of enterococcus is likely to result in the need for yet another BPA amendment in the future and creates uncertainty about the level of effort stakeholders must invest in both monitoring and in management actions.

The San Francisco Bay Regional Monitoring Program for Water Quality (RMP) has a long history of providing a forum for the Regional Board, scientists and dischargers to collaboratively identify, prioritize and fund studies to improve management of San Francisco Bay. Development and implementation of a source identification plan to inform this BPA should take place as part of the RMP. This will help ensure that all stakeholders actively support the generation of data and that source identification efforts will be consistent across all San Francisco Bay beaches. We recognize that RMP’s budget for pilot and special studies is currently over-subscribed, and would commit to identifying additional funding from stakeholders and other sources to ensure that studies to support this TMDL proceed on an appropriate schedule.

⁴ Draft Staff Report for Proposed Basin Plan Amendment at 40.

⁵ Draft Staff Report for Proposed Basin Plan Amendment at 65.

2. Wasteload allocations for urban stormwater are unnecessarily stringent and unattainable.

The draft BPA's wasteload allocation (WLA) for urban stormwater is the same as the targets for the TMDL: no more than 10 percent of samples may exceed 104 MPN/100 mL and the geometric mean cannot exceed 35 MPN/100 mL. Fecal indicator bacteria are not conservative pollutants – their concentrations decline with time due to transport, mixing and dilution, predation, and die-off. It is inappropriate to essentially require that urban stormwater discharges comply with numeric water quality objectives without taking into account these factors.

Even though the BPA states that numeric effluent limitations will not be incorporated into municipal separate storm sewer (MS4) permits, it is unclear whether this BPA can constrain future permitting actions. Notably, end-of-pipe monitoring (outfall) for stormwater is now being required in some municipal separate stormwater (MS4) permits, and even this region's Phase I MS4 permit has been appealed to the State Water Board on the grounds, inter alia, that it fails to require wet weather or end-of-pipe monitoring sufficient to determine compliance. Additionally, while the BPA does not currently require end-of-pipe monitoring, such monitoring may be helpful to better characterize sources of loading to a particular beach. If exceedances of the numeric water quality objective are detected as part of a source identification effort, these data could be used in future compliance determinations, regardless of this Regional Board's intent and whether the exceedance is attributable to anthropogenic sources.

As recognized in the draft BPA, a number of studies have confirmed that fecal indicator bacteria are typically found in elevated concentrations in urban stormwater runoff.⁶ The non-structural best management practices available to reduce bacteria in urban runoff are relatively limited, and consist mainly of source control measures such as street cleaning and pet waste control programs, which are already implemented to some degree at San Francisco beaches. We are currently unaware of any instance in which enterococcus in stormwater has been reduced to concentrations below the draft BPA's WLA through implementation of non-structural BMPs. Structural BMPs are also proving unable to consistently reduce enterococcus levels to water contact standards⁷. While this is likely partly a function of the limitations of enterococcus as an indicator of fecal contamination, it is also likely due to the challenges in controlling diffuse and ubiquitous sources of pollution. Structural BMPs, such as chemical or ultraviolet disinfection, have the potential to reduce concentrations to below the WLA. Such measures, however, would likely have substantial environmental and financial costs, and would be exceedingly challenging to deploy across many stormwater outfalls and operate on a standby basis. The SFPUC is concerned that the stringent WLA for urban stormwater may result in requirements to implement structural BMPs which are not feasible and without a cost/benefit analysis.

⁶ Draft Staff Report for Proposed Basin Plan Amendment at 43.

⁷ See Clary, J., *Fecal Indicator Bacteria Reduction in Urban Runoff*, Forester Daily News (Feb 2016).

Finally, the SFPUC requests modifications to the Source Assessment section related to Candlestick Point Beaches.⁸ The Candlestick area is part of the larger Hunters Point Shipyard and Candlestick redevelopment area that comprises over 700 acres of waterfront land along San Francisco's southeastern shores. These projects are being designed to provide over 10,500 residential units and over 300 acres of new waterfront parks.⁹ For various reasons, including the goal of not increasing the volume of combined sewer discharges, these areas will consist of separate storm and sanitary sewers.

The draft BPA states that "stormwater controls...must be incorporated into the new design(s) and construction as the property is redeveloped, with the goal of eliminating or minimizing urban runoff flows to the Candlestick Recreation Area shoreline," and that "[a]ny new development of these parcels should be designed to eliminate or minimize runoff to the Candlestick Recreation Area shoreline."¹⁰ These sentences should be deleted from the draft BPA. All redevelopments in the separate storm sewered area of San Francisco are required to capture and treat the rainfall from a 0.75 inch storm, with a preference towards approaches, like rainwater harvesting, that retain stormwater. Accordingly, all private parcels and the future public right of way will be developed to comply with San Francisco's Stormwater Management Ordinance. Additionally, in the absence of a source assessment, it is premature to speculate about the causes of exceedances at the Candlestick beaches or the appropriate control measures.

3. Economic analysis pursuant to §13241 is required.

As articulated in the previous comment, implementation of the available non-structural best management practices do not generally reduce the elevated bacteria levels typically found in urban stormwater. Accordingly, the SFPUC is concerned that the stringent WLA may result in requirements to implement costly structural BMPs which would be exceedingly challenging to deploy and maintain, with limited water quality benefit.

Water Code §13241 requires a Water Board to take economic considerations into account when establishing objectives. This TMDL takes a general receiving water objective and redefines it as an objective that applies to end-of-pipe, without any dilution or consideration of attenuation. This redefinition of the objective requires the §13241 cost/benefit analysis. An economic analysis for this TMDL is particularly critical because of the likelihood that significant public expenditures will be needed and the required measures may have only very limited impact on water quality due to the natural sources of bacterial at the beaches. Benefits would likely need to be assessed in terms of beach user-days.

⁸ Draft Staff Report for Proposed Basin Plan Amendment at 48.

⁹ <http://sfocii.org/overview>

¹⁰ Draft Staff Report for Proposed Basin Plan Amendment at 49.

4. The TMDL is not self-implementing.

All of the implementation plan tables include a footnote to the column titled “Completion Timeframe.” This footnote states that the timeframe for completing the implementation actions begins on the effective date of the BPA.¹¹ TMDLs are not self-implementing, but must be incorporated into permits or other regulatory mechanisms. This footnote should be deleted and the Regional Board should continue to engage stakeholders in developing a logical and practical strategy for implementation. For example, the implementation plan for Sanitary Sewer Collection Systems requires submittal of an “enhanced Sewer System Management Plan that prioritizes sewer system inspections and repairs in areas within ¼ mile of [the impaired] beach.”¹² Most of the SFPUC’s pipes that are within this area are part of the SFPUC’s combined sewer system and not subject to the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems’ requirement to develop these plans.

The following comments are made in the event that the TMDL proceeds forward, despite previous comments.

5. The sewer system inspection requirement should be limited to sewer mains.

The TMDL should require inspection and repairs of sewer mains only. The City’s large transport/storage (T/S) structures and force mains should be excluded. T/S structures should be excluded from the inspection requirement because inspection requires confined space entry and the technologies – such as closed circuit television and Electroscan – available for inspecting sewer mains have limited utility for inspecting T/S structures. Additionally, because they are designed to store very large volumes of stormwater, T/S structures typically contain very low volumes of dry weather sanitary flows, making exfiltration from these structures unlikely. Force mains similarly present inspection challenges in that they must be taken out of service to inspect, which may not be feasible if a particular force main does not have redundancy.

6. The timeframe for sewer system repairs should be flexible.

The SFPUC’s Collection System Division has estimated the length of sewer mains affected by the TMDL inspection provisions. We anticipate being able to complete these inspections within the three years specified by the draft TMDL without significantly disrupting our current condition-based asset preventative maintenance program. It is possible, however, that any needed repairs or replacements cannot be completed within three years. The schedule for repairs and replacements would need to be driven by the results of the inspections, other condition-based priorities in the collection system, and factors outside of the SFPUC’s control such as the City’s moratorium on disturbing newly paved roads for five years. The BPA should be revised to allow the collection system owner to propose a schedule for identified repairs based on feasibility and other priorities.

¹¹ Draft Staff Report for Proposed Basin Plan Amendment at 80.

¹² See Draft Staff Report for Proposed Basin Plan Amendment at 81.

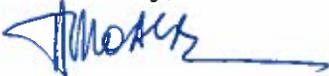
7. The BPA should clarify requirement to inspect and repair pipes within a quarter mile of a beach.

The requirement to inspect all sanitary sewer pipes within a quarter mile of the affected beaches needs to be better delineated. It is unclear whether the requirement applies to all pipes within a quarter mile of the property line of the beach, to all pipes within a quarter mile of the listed sampling location, or to some other measurement. For smaller beaches, such as Aquatic Park, it may be appropriate to require inspections within a quarter mile of the property line. For larger beaches where only one sampling station is driving impairment, such as Crissy Field, some other demarcation may be more appropriate.

8. The requirement to implement a private lateral replacement program should be deleted.

Implementing a city-wide private sewer lateral program in San Francisco would require Board of Supervisors approval and a substantial investment of resources to develop and manage certification, inspection and enforcement programs. The benefit to water quality of a city-wide private sewer lateral program would be small or none. The majority of San Francisco's estimated 195,000 private sewer laterals are located in the combined sewer system and a quite a distance from the shoreline, and therefore, are not likely to affect water quality. Moreover, the SFPUC has existing authority to compel repair or replacement of a private sewer lateral so, if laterals were identified as contributing to impairment, the SFPUC would take targeted actions against the owners of the properties associated with those laterals.

Sincerely,



Tommy T. Moala
Assistant General Manager
Wastewater Enterprise
San Francisco Public Utilities Commission



February 27, 2016

Jan O'Hara
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Thank you for the opportunity to comment on the *Total Maximum Daily Load for Bacteria at San Francisco Bay Beaches Draft Staff Report for Proposed Basin Plan Amendment* released January 15, 2016. The Department of Parks and Recreation (State Parks) operates Candlestick Point State Recreation Area (CPSRA).

CPSRA is not currently operating under an NPDES Stormwater Permit. Outside the context of an NPDES Stormwater Permit it will be very difficult to meet the terms and requirements of the proposed TMDL. Many State Parks currently operate under the state-wide Phase II MS4 NPDES Stormwater Permit (non-traditional) (Order No. 2013-0001-DWQ). The next permit cycle for the state-wide Phase II MS4 NPDES Stormwater Permit is anticipated to begin September of 2018, when the next permit will be adopted. Therefore, State Parks requests that CPSRA enroll in the next permit cycle; with the start date of meeting TMDL requirements corresponding with the effective date of the Phase II Stormwater Permit.

Additionally, CPSRA is currently not enrolled in the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (WDR SSS) (Order No. 2006-0003-DWQ). A preliminary assessment of the sanitary sewer system at CPSRA indicates that the sanitary sewer system has an estimated total length greater than 1 mile. Therefore, State Parks staff will initiate the enrollment process for the WDR SSS.

Concerning the staff report, State Parks recommends the following change:

- No deadline in Table 10.3 should be less than 2 years to allow State Parks time to provide funding and comply with the provisions in the WDR SSS.

If you have questions, please contact Gerald O'Reilly at 707-769-5652 and/or email at Gerald.O'Reilly@parks.ca.gov

Sincerely,

Memorandum

TO: Janet B. O'Hara, SFBRWQCB

CC: Gerald Bowes, SWRCB

FR: Patricia A. Holden, UCSB

DATE: 11-15-15

RE: Peer Review of the Scientific Basis of the "San Francisco Bay Beaches Bacteria Total Maximum Daily Load and Associated Implementation Plan"

This memo provides the requested peer review of the "San Francisco Bay Beaches Bacteria Total Maximum Daily Load and Associated Implementation Plan", herein referred to as the Staff Report. The primary charge to peer reviewers is to assess the data and analytical methodologies used to develop the Staff Report, which recommends load reductions and numeric targets that are necessary to attain bacterial water quality standards. For each finding, assumption or conclusion of the Staff Report, the reviewers are to determine whether each is "based on sound scientific knowledge, methods, and practices". The date of the Staff Report reviewed is October 1, 2015.

1. Nature of the water quality problem

The scientific basis is sound for establishing the conclusion that "the Bacteria Water Quality Objective is not being fully supported in the subject watershed". This assessment is based upon the indicator bacterial results as reported in the Staff Report. The magnitude of the water quality problem varies by beach, but the assessment overall is sound.

2. Desired Target Conditions

The numeric target emphasizes Enterococcus and is consistent with EPA guidelines according to the Staff Report (Table 6.1). However, it is noted that strains of *E. coli* are known to be pathogenic and thus continued monitoring of *E. coli* may improve the relatedness of fecal indicator data to actual threats to human health.

The implementation of numeric targets in section 6.2 uses two different cut-offs for rejecting the null hypothesis versus the alternate hypothesis. A ten percent proportion could strictly be used, and it is recommended that this be considered as it could be more protective.

3. Source Analysis

The potential sources discussed are logical and, as described, are hypothetical. Since there are no data to determine if the sources are real, one can comment on the logic related to the "sanitary survey" dimension of this report which, again, is logical and shows a reasonably good understanding of the study areas, infrastructure, and possibly influential fecal sources. Further studies would be needed, for each beach, to examine actual sources that could be controlled to bring beaches into compliance.

A question regards the SSOs: as mentioned in the detailed comments, it is unclear how the analysis was performed to rule these out as influential. The time period intervening the SSO event and sampling, even though sampling was after the

SSO event, may be influential in determining the effect of SSOs on water quality. This deserves to be examined more carefully.

4. TMDL. Loading Capacity, and Allocations, and Margin of Safety

The density basis of the TMDL is sound. The allocations as per Table 8.2 are sound. However, *E. coli* is a regulated fecal indicator that also includes pathogenic strains, and thus allocations of *E. coli* could be additionally protective.

5. Linkage Analysis

In this report, the sources are not identified, but are preliminarily hypothesized. The allocations in Table 8.2 are protective on the basis of Enterococcus. Because the allocations prohibit discharge of Enterococcus from human waste sources, these are likely to protect beneficial use as defined by the regulated water quality criteria. However, the absence of Enterococcus doesn't equate to the absence of pathogens.

6. Implementation Plan

The implementation plan involves invoking all relevant existing regulations regarding source controls (e.g. SSOs, sanitary sewer inspection and repair, pet waste cleanup enforcement, etc.) and performing MST according to State of California (Griffith et al. 2013) guidelines to determine sources of fecal indicator bacteria. This is reasonable, and can be reasonably applied to the already-hypothesized sources, including completing sanitary surveys and refining hypotheses, then designing study plans, and performing MST.

Other Issues

Broad comments

The discharge of WWTP effluent from multiple treatment plants into the areas described likely delivers other than fecal indicator bacteria: nutrients, contaminants of emerging concern and, as already noted, viruses and other infectious microbial forms resistant to disinfection practices. The State of California should be evaluating such issues in aggregate, not in isolation of one another. The health of the public and the waters in which recreation occurs is simultaneously affected by multiple contaminants. Rarely are individual contaminants in a mixture singularly effective in causing harm to receiving streams and organisms within. A holistic approach to addressing co-occurring contaminants would be more protective overall.

Detailed comments about the Staff Report

Overall, this is a very readable and accessible Report. Below are some recommendations or comments that are intended as helpful.

Section 1, page 1: It would be helpful to mention if the beaches in Figure 1.1 that are not included in this TMDL are not impaired, or if there are other reasons that they are not addressed.

Section 4.1, P12: The second bullet at the bottom states: "Fecal coliform are a subset

of total coliform and are more specific than total coliform to wastes from warm-blooded animals, but not necessarily to humans. As discussed further below, the U.S. EPA no longer recommends total coliform be used as FIB.” The question is if the last “total coliform” is in error and therefore if the author meant “fecal coliform” here, since “total coliform” was addressed in the preceding bullet.

Tables 5.1, 5.3 – 5.5, 5.7: The text regarding these tables emphasizes that wet weather was when most exceedances occurred. The basis for this conclusion would be more clear if the Tables were modified to show exceedances in wet, versus dry, weather, and noted when those occurred during AB411.

Table 5.6: Why doesn't Windsurfer Circle have a column in this Table?

P24: It is stated, as with most other beaches in the prior sections that, although Crissy Field Beach is exceeding water quality criteria mostly during wet weather, exceedances at Crissy Field Beach are not significantly from CSDs. How is this concluded? Table 5.8 displays overflow events relative to weekly sampling, but we don't know when the latter was. Was weekly sampling with a day, 2 days, etc. after the event? The timing of the overflow relative to weekly sampling at the beach could make a difference to this interpretation of the CSD not having an impact. Epidemiological studies guide swimmers to not swim within the vicinity of drains during 72 hours following a storm. Using 72 hours as a guide, does this window change the interpretation?

P37, Section 7.1.1: With the number of outfalls discharging to a Bay, the strict reliance on fecal indicator bacteria seems inadequate. It is known that viruses are more resistant to destruction by common disinfection approaches. The possibility for all of this discharge impinging on public health is the bigger issue that needs to be addressed, not just whether fecal indicator bacteria are being discharged. This would require other monitoring, e.g. for viruses, other resistant pathogens, and other inputs that can synergistically impair water quality.

Table 7.3: The relationships are unclear regarding these locations relative to the beaches that are the foci of the Staff Report.

P54, section 7.2.4, Conclusions: The Staff Report should be careful to not interchange “pathogens” with “fecal indicator bacteria” since, as pointed out early in the report, they are not the same, and the latter is all that are reported in the data used to drive this plan.

**Scientific Peer Review of the Scientific and Technical Basis for
The San Francisco Bay Beaches Bacteria Total Maximum Daily Load
Staff Report and Proposed Basin Plan Amendment**

Submitted by Peter F. Strom, Ph.D.

Professor
Department of Environmental Science
Rutgers, The State University of New Jersey
School of Environmental & Biological Sciences
Environmental & Natural Resource Sciences Building, Room 228
14 College Farm Road
New Brunswick, NJ 08901-8551

848-932-5709
strom@aesop.rutgers.edu

November 23, 2015

This report has been prepared in response to a request for scientific peer review of the staff report and proposed basin plan amendment for the San Francisco Bay beaches bacteria total maximum daily load (TMDL), as outlined in the October 2, 2015, letter addressed to me from Water Resource Control Engineer Janet B. O'Hara of the San Francisco Bay Regional Water Quality Control Board. The review is based on the 4 enclosures (Attachments A to D) provided with that letter; I am not personally familiar with the beaches included. Attachment A was the original request letter from Ms. O'Hara to Dr. Gerald Bowes, Manager of the Cal/EPA Scientific Peer review Program, dated July 30, 2015, which itself includes 3 attachments (1 to 3). Among these, Attachment 2, entitled "Description of Scientific Conclusions to Be Addressed by Peer Reviewers", serves as the basis for the organization of this report.

Some general background information also influenced this review. Several of these points are summarized here because of their relevance to the issues discussed below.

Development of Total Maximum Daily Loads (TMDLs) for impaired waterbodies (those that do not meet water quality standards) is often a complex process, but this may be especially true for indicator bacteria. In part this is because the indicators themselves do not impair water quality; rather they are intended to indicate the presence of fecal contamination, which represents a potential human health risk for a variety of beneficial water uses, including contact (REC-1) and non-contact (REC-2) water recreation.

An ideal microbial indicator of fecal contamination would be present in high concentrations in feces and absent from other sources; would not grow in the environment, and would die-off there a little more slowly than pathogens and parasites of concern; would not be pathogenic itself; and would be easy and inexpensive to quantify (Vaccari et al., 2006). Of course, no such ideal indicators exist, but some groups, such as total coliforms, fecal coliforms, enterococci, and *Escherichia coli*, have been found to be useful for particular applications. Still, health risks associated with specific indicator concentrations are difficult to quantify, and might be expected to vary among waterbodies.

Total coliforms and fecal coliforms include lactose-fermenting strains of a number of different species of bacteria from genera in the family Enterobacteriaceae, such as *Escherichia*, *Enterobacter*, and *Klebsiella*. Some of these strains can survive for prolonged periods, or even grow, in the environment, and may be present in the absence of recent (or perhaps even historic) fecal contamination. Thus while the presence of total and fecal coliforms usually indicates recent fecal contamination, in some cases it may have no sanitary significance.

E. coli and enterococci, on the other hand, are less likely to be found at elevated concentrations in the absence of recent fecal contamination. However, since *E. coli* (like many of the other coliforms) and enterococci are present in the intestinal tract of many warm-blooded animals, their presence in the environment is not limited to areas with recent contamination by **human** fecal wastes. Fecal contamination from other mammals and birds does represent a potential health risk to humans, although usually a lesser one than from human feces. This further adds to the complexity of estimating the levels of indicator bacteria that might be acceptable in a particular situation for various beneficial water uses.

An additional complicating factor in the development of pathogen indicator TMDLs is that in addition to some of the factors that influence the concentrations of other pollutants (e.g., dilution, sedimentation, sorption), bacteria may die or grow in the environment. These “reaction” terms may be especially hard to capture as part of a mathematical modeling effort, and can add a high degree of uncertainty.

Further, modeling of waters within the Bay also may be more difficult than would be the case in a river. This is due to the complexity of the water movement, which is potentially in three dimensions, whereas movement in a river often can be approximated as one-dimensional and one-directional.

Nature of the Water Quality Problem

1. Pathogenic indicator bacteria concentrations exceed the Bacteria Water Quality Objectives in the water column of each the listed beaches.

Review focus: Staff Report Chapter 4: Water Quality Standards and Chapter 5: Beach Water Quality Data

REC-1 and REC-2 are designated beneficial uses of the water at the 9 studied beaches. Since the REC-1 water quality objectives are more stringent, meeting them would also meet the REC-2 objectives. The present objectives as indicated in Chapter 4 are based on three indicator groups: total coliforms, fecal coliforms, and enterococci. The numeric values include objectives for both the geometric mean or median (depending on the indicator group) and the 90th percentile or maximum count.

Thus there were 6 objectives, two for each of the 3 indicator groups. One ambiguity is whether the median (indicated in Table 4.2) or the geometric mean (indicated in tables in Chapter 5) was used for total coliforms. (This is not critical to the results of the analysis, but should be clarified.) Waters are considered impaired if more than 10% of the samples showed counts greater than one or more of the 6 objectives.

The monitoring results presented in Chapter 5 are drawn from a number of sources and in most cases represent multiple years of sampling on a regular basis (range 144-593 samples per site, with two sites at some of the beaches). Fecal coliforms are not included, but *E. coli*, which are generally considered a subgroup of the fecal coliforms that is more specific to fecal contamination, were included and compared to the fecal coliform objective. This is a reasonable and useful comparison to make, although it could in some cases underestimate the number of exceedances of the fecal coliform water quality objectives.

All 9 beaches failed to meet at least one of the bacteria water quality objectives. Thus the waters are impaired, and the nature of the problem is clearly established.

Desired Target Conditions

2. The desired numeric target represents conditions supportive of the Bacteria Water Quality Objectives and the beneficial use of water contact recreation (REC-1).

Review focus: Staff Report Chapter 6: Numeric Targets

The proposed numeric targets will be a geometric mean and a single sample maximum for enterococci, dropping the present limits for total and fecal coliforms. This is based on recommendations from the U.S. Environmental Protection Agency (USEPA). As reported in Chapter 6, it has been found that for marine waters, enterococci are a better indicator of fecal contamination for recreation uses than total or fecal coliforms. Thus USEPA now recommends using enterococci as the sole bacteria indicator for this purpose.

The numeric targets presented in Table 6.1 are based on a most probable number technique, rather than a colony forming unit method shown in Table 4.3 for the USEPA recommendation. The MPN is a valid test, and in some ways is more reliable than the methods that yield colony forming units. It is also the method presently being used, which thus adds consistency that would be lost if the method were to be changed.

Table 6.1 also differs slightly from Table 4.3 in that a single sample maximum is given, rather than a statistical threshold value. It would be helpful if the report provided the methodology used to arrive at the value in Table 6.1. Additionally, the USEPA provides two slightly different possible numeric values (geometric means of 30 vs. 35 cfu/100 mL), one providing a slightly lower human disease risk (3.2 vs. 3.6%). It is recommended that the report indicate why the slightly higher risk level was chosen for this application. This is not a criticism of this choice, which is identical to the existing enterococci objectives and may be justified on several grounds, only a request that the basis for it be explicitly stated.

To summarize, the switch to use of enterococci only, dropping the total and fecal coliform objectives, is scientifically justified, as is the use of the MPN procedure. However, it is recommended that the report comment on the choice of 35 instead of 30 MPN/100 mL for the target geometric mean, and indicate the procedure used to calculate the single sample maximum chosen.

Source Analysis

3. The analysis reasonably and accurately identifies the probable sources of pathogen indicator bacteria.

Review focus: Staff Report Chapter 7: Source Assessment

There are numerous potential sources of bacterial indicators at the beaches, as presented in detail in Chapter 7, with each beach having its own combination of major and minor contributors. Further, these sources change in relative importance based on season and environmental conditions, especially rainfall. Definitive identification of the multiple sources and their relative contributions to the total concentrations of enterococci would be prohibitively expensive, even if it were technologically feasible (which is not certain). Instead the report evaluates the data available, and uses logic to determine the most likely sources in each situation.

While it is recognized that there is uncertainty in these determinations, it appears to make sense to proceed with implementation based on this best available information, rather than expend additional resources prior to implementation. Further, this uncertainty will be addressed by evaluating progress and making changes if the need arises.

TMDL, Loading Capacity, and Allocations, and Margin of Safety

4. The concentration-based TMDLs are a reasonable loading capacity for San Francisco Bay beaches and will likely be supportive of the Bacteria Water Quality Objective.

Review focus: Staff Report Chapter 8: TMDL and Pollutant Allocations

Although water quality objectives are usually concentration based (mass or number per volume), total maximum daily loads (TMDLs) are normally load based (mass or number per day), as their name indicates. Typically a mathematical model is used to determine the concentrations that will result at specific waterbody locations from wasteloads and loads contributed by the various point and non-point sources, taking into account dilution as well as other factors that might affect water concentrations (e.g., for chemical contaminants: biotransformation, sorption, volatilization, sedimentation, photolysis; e.g., for indicator bacteria: predation, die-off, growth, sedimentation, sorption). The loads from the various sources are then reduced so that the allocations result in achieving the TMDL and meeting the standard. As indicated above in my introduction, this is particularly difficult to do for indicator organisms compared to some other contaminants, and for San Francisco Bay compared to a stream flowing in one direction.

In recognition of these difficulties, the proposed TMDL has taken a different approach. It sets certain controllable wasteload (sanitary sewer collection systems) and load (vessels) allocations to 0, as these discharges are prohibited under current regulations. Other sources (urban runoff, pets, and wildlife) are limited to the TMDL concentration itself, with no allowance for dilution or other reduction factors. Since the sources themselves will meet the TMDL, there is no need for an additional margin of safety, nor for separate consideration of critical conditions.

Overall, this argument is compelling. It reduces many of the large uncertainties that would be introduced by a modeling approach, and would seem to be highly protective of water quality and the designated beneficial uses. In fact, the only way that the water quality standard could be exceeded would be if the enterococci indicator organisms grew after entering the bay.

On the other hand, an argument might be made that the TMDL is too stringent, requiring unnecessarily low levels of enterococci in urban runoff, for example. Supporters of this viewpoint might point to dilution and die-away as mechanisms that would allow achievement of the water quality standards even at higher loadings. However, the models to support such an argument, including an appropriate margin of safety, do not appear to exist, and there can be concern that during critical periods the water at the beaches may consist almost entirely of urban runoff. Thus the proposed approach appears justified.

In Table 8.2, footnote “e” states that, “Wildlife is not believed to be a readily controllable source of bacteria” However, geese and some other wildlife may be controllable (e.g., Section 10.1.5, and Basin Plan Amendment Table 7.2.5-3, footnote “c”), so that some expansion upon this comment may be needed.

Linkage Analysis

5. The Staff Report provides a reasonable description of the relationship between the desired target conditions and impairment to beneficial uses of water.

Review focus: Staff Report Chapter 9: Linkage between Water Quality Targets and Pollutant Sources

Chapter 9, in combination with the previous chapters, establishes the linkage between the water quality target and the indicator bacteria sources. However, the risk of illness given, based on the US EPA (1986) citation, is lower than the risks given in Table 4.3, which is based on a different USEPA (2012) citation. It would be helpful to explain the reason for this difference.

Implementation Plan

6. The implementation plan will reasonably ensure progress towards attaining water quality standards and supporting recreational beneficial uses.

Review focus: Staff Report Chapter 10: Implementation Plans and Monitoring

The implementation plan described in Chapter 10 would appear to address many of the relevant issues. It is likely that it will lead to progress in attaining the water quality standards. Further, it includes monitoring and an adaptive strategy so that changes can be made if the standards are not met according to the timetable provided.

Other Issues

A few apparent typos were noted. Copies of scanned pages with proposed edits are attached to help in eliminating these.

Summary

Development of a TMDL for indicator bacteria designed to protect San Francisco Bay beaches is a challenging task. Taken as a whole, the scientific portion of the reviewed Draft Staff Report and Basin Plan Amendment appear to be based upon sound scientific knowledge, methods, and practices, and to appropriately incorporate good professional judgment.

Additional Literature Cited

Vaccari, D.A., P.F. Strom, & J.E. Alleman. 2006. Environmental Biology for Engineers and Scientists. John Wiley & Sons, Inc., New York. 931 pp.