

This document was prepared in October 2005 and presents EOA's responses to comments in a September 15, 2005 e-mail from John Plummer (Friends of Lake Merced) to Patrick Sweetland (Daly City). Responses are inserted below in italics.

Patrick:

On first reading the report you sent seems much more thorough, and accurate, than the paper presented in Copenhagen. However, a few notes:

1) While full contact recreation may not be 'permitted' at Lake Merced, Water Contact Recreation remains a designated beneficial use according to the Regional Water Quality Control Board (RWQCB), and water quality standards appropriate to that beneficial use should apply. Further, full body contact does occur, occasionally, and usually inadvertently, when someone flips a boat. I think that we have now agreed with the Health Department and the Public Utilities Commission that standards for infrequent fresh water contact should apply. I believe that represents an E-coli count of 583 MPN/L or less. (Your report says 576; I'll go with that.)

The "infrequently used area" water contact criteria for E. coli is correctly stated in the draft report (Table 10) as 576 colonies per 100ml (USEPA 1986 and SFBRWQB 1995). The draft report conservatively compares study data to full body water contact recreation criteria. We will add a footnote to the report stating that infrequent full body contact may occur due to accidental capsizing of boats in the lake.

2) If metals are in the feedstock, and not in the lake and not in the ground, where did they go?

A number of physical, biological and chemical processes potentially govern the fate of metals in the stormwater runoff diverted to the riparian buffer/lake. Such potential processes include accumulation in the riparian buffer soils (with any changes in soil concentrations potentially masked by natural variability), removal by biological uptake in the buffer or the lake, and adsorption to particles in the lake system. Transformations among species of individual metals are also likely. Characterization of the fate of the metals would require additional monitoring data and engineering analysis. Such monitoring and analysis were beyond the scope of the pilot study.

3) Scientific method dictates that the hypotheses tested should be the opposite of the desired outcome, the so-called null hypotheses. I have not yet read the actual statistical evaluation so perhaps this issue has been addressed. However, the hypotheses as stated are not fully testable.

We are not familiar with the null hypothesis being defined as the opposite of the desired outcome. Our understanding is that a null hypothesis is a hypothesis that is assumed to be true until statistical evidence indicates otherwise, and is often the opposite result to what the experimenter expects. The null hypotheses in the draft report were fully testable.

4) Your statistical analysis (Appendix E) states that "all of the log-normally transformed groups are normally distributed." However, your tables indicate no reportable results for either Kolmogorov-Smirnov or Shapiro-Wilks tests of normality when sample size was just 3. In fact, calculating a variance with a sample of just three points is a highly dubious enterprise. I would not be willing to bet my lake on that outcome.

Data groups from this study with a sample size of six passed normality tests. While it is true that normality cannot be tested for with a sample size of three, it is reasonable to assume the underlying population distribution is lognormal, since other data from this study were lognormally distributed and, in general, most environmental data are reasonably represented by a lognormal distribution. The report does acknowledge that small sample sizes lead to some uncertainty in the results of the statistical analyses.

5) That said, your next observation, that the Student t test assumes normally distributed populations is quite correct. Therefore, with sample sizes less than 5 I think that the Student t test is simply not applicable. Whether there is some opportunity to cluster or group these samples is worth exploring.

Please see the above response.

6) I note that in some places you report taking a logarithmic mean, in others a geometric mean of logarithms. I'm not sure what the implication of the latter is, but it sounds like a double smoothing. If so it may obscure differences rather than correct for non-normal distributions in the raw data.

There is only one geometric mean of a data set, and we did not report a "logarithmic mean" or a "geometric mean of logarithms." The draft report does present geometric means two ways (Table 2): \log_{10} values and in base 10. This is simply two ways of reporting the same value.

7) Again, with respect to significant differences, since the value of t is inversely related to the square root of the sample size, with very small samples (i.e., <5) the sensitivity of this test is substantially reduced. That is, the difference between two outcomes would need to be quite large to indicate statistical significance. We come then to the distinction between importance and significance. Were observed differences to be important if actual then the question as to whether or not they are statistically significant may be moot. Has that question been addressed?

Geometric mean E. coli concentrations at most lake sample stations were higher following diversion events than background storm events. We will edit the report to more clearly point this out. With regard to whether the observed differences are "important," we used a weight-of-evidence approach. The two bacterial indicators monitored during this study most closely associated with human health risk were E. coli and enterococci. Although the diversions increased geometric mean E. coli concentrations, the differences were not statistically significant. Enterococci were not detected in most lake samples and concentrations generally were not increased by the stormwater diversions. In addition, E. coli and enterococci concentrations generally did not exceed water quality criteria for full body contact recreation. Overall, these study results suggest that the pilot diversions probably did not increase human health risk associated with fecal contamination during recreation in South Lake Merced.

I'm sure there are more questions that would be suggested by a thorough review of this draft document. However, since community members are supposed to defer such activity until all of the involved government organizations have had their say, I'll refrain from conducting such a review.

I assume that this paper, although still in draft version, is available for public review. I have then posted a copy to our web site.

Thanks.

John

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References cited in responses:

San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) 1995. *Water Quality Control Plan, San Francisco Bay Basin (Region 2)*. June 21.

USEPA 1986. *Ambient water quality criteria for bacteria*. EPA440/5-84-002. January.