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M E M O R A N D U M
October 29, 1980

To: John Bernhardt

From: Lynn Singleton and Joe Joy

Subject: Review of Lake Chelan Water Quality Study Proposal

The Lake Chelan Water Quality Study plan submitted by the Chelan-Douglas Health District has been reviewed. Fecal and total coliform data taken from March to September of 1980 by the health district at the 26 sites designated in the proposal proved to be helpful in reviewing the document. Comments reflect the use of these data.

When all of the objectives are considered, the proposal lacks specific sampling site information, adequate control sites, and sampling technique description. On the map obtained with the proposal, it is not clear whether point source sampling sites are located in-stream or in receiving waters at sites number 1, 3, 4, 8, 9, 22, and 23. It is also unclear whether the sample from site number 7, City Pump, is taken from the pump line or from the lake surface.

The proposed control sampling sites for both water and sediment stations are inadequate. Ambient levels in lake water and sediment, as well as ambient levels in the source stream water and sediments, must be closely monitored to evaluate the level of water quality degradation by use activities. Non-affected parent soil adjacent to each proposed sediment site also needs to be sampled to determine background levels. Stehekin Landing is not a suitable sediment control site because of intensive boating activity there.

More information on the water/sediment sampling procedure is necessary to ensure that consistent techniques are used over the course of the project, and so that data can be accurately interpreted. It must be known whether a sample is taken from the surface or at a certain depth, whether it is a simple grab sample or a composite sample over time or depth, and whether the sample is taken by core or dredge. Also, discharge rates from influent sources need to be taken so that loadings may be calculated.

The monitoring program has been designed around certain use activities which the health district has prioritized as to their importance or potential adverse impact on water quality. Based on the 1980 fecal

coliform data, any conclusions concerning sources appear to be premature at this point and a diagnostic approach to monitoring should be taken. For example, the fecal coliform data indicate a more serious contamination problem along the sewered portion of the lake than along the portion served by septic systems. Yet, the proposal infers that septic system effluent is of most immediate concern while activities causing fecal contamination in the sewered area are of less importance. Furthermore, the proposal infers that data will be used to compare the two sections with the sewered section being the cleaner of the two. It appears that conclusions about future results have been drawn prematurely. The proposal also states that the pre-sewering water quality data obtained in 1967 will be of no use to this present study because the area is now sewered. These data may be very useful in determining the real impact sewering has had on water quality in that area. The coliform data also indicate all stations north of Granite Falls are well within the Lake Class and AA water quality standards. The current problem appears to be confined to the southern part of the lake.

Prioritizing and data condemnation should come after basic monitoring has been completed. These practices tend to diminish the necessary objectiveness needed for a good monitoring program.

The proposed sampling schedule and parameters to be tested were generally in the right direction to achieve the project goals. It is unclear whether nitrite, nitrate, or ammonia will be tested since total nitrogen may mean Kjeldahl nitrogen. No inorganic nitrogen element is included in the Kjeldahl nitrogen test. Nitrate, nitrite, and ammonia are important elements of agricultural, sanitary, and urban runoff effluent and their addition should be considered. The total organic carbon (TOC) analysis is adequate if its relationship to biological oxygen demand (BOD) or chemical oxygen demand (COD) is initially found at each TOC site. This relationship, however, may be difficult to determine in areas having low levels of organic carbon. Total coliform data are misleading at times and could be deleted, leaving the fecal coliform data for bacterial evaluation. Chlorophyll a analysis should be included in the proposal at ambient water sampling sites. If unmonitored, the seasonal variation of phytoplankton may cloud TOC and nutrient data.

The immediate objective of the study is to determine degradation of water quality from six use activities of a point and nonpoint nature. To reasonably achieve such an objective requires precise site selection and intensive sampling procedures over a long duration. This is especially true of the southern portion of Lake Chelan where five of the six activities are suspected of causing degradation. To determine the prime contributor or the percentage of degradation by each activity will be very difficult. The following are specific concerns on the proposed monitoring of the six use activities.

As previously mentioned, the impact of septic system effluent is of most immediate concern to the health district. On-site inspection and dye testing may give a better indication of septic system failure, especially since boating and agricultural activities are suspected problems in the area. The use of the sewered portion of the lake as a control is flawed due to multiple activities there as well.

Evaluating the impacts of recreational boating on lake water quality poses the same interference problems mentioned for septic system effluent. If monitoring is to be done as outlined, sites number 12, 13, and 14 should be sampled for TOC to achieve consistency in the data. The high fecal coliform counts found at the swimming beaches during 1980 would warrant additional site locations there. A source other than swimmers is quite probable with marinas and urban runoff outfalls in the immediate vicinity. This is supported by the fact that fecal coliform levels increase during the spring runoff period, a time when the number of swimmers is probably quite small, and decline in the summer when swimmers would be more prevalent.

The pH problem at Railroad Creek should be investigated. It was proposed that Chelan Falls water could be used to evaluate the impacts of urban runoff. Many alterations in water quality may occur between the two cities, a problem which makes conclusions about cause and effect very tenuous.

Considering the above concerns, a change in the project's scope may be justified. It appears that the proposed monitoring program attacks too many problems at once and the data received will be of dubious benefit in identifying primary activities of lake degradation. From the 1980 fecal coliform data, it may be more prudent to concentrate monitoring activity around the City of Chelan, while periodically monitoring other areas of the lake. Perhaps a series of three intensive surveys spanning the active tourist and rainy seasons could be accomplished around the city marina, swimming beaches, and urban runoff outfalls. A few mid-lake control stations would need to be established in the southern portion of the lake to accomplish this task. If need or interest dictates, a different intensive survey could monitor the impact of septic systems, recreational boating, and agricultural activities on the unsewered areas; or the impact of mining and boating activities in the northern reaches of the lake. Again, control sites, precise sampling locations, and seasonal monitoring would be important. However, it is difficult for us to give specific recommendations to the intensive surveys without an on-site inspection of the system.

LS:JJ:cp

cc: Dick Cunningham
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