DONNER SUMMIT
Public Utility District

Joint Wastewater Facilities Committee Member Comments and Responses

Donner Summit PUD Draft Facilities Plan (March 2010)

Additional Thoughts on MBR and Disinfection

Jeff Hauser, ECO:LOGIC Engineering (April 27, 2010)

Donner Summit PUD Staff Recommendations to Joint Wastewater Facilities Committee

Donner Summit PUD Wastewater Treatment Plant Upgrades and Expansion (April 30, 2010)

MEMORANDUM

To: Tom Skjelstad, General Manager Donner Summit Public Utilities District
From: Bill Quesnel PE, Sierra Lakes County Water District
Subject: Comments: Administrative Draft DSPUD Wastewater Treatment Plant Facilities Plan
Date: April 14, 2010

The purpose of this memorandum is to transmit the comments of the Sierra Facilities Committee members to you and ultimately Eco:Logic, prior to our meeting in next week.

Without hesitation all of the reviewers compliment the preparers on the thoroughness and thought that went into the preparation of the Plan. Many issues, more than some expected, were considered in detail and the accompanying analysis is very helpful in understanding the inter-relationships of how the plant's components must work together to meet discharge standards. There is no doubt the Plan serves as an excellent starting point for future decision-making by the DSPUD Board as to how to upgrade the plant.

The majority of the Sierra reviewers have expressed concern about the selection and construction of a biological process **prior** to confirmation that the other work identified in the Plan (equalization, heating, chemical feed and build-up of the micro-organism population) can all be implemented with the expected results. We understand the ramifications of the 2014 compliance deadline but also feel that given the tight working area and the need to continue to treat influent during construction, completion of the project will likely take three years. Given this probable construction timing it makes sense to the reviewers to concentrate on the pre-treatment work in 2010 and 2011, and select and construct the biological treatment systems in 2012 and 2013 having the benefit of actual flows, load and treatment data. We are also of the opinion the CEQA process will very likely become lengthy and costly if the entire project (improved treatment and increased capacity) is considered/reviewed in one document. A strong argument can be made that a project solely designed/constructed to meet discharge requirements can be reviewed separately from one that increases capacity.

Attached are the comments from each reviewer. You will find some redundancy and different formats but believe the documents will enable us to have a meaningful discussion next week and provide suggestion for further discussion, analysis and revisions/edits to the final Plan before it is released to both Boards and the Public for discussion.

Attachments

Bill Quesnel Questions/Comments:
March 2010 Administrative Draft Donner Summit PUD Wastewater Facilities Plan

General Comments:

- Construction cost contingencies (20%), Contractor mark-up of Overhead and Profit (25%) and Engineering/Environmental (25%) seem high given the current economy and bidding results.
- A discussion re: staged construction, operation of plant during construction and number of seasons required to construct all improvements should be included in the Alternatives Rating and Ranking discussion (Table 17-2) and considered in the Selection of the Apparent Best Project.
- Does the Engineering Team have confidence that enough data is available to design the plant?

Specific Comments/Questions:

Table 2-4:

- Is non-compliance with Aluminum a function of the domestic water treatment process/chemical used by DSPUD or another influence that requires additional research?

Table 4-1:

- Why are the assumed BOD Concentrations for the *Allowance for Growth* greater than the *Existing Conditions*?

Figure 4-2:

- Is the disparity in the Monthly Average BOD ratio for December 2005 and 2007 as compared to December 2006 a result of a specific storm event? The data in Figure 4-1 does not mirror that difference in 2006 vs. 2007.

Table 5-1:

- Do the volumes of the anoxic zones include the modifications done in the Fall of 2009?

Page 5-7:

- One of the reasons given for high ammonia and nitrate concentrations is: ….*low mixed liquor temperatures (less than 8 degrees C).* Later in the document the analysis assumes a desired temperature of 7 degrees can be accomplished by heating. What temperature is preferred or is there no real difference in performance between 7 and 8 degrees? Is there a possibility the reactor basins and IFAS media are **not** "inadequately sized" if the other three contributing causes are rectified?

Page 5-10:

- My understanding is the existing usable irrigated area is approximately 34 acres, not 45 acres.

Page 8-4:

- While the statement "Plant facilities that generally could not be downsized based on equalization storage include biological reactor basins and sludge handling facilities" may be accurate, it seems that equalizing flows to the lowest practical amount possible (<0.6MGD) will provide an additional buffer during the period when the microorganism population may not be sufficient to treat peak holiday flows. Equalizing over a longer period (greater than one week) a few times of the year may not be typical but the cost of the additional storage capacity may be preferable to exceeding discharge standards because of insufficient treatment capacity. Similarly, when the 20% increase in future flows is considered, should thought be given to maintaining flows of less than 0.6MGD and increasing EQ tank volume? Should the plant be designed for a flow of 0.72MGD with an equalization volume of 0.60MG when the plant typically operates at a much smaller rate of approximately 0.40 MGD (Figure 8-2)?

Page 8-7:

- Is it practical to construct a new equalization tank at the location of the existing tank if it can be done during the late summer and fall when equalization is not usually required? If the new tank is located "below" the headworks the cost of pumping 24/365 seems significant.

Page 9-1:

- If a 20 degree temperature requires one-half of the reactor bay sizing as compared to a 10-degree temperature, does an increase from 7 to 10 degrees reduce the tank size by 30%?

Page 9-2:

- As mentioned earlier, why was 7 degrees chosen as a target influent temperature when 8 degrees was mentioned earlier? Considering the DSPUD staff seemed to experience difficulty increasing the ammonia treating microorganism population in the Fall of 2009 when the temperatures were likely in the 10 degree range (Figure 9-1), is 7 degrees warm enough?
- Does the temperature modeling consider the effects of snow falling on the reactor basins or open equalization tank? It is not clear if the addition of this "cold water" has a greater effect on the temperature of the influent/effluent than ambient temperature and wind?

Table 9-3:

- If 2,000 gallons of diesel is required each week (on average) for a 16-week period (December through March) the total gallons required is 32,000. The annual diesel fuel cost of $21,000 in Table 9-3 seems low ($0.65/gallon).

Section 9.2 Biological Treatment:

- The success of all biological processes assumes that "conditioning" of the influent will occur:
    - Equalization
    - Temperature adjustment
    - Addition of ammonia and a carbon source to increase the microorganism population
    - Use of lime for alkalinity

  The MBR system was modeled using Bio-Win under improved influent parameters and the result was the system would meet discharge standards (Page 9-33). No modeling for either an IFAS or submerged attached growth system is included in the Facilities Plan and the reason is not clear. Waterworks Engineers did some preliminary modeling of an IFAS system using Bio-Win and found the plant could meet discharge standards with modification. If conditioning of the influent is necessary (a given?), two fundamental questions should be considered:
    - Should the "conditioning" improvements be installed and operationally tested to confirm effectiveness before a biological system is installed?
    - Should the actual results of the "conditioning" improvements be used in the Bio-Win modeling to determine the appropriate biological system?

- It would be helpful to have an overall site plan showing the location of the clarifiers (new IFAS system) or the membrane basins (new MBR system) similar to Figure 5-1 to understand the physical limitations on the areas available for construction.

Page 11-3:

- Is it realistic to suggest a revision to the permit is possible considering the Regional Board's decision to not consider dilution credits in April 2009? Significant costs are involved in investigating the *feasibility* of credit (mixing zone study, analysis and permit modification request submission) with no reasonable expectation that those expenses will be beneficial (i.e. a permit revision to allow dilution). Why is the use of chloramines considered not nearly as reliable as obtaining dilution credits but used successfully at other plants?

Section 16 Preliminary Environmental Analysis:

- Some discussion of the levels of CEQA review and corresponding time/effort required for each process improvement should be included. For instance, could installation of the improvements necessary for "conditioning" of the influent (EQ tank, heating, chemical feed) and a "biological system" that result in improved treatment capability be reviewed under the Initial Study/Mitigated Negative Declaration process saving significant time and expense? Conversely the construction of improvements on non-District owned property (i.e. bio-stimulation storage) and capacity improvements will likely trigger significant "interest" and potentially the need for a much more significant environmental review (i.e. EIR) which will delay project construction and result in increased costs. The potential time and cost ramifications of the environmental review process should be included in Table 17-2.

Section 17 Selection of Apparent Best Project:

- It is not clear from the draft plan why IFAS and MBR were rated almost equally in the "Confidence in Design/Technology" when no Bio-Win simulation for an IFAS system was provided in the document.
- If "conditioning" is performed, is an upgrade of the existing system still ranked as a "4" based on Bio-Win?
- Considering that the increased capacity requirements are likely to occur over a long period of time (10+ years) and during that time permit conditions (discharge requirements) will likely become more stringent (pharmaceuticals, etc.) which biological system (MBR or IFAS) allows the greatest flexibility (cost and footprint) to incrementally increase the capacity while reducing the upfront costs?

DSPUD Wastewater Facilities Plan by Eco:Logic
JUGGLING ADD-ON PERCENTAGES 4/02/10 rev. 4/14/10

Example: Effluent Storage

Section 13 of Plan, Table 13-2	**Cost** $,000
Construction incl. piping, electrical and 20% contingency	2,626
General conditions, OH, profit 20%	525
Total construction cost	3,151
Engineering, Admin, Envir. etc. 25%	788
Total estimated Capital Cost	**3,939**

Section 17 Of Plan, Table 17-3

Biostimulation Storage etc	2,000
Electrical and instrum. 25%	500
Sitework 5%	100
Site piping 10%	200
Subtotal 2	2,800
General conditions, OH, profit 20%	560
Subtotal 3	3,360
Contingencies 20%	672
Total Construction Cost	4,032
Engineering, Admin, Envir. etc 25%	1,008
Total Project Cost	**5,040**

It appears that the computations of Section 17 added $1.1 million to the Effluent Storage cost!
Which of these two numbers is right?
Could there be other similar discrepancies/escalations?
Are the costs of the increased irrigation area considered in the total effluent storage cost?
And, if Table 17-3 is believed, is effluent storage worth $5 million?

4/07/10 rev. 4/14/10

U. Luscher Comments on Ecologic's Wastewater Facilities Plan

These comments were originally written for the 4/09/10 meeting of the SLCWD members of the Joint DSPUD/SLCWD Joint WWTP Committee and were modified after that meeting.

Overall Comments

This is a well-crafted report. It appears to address every conceivable issue that may be raised in connection with the upgrade/expansion of the plant, and develops a believable response to it. It also is quite clear what elements of the conceptual design fit together or what do not, such that many combinations of alternatives are addressed. The Executive Summary is excellent.

I do have several overall concerns, as follows. I also have numerous detailed comments, which are provided under a separate heading.

Regarding the key issue of the selection of a basic treatment system, I feel strongly that we must search more diligently to further upgrade the existing plant without needing to involve Brentwood. In my opinion the Draft Report too easily dismisses this alternative on the basis of the unreliability of Brentwood's technology in the Alternatives Rating and Ranking in Table 17-2. I concur that, in view of past history, we should not rely on Brentwood at all.

In the context of the preceding paragraph, I like very much the concept discussed at the 4/09/10 meeting to develop the plant improvements and expansion in a two-stage process. This approach would give the operators the opportunity to study the effectiveness of (1) the recently made changes in the treatment vessels and (2) the consensus changes made in a first stage of construction, before making a decision on the main basic treatment system in a second stage. The consensus changes constructed probably in 2011 would involve at least adding influent equalization storage, adding a process tank heating system and improving the feed systems and materials. With these improvements in place and the recent changes in the treatment vessels fully operational, the plant designers could take a fresh look at any needed additional changes to the treatment processes.

I feel the plan is generally very conservative, in particular how it overreacts to rare events, especially the 2008 algae bloom (in effluent storage) and to a lesser extent the high sewer flows of year-end 1005/06 (in influent flow equalization). Considering that the existing effluent storage capacity was sufficient in 2009 to retain the effluent during the critical potential biostimulation time period, why do we need an additional 6 mio. or more gallons of effluent storage? Also, we can reasonable expect that the ongoing I/I reduction efforts by both Districts will reduce the maximum expected inflows during events such as the 1005/06 year-end sewer flows. Can the Districts really afford to design for these events? Perhaps we will know the answer to this question better once the study of financing alternatives is more advanced. But I certainly support any decision to delete the huge effluent storage system entirely.

I have no good feel for the accuracy of the cost estimates presented. Are they the mentioned intended 10% to 15% conservative? Also, are they of comparable accuracy and conservatism for different elements of the Plan, such that cost comparisons are reasonably reliable in presenting real cost differences between alternatives and in leading to the most cost-effective alternative among several alternatives considered?

I found some discrepancies between the cost estimates given in the report sections on specific elements of the overall plan and the final cost estimate for the tentatively selected plant. Specifically, for effluent storage, the "total capital cost" was estimated as just below $4 million (Table 13-2), while in the Section 17 cost estimate for the overall plant the "total project cost" attributable to effluent storage was just over $5 million. See detail attached. Further, is the additional cost of the enlarged irrigation area included in this estimate? I also question the estimated cost of diesel fuel of $21,000 (Table 9-3) to operate the tank heating system for a year (it does not follow from the text, and looks way too low).

Despite the extensive information provided in the Plan, I have to accept many of the conclusions on faith, as there is not enough specific information provided to fully track the reasoning and conclusions reached. Also, I am not a wastewater engineer. This issue calls for a thorough peer review of the Plan by an independent wastewater engineer.

I have many specific comments on specific text, figures and tables. One general comment here is that the language and expression in many places could be strengthened. Main examples are:

- Avoid the word "assume" where the value given is based on data rather than is a rank guess; for instance, in Section 4, page 1, second-to-last line, TSS load is "assumed" to be 1.0 times the BOD load. Use "estimate", "judge" or similar; or use a different formulation.
- Be sure to define acronyms where they first occur, and include a list of them in a later issue of the report.
- Alter expressions that may be construed as extreme, or leading, or inflammatory, or denigrate the team's efforts.
- Clarify several figures, e.g. Figure 4-2 and 9-3.

Specific locations where I identify such issues are listed in the Detail Comments that follow.

Detail Comments

- Simple typos (of which there are very few) are not called out, unless they may lead to questions or misunderstandings.
- Note the general categories of comments on language or expression noted above.

Page 1-2, para after bullets, line 5: suggest replacing "undoubtedly" by "likely" or "probably"
Page 2-3, Table 2-3: this is the place where acronyms should first be explained, also units such as Mgal/d
Page 2-7, para 3, line 4: suggest adding ""always" before "comply"
Same para, line 6: suggest adding "contribute to" before "promote" and "may" before "cause"
Page 2-7, para 4, line 3: replace "B" by "C"
Page 2-7, bullets: explain acronyms
Page 2-8, table headings: the dark shading makes it hard to read the table headings, especially the small superscripts (comment applicable to many other tables)
Page 2-9, note (b): I believe the number after the DNQ indicates the specific quantitation limit; note should so state
Page 2-20, last line: it might be worthwhile to note here the expected level of conservatism of the cost estimate
Page 2-24, last line: add "years"
Page 3-1, second-to-last para, line 4: replace "late May" by "mid-June"
Page 3-2, table headings: column 2 should state that the 2-yr RP is a minimum and the 100-year RP maximum. Incidentally, I note that I have reviewed the High Sierra Snow Lab precipitation records for the years 2002 – 2009 and found higher numbers than the monthly averages quoted for all except 2 months, with a total of all monthly averages about 50% higher than the 51.67 inches noted here. Has it gotten wetter recently, or are the recording locations different?
Page 4-1, second-to-last line: suggest replacing "assumed" by "estimated" or "projected"; "assume" implies essentially an uneducated guess.
Page 4-3: The designation of the ordinate (vertical axis) in Figure 4-2 appears to not match the numbers shown; also, the designation of the ordinate in Figure 4-1 may be clearer if "daily" were added before "flow" both times
Page 5-7 para 2 line 1: suggest adding "always" before "meet" (to soften the language a bit)
Page 5-7 first bullet: suggest replacing "extreme" with "high" (see reason just above)
Page 6-1 para 1 end: would it be worth while to mention that the discharge limits are to be met by (date)

Page 6-1 para 2 in 2 places: replace "Appendix B" by "Appendix C"
Page 6-1 para 3 line 6: suggest adding "may" before "cause"
Page 6-2, table heading: too dark
Page 6-2, row for copper, last column: significance of WER?
Page 6-3, footnote (b): see comment re. page 2-9
Page 7-1: again Appendix B.
Page 8-3, end of para 2: couldn't the noncompliant effluent be routed back through the plant?
Page 8-7, indented paragraphs: suggest naming them Concept 1 and Concept 2
Page 8-9, end: I see a narrow cost difference only ($100,000 in capital cost, or do I misread the table?), could it be worthwhile to reconsider this issue with more reliable cost data?
Page 9-5, wind speed: Considering how rare a sustained wind speed of 9 mph is, and how long it would have to be sustained to cool down the tank contents, is 9 mph too conservative?
Page 9-6, bottom: how much of what kind of insulation was used, with what thermal properties?
Page 9-7, Figure 9-3: Annotations are practically unreadable (see following page for readable ones)
Page 9-12, bottom: but during spring snowmelt the average air temperatures are much warmer
Page 9-13: suggest improving table column headings to clarify table (I don't understand it); also, 0.74 Mgal/day is very rare
Page 9-14, para 1: line 6 suggest adding at end "volume and"; and at end may also note that the loads during the spring snowmelt are low because of low occupancy
Page 9-14, Table 9-2: might note the estimate includes covers for 4 tanks
Page 9-15 para 2: calc. Uses a very conservative combination of very high flow and "design wind conditions" (is it 3-4 mph, should note); suggest adding that this is expected maximum
Page 9-16, Table 9-3: the diesel fuel annual cost of $21,000 appears erroneous, with an average WEEKLY consumption of 2000 gallons for up to 17 weeks, with a cost of diesel fuel near $3/gallon (could be as high as $100,000 per year by my rough calcs); could this apparent error change the conclusion?
Page 9-2: does the use of RAS (definition?) make this a 4-stage process?
Page 9-32, para 3: line 5, where "above" is the spreadsheet discussed? And what was the basis for the "set" temperatures?
Page 9-39, end of para 1: conclusion in last 2 lines appears to disagree with the solids data at the bottom of Table 9-5 (but I may interpret incorrectly)
Page 10-4 bottom para: is the quoted cost of $500,000 comparable to the $201,000 of Table 10-1?
Page 11-3, para 4 (3rd full para), third-to-last line: see comment on "assumed" re. page 4-1
Page 11-8, para 3, second-to-last line: suggest wording other than "objective is to discontinue using chlorine", in view of use by "apparent best project"
Page 12-1, second-to-last line: suggest adding at end of line "or contributing to"
Page 13-2 para 3: on line 5 suggest adding "apparent" before "2008" and deleting "immediately"; on line 7 add "potential" before "cause"
Page 13-16 para 4 line 6: replace "enforce" by "reinforce"
Page 13-17 Table 13-2: is land acquisition cost of $200,000 reasonable and not way too low? Also, might add a subtotal before contingency (as in most other cost estimates)
Page 14-1: on line before numbered items, suggest a formulation not using "assumptions" (see earlier comment); also, isn't item 3 a condition of all other flow and load considerations, and is discussed there? And in item 5, suggest adding"significant" before "change"
Page 14-3, para 3, third-to-last line: "can be returned" is vague; is it returned, or allowed to seep into the ground or evaporate, or what else?
Page 14-4: Table 14-1, can now complete; and para 3, line 1, suggest adding"about"before "25; last para, lines 2 and 3, replace "are absolutely" by "is"
Page 14-5: para2 line 2, suggest deleting "absolutely" (unless the specific word is in the permit); para 3 last line, these values are huge compared to normal, and probably were recorded in different years (also, where is the DWR gage located?); re. para 4, line 6, suggest replacing "would not necessarily be" by "is unlikely to be", on line 10 suggest replacing "might not produce" by "will not produce much"; and suggest replacing the entire last line by "a substantial rise in the groundwater table that could cause infiltration into low-lying sewer lines"

Page 14-8, para 2 line 5: replace “assume” (see earlier comments)
Page 14-9 para 2 line 3 and Figure 14-3, also Figure 14-4 on page 14-10, need to define “precipitation effectiveness”
Page 14-11: para 1, why is September most conservative, and why do we have to use the most conservative month combined with the 100-year precipitation? on para 2 last line, replace “less” by “lower” and possibly explain more; and in Tables 14-4 and 14-5 titles, note that tables are based on future flows and define the storage capacity
Page 14-12: in para 1 line 7, try to replace “assumed”; and in last para, use the terms of the tables “more conservative (8 Mgal)” and “less conservative (4.5 Mgal)” in preference to “extreme” and “typical”
Page 15-2, last para: suggest adding “minimum” before “solids retention times”
Page 15-6, second-to-last para line 6: the Excel analysis may require a brief explanation
Page 16-1, last line: “looking at” is not a professional term
Page 16-24: para 4, lines 8 and 9, suggest replacing “when there are no flows within the river or flows are minimal” by “when flow in the river is small”; and in para 5 last line, add “and construction” after “design”
Page 17-3, Table 17-1 and accompanying text on page 17-2: I feel the capital cost is not rated high enough, it should be at least 50%. The operating costs are represented by not only the annual cost but also by ease of operation, power use, chemical usage and residuals produced, and are overrated at combined 28%. Plant footprint is a vague criterion and is overrated.
Page 17-5: para 2, the preceding comments re. operating costs also apply here; para 4, as discussed in the overall comments, the selection of the “apparent best project” appears premature at this time
Page 17-8, Table 17-3: Some preceding comments address several issues with this table: What is the intended conservatism of the cost estimates? Are there too many and too expensive percentage add-ons, amounting to a multiplier of 2.43? A prior comment (in Overall Comments re. Table 13-2) also notes that there may be correlation issues between the earlier cost tables for elements of the plant and this table. Finally, if deletion of effluent storage is seriously considered, an alternate table minus all sub-elements of this item (including additional spray irrigation area, additional environmental studies etc.) should be presented.

Attachment: Juggling Add-On Percentages – Effluent Storage

SIERRA LAKES COUNTY WATER DISTRICT
P.O. Box 1039
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(530) 426-7800
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MEMORANDUM

TO: Tom Skjelstad, Donner Summit Public Utility District

FROM: Wade Freedle

RE: Comments in support of the Draft Wastewater Facility Plan prepared by Jeff Hauser of ECO:Logic

DATE: April 14, 2010

These are my individual comments in regard to possible review of some elements of the facilities plan.

1. Incremental Expansion: Since the physical life of the proposed plant will be approximately 30 years, I would like to emphasize the importance of a provision for incremental expansion of the plant over this time frame. Specifically, the additional capacity required for full build-out of both the Sierra Lakes and Donner districts is approximately 33%. If the additional capacity could be phased into three components (i.e. 11% now, 11% in 10 years and 11% in 20 years), this would greatly reduce the amount of capital required to be invested in the facility at this point in time.

2. Schedule of Alternative Rankings (17-2): The Schedule of Alternative Rankings appears to place too much emphasis on Capital and Operating Costs as opposed to the reliability of the design and technology. While there is nothing mandatory about the weighting factors themselves (i.e. they are to a certain extent subjective) it would appear that more emphasis should be placed on design technology and less on the costs. My own feeling is that design technology should be increase to 45, with capital costs reduced to 15, and annual costs reduced to 5.

3. Heating: Your comments in regard to the value of heating the wastewater from 7 degrees centigrade to 10 degrees centigrade is certainly well founded, however, you
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costs reduced to 15, and annual costs reduced to 5.

3. <u>Heating</u>: Your comments in regard to the value of heating the wastewater from 7 degrees centigrade to 10 degrees centigrade is certainly well founded, however, you also mentioned that an increase in temperature from 10 degrees centigrade to 20 degrees centigrade would double the capacity of the biological process. I think consideration should be given to the possibility of installing a facility that would be capable of heating the wastewater to a temperature of 20 degrees centigrade. This would in effect double the processing capacity of the system at a very minor capital cost.

4. <u>Insulating the Tanks</u>: There is no question that better insulation of the tanks would enhance the process considerably. Especially if external heating of the wastewater is to be considered. The tanks could be covered with a shell of industrial insulation at a relatively small cost since the frame work would only have to support the weight of the insulation.

Sincerely;

Wade Freedle

Wade Freedle
President
Sierra Lakes County Water District
Attachment
WF/an

Comments on DSPUD Wastewater Facilities Plan

Section 9.1 Heat Transfer and Temperature Management:

- The heat loss from uncovered tanks is strongly a function of wind speed, with the analysis using assumptions about average wind speeds typically under 9 MPH. It states on page 9-4, "Of course, winds occurring for shorter durations, such as several hours, could be much higher, but these short-term events would not have a significant impact on waste water process temperatures." This may be an oversimplification. When we experience a winter storm (when the demands on the plant are at their highest), we can have high winds, regularly exceeding 30 MPH, for two, three, or four days in a row. This might cause process temperatures to drop several degrees below the 7° C target level, just as the plant is being stressed to the maximum. Further analysis of such conditions may be warranted.
- The heat loss analysis does not appear to consider the cooling affects of snow accumulation on the top of the open vats. In more mild climates, this may well be a reasonable assumption. But considering that our average snowfall is 34 feet, this may be an oversimplification – once again at the time of the year the plant is being stressed to its maximum.
- The cost of full enclosures for the open vats at $4.6 million does seem expensive and hard to justify. But what about more simply metal canopies to block winds from the prevailing direction and/or to prevent snow accumulation in the vats?

Section 9.2 Biological Treatment Alternative Analysis

- The required EDUs for expansion need to include those required for full buildout of Serene Lakes. Does that change the conclusion that the existing vats can handle the capacity needs of both the new IFAS process and the MBR process?
- The sewage processing requirements per EDU is assumed to remain constant. Casual observation indicates that homes in the community are getting bigger and occupancy rates are increasing (as more property owners take up full-time residence). An analysis should be undertaken to see if sewage processing requirements per EDU have, in fact, been increasing in recent years and, if so, what does that imply for estimates going forward.

Section 13 Effluent Storage to Mitigate Biostimulation

- Most likely, the danger of contributing to nuisance biostimulation increases dramatically as the water level of Lake Van Norden drops down to the height of the existing spillway and water ceases to flow from the lake into the South Yuba cease. When this happens, there are still a significant number of acre-feet of water in Lake Van Norden.
- Moreover, there appears to be a release valve on the dam that could presumable release remaining water in the lake.

- If Royal Gorge would allow the release of additional water in the spring until the irrigation disposal fields are ready for use, this could significantly reduce the risk of biostimulation in the South Yuba.

14.3 Identification and Evaluation of Potential Irrigation Disposal Sites

- The evaluated sites are all primarily north-facing. This is unfortunate, because a south-facing site might be available for irrigation disposal each spring several weeks before a north-facing site. This would be due to the fact that south-facing slopes should accumulate less snow during the winter (due to sublimation) and the remaining snow melts more quickly in the spring.
- The ability to use irrigation disposal earlier in the spring could go a long way toward minimizing the potential for nuisance biostimulation – and might preclude the need for expensive biostimulation storage, such as the proposed reservoir.
- The backside of the Boreal Ski Resort is a large south-facing slope. It should be evaluated as a potential irrigation disposal site – particularly since it would involve contracting with the same entity that leases the current irrigation disposal site to DSPUD.
- Also, a field evaluation should be made this spring to determine how much earlier the Boreal site is available for irrigation than the current irrigation site. This could be used to understand better the need for biostimulation storage if irrigation disposal is, in fact, available earlier in the season.
- Table 14-1 is inconsistent with Table 13-1. The last date of river discharge for 2008 is July 2 in Table14-1 versus May 31 for Table 13-1.

General Comments: Margin for Error

- Though the design of the proposed treatment facility is based on well-established engineering standards and calculations, there remains a possibility that the new plant might not consistently meet the NPDES effluent limitations for river discharge – given the known challenges of wide seasonal variations in weather and sewage load. This is particularly so given that we do not have a daily historical record (over several years) of the flows and constituent loads of the influent as the basis for simulating plant performance.
- As such, the evaluation of alternatives and selection process should encompass a discussion of the margin for error. That is, if the initial plant design does not meet specification, what are the available avenues and strategies for further improving performance anticipated in the selected design – short of another major plant reconfiguration?
- For example, since the MBR process can handle mixed liquor concentrations roughly twice that of IFAS, does MBR provide significantly more flexibility for lengthening the solids retention time – if needed to achieve specification?
- Or, should the new equalization storage be consciously oversized (relative to the current proposal) to provide maximum flow equalization – again, if needed to achieve specification? Or, should the Boiler/Heat Exchanger System be oversized -- if higher thermal input turns out to be needed during the winter?

- Accordingly, there should be more analysis and discussion in the report as to a) which processes offer the greater flexibility and adaptability to meet challenging requirements and b) where might additional capital cost be warranted at the front end to provide additional margin for error at a modest additional cost.
- In this vein, the Alternative Ratings and Ranking (Table 17-2) should include an additional criterion that assesses and rates each alternative's flexibility, band-width and margin for error. Field evaluations of existing sewer processing facilities with the alternative technologies (in environments similar Donner Summit) could provide useful information as to the operational flexibility and band-width in meeting difficult standards. Such field trips could also provide documented operational strategies that have been effective for others.

Wake

ECO:LOGIC RESPONSES TO COMMENTS OF THE SLCWD REVIEWERS ON THE DRAFT DSPUD WASTEWATER FACILITIES PLAN

April 27, 2010

To allow responding in the most efficient manner, the original comments were received in electronic form and were pasted into this document in italics. A response to each comment or group of comments is given in non-italics, immediately following the comment(s). The comments and responses are arranged under headings, according to the reviewer. In several cases, reference is made to ECO:LOGIC responses to the comments of Waterworks Engineers, which are covered in a separate document.

Transmittal Memorandum by Bill Quesnel

The main point of the text in the cover memorandum is to propose the two-stage project concept. See response to Waterworks Item 3.

Bill Quesnel Comments

General Comments:

- *Construction cost contingencies (20%), Contractor mark-up of Overhead and Profit (25%) and Engineering/Environmental (25%) seem high given the current economy and bidding results.*

  At the Facilities Planning level, proposed facilities are not developed in any detail. There are many items that can come to light as more details are developed in preliminary design and design. A 20% contingency allowance for such unknowns is actually on the low side. The 25% allowance mentioned for overhead and profit is actually for general conditions as well as overhead and profit. General conditions include bonds and insurance, contractor's field office, engineer's field office, storage and staging provisions, temporary utilities, and various other requirements for the job. Also included in the 25% allowance are mobilization and demobilization, field supervision, as well as overhead and profit. Based on consultations with construction experts, this is a reasonable allowance. We have been using such allowances in recent engineer's cost estimates for wastewater treatment plant construction projects and have been reasonably accurate. A rough rule of thumb for design engineering for a wastewater treatment plant modification/expansion project of the nature involved is 10% of the construction cost. Basic engineering services during construction can be around 3 or 4% and construction management and administration can be around 6 or 7%. When other District administration costs and environmental review are added, the 25% allowance is appropriate.

- *A discussion re: staged construction, operation of plant during construction and number of seasons required to construct all improvements should be included in the Alternatives Rating and Ranking discussion (Table 17-2) and considered in the Selection of the Apparent Best Project.*

See our previous response regarding project staging. We believe all alternatives would involve at least a two-year construction schedule. In the first year, most underground work would be completed and new structures would be built, while leaving existing facilities in operation. In the second year, each of the existing package plants would be taken down one at a time for required modifications while flows and loads are low. Temporary plant shutdowns and wastewater storage could be required for short durations during key tie-ins between new and existing facilities. During preliminary design, we propose to consult with a construction consultant to confirm appropriate construction scheduling as needed to obtain good bids and still comply regulatory requirements. We do not currently believe that issues of construction scheduling would cause differential ratings of the alternatives.

- *Does the Engineering Team have confidence that enough data is available to design the plant?*

  In addition to data used in the Facilities Plan, Plant data from 2009/2010 and 2010/2011 will be available for design in 2011. We will work with the District to confirm appropriate monitoring efforts in 2010/2011. We believe adequate data will be available for design.

Specific Comments/Questions:

Table 2-4:

- *Is non-compliance with Aluminum a function of the domestic water treatment process/chemical used by DSPUD or another influence that requires additional research?*

  Yes, aluminum concentrations in wastewater are impacted by alum and other aluminum-based water and wastewater treatment chemicals. Additionally, aluminum is common in the natural environment. Various methods of aluminum compliance are currently being considered separately from the Facilities Planning effort. It is likely that a Water Effects Ratio will have to be developed to obtain relief on the aluminum limit.

Table 4-1:

- *Why are the assumed BOD Concentrations for the Allowance for Growth greater than the Existing Conditions?*

  In June 2004, a joint engineering study was completed by DSPUD and SLCWD to quantify peak three-day flows and loads per EDU in each District. The flow per EDU in DSPUD was substantially higher than the flow per EDU in SLCWD (440 vs 250 gpd), however, sewage concentrations were lower for DSPUD, resulting in similar peak three-day BOD loads per EDU (0.88 and 0.83 lb/d). Since the results of that study are believed to be reasonably reliable and allow separate calculations to be made for growth in each of the Districts, it was considered appropriate to use these results for the Facilities Plan projections. However, for the Facilities Plan, the three-day average flows and loads were converted to weekly averages, based on judgments that are developed in Appendix A. The most important values to be derived from these data are loads per EDU, not sewage concentrations. The peak week BOD loads per EDU for DSPUD and SLCWD derived from the data in the joint engineer's study are 0.62 and 0.59 lb/d, respectively. Assuming the number of EDUs has not changed by a significant percentage in the last few years, the existing overall plant influent peak week BOD load developed in the Facilities Plan corresponds to an EDU loading of about 0.55 lb/d, averaged over the two Districts. It is acknowledged that the allowance for new growth is slightly more conservative than the allowance for existing conditions, but this is considered to be reasonable. Furthermore, the impact of these slightly more conservative values for new EDUs on the overall project design criteria is relatively insignificant.

Figure 4-2:

- *Is the disparity in the Monthly Average BOD ratio for December 2005 and 2007 as compared to December 2006 a result of a specific storm event? The data in Figure 4-1 does not mirror that difference in 2006 vs. 2007.*

  Figure 4-2 is in error: the data shown are actual monthly BOD loads in lb/d, not ratios to average loads. A corrected figure will be provided, but the curves will have the same shapes. In any case the data are based on loads, not concentrations. BOD loads would not be altered by storm-related infiltration and inflow. However, BOD loads could be altered by a storm event to the extent that this would impact occupancy rates in the area.

- *Table 5-1:*
- *Do the volumes of the anoxic zones include the modifications done in the Fall of 2009?*

  Yes.

- *Page 5-7:*
  - *One of the reasons given for high ammonia and nitrate concentrations is: ….low mixed liquor temperatures (less than 8 degrees C). Later in the document the analysis assumes a desired temperature of 7 degrees can be accomplished by heating. What temperature is preferred or is there no real difference in performance between 7 and 8 degrees? Is there a possibility the reactor basins and IFAS media are* ***not*** *"inadequately sized" if the other three contributing causes are rectified?*

    The choice of 7 °C as a minimum desired design temperature is based on engineering judgment, taking into consideration the slower rates of biological activity at lower temperatures, the increasing uncertainty regarding accuracy of design models as temperatures decrease substantially below 10 °C, and the facilities and costs involved with heating wastewater. There would be a slight increase in biological activity at 8 °C as compared to 7 °C; however, substantially more energy would be required for heating to 8 °C. As an example, the incremental amount of energy required to go from a design criterion of 7 °C to 8 °C would be much more than the incremental amount of energy required to go from a criterion of 6 °C to 7° C. With each incremental one degree increase in temperature, the incremental amount of energy would be much more than for the previous temperature increment. This is because of three compounding factors: 1) with each higher temperature criterion, there would be substantially more times that the influent wastewater was colder than that criterion and would need to be heated, 2) more heat would be required to change the temperature of the influent to the higher temperature, and 3) with higher temperatures, the rate of heat loss from the process would be higher.

At the design temperature of 7 °C, the existing reactor basins and media areas are inadequate for future flows and loads, even with improved chemical feeding and flow equalization.

- *Page 5-10:*
    - *My understanding is the existing usable irrigated area is approximately 34 acres, not 45 acres.*

  Yes, that is correct. The statement on Page 5-10 will be clarified.

- *Page 8-4:*
    - *While the statement "Plant facilities that generally could not be downsized based on equalization storage include biological reactor basins and sludge handling facilities" may be accurate, it seems that equalizing flows to the lowest practical amount possible (<0.6MGD) will provide an additional buffer during the period when the microorganism population may not be sufficient to treat peak holiday flows. Equalizing over a longer period (greater than one week) a few times of the year may not be typical but the cost of the additional storage capacity may be preferable to exceeding discharge standards because of insufficient treatment capacity. Similarly, when the 20% increase in future flows is considered, should thought be given to maintaining flows of less than 0.6MGD and increasing EQ tank volume? Should the plant be designed for a flow of 0.72MGD with an equalization volume of 0.60MG when the plant typically operates at a much smaller rate of approximately 0.40 MGD (Figure 8-2)?*

  Although very rough cost implications can be developed as done in Section 8 of the Facilities Plan report, the choice of how much to equalize is based in large part on engineering and operations judgment. With lower limiting flows, not only do required tank volumes increase substantially, there is more and more uncertainty as to what the tank volume should be. Furthermore, in actual operations, with longer equalization durations and lower limiting flows there is more and more uncertainty as to how to control how much flow is actually sent through the plant. As developed in Appendix B and Section 8, control of plant flows and equalization volumes requires the operator to predict what he thinks future flows will be over the time of the equalization period. If he guesses too low and sets the plant flow accordingly, the equalization tank will fill too rapidly, potentially causing the need for a drastic setpoint flow increase or exhausting the equalization volume altogether, in which case the plant flow would then be the same as the influent flow (no attenuation in peak flows). If he guesses too high, the equalization volume will not fill and be used effectively.

The choice to provide enough equalization volume for theoretically equalizing flows over the design peak week condition is a reasonable judgment call, taking into consideration cost and operational implications. It is noted that the equalization volume required for the design peak week would theoretically be adequate to equalize over a much longer period in most years. For example, as noted in the last full paragraph on Page 8-2, the 500,000 gallons of volume that would have theoretically been required to equalize to the existing peak week design flow of 0.61 Mgal/d in 2005/2006 would have been adequate to equalize to 0.4 Mgal/d (about the existing peak month flow) in the second and third most severe events occurring in the years 2001 to 2008. In other years, even lower limiting flows (and longer equalization durations) would have been theoretically possible. These criteria can be extrapolated to indicate that the proposed design equalization volume for the plant expansion can theoretically provide equalization over a week in a rare event that might occur maybe only once in ten years, while equalization over at least a month might theoretically be possible in all other years. However, due to the uncertainties involved in actual equalization operations, it is unlikely that the operator would ever try to accomplish such long periods of equalization during peak winter months. He would never be sure whether flows occurring over the next 30 days would be low, normal, or extremely high.

- *Page 8-7:*
    - *Is it practical to construct a new equalization tank at the location of the existing tank if it can be done during the late summer and fall when equalization is not usually required? If the new tank is located "below" the headworks the cost of pumping 24/365 seems significant.*

    The proposed location of a new equalization tank is behind the District office building (the original fire station). The proposed tank would be able to fill and drain almost completely by gravity. Only the lower portion of the tank would require pumping to empty.

- *Page 9-1:*
    - *If a 20 degree temperature requires one-half of the reactor bay sizing as compared to a 10-degree temperature, does an increase from 7 to 10 degrees reduce the tank size by 30%?*

    Using the same rough rule of thumb that indicates a 50% reduction in size from 10 °C to 20 °C would result in a reduction of about 19% from 7 °C to 10 °C (these are calculated as $1\text{-}1.072^{-10}$ and $1\text{-}1.072^{-3}$). However, this is just a rough rule based on growth rates for ammonia oxidizing bacteria. It is more complicated than that; decay rates, aerobic and anoxic times, sludge yield and other factors must be considered.

- *Page 9-2:*
  - *As mentioned earlier, why was 7 degrees chosen as a target influent temperature when 8 degrees was mentioned earlier? Considering the DSPUD staff seemed to experience difficulty increasing the ammonia treating microorganism population in the Fall of 2009 when the temperatures were likely in the 10 degree range (Figure 9-1), is 7 degrees warm enough?*

    The choice of 7 °C is explained in a previous response above. The problem in 2009 was that the ammonia feeding ramp up did not begin early enough in the year.

  - *Does the temperature modeling consider the effects of snow falling on the reactor basins or open equalization tank? It is not clear if the addition of this "cold water" has a greater effect on the temperature of the influent/effluent than ambient temperature and wind?*

    This is an excellent comment. The answer is no, the impacts of snow falling on tanks is not included in the literature upon which the temperature modeling was based, and was therefore not included in the model used. The energy required to melt snow (the heat of fusion) is the most significant factor. There is also energy required to raise the temperature of the snow to the melting point and then to raise the temperature of the water formed. With extreme high snow fall amounts (like 6 feet in a week), the impact of snow could be an additional cooling of several degrees C at lower flows, but less than 1 °C at higher flows. During a peak week, the increased diesel consumption needed to counteract this cooling effect would be on the order of 500 gallons. When average energy costs over a season are considered, we must look at average snow fall. Using 35" of precipitation as water (probably over 30 feet as snow) from December through March, approximately 2500 gallons of diesel would be required to melt the snow and raise the temperature to 7 °C. Thus, the annual cost would be about $7500 and the present worth of this cost would be about $110,000. This would not change the choice between heating or covering the basins. We will incorporate these issues in the Facilities Plan.

- *Table 9-3:*
  - *If 2,000 gallons of diesel is required each week (on average) for a 16-week period (December through March) the total gallons required is 32,000. The annual diesel fuel cost of $21,000 in Table 9-3 seems low ($0.65/gallon).*

    The 2000 gallons is the maximum week consumption, not the average over the period from December through March. From December through March, the estimated consumption (without the snow effect) is roughly estimated at about 7000 gallons in total.

- *Section 9.2 Biological Treatment:*
    - *The success of all biological processes assumes that "conditioning" of the influent will occur:*
        - *Equalization*
        - *Temperature adjustment*
        - *Addition of ammonia and a carbon source to increase the microorganism population*
        - *Use of lime for alkalinity*

    The MBR system was modeled using Bio-Win under improved influent parameters and the result was the system would meet discharge standards (Page 9-33). No modeling for either an IFAS or submerged attached growth system is included in the Facilities Plan and the reason is not clear. Waterworks Engineers did some preliminary modeling of an IFAS system using Bio-Win and found the plant could meet discharge standards with modification. If conditioning of the influent is necessary (a given?), two fundamental questions should be considered:
        - *Should the "conditioning" improvements be installed and operationally tested to confirm effectiveness before a biological system is installed?*
        - *Should the actual results of the "conditioning" improvements be used in the Bio-Win modeling to determine the appropriate biological system?*

    These issues are mostly covered by our response to Waterworks comments 2 and 3. The long-term dynamic model of the MBR was presented in the Facilities Plan as an example of results that we can likely expect from all biological treatment options. The Facilities Plan recommends similar dynamic modeling, during pre-design for IFAS, if an IFAS system is selected for implementation.

    - *It would be helpful to have an overall site plan showing the location of the clarifiers (new IFAS system) or the membrane basins (new MBR system) similar to Figure 5-1 to understand the physical limitations on the areas available for construction.*

    A site layout for the selected alternative will be presented in Section 17. We are confident that all alternatives can be accommodated on the site, but we did not want to develop and present site plans for all alternatives, considering study budget limitations.

    - *Page 11-3:*
    - *Is it realistic to suggest a revision to the permit is possible considering the Regional Board's decision to not consider dilution credits in April 2009? Significant costs are involved in investigating the feasibility of credit (mixing zone study, analysis and permit modification request submission) with no reasonable expectation that those expenses will be beneficial (i.e. a permit revision to allow dilution). Why is the use of chloramines considered not nearly as reliable as obtaining dilution credits but used successfully at other plants?*

    See our response to Waterworks Comment 5.

- *Section 16 Preliminary Environmental Analysis:*
    - *Some discussion of the levels of CEQA review and corresponding time/effort required for each process improvement should be included. For instance, could installation of the improvements necessary for "conditioning" of the influent (EQ tank, heating, chemical feed) and a "biological system" that result in improved treatment capability be reviewed under the Initial Study/Mitigated Negative Declaration process saving significant time and expense? Conversely the construction of improvements on non-District owned property (i.e. bio-stimulation storage) and capacity improvements will likely trigger significant "interest" and potentially the need for a much more significant environmental review (i.e. EIR) which will delay project construction and result in increased costs. The potential time and cost ramifications of the environmental review process should be included in Table 17-2.*

      Table 17-2 is a comparison of the biological treatment and disinfection alternatives. We believe the environmental issues associated with work on the plant site would be essentially the same for all alternatives. However, you bring up a valid point with regard to chlorine disinfection; as this would require work in the South Yuba River to install a diffuser, as needed to obtain dilution credits. We can add a discussion and rating regarding this topic.

      Our response regarding a two-stage project to build the "conditioning" improvements first is covered in our response to Waterworks comments. We believe one CEQA process should cover all the improvements, whether or not they are broken into phases.

- *Section 17 Selection of Apparent Best Project:*
    - *It is not clear from the draft plan why IFAS and MBR were rated almost equally in the "Confidence in Design/Technology" when no Bio-Win simulation for an IFAS system was provided in the document.*

      We agree we should slightly lower the rating for IFAS.

    - *If "conditioning" is performed, is an upgrade of the existing system still ranked as a "4" based on Bio-Win?*

      Yes, Upgrade Existing IFAS would still receive a 4 rating because of lack of full-scale project experience with structured sheet media.

    - *Considering that the increased capacity requirements are likely to occur over a long period of time (10+ years) and during that time permit conditions (discharge requirements) will likely become more stringent (pharmaceuticals, etc.) which biological system (MBR or IFAS) allows the* *greatest flexibility (cost and footprint) to incrementally increase the capacity while reducing the upfront costs?*

The currently proposed design capacity is only about a 20% increase over existing flows. That is a relatively small increase and it is really not practical to develop an incremental staging plan within that capacity increase. Certainly, there would be no economic benefit to staging the 20% increase. However, for expansion beyond the 20%, the MBR does have some advantage with regard to ease of expansion, which is already reflected in Table 17-2. We will be adding another rating criterion with regard to accommodating future permitting requirements, for which the MBR will get the highest score.

Ulrich Luscher Comments

Overall Comments

This is a well-crafted report. It appears to address every conceivable issue that may be raised in connection with the upgrade/expansion of the plant, and develops a believable response to it. It also is quite clear what elements of the conceptual design fit together or what do not, such that many combinations of alternatives are addressed. The Executive Summary is excellent.

I do have several overall concerns, as follows. I also have numerous detailed comments, which are provided under a separate heading.

Regarding the key issue of the selection of a basic treatment system, I feel strongly that we must search more diligently to further upgrade the existing plant without needing to involve Brentwood. In my opinion the Draft Report too easily dismisses this alternative on the basis of the unreliability of Brentwood's technology in the Alternatives Rating and Ranking in Table 17-2. I concur that, in view of past history, we should not rely on Brentwood at all.

These and related issues are covered in the response to Waterworks comments, Item 2.

In the context of the preceding paragraph, I like very much the concept discussed at the 4/09/10 meeting to develop the plant improvements and expansion in a two-stage process. This approach would give the operators the opportunity to study the effectiveness of (1) the recently made changes in the treatment vessels and (2) the consensus changes made in a first stage of construction, before making a decision on the main basic treatment system in a second stage. The consensus changes constructed probably in 2011 would involve at least adding influent equalization storage, adding a process tank heating system and improving the feed systems and materials. With these improvements in place and the recent changes in the treatment vessels fully operational, the plant designers could take a fresh look at any needed additional changes to the treatment processes.

See response to Waterworks comments, Item 3.

I feel the plan is generally very conservative, in particular how it overreacts to rare events, especially the 2008 algae bloom (in effluent storage) and to a lesser extent the high sewer flows of year-end 1005/06 (in influent flow equalization). Considering that the existing effluent storage capacity was sufficient in 2009 to retain the effluent during the critical potential biostimulation time period, why do we need an additional 6 mio. or more gallons of effluent storage? Also, we can reasonable expect that the ongoing I/I reduction efforts by both Districts will reduce the maximum expected inflows during events such as the 1005/06 year-end sewer flows. Can the Districts really afford to design for these events? Perhaps we will know the answer to this question better once the study of financing alternatives is more advanced. But I certainly support any decision to delete the huge effluent storage system entirely.

ECO:LOGIC believes an appropriate level of conservatism has been used with regard to the 2005/2006 flows. Although these flows were used in the sizing of the equalization basin, no safety factor was applied. Since it is virtually impossible to control the operation of an equalization basin to handle unknown future flows in a manner that would match theoretical volume requirements based on analysis of historical data, without a safety factor (typically 2), the proposed equalization volume would not be capable of equalizing a repeat of the 2005/2006 event. We have already presumed the Districts will make I/I improvements to help mitigate such peak flow events, however, a high degree of success with these efforts should not be presumed before being proven. It is generally our understanding that, if anything, more equalization volume would be desirable.

With regard to the biostimulation storage reservoir, there is much uncertainty regarding what causes algae blooms and when the next one will occur. Fortunately, a severe bloom did not occur in 2009. The District will need to make a policy decision on whether or not to proceed with biostimulation storage in view of the risks and uncertainties involved.

I have no good feel for the accuracy of the cost estimates presented. Are they the mentioned intended 10% to 15% conservative? Also, are they of comparable accuracy and conservatism for different elements of the Plan, such that cost comparisons are reasonably reliable in presenting real cost differences between alternatives and in leading to the most cost-effective alternative among several alternatives considered?

With the 20% contingency allowance included, we are hopeful that the future project capital cost estimates may be slightly conservative; however, we would not want to say they are 10% to 15% high. The same level of conservatism has been used in the estimates for all alternatives.

I found some discrepancies between the cost estimates given in the report sections on specific elements of the overall plan and the final cost estimate for the tentatively selected plant. Specifically, for effluent storage, the "total capital cost" was estimated as just below $4 million (Table 13-2), while in the Section 17 cost estimate for the overall plant the "total project cost" attributable to effluent storage was just over $5 million. See detail attached. Further, is the additional cost of the enlarged irrigation area included in this estimate? I also question the estimated cost of diesel fuel of $21,000 (Table 9-3) to operate the tank heating system for a year (it does not follow from the text, and looks way too low).

Some discrepancies are acknowledged and we will fix them. The storage reservoir and irrigation improvements are in separate cost estimates or line items. The diesel fuel cost of $21,000 per year is based on estimated average consumption from December through March and is believed to be correct, except that it will be increased by about $7500 per year to account for snow falling in the treatment basins, as set forth in the response to other comments on this issue.

Despite the extensive information provided in the Plan, I have to accept many of the conclusions on faith, as there is not enough specific information provided to fully track the reasoning and conclusions reached. Also, I am not a wastewater engineer. This issue calls for a thorough peer review of the Plan by an independent wastewater engineer.

We have attempted to provide a high level of specific information, without providing too much volume that would be inappropriate for most readers. A peer review is welcomed.

I have many specific comments on specific text, figures and tables. One general comment here is that the language and expression in many places could be strengthened. Main examples are:

- *Avoid the word "assume" where the value given is based on data rather than is a rank guess; for instance, in Section 4, page 1, second-to-last line, TSS load is "assumed" to be 1.0 times the BOD load. Use "estimate", "judge" or similar; or use a different formulation.*
- *Be sure to define acronyms where they first occur, and include a list of them in a later issue of the report.*
- *Alter expressions that may be construed as extreme, or leading, or inflammatory, or denigrate the team's efforts.*
- *Clarify several figures, e.g. Figure 4-2 and 9-3.*

We will review wording and clarify figures in accordance with your comments.

Specific locations where I identify such issues are listed in the Detail Comments that follow.

Detail Comments

- *Simple typos (of which there are very few) are not called out, unless they may lead to questions or misunderstandings.*
- *Note the general categories of comments on language or expression noted above.*

We have been asked to respond only to the more substantive comments that follow. Comments regarding choices of words and other comments of a general editorial nature are not considered herein, but will be considered in the Facility Plan revisions.

Page 1-2, para after bullets, line 5: suggest replacing "undoubtedly" by "likely" or "probably"

Page 2-3, Table 2-3: this is the place where acronyms should first be explained, also units such as Mgal/d

Page 2-7, para 3, line 4: suggest adding ""always" before "comply"

Same para, line 6: suggest adding "contribute to" before "promote" and "may" before "cause"

Page 2-7, para 4, line 3: replace "B" by "C"

Page 2-7, bullets: explain acronyms

Page 2-8, table headings: the dark shading makes it hard to read the table headings, especially the small superscripts (comment applicable to many other tables)

Page 2-9, note (b): I believe the number after the DNQ indicates the specific quantitation limit; note should so state

Page 2-20, last line: it might be worthwhile to note here the expected level of conservatism of the cost estimate

Page 2-24, last line: add "years"

Page 3-1, second-to-last para, line 4: replace "late May" by "mid-June"

Page 3-2, table headings: column 2 should state that the 2-yr RP is a minimum and the 100-year RP maximum. Incidentally, I note that I have reviewed the High Sierra Snow Lab precipitation records for the years 2002 – 2009 and found higher numbers than the monthly averages quoted for all except 2 months, with a total of all monthly averages about 50% higher than the 51.67 inches noted here. Has it gotten wetter recently, or are the recording locations different?

We do not understand using the words minimum and maximum, the indicated return periods are appropriate.

We noted many discrepancies between the raw data from Snow Lab and the data we obtained from DWR for Soda Springs. We were told that the Snow Lab rainfall data does not go through the more rigorous checking and quality control of the DWR data. The data we received from DWR are apparently based on several monitoring stations in the Soda Springs area.

Page 4-1, second-to-last line: suggest replacing "assumed" by "estimated" or "projected"; "assume" implies essentially an uneducated guess.

Page 4-3: The designation of the ordinate (vertical axis) in Figure 4-2 appears to not match the numbers shown; also, the designation of the ordinate in Figure 4-1 may be clearer if "daily" were added before "flow" both times

Figure 4-2 is in error. The figure is actually showing BOD load in lb/d, not ratios to average annual loads as intended. This will be corrected.

Page 5-7 para 2 line 1: suggest adding "always" before "meet" (to soften the language a bit)

Page 5-7 first bullet: suggest replacing "extreme" with "high" (see reason just above)

Page 6-1 para 1 end: would it be worth while to mention that the discharge limits are to be met by (date)

Page 6-1 para 2 in 2 places: replace "Appendix B" by "Appendix C"

Page 6-1 para 3 line 6: suggest adding "may" before "cause"

Page 6-2, table heading: too dark

Page 6-2, row for copper, last column: significance of WER?

A Water Effects Ratio (WER) is a determination of site-specific toxicity of a constituent, which may be different than the default water quality criterion that is intended to be conservative for all circumstances and is the initial basis for permit limits. With the mix of various dissolved constituents that exist in the DSPUD wastewater effluent, the allowable (nontoxic) concentration for copper may be higher than the default. It is likely that a WER will have to be developed for several constituents at DSPUD, including copper.

Page 6-3, footnote (b): see comment re. page 2-9

Page 7-1: again Appendix B.

Page 8-3, end of para 2: couldn't the noncompliant effluent be routed back through the plant?

Yes, in all cases, noncompliant effluent stored in the emergency storage tank would be returned back through the plant. However, if the emergency storage tank capacity was fully exhausted in an extreme peak flow event, all subsequent effluent would have to be discharged to the river, regardless of compliance status.

Page 8-7, indented paragraphs: suggest naming them Concept 1 and Concept 2

Page 8-9, end: I see a narrow cost difference only ($100,000 in capital cost, or do I misread the table?), could it be worthwhile to reconsider this issue with more reliable cost data?

We do not understand this comment. After dismissing equalization alternatives based on Concept 2, the only remaining alternatives are 1 and 1-MBR. There is about a $1.5 million capital cost differential between them; however, the choice between these alternatives is forced by the selection of the biological treatment alternative. Equalization alternative 1-MBR must be used if the MBR is the chosen biological treatment alternative.

Page 9-5, wind speed: Considering how rare a sustained wind speed of 9 mph is, and how long it would have to be sustained to cool down the tank contents, is 9 mph too conservative?

The 9 mph wind speed is considered only as a boundary condition based on the Blue Canyon data. It is acknowledged that normal wind speeds at DSPUD are likely much lower and the lower wind speeds are the basis of the cost-effectiveness analysis between covering and heating the basins.

Page 9-6, bottom: how much of what kind of insulation was used, with what thermal properties?

It is understood that the stud spaces around Plants 1 and 2 are filled with fiberglass insulation and that level of insulation was assumed for all tanks in the analysis.

Page 9-7, Figure 9-3: Annotations are practically unreadable (see following page for readable ones)

Page 9-12, bottom: but during spring snowmelt the average air temperatures are much warmer

Acknowledged.

Page 9-13: suggest improving table column headings to clarify table (I don't understand it); also, 0.74 Mgal/day is very rare

We tried to make the table headings very explicit, indicating how the data was calculated. We would be happy to consider a suggestion for better headings. It is agreed that 0.74 Mgal/d weekly average design flow should be relatively rare.

Page 9-14, para 1: line 6 suggest adding at end "volume and"; and at end may also note that the loads during the spring snowmelt are low because of low occupancy

Page 9-14, Table 9-2: might note the estimate includes covers for 4 tanks

Page 9-15 para 2: calc. Uses a very conservative combination of very high flow and "design wind conditions" (is it 3-4 mph, should note); suggest adding that this is expected maximum

We will add the note on wind speed. This is not necessarily the expected maximum, but it is believed to be a reasonably conservative design condition.

Page 9-16, Table 9-3: the diesel fuel annual cost of $21,000 appears erroneous, with an average WEEKLY consumption of 2000 gallons for up to 17 weeks, with a cost of diesel fuel near $3/gallon (could be as high as $100,000 per year by my rough calcs); could this apparent error change the conclusion?

See responses to Bill Quesnel's comments.

Page 9-2: does the use of RAS (definition?) make this a 4-stage process?

We presume the reference should be to page 9-20. No, return activated sludge (RAS) is needed for either a 2-stage or 4-stage process to bring the solids that settle in the clarifier back to the reactor basins.

Page 9-32, para 3: line 5, where "above" is the spreadsheet discussed? And what was the basis for the "set" temperatures?

The reference "above" is to the discussion of the Flow Equalization Model on the previous page. The set temperatures are generally based on Figure 9-1.

Page 9-39, end of para 1: conclusion in last 2 lines appears to disagree with the solids data at the bottom of Table 9-5 (but I may interpret incorrectly)

The conclusion is believed to be consistent with the data in Table 9-5. The table shows a total aerobic solids inventory of 16,973 lbs for the Upgrade IFAS alternative and 10,191 lbs for the New IFAS alternative.

Page 10-4 bottom para: is the quoted cost of $500,000 comparable to the $201,000 of Table 10-1?

No, the $500,000 is just the construction cost, while the $201,000 is a total capital cost (including engineering, administration, and environmental).

Page 11-3, para 4 (3rd full para), third-to-last line: see comment on "assumed" re. page 4-1

Page 11-8, para 3, second-to-last line: suggest wording other than "objective is to discontinue using chlorine", in view of use by "apparent best project"

This statement is in the ozone section. If ozone is used, the objective would be to discontinue using chlorine.

Page 12-1, second-to-last line: suggest adding at end of line "or contributing to"

Page 13-2 para 3: on line 5 suggest adding "apparent" before "2008" and deleting "immediately"; on line 7 add "potential" before "cause"

Page 13-16 para 4 line 6: replace "enforce" by "reinforce"

Page 13-17 Table 13-2: is land acquisition cost of $200,000 reasonable and not way too low? Also, might add a subtotal before contingency (as in most other cost estimates)

The cost of the land will depend on what deal can be made by DSPUD or what value is established in condemnation. We do not know how to speculate on these things. We can use a different value if desired. We can provide the subtotal.

Page 14-1: on line before numbered items, suggest a formulation not using "assumptions" (see earlier comment); also, isn't item 3 a condition of all other flow and load considerations, and is discussed there? And in item 5, suggest adding"significant" before "change"

Page 14-3, para 3, third-to-last line: "can be returned" is vague; is it returned, or allowed to seep into the ground or evaporate, or what else?

Whatever does not evaporate is eventually returned. The basin is lined to prevent seepage. We can clarify.

Page 14-4: Table 14-1, can now complete; and para 3, line 1, suggest adding"about"before "25; last para, lines 2 and 3, replace "are absolutely" by "is"

Page 14-5: para2 line 2, suggest deleting "absolutely" (unless the specific word is in the permit); para 3 last line, these values are huge compared to normal, and probably were recorded in different years (also, where is the DWR gage located?); re. para 4, line 6, suggest replacing "would not necessarily be" by "is unlikely to be", on line 10 suggest replacing "might not produce" by "will not produce much"; and suggest replacing the entire last line by "a substantial rise in the groundwater table that could cause infiltration into low-lying sewer lines"

The 100-yr return frequency precipitation for each month is a statistical calculation for that month and does not represent any particular year. Yes, they are huge compared to normal, but that is the intent.

Page 14-8, para 2 line 5: replace "assume" (see earlier comments)

Page 14-9 para 2 line 3 and Figure 14-3, also Figure 14-4 on page 14-10, need to define "precipitation effectiveness"

Precipitation effectiveness is defined on the bottom of page 14-8.

Page 14-11: para 1, why is September most conservative, and why do we have to use the most conservative month combined with the 100-year precipitation? on para 2 last line, replace "less" by "lower" and possibly explain more; and in Tables 14-4 and 14-5 titles, note that tables are based on future flows and define the storage capacity

September is the most conservative month because the 100-year precipitation (which is used for design based on Regional Board policy) and evaporation amounts in that month are most limiting with regard to possible irrigation amounts. We can clarify the other matters mentioned.

Page 14-12: in para 1 line 7, try to replace "assumed"; and in last para, use the terms of the tables "more conservative (8 Mgal)" and "less conservative (4.5 Mgal)" in preference to "extreme" and "typical"

Page 15-2, last para: suggest adding "minimum" before "solids retention times"

Okay.

Page 15-6, second-to-last para line 6: the Excel analysis may require a brief explanation

Will clarify.

Page 16-1, last line: "looking at" is not a professional term

Page 16-24: para 4, lines 8 and 9, suggest replacing "when there are no flows within the river or flows are minimal" by "when flow in the river is small"; and in para 5 last line, add "and construction" after "design"

Page 17-3, Table 17-1 and accompanying text on page 17-2: I feel the capital cost is not rated high enough, it should be at least 50%. The operating costs are represented by not only the annual cost but *also by ease of operation, power use, chemical usage and residuals produced, and are overrated at combined 28%. Plant footprint is a vague criterion and is overrated.*

We will work with all involved to determine a consensus on appropriate weighting factors. It is acknowledged that the rating criteria are not completely independent, nevertheless, we believe it is appropriate to provide the breakdown indicated. Ease of operation does not necessarily reflect directly into a cost of operation. Power use, chemical use, and residuals produced are intended to represent impacts on resources and the environment, which are not reflected in the costs.

Page 17-5: para 2, the preceding comments re. operating costs also apply here; para 4, as discussed in the overall comments, the selection of the "apparent best project" appears premature at this time

We presume that a suitable "apparent best project" will be identified before this Facilities Plan is finalized.

Page 17-8, Table 17-3: Some preceding comments address several issues with this table: What is the intended conservatism of the cost estimates? Are there too many and too expensive percentage add-ons, amounting to a multiplier of 2.43? A prior comment (in Overall Comments re. Table 13-2) also notes that there may be correlation issues between the earlier cost tables for elements of the plant and this table. Finally, if deletion of effluent storage is seriously considered, an alternate table minus all sub-elements of this item (including additional spray irrigation area, additional environmental studies etc.) should be presented.

Comments regarding the cost markups and level of conservatism have been addressed previously in this document. We will correct any differences between tables. We can show a cost column without biostimulation storage and irrigation.

Attachment: Juggling Add-On Percentages – Effluent Storage

The discrepancies regarding costs will be corrected.

<u>Wade Freedle Comments in April 14, 2010 Memorandum to Tom Skjelstad</u>

Note: The electronic file of this memo was not received. Responses are given below under the headings from the memo.

<u>*Incremental Expansion*</u>

The existing alternative analysis does include a rating criterion for ease of expansion (Table 17-2). Although the ratings do favor the MBR somewhat, we will probably want to increase the spread somewhat to reflect the fact that some reserve capacity would already exist in the reactor basins. Also, the membrane basins could be designed with space to accommodate additional membranes and the other membrane equipment components could be sized to handle more flow. Although there would be some initial cost impact for these expansion provisions, it would be relatively minor. Even without these provisions, it would be easier to add membrane basins and equipment than to add a clarifier and RAS pump station for the IFAS alternatives.

As discussed under another comment later in this document, expansion provisions for all plant components should be a consideration during preliminary design and design.

<u>*Schedule of Alternative Rankings*</u>

We will work with all involved to establish a weighted rating system that best reflects the concerns of the two districts. Since there are differences of opinion, some discussion is probably warranted.

<u>*Heating*</u>

Although the capital cost of heating to 20 °C might not be too large, the annual costs for fuel would be prohibitive. See the discussion under related comments by Bill Quesnel.

If heating wastewater to improve biological reaction kinetics was cost-effective, we would see that practice in many wastewater treatment plants. However, we know of no plants that practice heating (however, Kirkwood generates all of its own power and dumps the waste heat from the engine generators into the wastewater).

<u>*Insulating the Tanks*</u>

Plants 1 and 2 tank walls are already insulated. Insulation of equalization basin walls will be considered for cost-effectiveness. We are not aware of an inexpensive way to cover and insulate the tops of the tanks while still allowing operator access and accommodating the snow load at DSPUD.

<u>**Wade Freedle Additional Comments**</u>

Section 9.1 Heat Transfer and Temperature Management:

- *The heat loss from uncovered tanks is strongly a function of wind speed, with the analysis using assumptions about average wind speeds typically under 9 MPH. It states on page 9-4, "Of course, winds occurring for shorter durations, such as several hours, could be much higher, but these short-term events would not have a significant impact on waste water process temperatures." This may be an oversimplification. When we experience a winter storm (when the demands on the plant are at their highest), we can have high winds, regularly exceeding 30 MPH, for two, three, or four days in a row. This might cause process temperatures to drop several degrees below the 7° C target level, just as the plant is being stressed to the maximum. Further analysis of such conditions may be warranted.*

  See Figure 9-2 regarding wind speeds. Based on Snow Lab data, the maximum daily average wind speeds are around 6.5 mph. Although you may see frequent gusts much higher than that, we are only interested in longer term averages (daily, weekly, and monthly, but not hourly).

- *The heat loss analysis does not appear to consider the cooling affects of snow accumulation on the top of the open vats. In more mile climates, this may well be a reasonable assumption. But considering that our average snowfall is 34 feet, this may be an oversimplification – once again at the time of the year the plant is being stressed to its maximum.*

  This has been addressed under Bill Quesnel comments.

- *The cost of full enclosures for the open vats at $4.6 million does seem expensive and hard to justify. But what about more simply metal canopies to block winds from the prevailing direction and/or to prevent snow accumulation in the vats?*

  Wind screens might be useful, but even they would not be inexpensive and we would have to make sure not to impair access. We do not believe there is anything substantially less expensive than we have analyzed that would keep snow out and allow operator access under the cover.

Section 9.2 Biological Treatment Alternative Analysis

- *The required EDUs for expansion need to include those required for full buildout of Serene Lakes. Does that change the conclusion that the existing vats can handle the capacity needs of both the new IFAS process and the MBR process?*

  Full buildout of Serene Lakes would require re-assessment of all project components (equalization storage, biological treatment, chemical feed systems, filtration, disinfection, sludge handling, biostimulation storage, and irrigation disposal). For the IFAS alternatives, new reactor tanks and larger or additional clarifiers would be needed. For the MBR alternative, we can probably squeeze some more capacity into the existing reactor basins, but must consider the impacts on the membrane basins and equipment, blowers, and other ancillary facilities. In many cases, it may be appropriate to design for the future EDUs from the outset. For example, it would be much better to make the initial equalization basin larger than to add another basin later. If an MBR is selected, it would probably be advisable to enlarge the membrane basins to allow addition of more membranes later. It will be very appropriate to consider provisions for future expansion during preliminary design.

- *The sewage processing requirements per EDU is assumed to remain constant. Casual observation indicates that homes in the community are getting bigger and occupancy rates are increasing (as more property owners take up full-time residence). An analysis should be undertaken to see if sewage processing requirements per EDU have, in fact, been increasing in recent years and, if so, what does that imply for estimates going forward.*

  Such an analysis can be accomplished, if desired. However, there is so much variability in the data, it may be difficult to quantify the trend you are talking about. As noted in a previous comment, the allowances for future EDUs are already slightly more conservative than for existing EDUs.

Section 13 Effluent Storage to Mitigate Biostimulation

- *Most likely, the danger of contributing to nuisance biostimulation increases dramatically as the water level of Lake Van Norden drops down to the height of the existing spillway and water ceases to flow from the lake into the South Yuba cease. When this happens, there are still a significant number of acre-feet of water in Lake Van Norden.*
- *Moreover, there appears to be a release valve on the dam that could presumable release remaining water in the lake.*
- *If Royal Gorge would allow the release of additional water in the spring until the irrigation disposal fields are ready for use, this could significantly reduce the risk of biostimulation in the South Yuba.*

  We do not know if the residual volume in the lake would be adequate to make a significant contribution to biostimulation mitigation. We also do not know if additional releases from the lake would be feasible or effective. This would require a separate investigation.

14.3 Identification and Evaluation of Potential Irrigation Disposal Sites

- *The evaluated sites are all primarily north-facing. This is unfortunate, because a south-facing site might be available for irrigation disposal each spring several weeks before a north-facing site. This would be due to the fact that south-facing slopes should accumulate less snow during the winter (due to sublimation) and the remaining snow melts more quickly in the spring.*
- *The ability to use irrigation disposal earlier in the spring could go a long way toward minimizing the potential for nuisance biostimulation – and might preclude the need for expensive biostimulation storage, such as the proposed reservoir.*
- *The backside of the Boreal Ski Resort is a large south-facing slope. It should be evaluated as a potential irrigation disposal site – particularly since it would involve contracting with the same entity that leases the current irrigation disposal site to DSPUD.*
- *Also, a field evaluation should be made this spring to determine how much earlier the Boreal site is available for irrigation than the current irrigation site. This could be used to understand better the need for biostimulation storage if irrigation disposal is, in fact, available earlier in the season.*

  We agree that a south facing slope would be much preferable to a north facing slope. Unfortunately, opportunities for using south facing slopes are limited. Boreal can be considered, but the costs for pumping and piping would limit the attractiveness of this option.

- *Table 14-1 is inconsistent with Table 13-1. The last date of river discharge for 2008 is July 2 in Table14-1 versus May 31 for Table 13-1.*

  We will try to confirm the dates.

General Comments: Margin for Error

- *Though the design of the proposed treatment facility is based on well-established engineering standards and calculations, there remains a possibility that the new plant might not consistently meet the NPDES effluent limitations for river discharge – given the known challenges of wide seasonal variations in weather and sewage load. This is particularly so given that we do not* *have a daily historical record (over several years) of the flows and constituent loads of the influent as the basis for simulating plant performance.*

- *As such, the evaluation of alternatives and selection process should encompass a discussion of the margin for error. That is, if the initial plant design does not meet specification, what are the available avenues and strategies for further improving performance anticipated in the selected design -- short of another major plant reconfiguration?*
- *For example, since the MBR process can handle mixed liquor concentrations roughly twice that of IFAS, does MBR provide significantly more flexibility for lengthening the solids retention time – if needed to achieve specification?*
- *Or, should the new equalization storage be consciously oversized (relative to the current proposal) to provide maximum flow equalization – again, if needed to achieve specification? Or, should the Boiler/Heat Exchanger System be oversized -- if higher thermal input turns out to be needed during the winter?*
- *Accordingly, there should be more analysis and discussion in the report as to a) which processes offer the greater flexibility and adaptability to meet challenging requirements and b) where might additional capital cost be warranted at the front end to provide additional margin for error at a modest additional cost.*
- *In this vein, the Alternative Ratings and Ranking (Table 17-2) should include an additional criterion that assesses and rates each alternative's flexibility, band-width and margin for error. Field evaluations of existing sewer processing facilities with the alternative technologies (in environments similar Donner Summit) could provide useful information as to the operational flexibility and band-width in meeting difficult standards. Such field trips could also provide documented operational strategies that have been effective for others.*

All of the alternatives have been developed based on compliance with requirements. It would be difficult to have a rating criterion to represent how easily modifications could be made in the event of failure to meet requirements, not knowing what the potential cause of the failure might be. Your comments regarding safety margins in design are good, however, there are tradeoffs between safety factors and cost. Ulrich has questioned whether the Facilities Plan is too conservative. Further discussions on desired safety margins are probably appropriate.

We do acknowledge that the proposed MBR design is more robust than the IFAS designs because the existing basin volumes are more than enough for the MBR, but marginally just enough for the IFAS options. Additionally, the MBR is more resistant to failure in that it does not depend on sludge settling characteristics in a clarifier (solids cannot be washed out of an MBR). Originally, we had a "process reliability" criterion to reflect this, but it was judged to be too confusing and overlapping with "confidence in design and technology". We may consider putting a similar "robustness/reliability" rating criterion back in, if that is desired. We are also planning to add a criterion to reflect adaptability to future permit requirements (which will favor the MBR).

We strongly agree that field trips to existing plants of the types being considered would be worthwhile, particularly for the New IFAS alternative. We have already discussed this with Kruger and have obtained information on plants in Colorado.

SIERRA LAKES COUNTY WATER DISTRICT
DONNER SUMMIT PUD WWTP
Comments on Draft Facilities Plan

Date: April 16, 2010
Prepared By: Jim Geselbracht, P.E., Water Works Engineers

We have the following comments on the Draft Facilities Plan:

1. Section 15 recommended that the existing sludge storage tank be retrofitted with a new aeration and mixing system and a new solids excluding decanter. However, no explicit rationale for doing these improvements was made. It isn't clear what problem these improvements are addressing and without such a rationale, the improvements should be removed from the plan.

2. Section 9 recommends the 4-stage IFAS (or MBBR) process. While Brentwood may not feel comfortable with the ability of the existing 2-stage IFAS system to meet the effluent requirements, the Facilities Plan has not independently established why the existing system cannot meet the requirements. Without this analysis, it isn't clear how construction of two new clarifiers is justified. Is the problem with the existing secondary treatment system a fundamental design problem, or would it work properly if all of the support systems (equalization, carbon feed, ammonia "run up", wastewater heating) were in place?

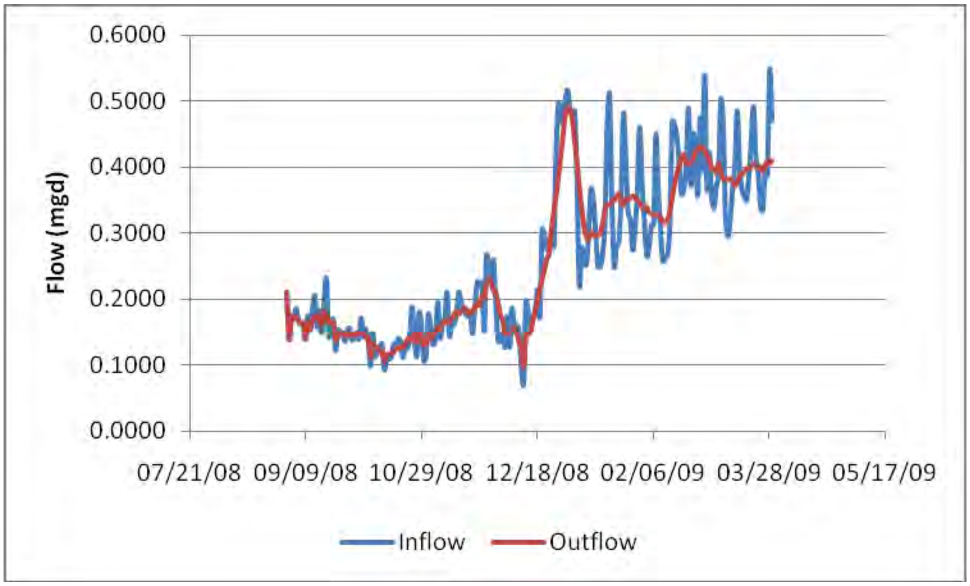
3. The facilities plan does not have a recommended phasing plan, and should. I would recommend splitting the projects included in Table 2-11 into three distinct construction projects as shown below, using the costs presented in Table 2-11.

Item	Phase 1	Phase 2	Phase 3
Existing EQ Facilities Modifications	$ 180,000		
New EQ Storage Tank and Ancillary Facilities	$ 770,000		
Modify Plants 1 and 2 for New IFAS Facilities		$ 135,000	
New IFAS System Equipment, Installed		$ 1,300,000	
Building Expansion for New Blower System		$ 150,000	
New Secondary Clarifiers and Splitter Box		$ 900,000	
New RAS/WAS Pump Station		$ 300,000	
Secondary Process Supplemental Heat System	$ 579,000		
Ammonia Feed System Modifications	$ 175,000		
Methanol Storage and Feed System	$ 225,000		
Soda Ash Feed System Modifications	$ 20,000		
Filtration System Clearwell and Ancillary Facilities		$ 200,000	
Chlorine and Sulfur Dioxide System Modifications		$ 212,000	
Expand Chlorine Contact Basin		$ 60,000	
Modify Existing Sludge Storage Tank			$ 232,000
Shop/Office Space		$ 350,000	
Biostimulation Storage and Ancillary Facilities			$ 2,000,000
Expand Spray Irrigation Disposal System			$ 360,000
Effluent Diffuser in South Yuba River		$ 150,000	
Flow Gaging Station in South Yuba River		$ 100,000	
New Standby Power System in Building		$ 300,000	
SubTotal 1	$ 1,949,000	$ 4,157,000	$ 2,592,000
Electrical & Instrumentation @ 25%	$ 487,000	$ 1,039,000	$ 648,000
Sitework @ 5%	$ 97,000	$ 208,000	$ 130,000
Site Piping @ 10%	$ 195,000	$ 416,000	$ 259,000
Subtotal 2	$ 2,728,000	$ 5,820,000	$ 3,629,000
General Conditions, Overhead & Profit @ 20%	$ 546,000	$ 1,164,000	$ 726,000
Subtotal 3	$ 3,274,000	$ 6,984,000	$ 4,355,000
Contingencies @ 20%	$ 655,000	$ 1,397,000	$ 871,000
Total Construction Cost	$ 3,929,000	$ 8,381,000	$ 5,226,000
Engineering, Admin & Environmental	$ 982,000	$ 2,095,000	$ 1,307,000
Studies & Permitting for Dilution Credits		$ 170,000	
Total Project Cost	$ 4,911,000	$ 10,646,000	$ 6,533,000

Phase 1 improvements would be constructed in the summer/fall of 2011. Phase 2 improvements would be designed in the summer/fall of 2012 and constructed in the summer/fall of 2013. This provides operation of the plant in the winter of 2011 with the EQ and chemical feed improvements in place to demonstrate the performance of the existing 2-stage secondary process with the "ammonia run-up" and flow equalization strategy in place to demonstrate that the strategy will work.

Phase 3 improvements would be pushed off into the future for implementation in the event that biostimulation actually recurs.

4. Since very little detail on the proposed MBR was provided, we contacted one of the vendors (Enviroquip) to get the information used to develop the cost estimates. Based on the information provided by Enviroquip, the membrane package was quoted by the vendor at $1.1 million (Table 9-4 lists the price at $1.9 million, including installation) for four membrane trains, each with three RW400 membrane units. Our comments:
   a. An installation cost of $800,000 (73% of equipment cost) for the membrane equipment (membrane cassettes, blowers, filtrate pumps, decant valves, recirc/feed-forward pumps) seems way too high and skews the overall cost. Remember that the air and permeate piping is costed separately ("internal process piping"), and the installation cost associated with that piping is included in the piping cost. On an ongoing WWE project where we are constructing an Enviroquip MBR plant, the Enviroquip scope of supply cost $2.2 million (membranes and all process equipment) and the bid cost for installation of this equipment varied from $140,000 to $200,000. Even using the highest bid price of 9% and adding sales tax (8.5%) to the equipment price results in a 17.5% adder for the total installed cost, or less than $200,000.
   b. There is a building cost of $950,000 for the MBR option. We have recently finished a similar 2-train Enviroquip MBR system and the equipment room for those 2 trains (including process air blowers, electrical room and UV equipment) was 1650 sq.ft. A 4-train system would require no more than 3000 sq.ft. Using a unit cost of $200/sf would result in a cost of $600,000.
   c. The membrane was designed based on a fully-redundant train; Enviroquip has said that 3 trains of 3 RW-400 units in each train are required to treat 0.73 mgd at 7 deg C. The price in the facilities plan includes the equipment for one additional, redundant train. This approach seems overly conservative, especially since one considers that the 0.73 mgd is a once in 11 to 18-year occurrence (see page 8-2), and will only last for approximately 1 week. For example, when one takes the equalization strategy (page 9-31) described in the facilities plan and couples it with the actual flow data from 2008/2009 (increased by 30% to account for future peak month and peak week flows, see page 9-28), the peak sustained flow would have been 0.49 mgd and would last for 1 day, with a maximum weekly flow of 0.46 mgd, as shown below:



The allowable membrane flux sustained for 7 days at 7 deg C is given by Enviroquip as 13 gfd, and so 0.73 mgd requires 3 trains with 3 RW-400 units. Operating 3 trains at 0.46 mgd would give a flux of 8.2 gfd. Operating 2 trains at 0.46 mgd would give a flux of 12.3 gfd. So, for last year, the recommended 4 trains would have provided two redundant trains (and accounting for a future 30% flow increase). We believe that this level of conservatism has overly penalized the membrane alternative.

d. Using only three membrane trains would lower the cost of the Enviroquip equipment to $832,000 based on a quote we received from Enviroquip. In the table below, the MBR costs from Table 9-4 (with a redundant train) are compared to the costs we've developed here. We believe that a more reasonable cost for a 3-train MBR system would be $2.6 million (without the other multipliers), which is less than the cost of a new IFAS system ($2.9 million).

Item	MBR (N+1)	MBR (N)
Demolition/Modification of Plant 1 & 2	$ 100,000	$ 100,000
Membrane Basins	$ 330,000	$ 248,000
Main Vendor Equipment Package	$ 1,100,000	$ 832,000
Installation and Taxes on Equipment Package	$ 800,000	$ 166,000
Anoxic Mixers, Installed	$ 90,000	$ 90,000
Aeration Facilities Not in Main Equip Pkg	$ 250,000	$ 250,000
Other Ancillary Facilities & Equipment	$ 100,000	$ 100,000
Internal Process Piping	$ 300,000	$ 300,000
Building Enclosures	$ 950,000	$ 500,000
SubTotal 1	$ 4,020,000	$ 2,586,000

5. Section 11 recommends retaining gaseous chlorine disinfection with some modifications:
   a. It is recommended to expand the chlorine contact basin to provide a 60 minute contact time at 0.74 mgd. However, the existing plant has not had a problem meeting effluent total coliform limits in the past without the level of equalization proposed here, so it isn't clear why the contact basin needs to be expanded.
   b. The chlorine disinfection recommendation is contingent on the RWQCB modifying the discharge permit to provide DBP dilution credits. There appears to be a strong opinion among DSPUD and SLCWD staff and board members that obtaining a modification to the permit is unlikely. Switching to chloramines is mentioned as a possible alternative, however since chloramines is a less-strong disinfectant, a longer chlorine contact time would likely be required (and was not included in the cost analysis).

6. Some significant improvements have been made at the plant in the past year, including expanding the anoxic zone and operating with carbon addition (MicroC). We propose that some additional improvements be made this summer to allow for monitoring plant operations over next winter to verify the effectiveness of the proposed operating strategy:
   a. Install piping to allow a portion of the existing 1.5 MG emergency storage basin as additional flow equalization storage for next winter, to allow flattening the load between weekends and week days.
   b. Verify that the existing ammonia feed and carbon feed systems have sufficient capacity to allow for the proposed operations (up to 200 ppd as N ammonia addition, 600 ppd COD addition). Make whatever changes are required to safely achieve these dosages.

   With these changes made, we should be able to see a significant improvement in the effluent ammonia nitrate levels through the winter. If we don't see the improvement, it would call into question the fundamental approach of "ammonia run-up" as a means of building and maintaining an effective nitrifier biomass during the winter.

7. Section 9.3.2 develops the cost of the carbon feed storage and feed system assuming the use of methanol. DSPUD plant staff has indicated to us that they are not interested in methanol because of safety considerations, and have had good success with MicroC, a proprietary chemical. This chemical is currently procured in 350-gallon tote bins. Based on the requirement of 60 gpd of methanol (600 ppd COD addition) stated in Section 9.3.2, approximately 100 gpd of MicroC would be required under peak

conditions. 2-weeks worth of storage would be approximately 5 tote bins. This storage (non-hazardous) could be done for significantly less than the $459,000 assumed here.

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April 27, 2010

Mr. Tom Skjelstad
Donner Summit Public Utilities District
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P. O. Box 610
Soda Springs, CA 95728

Re: Response to Draft Facilities Plan Comments by Waterworks Engineering

Dear Tom:

As requested, we are writing this response to the Comments on Draft Facilities Plan, prepared by Waterworks Engineers, dated April 16, 2010. The responses below are numbered in accordance with the comments in the Waterworks document.

1. The existing sludge storage tank was not designed as an aerobic digester. In the original designs, aerobic digestion was provided within Plants 1 and 2. Now that the sludge storage tank has become an aerobic digester and solids loading to it will increase substantially with future growth, much more aeration capacity is needed. Additionally, because of the size of the tank, mixing requirements will exceed the mixing to be provided solely by aeration. Therefore, supplemental mixing is recommended to avoid anaerobic dead spots. In its new function as an aerobic digester and with increased loadings, it is essential to have a good system for withdrawing supernatant from the tank. According to plant staff, the existing system for supernatant removal is inadequate and a new decanter is needed.

2. At this time, it is not possible to predict the capacity and performance of the existing web-based IFAS system. The original system manufacturer, Brentwood Industries, states that they do not have a reliable model and that they have not developed calibration parameters and procedures that would allow the webs to be simulated using BioWin or other process simulation software. Furthermore, Brentwood discontinued offering the webs due to unreliable performance, particularly in regards to nitrification and the impacts of red worms. The other manufacturer of web-based IFAS systems, Entex Technologies, was invited to propose on developing an upgrade/expansion project for DSPUD, but, after careful consideration, Entex declined, indicating that a loose-fill media (such as the New IFAS alternative in the Facilities Plan) would be preferred.

   As an alternative to web-based media, Brentwood has recommended using structured sheet media, for which they have reportedly done extensive research and testing and can accurately predict performance. Brentwood indicates that they have developed calibration parameters that will allow the structured sheet media to be accurately simulated in BioWin. Although extensive full-scale plant performance data for the relatively new structured sheet media is lacking, ECO:LOGIC would certainly rely heavily on Brentwood's experience with the webs and structured sheet to conclude that structured sheet is the most reliable of these two options.

Although DSPUD can investigate the performance of the webs in the next year or two with improved programs and systems for feeding ammonia and Micro-C (a methanol alternative), improved equalization storage and possible heating, the net result of those efforts will be a determination of how well the webs performed under the specific flow and load conditions occurring in those years, and these results may or may not be encouraging. Even if the results are encouraging, it is questionable whether adequate information would be developed to allow a reliable design under future flow and load conditions. Furthermore, based on Brentwood's experience, even if some success is seen with the webs, replacement with structured sheet media would still provide a more reliable solution and would be preferred, particularly since it is doubtful that there would be any cost advantage associated with testing and continuing with the webs (see below).

Based on manufacturer proposals for the structured sheet option and the New IFAS option and the analysis presented in the Draft Facilities Plan, the best possible scenario for using webs in the proposed project would undoubtedly involve reactor configurations and other improvements at least as significant as those developed for the structured sheet media. Accordingly, it is suggested that the cost of a web-based option would be at least as much as the cost of the structured sheet option, minus the cost of replacing the webs with structured sheet, plus the cost of additional webs that would be required. Since the cost (including installation) of the structured sheet media and all ancillary equipment is estimated at $450,000 in Table 9-4 of the Facilities Plan, it is clear that the potential cost savings for continuing with webs (if they were first successfully tested) versus replacement with structured sheet is probably only a few hundred thousand dollars. That potential benefit would be offset by the costs of testing the webs and the impacts of delaying and splitting up the overall improvement project while awaiting testing results on the webs. In the end, the actual cost of testing and continuing with the webs might be more than the cost of switching to the apparently more reliable structured sheet option.

In making the statements above, we are not advocating the structured sheet option, we are just indicating that structured sheet would be preferred over the webs. The comparison of the structured sheet option to other biological treatment options is developed in the Facilities Plan.

New clarifiers are justified for two reasons: 1) because improved clarification is needed, and 2) because more reactor volume is needed and can be cost-effectively provided by using existing clarifier volumes. Plant staff report that the existing clarifiers do not perform well under current flow and load conditions and must be supplemented with polymer addition. This, combined with ECO:LOGIC's process analysis for the expansion, including consideration of the negative impacts of low temperatures on sludge settling characteristics, result in the recommendation for new and improved clarifiers with modern design features (energy dissipating inlets, flocculating center wells, density current baffles, etc.).

3. ECO:LOGIC agrees that biostimulation storage and irrigation improvements can be separate construction projects and can occur at a later time than the wastewater treatment plant improvements if DSPUD makes the policy decision to defer biostimulation storage (and possibly eliminate this item altogether) until more data on algae growth in the South Yuba River is developed. However, ECO:LOGIC does not support a two-stage approach for constructing improvements at the wastewater treatment plant.

   It seems that the main logical reason for deferring the selection and construction of biological treatment improvements would be to determine if the webs can be used successfully in the expansion project, based on testing to be completed during the interim period between the proposed Phase 1 and Phase 2 projects. As developed in Item 2, above, we do not believe that to be a valid reason.

   The other reason that has been indicated for deferring the biological treatment improvements is to allow time to test the effects of additional equalization storage, improved chemical feeding, and wastewater heating on the performance of the biological treatment system. However, ECO:LOGIC suggests that it is already well-established in the wastewater treatment field that equalization and heating would be beneficial to any biological treatment process and testing is not needed to confirm this fact. With regard to building the nitrifier population by supplementing ammonia, success with testing on the existing web-based treatment system would serve to confirm the likely benefits of this program on biological processes in general. However, if testing of this program with the existing webs is not entirely successful, that could be caused by other limiting factors associated with performance of the webs and would not necessarily indicate poor performance with other biological treatment options. There is little question that, without ammonia supplementation, an adequate nitrifier population will not be present with the sudden onset of peak flows and loads in cold winter conditions, regardless of which treatment option is chosen. Ammonia supplementation is believed to be the best means of building an adequate nitrifier population, and this concept has been discussed and is supported by the manufacturers involved in all of the biological treatment options considered in the Facilities Plan Report. Since ammonia supplementation is common to all biological treatment alternatives, interim testing of the concept would not provide any additional basis of selection between the biological treatment options.

   Based on the above, there would appear to be no substantial benefit to deferring selection of a biological treatment alternative to a Phase 2 project. However, we believe there are very definite disadvantages with this approach:

   a. Having two separate construction projects will cost more money. Engineering costs will be higher to develop two separate sets of design drawings and other bidding documents. CEQA costs would also be higher if there were two separate CEQA processes (however, we believe one CEQA process should cover all possible phased improvements). Construction costs will be higher because of the inefficiencies of having two separate mobilizations and demobilizations, two separate times of tearing up the plant site and then restoring it, an overall combined construction time that would be longer for two projects than one, lack of economy of scale, and inability to accomplish different improvements in a coordinated manner that is more efficient than accomplishing the same improvements separately. Additionally, the delay in time will result in increased construction costs due to inflation.

b. All of the improvements in the wastewater treatment plant project should be integrated into one cohesive and efficient design. The location and layout of buildings, utilities, piping, etc. would be substantially different for the various biological treatment options. For example, proposed chemical feed systems and wastewater heating improvements designed to suit the New IFAS alternative would likely be in different locations, in differently configured buildings and with different piping arrangements compared to the same improvements designed to suit a MBR treatment alternative. If the improvements must be designed before selection of the biological treatment alternative, it would not be possible to optimize the design layout for the biological alternative that would eventually be selected.

c. Deferring the biological treatment improvements will almost certainly push their completion beyond the required time of compliance with the permit, potentially leading to violations and fines. Although the specific length of time involved can be debated and different scenarios can be considered, there is no question that the two-stage approach will delay overall project completion as compared to the single-stage approach and would almost certainly jeopardize compliance by the April 2014 date established in the permit.

Although ECO:LOGIC does not support a two-stage project approach that would delay selection of a biological treatment alternative for a year or two, ECO:LOGIC would strongly support implementation of interim facilities and operating procedures to improve the performance of the existing plant until the future improvements can be constructed, to the extent that such improvements are reasonably cost-effective and would not jeopardize optimization of the future improvements. This includes the chemical feed program improvements (ammonia and Micro-C) and possibly the installation of an overflow from the equalization storage tank to the emergency storage tank that would allow a portion of the emergency tank volume to be used for improved equalization. However, the overall benefit-to-cost ratio of the interim equalization improvements should be confirmed when all of the ancillary facilities requirements and costs are known, particularly since these would be “throw away” improvements that would be replaced by the future equalization storage system and plant piping. The cost-effectiveness of implementing wastewater heating as a fast-track improvement before selection of a biological treatment alternative is questioned because of the major new facilities and equipment involved and the potential lack of coordination with the ultimate improvements.

4. Each of the subparts of this comment are addressed below:

   a. The membrane equipment installation cost included in the Facilities Plan is not $800,000. The proposed price of the MBR equipment package, together with associated manufacturer services, based on a quote from Enviroquip (copy already provided to DSPUD) is $1.4 million. With sales tax, that would increase to about $1.5 million. We allowed an additional cost of $100,000 for a bridge crane system to service the equipment, which brings the total to $1.6 million. We then allowed $300,000 for installation of the MBR equipment, resulting in the $1.9 million cost indicated in Table 9-4. That is only 20 percent of the manufacturer's quoted price and is not at all excessive. Also, we do not know who the successful MBR manufacturer would be, if an MBR system is selected for implementation. The cost estimate is intended to allow for more than one possible manufacturer.

   b. We estimated a total building enclosure of 4750 square feet, resulting in a cost of $950,000. The main difference between this and the 3000 square feet suggested by Waterworks is that we put the membrane basins themselves inside a building. Whereas it is typical in other locations to locate membrane basins outdoors and provide plank grating covers, we do not believe this is practical at DSPUD where snow would pile up on the basins and make winter access far too difficult. The actual size of the building(s) will have to be confirmed when equipment layouts are developed in more detail during preliminary design.

   c. A fully redundant membrane train is believed to be appropriate for two reasons:

      i. It is common to provide redundant units for all critical pieces of equipment in a wastewater treatment plant. Then, if a unit fails, the design flow can still be treated with one unit down.

      ii. As developed in the sections of the Facilities Plan dealing with equalization storage (Section 8 and Appendix B), it is critical to have provisions for emergency peak flows that might cause the equalization basin to be filled to capacity and even use up emergency storage. This is a common feature of all the biological treatment alternatives considered in the Facilities Plan and is a feature already included in the existing plant design. The existing plant was designed to treat an equalized peak flow of 0.52 Mgal/d, but the plant was designed to pass up to 1.7 Mgal/d in case such extreme peak flows occurred after filling the equalization basin. The IFAS alternatives would be able to pass this same 1.7 Mgal/d flow on an emergency basis. With a MBR system, no wastewater can move through the plant without going through the membranes. For emergency peak flows, it is proposed to plan on running all membrane trains, including the redundant unit (it is considered overly conservative to assume the redundant unit would be broken down or unavailable when emergency peak flows occur). According to Enviroquip, when the redundant train is in use, the plant would be able to pass up to 0.97 Mgal/d as an average over 24 hours and up to 1.63 Mgal/d for an hour. These are not overly conservative when compared to the design peak day and peak hour plant influent flows of 1.18 and 1.7 Mgal/d, respectively. Handling these peak influent flows would still require attenuation by storage. Hopefully plant storage capacity would not be exceeded before these peaks occurred. If the plant were not designed to handle emergency peak flows and such flows occurred, raw sewage would overflow the plant basins and flow overland to the South Yuba River. All things considered, the redundant membrane train is highly recommended.

5. Each of the subparts of this comment are addressed below:

   a. The proposed chlorine contact basin will provide a contact time of 60 minutes under the equalized peak design flow of 0.74 Mgal/d. This is not at all excessive for a plant that must meet a 2.2 MPN total coliform limit on a weekly median basis. It is noted that under the State of California Water Recycling Criteria, a modal contact time of 90 minutes is specified for the same coliform limit. A theoretical contact time of 120 minutes is routinely provided to meet the modal contact time requirement, after allowing for limited short-circuiting in the basin. It is more conceivable that the contact time of 60 minutes would be challenged as being too low, rather than too high. However, based on historical plant performance and knowing chlorine dose could be increased to offset contact time limitations, we believe the 60 minutes is appropriate.

   b. Yes, continuing with chlorine disinfection is contingent upon receiving dilution credits, but only for disinfection byproducts, which have very long (lifetime) averaging periods. Over such long averaging periods, it must be conceded by all that there is significant dilution in the South Yuba River. By contrast, for ammonia and nitrate, averaging periods are only a few days or a month and it is hard to make a convincing case that dilution would always be available. The work needed to attain dilution credits for disinfection byproducts and to continue with chlorine disinfection should not proceed unless discussions with the Regional Board staff provide a favorable indication that adequate dilution credits would be provided. Even then, there would be no guaranty that the Regional Board would actually adopt a permit with dilution credits or that the dilution credits, if approved, would be adequate to avoid violations for disinfection byproducts. Accordingly, DSPUD must make a policy decision on whether or not to pursue dilution credits and continue with chlorine disinfection.

As mentioned in the Facilities Plan, chloramination (chlorine disinfection with ammonia present to form chloramines) is a possible means of mitigating disinfection byproducts. It is noted that ammonia has been present in the plant effluent much of the time historically, resulting in chloramination by default. With improved treatment, however, the ammonia will be removed, increasing the risk of disinfection byproduct formation. In that case, ammonia would actually have to be fed back in at the proper concentration before disinfection to accomplish chloramination. The efficacy of chloramination to mitigate disinfection byproducts at DSPUD would have to be proven by laboratory testing of chlorine disinfection of a fully nitrified effluent, with and without ammonia addition. If the District would like to investigate continuing with chlorine disinfection but does not wish to pursue dilution credits, such testing would be highly recommended. Even if chloramination is believed to be effective, however, we would still suggest pursuing dilution credits as an additional measure of safety against possible violations.

6. Our response regarding the suggested improvements is included under Item 3.

7. The Facility Plan acknowledges that there are alternatives to methanol for carbon supplementation and that these must be investigated during preliminary design, considering all of the costs (capital and annual) and other implications involved. For all chemicals considered, the costs for bulk deliveries versus totes will have to be compared. Bulk deliveries would result in the lowest cost per gallon, but would require the installation of bulk storage facilities at significant capital cost. If the most cost-effective solution involves using a chemical and delivery method for which capital costs would be lower than for bulk shipments of methanol, the savings in capital cost, compared to that currently in the Facilities Plan, would then be recognized.

Please do not hesitate to call if you would like to discuss these issues further.

Sincerely,

ECO:LOGIC Engineering

Jeffrey R Hauser

Jeffrey Hauser, P.E.
Principal Engineer

DSPUD WASTEWATER FACILITIES PLAN
ADDITIONAL THOUGHTS ON MBR AND DISINFECTION
APRIL 29, 2010

Emerging Contaminants of Concern and Selection of a Disinfection Process

Throughout the United States and the industrialized world, regulators, environmental interests, wastewater professionals and, in many cases, the public have become very concerned over the presence of pharmaceuticals and personal care products, pesticides, and other emerging contaminants of concern in wastewater treatment plant effluents. Many substances in wastewater effluent are known endocrine disrupting compounds (they interfere with normal hormonal activity in exposed organisms). Substantial feminization of male fish and other aquatic life abnormalities have been seen in many locations. The USGS has conducted extensive monitoring for emerging contaminants in water bodies throughout the United States.

Since 1997, the Southern Nevada Water Authority has been monitoring for emerging contaminants in the Las Vegas Wash and Lake Mead, which receive the wastewater effluents from two plants serving the Las Vegas area and one serving the City of Henderson, Nevada. Estrogen compounds were detected in the Las Vegas Wash and the Las Vegas Bay in Lake Mead. Feminization of male fish has been documented in the area. Beginning in 2005, as the Clark County Water Reclamation District considered expansion of its wastewater treatment plant from 110 to 150 Mgal/d, it conducted an extensive research program to study the removals of emerging contaminants during disinfection with UV, chlorine, and ozone. Very little removals were seen with UV (typically less than 30% for most compounds studied), while very substantial removals were seen with ozone (greater than 70% removal for most compounds studied). Chlorine provided an intermediate level of removals (greater than 70% for many compounds, but also less than 30% for many other compounds), with free chlorine providing substantially higher removals than chloramines. The Clark County Water Reclamation District has proceeded with the installation of ozone disinfection.

In California, the State Water Resources Control Board has formed a Blue Ribbon Panel of Experts to provide direction on monitoring for emerging contaminants. The Santa Ana Watershed Project Authority (SAWPA), including 15 water and wastewater agencies in the Santa Ana region, has formed an Emerging Constituents Workgroup and has developed a voluntary program for monitoring emerging constituents in source waters and wastewater plant effluents throughout the area. In December, 2009, the California Regional Water Quality Control Board, Santa Ana Region, approved the monitoring and reporting program developed by SAWPA, with the caveats that the Executive Director of that Regional Board can add additional requirements and the approved monitoring program could be superseded by any statewide policy adopted by the State Water Resources Control Board.

Based on the above, it is believed to be only a matter of time before many of the emerging contaminants must be monitored and possibly removed by treatment at many wastewater treatment plants, including DSPUD. In this light, UV disinfection is apparently not the best long-term option for

DSPUD. Rather, it is recommended that DSPUD should plan for future implementation of ozone disinfection. At this point in time, however, the emerging contaminants are not regulated, so there is no immediate need to implement ozonation. Accordingly, it seems that the best alternative for DSPUD is to continue with chlorine disinfection until such time as a switch to ozone becomes appropriate or further direction is developed that would indicate a different course of action. Waiting to implement ozonation gives more time for that technology to be more developed as a mainstream advanced wastewater treatment technology and, hopefully, for ozone systems to become more cost-effective.

As previously established, continuation with chlorine is contingent upon receiving dilution credits for disinfection byproducts. Alternatively, or in addition, chloramination (chlorine disinfection with ammonia present) could be considered to mitigate disinfection byproducts. However, investigations would have to be done to confirm the efficacy of chloramination. Depending on chloramination performance and on the degree to which dilution credits may become available for disinfection byproducts, both chloramination and dilution credits may be desired.

In consideration of the likelihood of violating requirements for disinfection byproducts and the need for dilution credits and/or chloramination, it must be recognized that historical plant performance has resulted in substantial ammonia concentrations in the plant effluent much of the time. Accordingly, disinfection has been by chloramination by default. When ammonia is more completely removed through improved biological treatment, chloramination will not occur, unless some ammonia is added back in after biological treatment and prior to disinfection. Without ammonia present, violations of disinfection byproducts limits would be expected to be much more frequent and severe.

Further Considerations Regarding MBR Treatment

Although the Draft Facilities Plan already mentions many benefits associated with MBRs, it has become apparent that additional factors should be considered as noted below:

Miscellaneous Compliance Improvements. To the extent that various regulated constituents exist in particulate form, membrane filtration should provide additional removals, as compared to granular medium filtration. Membrane filtration can even provide incremental removals of constituents that are currently measured as “dissolved”. This is because dissolved constituents are actually determined as those that would pass through a 0.45 micron filter. The pore size used in MBR membranes can be substantially smaller than 0.45 micron, depending on the manufacturer of the membranes. The potential benefit of membrane filtration in removing existing regulated compounds cannot be quantified at this time because plant effluent samples have not been tested with and without subsequent membrane filtration. A program is currently underway to do such membrane filtration testing in conjunction with routine monitoring for several constituents (aluminum, silver, zinc, copper, and manganese).

In addition to possible incremental removals of constituents already in the wastewater, MBR treatment would eliminate the need to add certain chemicals that could otherwise exacerbate permit compliance. In particular, with granular media filtration that would exist with biological processes other than the MBR, it is frequently necessary to add aluminum-based coagulants. These coagulants would not be necessary with a MBR and, therefore, aluminum compliance could be improved with the MBR. Similarly, if chlorine disinfection is continued, lower chlorine doses would be needed and this would result in lower sulfur dioxide doses for dechlorination. Lowering the additions of all these chemicals will reduce the salinity of the final effluent.

Adaptability to Future Permit Requirements. Just as developed above for existing regulated constituents, membrane filtration could provide incremental removals of any future regulated constituent that exists partly in particulate form. Additionally, MBR treatment conditions the effluent for subsequent disinfection. The benefit of this, as already developed in the Facilities Plan, is to allow much more economical UV and ozone disinfection, if either of these options is chosen. With UV disinfection, the combined benefits of a higher transmittance and a lower required UV dose result in smaller and less expensive UV facilities with a MBR as compared to other biological treatment options. With ozonation, a MBR would preclude the need for supplemental UV disinfection, which would be required with other biological treatment alternatives. This, of course, would make the future implementation of ozonation more cost effective.

If it is decided to stay with chlorine disinfection for now, but then to switch to ozone in future years, then, based on Table 11-4, the capital cost for the switch to ozone would be $1.2 million less for the MBR than for the other biological treatment alternatives. This is based on the first quarter 2010 cost level, with no adjustment for the time value of money until the time of construction, and no adjustment for possible technology advances that would improve the cost-effectiveness of ozone.

Robustness and Reliability. Robustness and reliability represent the degree to which the process is resilient and can perform consistently well, even in problematic conditions, such as influent flow or load spikes, extreme weather, or other challenging biological process conditions. Because the membranes provide an absolute barrier to the escape of particulate matter from the biological treatment system, very consistent performance can be assured. With a biological treatment system that relies on sludge settling in a clarifier (such as IFAS), there can be much more variability in effluent quality, which would lead to a higher probability (although still low if properly designed and operated) of potential permit violations. The point is that the MBR is more resilient and can more readily accommodate challenging conditions, including potential operator error, without compromising effluent quality. In the specific case of the DSPUD wastewater treatment plant, the existing process basins are more than adequate for the reactor requirements of a MBR, whereas they are just marginally okay for the IFAS alternative. This adds to the relative robustness of the MBR design, as compared to the IFAS design. This robustness is partly evidenced by the ability to maintain a much higher biomass inventory in the MBR (see Table 9-5 of the Draft Facilities Plan). Based on this discussion, the MBR would be considered more robust and reliable than the IFAS alternative.

Robustness and reliability as discussed above is considered to be a separate and distinct criterion from confidence in design and technology. Confidence in design and technology represents the degree to which the technology has been developed and is fully understood and can be modeled and designed using commonly accepted principals. It also includes the degree to which the technology has been proven successful through many full-scale applications at domestic wastewater treatment plants.

Revised Rating/Ranking Table

A revised version of Table 17-2, including the additional rating criteria discussed above and some revisions to previous ratings is attached.

Table 17-2

Alternative Ratings and Ranking

Criterion	Weighting Factor %	Ratings For Indicated Alternative Combination (a)							
		Upgrade Existing IFAS		New IFAS		MBR		Submerged Attached Growth	
		Chlorine	UV	Chlorine	UV	Chlorine	UV	Chlorine	UV
Capital Cost	25	10	8	9	7	7	6	4	3
Annual Cost	10	10	9	10	9	10	9	7	6
Confidence In Design/Technology	25	4	4	8	8	10	10	7	7
Robustness and Reliability	5	8	8	8	8	10	10	8	8
Misc. Compliance Improvements	5	5	6	5	6	8	9	5	6
Adaptability to Future Permits	5	4	6	4	6	8	6	4	6
Ease of Future Expansion	5	9	9	9	9	10	10	9	9
Plant Footprint	5	8	8	8	8	10	10	8	8
Construction Impacts in River (d)	3	5	10	5	10	5	10	5	10
Power Use	3	9	8	9	8	8	7	10	9
Chemical Use	3	9	10	9	10	9	10	8	9
Residuals Produced	3	10	10	10	10	10	10	8	8
Hazardous Gas Exposure Risk	3	3	10	3	10	3	10	3	10
Overall Weighted Score (b)	100	7.28	7.19	8.03	7.94	8.60	8.56	6.17	6.33
Rank (c)		5	6	3	4	1	2	8	7

(a) The highest rated alternative is assigned a score of 10. Other alternatives are scored lower, according to the relative concern compared to the highest rated alternative.

(b) Summation of individual ratings multiplied by the corresponding weighting factors.

(c) The alternative with the highest overall weighted score is ranked "1". Other alternatives are ranked "2" through "8", according to overall score.

(d) Construction in the river would be associated with continuing chlorine disinfection, based on installing a diffuser to obtain dilution credits for disinfection byproducts.

Donner Summit Public Utility District

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MEMORANDUM

To: **Joint Wastewater Facilities Committee**

From: **Tom Skjelstad, General Manager and Jim King, Plant Manager**

Date: **April 30, 2010**

Re: **DSPUD Wastewater Treatment Plant Upgrades and Expansion**

RECOMMENDATION: Approve the following plant upgrades in a single phase schedule:

- Additional flow equalization at a minimum of 500,000 gallons with a request to evaluate the cost of 700,000 gallons.
- Provide for a boiler/heat exchanger in order to heat the influent to temperatures sufficient to provide for normal biological process to occur 7C or higher
- Install a Membrane Bio Reactor system
- Install an ultra-violet disinfection system
- Additional beneficial modifications to existing infrastructure and systems-improve the sludge holding tank, improve the ammonia feed system, carbon storage and feed system, add office and work space, remodel or relocate the laboratory facilities, new standby power generator, new or upgrade blower system, increase spray disposal area.

BACKGROUND: DSPUD entered into a pilot project agreement with Brentwood Industries in 2002, for installation of Brentwood's IFA System. The pilot project better known as the Accu-Webs consisted of installing seven webs in one of the DSPUD's two plants. The system was tested through two ski seasons with some mid-course corrections. In 2005 DSPUD authorized Brentwood to install an additional six webs in the pilot project plant thus a complete retro-fit of Plant 2 was accomplished. In 2007 the DSPUD authorized the installation of fourteen webs in Plant 1.

During the course of initial installation in 2002 thru today the District has worked with Brentwood in an effort to bring the treatment plants into compliance with the District's discharge permit. Mid – course corrections/actions included; ammonia feed systems, soda ash (to control pH) feed system including the purchase and installation of a soda ash silo, and other monitoring equipment. The cost of these additional systems exceeded $300,000. Additionally, the cost of ammonia averaged $20,000 per year. It should be stated that none of these additional facilities was anticipated when DSPUD agreed to the Accu-Web system.

At the direction of Brentwood Industries the DSPUD began feeding ammonia in August of 2006. The theory was that since not enough ammonia was coming into the plant by way of normal influent flows, the District needed to feed ammonia in order to build up a "bug" population that would be adequate to successfully process the sewage to the requirements of its permit during known periods of increased winter flows and cold influent temperatures. The results of the ammonia feed operation proved successful each year until November or December when the webs were overrun by the expected higher flows and lower temperatures causing the plant to operate out of compliance.

Despite these efforts the plant today remains out of compliance with the nitrate and ammonia requirements with the biggest problem being the plants inability to denitrify and resulting in the District violating its nitrate levels.

Based on the review of ECO:LOGIC's Draft Wastewater Facilities Plan, our professional experience in this field and intimate knowledge of the current facilities we have come to the following conclusions and recommendations.

Flow Equalization:

The ability to equalize and manage influent flows is a well understood benefit to process control, allowing for improved plant performance and stability. This process is of particular importance to the districts plant due to significant fluctuations in flows and loads caused by the areas ski resorts and its transient population. Currently the plant has 200,000 gallons of flow equalization storage capacity.
Our recommendation is for a minimum increase of 500,000 gallons more of storage and to look at the cost of possibility of increasing that to 700,000 gallons. If that cost is minimal I would recommend that the district go with the 700,000 gallon tank. This would then provide up to 900,000 gallons of equalization storage and help accommodate some future expansion.

Heating of Wastewater:

It is well documented that the wastewater coming to the treatment plant is very cold with influent temperatures around 5.5 C. This is mainly due to two factors, cold weather conditions and the fact that the districts fresh water source is surface water. This causes problems with maintaining a good biological process during the winter months. It is well known within the field of wastewater treatment that warming of the biological process increases process activity and overall plant performance.
Our recommendation is for the Boiler/Heat Exchanger to raise process operating temperatures to assist with plant performance.

Biological Process:

The current process (Brentwood's Web System) has proved to be unreliable and currently has no way of judging its ability to treat current and future flows and loads. It is my recommendation that this process be abandoned in favor of a more reliable and upgradeable system.
Two different biological system processes were evaluated in the facilities plan, a Membrane Bioreactor (MBR) of which there are thousands of proven installations and an Integrated Fixed Film Activated Sludge (IFAS) of which there are two types, fixed and suspended media. Both IFAS systems are similar in concept to the current system but with longer track records and some proven success.
Our recommendation is for the MBR system. It is my professional opinion that this type of system, along with the other proposed upgrades give the district its best chance at meeting current and future effluent limitations.

There are also other advantages to this type of process and are listed below.

1. Current plant clarifiers will no longer be needed thus freeing those areas for use as increased aerobic and anaerobic zones providing for better possible ammonia and nitrate removal.
2. Currently an aluminum based polymer has to be fed at the clarifiers to ensure good quality secondary effluent. With the use of the MBR system this would no longer be necessary. This could have a positive effect on the plant's current discharge of aluminum and help it to meet its new limitations, thus eliminating the need for costly studies and other treatment processes.
3. The current filtration system would no longer be needed freeing up space to be used for additional storage and working areas. Also an aluminum based coagulant is used at times to help the filtration process; this also would be eliminated helping with the current effluent limitation for aluminum.
4. The effluent from the MBR would guarantee the success of any proposed UV disinfection system.

UV Disinfection:

Currently the plant uses chlorine to disinfect its effluent and sulfur dioxide to remove the chlorine before release to the receiving waters. The problem caused by the use of chlorine is disinfection byproducts that are produced. The districts permit currently restricts the amount of byproducts that can be released. Currently there are two ways of addressing this problem ask for dilution credits from the regional board of convert to UV disinfection. Due to the sensitive political nature of the area I believe that pursuing dilution credits would cause delays with the project and unfavorable reactions from the public.
Our recommendation is to convert to UV disinfection; this would remove the above mentioned concerns. Also the discontinuation of chlorine and sulfur dioxide would allow for the current space occupied by storage, feed and monitoring equipment to be used as laboratory and or office space for staff.

Supporting Facilities:

We also recommend that the following facilities either be upgraded or included per the facilities plan.

- Modifications to the waste sludge holding tank.
- Ammonia feed system modifications.
- New carbon addition storage and feed facilities for use with non-hazardous chemical such as Micro-C.
- Addition of office and shop work space.
- Remodel and possible relocation of current laboratory facilities.
- New standby power system in building.
- New or upgraded blower system.
- Expansion of spray irrigation disposal system.

Conclusions:

With the implementation of the above mentioned upgrades and improvements the District would be assuring itself of meeting current and future discharge requirements. Also with the proven systems that would be installed any future expansion would become more feasible and economical.

Please feel free to contact either Tom Skjelstad or Jim King if you have any questions.