Comments on the updated designs and on the Program's answers to the Preliminary EAP report

The updated designs for Option #2, #3 and #4, and the answers to EAP report (Answers) from the Program were forwarded to EAP member in October 18th 2010. Following the reception of above documents, EAP prepared this document in order to further ask the clarification of the updated designs and Answers.

Inquiries to the updated designs

1. Design flow

The flow that was presented during the Workshop, was based on the population of 229,800 while the updated design stated that the flowrate was based on the population of 250,000. However, the flowrate shown in Page 5 is the same as presented in Workshop. What was the reason that the flowrate was unchanged even though the design population was increased?

2. Design population

What will be the population for the final design and for cost analysis: 250,000 or 270,000?

3. Loads and concentrations

During the Workshop, the Program and EAP agreed not to use per-capita loading from MOE data. Hence, EAP presumes that the loading in the updated design (Table 2) reflects it. Could the Program explain how Table 2 was prepared? Average differences between Workshop design and the updated design were TSS (9% down), BOD (5% up), TN (3% up) and TP (5% down).

4. Reactor tank sizing

BNR tank size in the updated design increased especially in Option #2 and #3. EAP also noted that the flow to BNR system was reduced to 120 ML (update) from 125ML (Workshop).

1) Aerobic tank was increased from 16500 ML to 18500 ML (12%) in the updated Option #2. What was the reason of the increase of aerobic zone in Option #2? Is it due to the increase of BOD (5%) and TN (3%)?

2) Workshop stated that further optimization will be done in terms of the anaerobic tank sizing. Workshop presented the difference between Simulo and Biowin and the Program acknowledged that the Simulo model will not be used. However, the Program neglected the BIOWIN simulation, which is proven in terms of biological P removal in North America, because of its conservativeness. As a result, the updated design does not contain the optimization of anaerobic tank size even though the TP loading in the updated design was 5% less than the earlier Workshop design.

3) EAP believes that Option #2 and #3 can be further optimized just as Option #4 was.

5. Expected TN quality in the final effluent (based on tables from each option)

The updated design presented the final effluent TN quality of 12 mg/L (Option #2, Table 26), 12 mg/L (Option #3, Table 59) and 14 mg/L (Option #4, Table 75). Why do the options have different design TN limits? Does this mean that Option #2 and #3 can be further optimized to bring them in-line with Option #4?

Inquiries to the "Answers to EAP report"

1. Comment on P3

Why does the design intend to use the external carbon source in pre-anoxic zone? EAP have never experienced a design with external carbon to a pre-anoxic zone to, presumably, reduce the redox potential. The idea is to provide more anoxic retention of sludge – rather than do it in the final clarifier - and to achieve endogenous decrease of ORP. Our concern is with an increase of complexity and costs here.

2. Comments on P5, P6 and P7

The Program's answers seem to agree with EAP's comments, but the updated design does not reflect this agreement. The clarifier sizing in the updated Option #2 and #3 was unchanged – in other words it was left over-sized.

3. Comment on P8

The explanation is clear but do we really believe that the influent TSS max day was 133,793 kg/d versus the other max days ~69,000 kg/d? This may be so, but seems very extreme.

Also, there is a difference in design if I receive 133,793 kg/d on one day and the remaining days are in the order of 20,000 kg/d.

4. Comment on P9

The reminder is appreciated, however, the issue is that for South End, there are primary settling tanks already constructed and operated. While if one were starting from scratch without existing equipment, the advantages noted are true when attempting to achieve the same % TSS removal, this application is not. The issue is why construct high rate primary treatment units when using CEPT at lower chemical dosing rates than a high rate primary treatment unit and no microsand can achieve approximately 75% TSS removal versus 85% removal. What is the benefit of the additional 10% TSS removal?

5. Comment on P10

So does CEPT not meet the effluent quality required? This needs to be clearly stated and not implied.

6. Comment on P27

During the Workshop, it was also stated that Simulo is not able to properly design the biological P removal. Still, the Program uses Simulo exclusively for the updated design. Why?

7. Comment on Phosphorus recovery (1.5)

1) Use of chemicals for struvite recovery

Struvite recovery requires an additional process, but it would be the best available method to recover phosphorus and it is only achievable with sludge from Option #2 and #3 as they do not add ferric. Struvite recovery requires chemical, so it will affect the operation cost. However, the chemical will be used for the recovery of phosphorus, not to bind phosphorus to an unrecoverable form.

EAP understands the economy of scale in P recovery. P-recovery appears economically feasible at SEWPCC but could also be done at NEWPCC where it could be more profitable when done from combined sludge at the NEWPCC site. As the protection of the digestion and gas system from sulphides at the NEWPCC currently requires ferric, the eventual P recovery there would have to be done before the methanogenic digestion.

2) Amount of recoverable P in Option #4

We agreed with the idea that Option #4 still has some portion of biologically recoverable P from BAF units. However, the amount shown in Answer should be re-visited. Here's a rough estimation based on the yearly average from updated design of Option #4.

P in raw influent:	6.3 mg/L and 552 kg P/d
P in primary effluent:	3.0 mg/L and 264 kg P/d

P in final effluent: 1.0 mg/L and 87.5 kg P/d

The amount of P in primary sludge will be 228 kg P/d (552-264). The amount of primary sludge in design is 14,123 kg TSS/d. So, %P will be 2.04% (228/14123), looks reasonable as chemicals added.

The amount of P in secondary sludge will be 177 kg P/d (264-87.5). The amount of secondary sludge in design is 7,730 kg TSS/d. So, the %P will be 2.28% (177/7730). It seems that %P in secondary sludge is too large, considering that cell growth is the only P removal mechanism in the updated Option #4. Therefore, the amount of recoverable P from Option #4 should be checked.

In summary, the phosphorus recovery can take place at SEWPCC but it can also be planned for the NEWPCC site, with appropriate sludge handling. The Program should explicitly state that in design and submissions to the regulator and include the differences in recoverable phosphorus from the different Options in the weighing/scoring.

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