Review Comments:

These comments apply to the draft preliminary engineering report by WRA, which was received on 12/19/2023 (e-mail)

Centreville WWTP ENR Upgrade and Expansion
BR-NR 05.18, WQBF-1036-18L
Queen Anne's County (Town of Centreville)
March 22, 2024

Abbreviations: RS = *Recommended Standards for Wastewater Facilities* (2014)

Part A: Completeness or Agreement with PER Checklist

1. Section 1: Cover Page. For the final version, the cover sheet must be signed and sealed by a professional engineer licensed by the State of Maryland.

2. Section 2: Project Planning
    a. Once the PER is complete, please provide the Cost & Effective Alternative Analysis Certification signed by the owner.
    b. *Environmental Resources Present*: Please add a CS-CRAB map to show the impact of sea level rise (or lack thereof). Please comment on this may affect the project. For more information, go to https://mdfloodmaps.net/CRAB/.
    c. *Location*: Please state the street address of the WWTP in this portion of the PER.
    d. *Population Trends*: No comments.
    e. *Community Engagement*: Because of the potential controversy of the increased WWTP capacity, the relocation of the outfall, and the proposed switch to year-round surface discharge, some commentary on public receptivity to the project would be appropriate.

3. Section 3: Existing Facilities
    a. *Location Map*: No comment.
    b. *History*: This should mention that the 2005 project was a BNR upgrade. Also, this should indicate the effluent TP limit that was provided.
    c. *Condition of Existing Facilities*: Section 4.6.2.9 indicates that polyaluminum chloride (PACl) solution is added for TP precipitation. During the reviewer's site visit in December 2023, he was informed that the PACl was *no longer used*. Please confirm whether PACl is, in fact, still used and revise as appropriate.
    d. *Financial Status of Existing Facilities*: No comments.

4. Section 4: Need for Project.
    a. *Health, Sanitation, and Security*: This section refers to violations of the NPDES discharge permit. Please elaborate on this subject, particularly the effluent TP exceedances.
    b. *Aging Infrastructure*. No comments.
    c. *Reasonable Growth*: Somewhere in the PER, there needs to be a justification or explanation for choosing 1.00 MGD as the expanded capacity of the WWTP. Also, in what year is that capacity expected to serve the Town's needs?

5. Section 5: Alternatives Considered
    a. *Description*:
        1) *Sect*ion 6.2.1.2 presents the aerobic granular sludge variation on the SBR alternative. Other than the appendix, which contains a proposal for it, where does the PER comment further on this subject? This seems incomplete. Please clarify and revise as appropriate.

2) *Table 6.5*: Please add the number of cycles per day per basin and the duration of these cycles.
3) *Table 6.6*: As per MDE design guidelines, the maximum hydraulic loading rate at average flow should be 2.2 gpm/SF instead of 2.0 gpm/SF, as shown in the table. Please revise. Also, from where does the peak flow hydraulic loading rate of 5.0 gpm/SF come? Does this correspond to the point beyond which the media is at risk of washout? Please clarify.
4) *Table 6.7*: Please indicate the side water depth. Please give a single value for HRT for the various zones and indicate to what flow condition it relates (e.g., ADF).
5) *Table 6.8*: Please indicate the side water depth.
6) *Table 6.9*: Please indicate the membrane surface area and the flux rates (average and peak). Why does this table indicate three trains while the schematic diagram (Fig. 1.3) shows only two trains? Please revise.

b. *Map & Schematic:* From the preliminary site plans, it appears that the footprint of the MBR biological reactor is almost as large as that of the conventional activated sludge. This is counterintuitive, considering that the design basis shows the MBR having an MLSS value that is twice as large. Please check this and revise as appropriate.
c. *Sustainability*:
   1) This section should comment on any differences in sustainability among the three alternatives. In particular, is there a difference in energy and chemical consumption? (Often this is viewed as a weakness of the MBR.)
   2) Compliance with Maryland's Coast Smart policy requires finished elevations to be *three* feet above the current 100-year flood plain elevation, not two feet. Please revise.
d. *Cost Estimates*: See Part C.
e. *Design Criteria*:
   1) How were these peaking factors for flows derived?
   2) What is the rationale for using an influent TSS of 145 mg/L and an influent TP of 8 mg/L when the data in the report (Appendix C.3) shows only an average influent TSS of 109 mg/L and an average influent TP of 3.6 mg/L?
f. *Land Requirements*: What are the differences in land usage (if any) among the alternatives? How much impact does this make? Please add some brief commentary to the PER on this.
g. *Potential Construction Problems*: This is too general. Are there any serious concerns about constructability among these alternatives? Realistically, does this favor any alternative or make any alternative particularly undesirable? Please explain.

6. Section 6: Selection of an Alternative
   a. *Life Cycle Cost Analysis:*
      1) Where are the "soft costs" such as engineering and administration incorporated into this?
      2) Table 7.5: Is there an arithmetic error? The capital cost of $33,921,000 + PW of O&M of $15,650,000 = $49,571,000, not $48,571,000. Please revise.
   b. *Non-Cost Factors*: These are suggestions.
      1) Why is "Compatibility with Water Reuse" included if it makes no distinction among alternatives? Perhaps it should be removed.
      2) Why is "Use of Existing Assets" included as a non-cost factor when its main benefit is the savings on construction costs, which is reflected in the life cycle cost analysis?

3) It seems that "Ability to Expand Treatment Process in Future" is misnamed. It is recommended to use the word "Upgrade" instead of "Expand" because the latter implies growth, which is addressed in a different non-cost factor.
4) How are Alt. 1 and 2 less able to "evolve with future technologies" than Alt. 3? Please give an example.
5) Would "Reliability" make an effective non-cost factor? This would refer to likelihood of the WWTP experiencing upsets and discharging unacceptable effluent. Essentially, no solids, for example, can pass through an MBR unless somehow the membrane is damaged.
6) Perhaps "Public Acceptance" would be a useful non-cost factor. The town may face opposition to their proposed new discharge permit, so it is important that stakeholders have confidence in it.

7. Section 7: Proposed Project (Recommended Alternative)
    a. *Preliminary Project Design*: There can be large differences between competing MBR system. How does the owner intend to select from among the various MBR technologies? Is pre-selection or pre-purchasing being considered? Also, how will the owner/engineer avoid some of the supply chain delays that are common today?
    b. *Sustainability Considerations*: Maryland Coast Smart policy requires that the finished floor elevation be *three feet* above the 100-year flood elevation, not just two feet. Please revise.
    c. *Schedule:* No comments.
    d. *Permit Requirements:* No comments.

8. Section 9: Project Asset Management/Fiscal Sustainability: No comments.

Part B: Technical Accuracy/Design Questions

9. Shellfish Protection: The design will have to include a 24-hour emergency holding basin if the capacity is going to be increased and the outfall moved to the Corsica River for year-round stream discharge. Please include this in the proposed site plans and cost estimates.

10. Flows & Pre-Equalization:
    a. What size pre-equalization basin was assumed for Alt. 1 in the PER?
    b. *FYI:* During the design phase, please present a more thorough flow analysis to demonstrate that the WWTP has sufficient pre-equalization.
    c. *FYI*: In Maryland, multi-train SBR systems typically have post-equalization but not pre-equalization. Thus, pre-equalization is assumed to be ineligible for BRF on SBR's until evidence is provided to the contrary.

11. Clarifiers:
    a. The PER text calls for rectangular clarifiers instead of circular clarifiers. Why? The latter seem to be more common for WWTP's of this size in Maryland.
    b. The appendices contain a proposal from Ovivo (with drawings) that show a circular clarifier instead of a rectangular clarifier. Please resolve this discrepancy and make sure the cost estimate is using the appropriate dollar figure.

c. Assuming rectangular clarifiers are being used, does this design use double-sided weirs? If not, please consider it. As per RS 72.43, the maximum hydraulic weir loading for a WWTP with a
d. capacity (ADF) of 1.0 MGD or less is 20,000 gpd/LF. (This loading is for peak hourly flow after equalization or other dampening is included.) Assuming single-sided weirs (for a total weir length of 70 ft), the hydraulic loading is 35,714 gpd/LF. Please clarify or revise this component.
e. *FYI*: If Alternative 2 is selected, please further optimize the clarifier sizing during the design phase. Preliminary calculations by the reviewer suggest that these units could perhaps be 5 to 15 ft shorter, depending on the values used for other design parameters, including the amount of pre-equalization.

12. Denitrification Filters:
    a. At design flow conditions, how frequently is each filter cell backwashed, how long does the backwash cycle typically last, and what volume of backwash flow does it produce?
    b. According to the manufacturer, what is the hydraulic loading rate at which washout of the media would occur?
    c. Would it be beneficial to use four smaller filter cells instead of three larger filter cells that are currently proposed? Please consider the following and discuss.
        - It appears that the proposed design can meet criteria for the empty bed contact time (EBCT) (minimum of 20 min.) and hydraulic loading rate (HLR) (maximum of 2.2 gpm/SF) at average daily flow (ADF) if all three units are in service. However, if one unit is out of service for maintenance and repair, then neither of these standards are met: 18.6 min. for EBCT and 2.4 gpm/SF for HLR.
        - During backwashing, one of the filters is effectively out of service. Thus, if any of the three filters is out of service for more than a few hours and a high flow event occurs, there is the risk that the WWTP will be running with only one filter in service during the backwash. This might place the filter at jeopardy of media washout.
    d. Based on communication of the reviewer with the vendor, it is the understanding of the reviewer that the proposed filter unit is not made in the USA. If Alternative 1 or 2 is selected, please investigate this matter before basing a design upon it. It is the understanding of the reviewer that domestically manufactured units *are* available by others.
    e. How large is the control building for the denitrification filter?

13. Membrane Bioreactor:
    a. Table 6.9 indicates that Veolia was used as the basis for design; however, the appendices lack a proposal from Ovivo. Instead, there is a submittal from a company called "AB-USA". Please resolve or clarify this apparent discrepancy.
    b. Is the reviewer correct in assuming that these are hollow fiber membrane units that are cleaned in place? If not, please clarify. If so, does the membrane tank have to be drained for major cleaning operations? Please explain.
    c. What is the peak flux rate that the MBR can handle from a hydraulic standpoint? This would avoid a bottleneck or hydraulic back-up on a short-term basis
    d. What is the peak flux rate that the MBR can handle for healthy biological activity during a peak monthly flow?
    e. *FYI:* If Alt. 3 is selected, please evaluate other supplemental carbon sources during the design phase.
    f. Has the engineer considered the use of a RAS screen to prevent an accumulation of fibrous one-dimensional debris on the membrane? Some systems use it. Please comment.

14. Sequencing Batch Reactors: The proposal by Aqua Aerobics in the appendix for the regular SBR (not AGS) might need to be updated. Proposal calls for three basins; text calls for four basins. Proposal is based on an influent BOD of 250 mg/L and influent TSS of 250 mg/L; text is based on 130 mg/L BOD and 145 mg/L TSS. How does this disparity affect the cost estimates?

Part C: Questions on Costs

15. Pre-Equalization:
    a. Appendix A indicates that the cost of the "Pre-Flow EQ Tank, Aerated, w Pumping" is $2,019,000 for Alt. 2 and 3. Is this referring to the conversion of the existing SBR basins to pre-equalization basins? If so, the cost seems too high, especially since the report states that the condition of the concrete is excellent. Please explain or revise.
    b. The first page of Appendix A lists the "Pre-Flow EQ Tank, Aerated w Pumping" as $2,054,000 for Alt. 1, but the fourth page seems to list is as $1,200,000 (sum of two lines).

16. Biological Reactors: Appendix A shows the same volume of concrete (400 CY) for the reactor tanks in Alt. 2 and Alt. 3. It would seem that those for Alt. 2 should involve substantially more concrete because MBR tanks are typically much smaller than those of conventional activated sludge. Please verify values and revise or explain, as appropriate.