

MEMORANDUM

To: Thomas Speer
*President, Briar Chapel
Community Association*

Cc: Laura Goguet
First Service Residential

From: Victor D'Amato, PE

Date: April 28, 2021

Subject: Briar Chapel WWTP Expansion
Application Review

1.0 BACKGROUND

At the request of the Briar Chapel Community Association (BCCA), Tetra Tech reviewed the "Request for Permit Minor Modification, Briar Chapel Wastewater Treatment Plant, Chatham County, WQ0028552", dated March 31, 2021, and prepared and submitted by John Phillips, PE, Diehl and Phillips, P.A., on behalf of Old North State Water Co., LLC.

The referenced minor permit modification application requests several modifications to the previously approved and permitted second phase expansion plan (from a capacity of 250,000 gallons per day to 500,000 gpd) for the Briar Chapel Wastewater Treatment Plant (WWTP). Tetra Tech performed a comprehensive but cursory review (e.g., we didn't back-check process sizing and other design calculations) with a particular focus on the efficacy of proposed modifications for mitigating odors from the WWTP.

The proposed modifications include the following (Figure 1-1):

1. Installation of a new mechanical fine screen with screenings washing, compacting, and bagging features. This will replace the existing static screen.
2. Using submersible mixers in the two new anoxic zones for the WWTP expansion, rather than the 3 horsepower (hp) surface mounted mixers used in the two existing anoxic zones.
3. Retrofitting the existing surface aeration equipment in the flow equalization, sludge holding, and aeration basins with diffused aeration systems (fine bubble for the aeration basins, and coarse bubble for the flow equalization and sludge holding basins). Diffused aeration systems will also be used in the expansion basins.

4. Removing the permitted ultraviolet (UV) disinfection system and dechlorination system from the permit and relying exclusively on chlorination for disinfection.
5. Adding a two-stage (sulfate reduction biofilter followed by a carbon sorption filter for polishing) odor control system to treat gas from the covered flow equalization basins, and the new screening and dumpster.

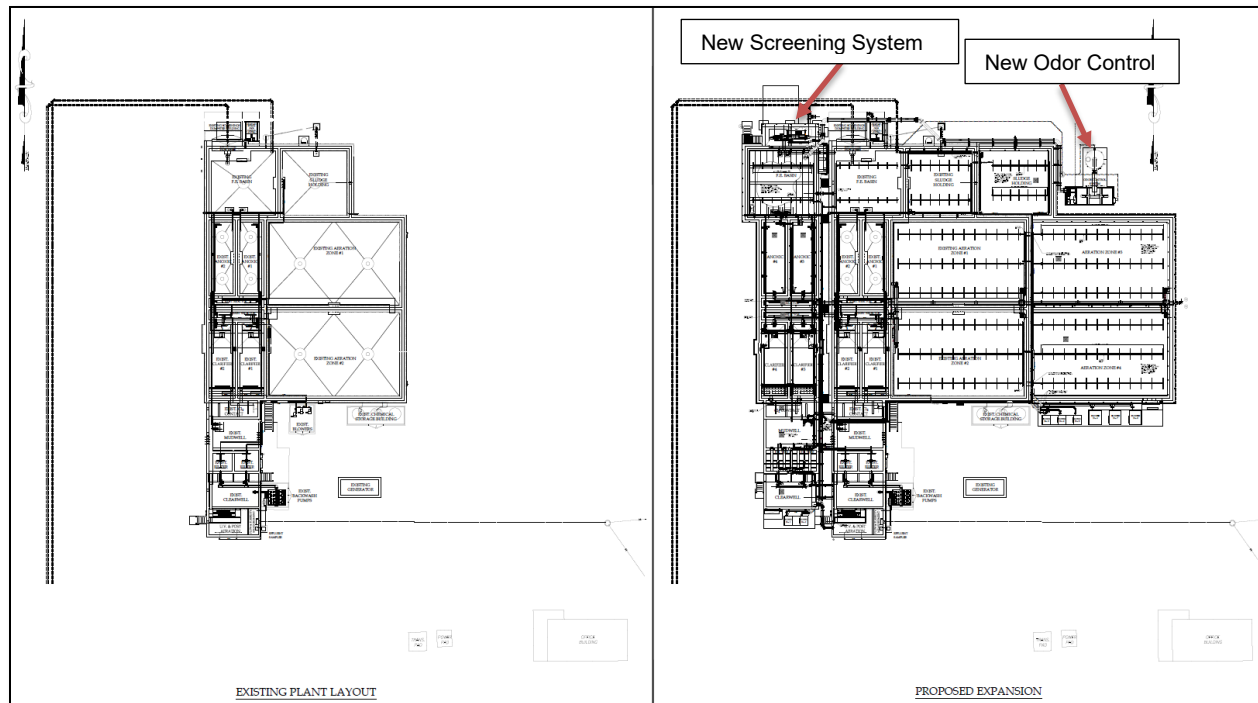


Figure 1-1. Existing Versus Expansion Plan Layouts (Diehl and Phillips, 2021)

2.0 RESULTS AND DISCUSSION

In general, we agree that the proposed WWTP modifications should provide substantial improvements in odor control; the main question is whether they are enough to fully alleviate community perceptions of odors associated with the plant. The proposed modifications are discussed in order below.

1. Installation of a new mechanical fine screen with screenings washing, compacting, and bagging features.

Odors associated with WWTPs are frequently associated with the plant “headworks” which describes the preliminary treatment processes, like screening, that prepare raw sewage to be treated biologically. Based on our review of the engineering documents in the application, we believe that the proposed screening modifications should mostly alleviate odors association with the WWTP headworks since everything – the mechanical screening unit and dumpster – will be covered, with exhaust air treated in the new odor control system. We especially like the automatic “forever bag” system which has the added benefit of making the removal and disposal of screenings more sanitary. Based on our understanding of the existing WWTP, the new screening unit should also result in improved removal of solids prior to the biological process (especially considering that the raw sewage is delivered to the plant via grinder pumps which chop solids into smaller pieces before pumping); this should also improve the reliability and treatment efficacy of the plant.

We recommend that the engineer provide a cut sheet, including specifications, of the proposed product (the Huber Rotamat Ro9-500-6). We were able to find information about the Rotamat Ro9 online, but not about the specific size/model proposed (i.e., the 500-6).

2. Using submersible mixers in the two new anoxic zones for the WWTP expansion, rather than the 3 horsepower (hp) surface mounted mixers used in the two existing anoxic zones.

This modification appears to be driven more by energy efficiency considerations than odor control, but this is not entirely clear. We agree that submersible mixers are likely to be significantly more efficient than surface-mounted mixers. It appears possible that submersible mixers will also provide less surface agitation than the mixers in the existing anoxic reactors. If this is the case, then the submersible mixers may also help reduce odors. The engineer should consider whether retrofitting the existing anoxic reactors should be retrofit with submersible mixers as well, as both an efficiency and odor control strategy.

3. Retrofitting the existing surface aeration equipment in the flow equalization, sludge holding, and aeration basins with diffused aeration systems (fine bubble for the aeration basins, and coarse bubble for the flow equalization and sludge holding basins). Diffused aeration systems will also be used in the expansion basins.

We fully agree with and support this modification and offer no additional suggestions. If noise from the existing WWTP is also a concern for Briar Chapel residents, then the engineer should provide details on noise dampening provisions for the new blowers.

4. Removing the permitted ultraviolet (UV) disinfection system and dechlorination system from the permit and relying exclusively on chlorination for disinfection.

This modification is proposed mostly to reduce unneeded redundancy. We see no problem with the modification. Although UV disinfection is typically considered more environmentally friendly (since it does not use chemicals), we agree that chlorination is more appropriate for this particular system, as UV doesn't provide any residual (i.e., lasting) disinfection, even though effluent from the Briar Chapel WWTP is held for days or even weeks before being irrigated out of the onsite storage ponds. Therefore, if UV were used for primary disinfection of effluent from the plant, chlorine would need to be added to prevent biological (i.e., bacterial, viral) regrowth within the ponds and reclaimed effluent distribution network. We see no reason to have both UV and chlorination and we generally agree that chlorination is more likely to improve odors associated with effluent management than UV would. As a strong oxidant, chlorine will oxidize and destroy some odor causing organic compounds in addition to potentially pathogenic microorganisms (the main objective of disinfection). Although the relative effect of chlorination on mitigating odor is probably low, every little bit helps.

Dechlorination is usually provided to remove chlorine prior to discharging effluent into a surface water where chlorine, in sufficient concentrations, can be toxic. Since reclaimed effluent will be irrigated, dechlorination is probably unnecessary. Chlorine reacts readily with organic matter (e.g., in the storage ponds, in the soil). Any residual chlorine in the irrigated effluent will react with organic matter in soil and not have a chance to effect the forest ecology or that of adjacent surface waters (e.g., much like irrigating your lawn with potable "city" water which contains a chlorine residual does not kill your lawn). We did note a reference to "wetland augmentation" as a potential reclaimed water use in the application. If wetland augmentation may indeed be used moving forward, then we recommend dechlorinating reclaimed water prior to discharging to wetlands.

We were unclear on whether a UV system is currently installed at the Briar Chapel WWTP, and if so, whether it is currently in service. Additionally, the disposition of the existing UV system should be described (will it be removed?).

5. Adding a two-stage odor control system (sulfate reduction biofilter followed by a carbon sorption filter for polishing) to treat gas from the covered flow equalization basins, and the new screening and dumpster.

Although we did not review the design (e.g., sizing) of the proposed odor control system in detail, we see no problems with the technologies proposed. As with the new screening process proposed, we recommend that the engineer provide cut sheets of the proposed products and double-check the model numbers in the application. It appears that the Evoqua biofilter proposed is called the Zabocs® biofilter and the model proposed is the 7015. (We were unable to pull up any information on Evoqua ZB-7015, as indicated in the application, but did find information on the carbon polishing filter, the RJC-0800).

The proposed odor control system should effectively reduce odors associated with the plant headworks and flow equalization units. We were, however, unclear what would happen to the existing odor control system at the plant. Can it be repurposed to treat gas from other WWTP unit processes (e.g., sludge holding)?

Although we agree that the most noxious odors are likely to be associated with the headworks, including flow equalization (which contains essentially raw sewage), is there value in covering and treating gasses associated with the sludge holding tanks and/or anoxic reactors? Although we recognize that this could greatly increase the size of the odor control system, we believe that such options should be considered if the proposed modifications do not resolve residents' odor concerns.

3.0 CONCLUSIONS AND RECOMMENDATIONS

As implied above, we recommend that the BCCA support the referenced *Request for Permit Minor Modification*. Although we have noted several questions and suggestions for consideration by the WWTP owner and their engineer, these mostly represent additional efforts and do not directly impact the current proposal, which we believe will significantly improve the community's perceptions of odor associated with the WWTP. Our suggestions and questions include:

1. Engineer should provide cut sheets, including specifications, for the proposed screening product (e.g., the Huber Rotamat Ro9-500-6).
2. Engineer should consider whether retrofitting the existing anoxic reactors should be retrofit with submersible mixers in addition to the new reactors, as both an efficiency and odor control strategy.
3. Engineer should provide details on any noise dampening provisions for the new blowers.
4. Engineer/Applicant should clarify whether "wetland augmentation" is a proposed reclaimed water use, and if so, whether dechlorination should continue to be available.
5. Engineer should clarify whether there is an existing UV disinfection system and what will happen to it during the expansion.
6. Engineer should clarify what will happen to the existing odor control system at the Briar Chapel WWTP.

We do recommend that the BCCA ask the WWTP owner to provide contingency plans in case the efforts described in the permit modification package are not sufficient. These contingency plans could include:

1. Covering other reactors (anoxic, aerobic, sludge holding) and treating gasses through an odor control unit.
2. Providing some sort of barrier to direct residual gasses from the WWTP up and away from the community (this could be informed by a process for monitoring odors throughout the community).

4.0 REFERENCES

Diehl and Phillips. 2021. *Request for Permit Minor Modification, Briar Chapel Wastewater Treatment Plant, Chatham County, WQ0028552*, dated March 31, 2021, and prepared and submitted by John Phillips, PE, Diehl and Phillips, P.A., on behalf of Old North State Water Co., LLC.