ETC Engineers & Architects, Inc.

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June 6, 2018

Mr. Layne Pemberton
Enforcement Analyst
Enforcement Branch
ADEQ Office of Water Quality
5301 Northshore Drive
North Little Rock, AR 72118

Ref: City of Forrest City; Permit No.: AR0020087
Overall Plan for Nutrient Reduction
Your email to Mayor Bryant Dated May 22, 2018

Dear Mr. Pemberton,

In my earlier letter to you dated May 10, 2018 I contended that the CAO related to nutrient reduction was due to prior Ammonia Nitrogen effluent limit violation. However, in response you correctly stated that the specific nutrient reduction related CAO was in fact triggered by a new permit requirement. The new permit requires that the City submit a plan for compliance with the development and implementation of Best Management Practice (BMPs) for reduction of nutrients in the effluent. In response to this requirement I had already submitted a report titled "Best Management Practices for Nutrient Reduction at the City of Forrest City WWTP".

In order to develop a specific plan to implement in the Forrest City WWTP (FCWWTP) for further reduction of nutrient, it is necessary to look at the current conditions first. FCWWTP effluent test results for Ammonia Nitrogen for the period of April 2016 through April 2018 indicate that the average of the monthly averages of Ammonia Nitrogen over the sampling period is only 0.18 mg/l. The maximum monthly average over the same period was 1.19 mg/l. This level of effluent concentration is fairly low. Effluent data also indicate that weekly and monthly ammonia level exceeded the permit level only once in over a two-year period. FCWWTP does not measure Phosphorus and as such no data is available.

To understand various options that are available to FCWWTP to further reduce nutrient level I researched the case studies presented in the EPA publication titled "Case Studies on Implementing Low-Cost Modification to Improve Nutrient Reduction at

Wastewater Treatment Plant" (EPA-841-R-15-004) dated August 2015. In that publication an Exhibit is presented on Table 1, page 12 which lists 12 WWTP located within the USA with various modifications implemented to achieve further reduction in nutrient level. All of the WWTPs are activated sludge type. The exhibit is attached to this letter. As can be seen the WWTP at Titusville, FL has the best post performing ammonia nitrogen effluent level. The ammonia nitrogen from this plant after the modification is 0.94mg/l. This compares very favorably to the FCWWTP effluent level. Based on this it can be concluded that additional reduction through modification of the FCWWTP aeration system (changes to existing physical aeration equipment, controls, operation and function of equipment and aerated areas), process system and process control (adjustments to process control characteristics such as food-to-microorganism ratio, mixed liquor suspended solids or return activated sludge) or plant configuration (addition of new flowstreams such as recycle lines or new unit process) may not yield any significant nutrient reduction and may be impractical. Chemical modification (addition of alkalinity or supplemental carbon) requires chemical feed which is very expensive and operationally unsustainable.

At this time, it appears that the most cost effective way to achieve any additional nutrient removal may be to implement discharge modification at the FCWWTP prior to delivery of the effluent to the receiving stream. In this option, discharge from the treatment plant will be diverted to a natural system that may include land application, wetland assimilation or holding pond with controlled discharge. FCWWTP is rich in land holding and as such can implement any of these alternatives at a reasonable cost. Further evaluation will have to be performed based on receiving stream nutrient level and reduction desired in the effluent nutrient load.

FCWU will continue to monitor the FCWWTP effluent for ammonia nitrogen permit limits as required by the NPDES permit and will report any violation as and when it happens. However, I request that you consider this CAO item has been satisfactorily complied by the FCWU. Please feel free to contact me if you have any question or need additional clarification.

Sincerely,

Mizan Rahman, P.E.
Project Manager

Attachments

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
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6/6/18

Table 1. Summary of Case Studies (basic, non-advanced treatment plants shaded in gray)

Case Study	Design Flow (MGD)	WWTP Type	Modification Type	Pre/post TN (mg/l)[1]	Pre/post TP (mg/l)[1]	Capital Costs	Operational Costs/Savings
Bay Point, FL	0.054	AS (MLE)	Aeration, chemical	6.33/3.99	N/A	$170,365	Savings not quantified
Bozeman, MT	5.2	AS	Aeration, configuration	17.8/10.5	3.7/2.5	$180,000	Zero
Chinook, MT	0.5	AS (Oxidation Ditch)	Aeration	20.3/5.44	4.13/1.72	$81,000	Energy savings more than offset $1,000/yr in maintenance
Crewe, VA	0.5	AS (Oxidation Ditch)	Aeration, chemical	7.85/3.63	N/A	$6,000	$17,440/yr savings
Flagstaff, AZ	6.0	AS (IFAS)	Process	14.0/8.5	N/A	$10,000	$1,000/yr
Hampden Twp., PA	5.69	AS (CSR)	Configuration, process	4.66/3.64	N/A	Zero	Zero
Layton, FL	0.066	AS (SBR)	Aeration, process	7.88/3.33	N/A	$53,000	$13,500/yr savings
Montrose, CO	4.32	AS (Oxidation Ditch)	Aeration	Unk/14.7	N/A	Zero	$34,000/yr savings
Tampa, FL	96	AS (Separate Stage)	Aeration, configuration	18.62/13.62	N/A	Zero	$519,900/yr savings
Titusville, FL	6.75	AS (A2/O)	Discharge, configuration, process	5.67/0.94	0.77/0.04	$2,240,000	$45,000/yr
Victor Valley, CA	13.8	AS	Aeration, process	8.93/6.83	N/A	$1,100,000	10% savings
Wolfeboro, NH	0.6	AS (Extended Aeration)	Aeration	6.32/1.97	N/A	$116,000	Savings not quantified

Notes:
AS = activated sludge; MLE = modified Ludzack Ettinger; IFAS = integrated fixed film activated sludge; SBR = sequencing batch reactor; N/A = not applicable; CSR = continuously sequencing reactor.

[1] Available flow data typically did not allow for quantification of pre- and post- optimization TN and TP loads (mass); therefore, concentration is used as the primary performance metric.

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