NUVODA

MOB Process

CASE STUDY:
BIOLOGICAL NUTRIENT REMOVAL
CHARLOTTE, NORTH CAROLINA

THE CHALLENGE:

Maintaining an SRT that supports winter nitrification without overloading the clarifiers has always been a narrow operating window for Charlotte Water's Sugar Creek WWTP. The plant has historically struggled to carry the mixed-liquor inventory needed for full nitrification without risking solids carryover, especially during seasonal settleability swings. As a result, Sugar Creek routinely bypasses flow to its neighboring facility, particularly in winter. For total nitrogen and phosphorus, the facility has a monitoring requirement only but still utilizes an MLE process to reduce alkalinity dosing required for nitrification.

On paper, the plant is rated for 20 MGD but typically operates around 16.2 MGD, sending anything above that to the bypass facility. Even with this buffer, consistently meeting the plant's ammonia limits of 2.0 mg/L NH_3 in winter remains tight. Charlotte's rapid growth means both Sugar Creek and its neighboring plant will increasingly feel the constraints of their existing infrastructure. Future expansion at Sugar Creek would require building over a popular public park. With a 28 MGD permit on the horizon, the challenge is clear: achieve stable nitrification at higher flows and unlock additional treatment capacity within the existing footprint.

WHAT WAS ACHIEVED:

- Strengthened, complete, year-round nitrification
- Increased flows to facility by 23% maintaining treatment
- Reduced suspended growth inventory & successfully operated with 33% less clarifier area. Read more about overall settleability performance here: link
- Retrofit installation without facility downtime

WHAT THE MOB PROCESS CAN DO FOR YOU:

- Increased Clarifier Capacity
- Stabilized Settling Performance
- High Loading Process Stability
- Full-Scale Demonstrations and Retrofits

WHY THE MOB PROCESS WAS CHOSEN:

The MOB Process® was selected as an intensification solution aligned with Sugar Creek's specific need for additional capacity within the existing footprint. As a hybrid biofilm-activated sludge technology, MOB uses mobile carriers that circulate with the flocculant sludge between the reactors and clarifiers. With the maturation of mobile biofilms comes two key benefits: reduced suspended growth inventory, as a portion of this biomass transitions to attached growth, and the decoupling of SRT between the floc and the biofilm. This decoupling proved critical in the winter of 2025–2026. Sugar Creek could maintain slow growing nitrifiers within the biofilm layer without the burden of managing excess suspended solids. Nitrification stability strengthened within months of startup.

Figure 1: Sugar Creeek WWTP Winter Nitrification Performance

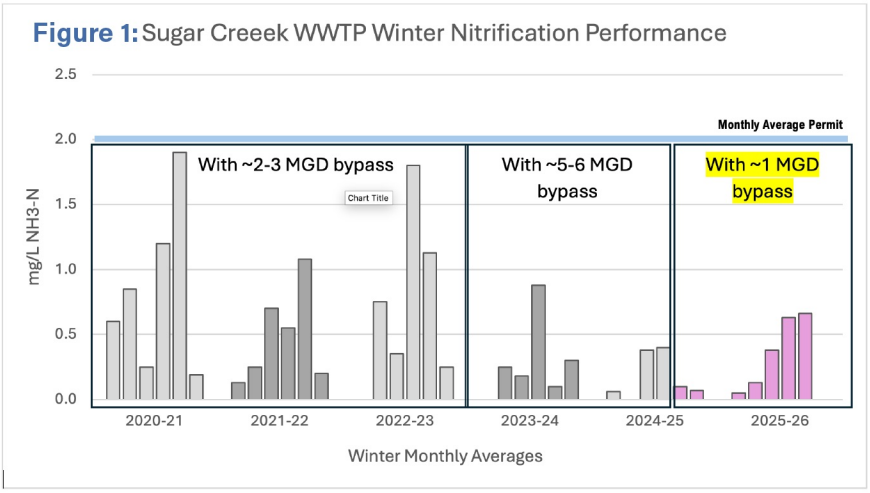

Figure 1: The graph depicts the monthly average effluent ammonia data from the past five winters. Winter 2025-26 was operated at the highest flow and load with the four (4) small clarifiers taken offline. Note that some Nov/Dec data points from past were not provided.

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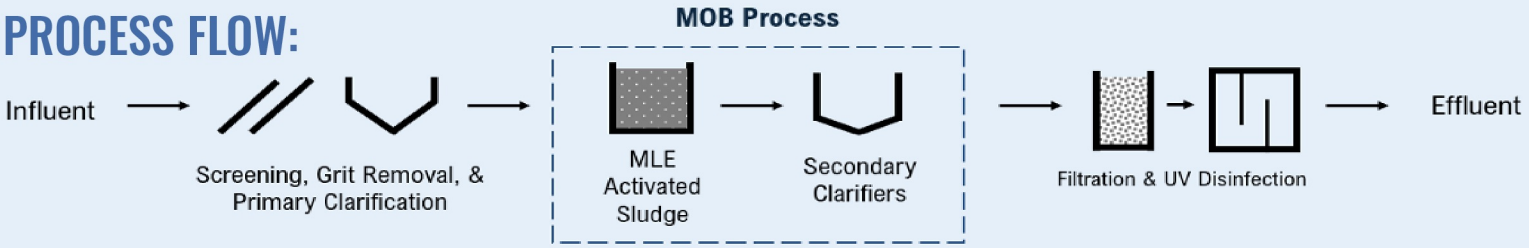
FACILITY OVERVIEW:

Facility Flows	▪ 16.2 MGD (61.3 MLD) Average ▪ 20 MGD (75.7 MLD) Achieved
Effluent Targets	▪ Summer: NH3 <1.0 mg/L ▪ Winter: NH3 <2.0 mg/L
Project Goals	▪ Stabilize complete, year-round nitrification ▪ Reduce bypass flows to neighboring facility ▪ Unlock additional capacity in existing infrastructure

WHY THE MOB PROCESS WAS CHOSEN (CONT.):

To explore these performance trends at a deeper level, DNA sequencing revealed a clear affinity of the nitrifiers to reside in the biofilm rather than the flocculant biomass (see Figure 2). Once biofilm was established, the facility had the confidence to reduce bypass flows and consistently treated more than 20% additional influent with no risk of clarifier washout. Furthermore, sludge blankets dropped so low that Sugar Creek was able to take one third of its clarifier area offline and still achieve treatment goals comfortably. With an average 2025 effluent ammonia of 0.17 (Winter 0.19) mg/L, Sugar Creek proved it could achieve higher capacity and stabilized treatment performance using only its existing infrastructure with the MOB Process.

PROCESS FLOW:



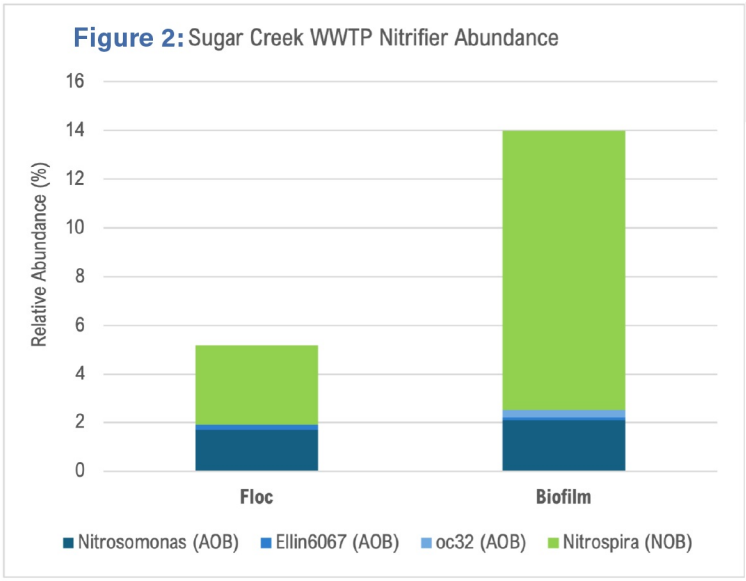


Figure 2: Ammonia Oxidizing Bacteria (AOB) and Nitrite Oxidizing Bacteria (NOB) relative abundance as observed in the floc versus the biofilm of the MOB System at the Sugar Creek WWTP.

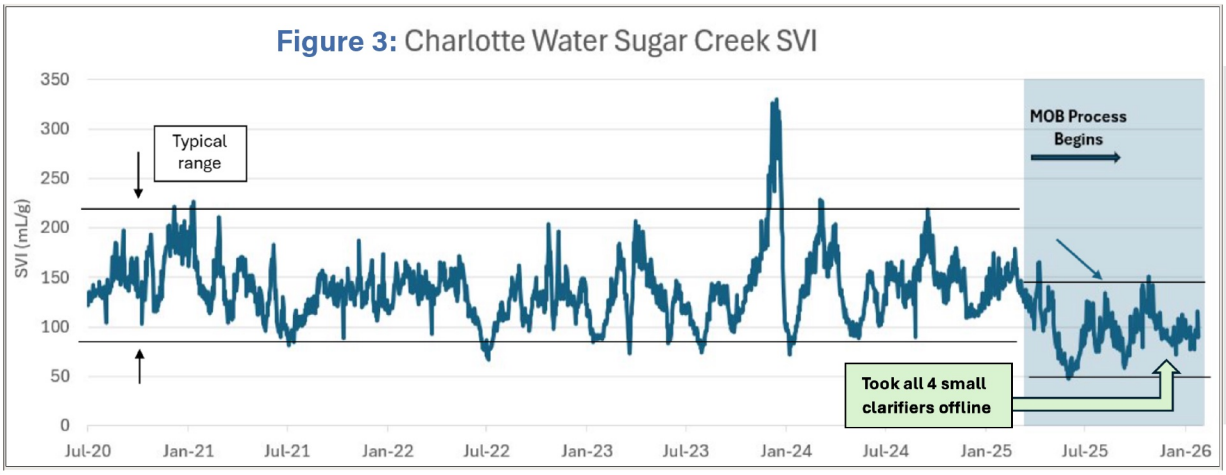


Figure 3: Sugar Creek SVI data before and during the MOB Process. Stabilizing settleability from SVIs of over 150 to less than 100 mL/g allowed the facility to take their four small clarifiers offline in winter of 2025.