

TOTAL NITROGEN REDUCTION AT BNL SEWAGE TREATMENT PLANT USING CAFETERIA WASTES – Robert J. Lee, William L. Chaloupka, Jason D. Remien, Peter D. Pohlot, Alex Hoimes (Summer Student, Penn State University)

Sanitary and process wastewater generated by Brookhaven National Laboratory (BNL) operations is conveyed to the Sewage Treatment Plant (STP) for processing before discharge to the Peconic River. Under a permit issued by New York State Department of Environmental Conservation (NYSDEC), the STP effluent uses a discharge point authorized under the State Pollutant Discharge Elimination System (SPDES), which regulates wastewater effluent at the laboratory. Starting in February 2005, the STP effluent total nitrogen concentrations began to exceed the SPDES permit limit of 10 mg/L. As a result, BNL initiated an investigation into the potential sources of elevated nitrogen concentrations observed at the STP and looked for opportunities to optimize the STP process with the goal of minimizing the release of nitrogen into the Peconic River.

Lower than normal flow conditions and decreased nutrients (bioload) in the waste stream were identified as the most likely causes to the increased levels of nitrogen in the discharge. Reductions in the number of employees and on-site residential population over the years are contributing factors to the low flow conditions and decreased bioload. In addition, a process where animal bedding was ground-up and discharged to the STP was discontinued. Although this process was providing a significant nutrient load to the plant, it frequently clogged up the sewer system and unnecessarily increased the amount of sludge for disposal.

Corrective actions to increase the level of nutrients in the influent waste stream were evaluated including the addition of enzymes to the plant to enhance the biological treatment process and/or adding a nutrient source such as dog food, both of which would cost the Laboratory money. The preferred corrective action identified was to utilize an existing source of food waste at BNL's cafeteria.

In April 2008, BNL initiated a putrescible waste disposal practice consisting of collecting cafeteria wastes that would normally be thrown away in the garbage and feeding it into

the sewage treatment plant. Each workday, an STP operator picks up a bag of food waste from the cafeteria and feeds it into the influent of the plant (see figures 1-3 below). This new practice is now increasing the bioload at the STP and, at the same time, reducing the amount of cafeteria waste being thrown away in the garbage. Since introducing the cafeteria wastes to the plant the total nitrogen concentrations have dropped by at least 25% and are now typically one-half the permit level of 10 mg/L.

By implementing this new waste disposal practice BNL is avoiding approximately \$14,200 in costs per year. This is based on the following:

- \$136/year cost avoidance from disposing the cafeteria food waste at a landfill.
- \$2,080/year cost avoidance from purchasing dog food to supplement the nutrient load in the influent to the STP (One bag of dog food each week, \$40/bag).
- \$12,000/year cost avoidance from purchasing enzymes to help the de-nitrification process and supplement the biomass at the plant.





Figures 1-3. Sewage Treatment Plant operator feeding cafeteria food scraps into the head of the plant.