



PROJECT HIGHLIGHT

Nitrogen Removal at NBC Facilities

Last revised: 12/1/14

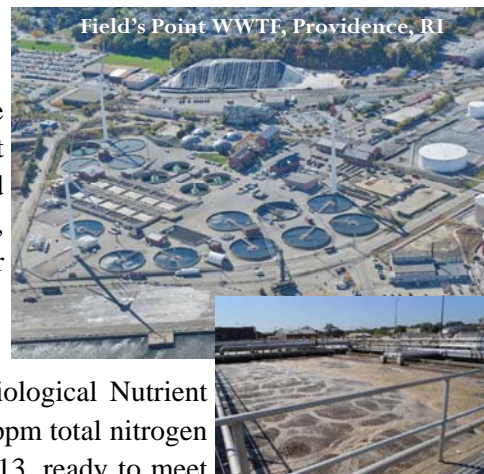
In response to the 2003 Greenwich Bay fill kill, the State of Rhode Island passed legislation that required RI Department of Environmental Management to permit wastewater treatment facilities (WWTFs) to reduce nutrients and nitrogen loads from WWTFs to the Narragansett Bay by 50% by 2008.

The Problem

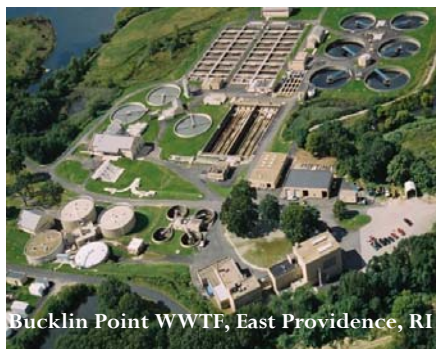
Fish kills are highly publicized events and nitrogen loadings from WWTFs are oftentimes identified as the cause of the low oxygen water quality impairments that can cause fish kills. However, nitrogen is not the only thing that causes low dissolved oxygen (hypoxia) in the Bay. Other factors include low flushing or hydrodynamics, high fresh water inputs, decreased wind mixing, warm weather and water temperatures and other physical factors causing stratification of the water column.

Nitrogen Removal at Field's Point

The NBC Field's Point facility underwent major facility renovations to employ Biological Nutrient Removal (BNR) upgrade for total nitrogen, implementing an IFAS system to meet 5 ppm total nitrogen (TN). Spending approximately \$31 million, construction was complete by spring 2013, ready to meet RIDEM permit limits for the 2014 season. From 2007-2011, the seasonal average was 13.6 ppm TN. Beginning in 2012 as construction phases were completed, effluent TN began to decrease significantly. With the first May—October permit season completed for 2014, the seasonal average was 3.4 ppm, with a low of 3.2 ppm for July and August 2014.



Field's Point Aeration tank filled with IFAS media



Nitrogen Removal at Bucklin Point

In 2005/2006, the NBC proactively upgraded the Bucklin Point plant to meet 8.5 ppm TN at a cost of \$8.3 million. The NBC continually tries to remain ahead of the environmental mandate curve, however, the RIDEM later mandated that the NBC redesign the Bucklin Point facility to meet 5 ppm at an estimated upgrade cost of \$13 million, for an additional reduction of approximately 158 pounds of TN/day. The NBC's Bucklin Point facility completed BNR upgrades in June 2014 to meet a permit limit of 5.0 ppm TN. As a result, average nitrogen loading to the upper Bay during the 2014 permit season was 4.0 ppm TN or 590 lbs/day.

Nitrogen Reductions to Upper Narragansett Bay

Since the fish kill in 2003, the NBC has significantly reduced its nitrogen loading to the upper Narragansett Bay. Both NBC facilities are now operating BNR systems to reduce TN to at least 5 ppm. The table to the right shows past, present and predicted TN loadings to the Bay considering all NBC construction upgrades. At NBC's Fields Point facility, the NBC has currently reduced TN loading by 82% since 2003. At NBC's Bucklin Point facility, the TN loading from 2003 to present has been reduced by 80%. Based upon 2014 data, the NBC has already reduced its total nitrogen loadings by 81% since 2003 (both WWTFs combined), clearly surpassing the State of Rhode Island's goal of a 50% reduction.

	Concentration (ppm)	Loading (lbs/day)	Percent Reduction (Loading)
Field's Point TN Loading			
Year of Fish Kill (2003)	15.7	5,834	
May - Oct 2014	3.4	1,051	82%
IFAS Upgrade (5 ppm)	5.0	1,572	73%
If plant achieves 3 ppm	3.0	943	84%
Bucklin Point TN Loading			
Year of Fish Kill (2003)	14.8	2,908	
May - Oct 2014	4.0	590	80%
Upgrade (5 ppm)	5.0	725	75%
If plant achieves 3 ppm	3.0	435	85%
Combined NBC Facilities			
2003	BP=14.8, FP=15.7	8,741	
May - Oct 2014	BP=4.0, FP=3.4	1,641	81%
FP&BP Upgrade to 5 ppm	BP=5.0, FP=5.0	2,297	74%
FP&BP Upgrade to 3 ppm	BP=3.0, FP=3.0	1,378	84%

For further information, please contact the EMDA Section at:
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Visit the NBC's websites – www.narrabay.com & <http://snapshot.narrabay.com/app/>
 for more information on the Narragansett Bay Commission, as well as to download NBC water quality data