Town of North Castle, NY

Evaluation of Capacity Increase to 0.60 mgd and 0.70 mgd Wastewater Treatment Plant Town of North Castle, NY Sewer District No. 2

February 2016

EVALUATION OF CAPACITY INCREASE TO 0.60 MGD AND 0.70 MGD

WASTEWATER TREATMENT PLANT

TOWN OF NORTH CASTLE, NY

SEWER DISTRICT NO. 2

Prepared for

TOWN OF NORTH CASTLE, NY

Prepared by

GHD CONSULTING SERVICES INC.
One Remington Park Drive
Cazenovia, NY 13035

February 2016

Project No. 3711093

Table of Contents

Tables

Appendices

List of Acronyms

BOD ..... Biochemical oxygen demand

CBOD ..... Carbonaceous biochemical oxygen demand

DON..... Dissolved organic nitrogen

GAC ..... Granular activated carbon
gpd ..... gallons per day

IX ..... Ion exchange

LIS ..... Long Island Sound

mgd ..... million gallons per day
mg/L..... milligrams per liter

NYSDEC..... New York State Department of Environmental Conservation

RBC ..... Rotating biological contactor
RO ..... Reverse osmosis

SPDES ..... State Pollutant Elimination Discharge System
TDH ..... Total dynamic head
TKN ..... Total Kjeldahl nitrogen
TMDL..... Total maximum daily limit
TN..... Total nitrogen
TSS..... Total suspended solids

USEPA ..... U.S. Environmental Protection Agency

UV..... Ultraviolet

VFD ..... Variable frequency drive

WWTP ..... Wastewater treatment plant

12-mra ..... 12-month rolling average

Table of Contents

Tables

Appendices

List of Acronyms

BOD ..... Biochemical oxygen demand

CBOD ..... Carbonaceous biochemical oxygen demand

DON..... Dissolved organic nitrogen

GAC ..... Granular activated carbon
gpd ..... gallons per day

IX ..... Ion exchange

LIS ..... Long Island Sound

mgd ..... million gallons per day
mg/L..... milligrams per liter

NYSDEC..... New York State Department of Environmental Conservation

RBC ..... Rotating biological contactor
RO ..... Reverse osmosis

SPDES ..... State Pollutant Elimination Discharge System
TDH ..... Total dynamic head
TKN ..... Total Kjeldahl nitrogen
TMDL..... Total maximum daily limit
TN..... Total nitrogen
TSS..... Total suspended solids

USEPA ..... U.S. Environmental Protection Agency

UV..... Ultraviolet

VFD ..... Variable frequency drive

WWTP ..... Wastewater treatment plant

12-mra ..... 12-month rolling average

Executive Summary

This report evaluates the capacity of the North Castle Wastewater Treatment Plant and identifies necessary improvements to process a maximum month flow of 0.60 mgd and 0.70 mgd. The report is intended to be utilized by the Town of North Castle for planning purposes. The following table summarizes the recommended improvements for the two capacity alternatives.

Future Maximum Month Flow of 0.60 mgd	Future Maximum Month Flow of 0.70 mgd
Necessary Improvements:	
1. Construct one additional primary clarifier.	1. Construct one additional primary clarifier.
2. Construct one additional denitrifying filter cell.	2. Construct two additional denitrifying filter cells.
3. Construct a granular carbon adsorption system for additional nitrogen removal.	3. Construct a granular carbon adsorption system for additional nitrogen removal.
4. Replace existing thickening equipment with greater capacity equipment.	4. Replace existing thickening equipment with greater capacity equipment.
--	5. Construct additional equalization storage volume.
--	6. Construct an additional rotating biological contactor train.
5. Construct building and site improvements.	7. Construct building and site improvements.
Opinion of Project Cost:	
$5,200,000	$9,000,000

1. Introduction

1.1 Background

The Town of North Castle Sewer District No. 2 owns and operates a wastewater treatment facility, located on Business Park Drive in the Town of North Castle, County of Westchester, NY. The Town's wastewater treatment facility was originally built in 1984 to treat 380,000 gallons per day (gpd). Treated effluent from the facility is discharged to the Wampus River, which is classified as a Class A waterway by the New York State Department of Environmental Conservation (NYSDEC). The Wampus River merges with the Byram River approximately 0.5 miles from the point of discharge. The Byram River ultimately flows to Long Island Sound.

In 1985, the U.S. Environmental Protection Agency (USEPA), New York State, and the State of Connecticut began a program to assess the water quality of Long Island Sound (LIS). In 1994, a plan was approved to protect and improve the water quality. In 1998, Connecticut, New York, and the USEPA adopted nitrogen reduction targets for 11 designated zones that compromise the Connecticut and New York portions of LIS. In 2001, the USEPA mandated a 58.5 percent reduction of nitrogen discharges to be achieved over a 15-year period. The Town of North Castle WWTP, along with four WWTPs operated by Westchester County, contribute to the portion of LIS that is designated as Zone 7.

In May 2004, NYSDEC initiated a modification to the North Castle WWTP State Pollutant Elimination Discharge System (SPDES) permit to include nitrogen limits that would be phased in over time. The NYSDEC issued Order on Consent #CO 3-20041207-3 in July 2006 requiring the Town to meet a schedule to comply with the nitrogen limits that were added to the SPDES permit. The schedule included enforceable milestone dates.

The Town of North Castle retained GHD Consulting Services Inc. to evaluate nitrogen removal options to upgrade the Town of North Castle WWTP to meet the new nitrogen limits in the SPDES permit. Engineering Report I, *"Nitrogen Removal Evaluation,"* was completed in September 2006 and submitted to NYSDEC and the Westchester County Department of Health. A design report for the nitrogen removal upgrade was submitted in June 2007, thus meeting the requirement of the Consent Order. As recommended in the design report, the WWTP was upgraded for improved performance and nitrogen removal. The upgrades were completed in accordance with the schedule established by the Consent Order, with many milestones being completed ahead of schedule.

In late 2008, the Town of North Castle again retained GHD to assist a Sewer Capacity Task Force in projecting future flows and to evaluate the capacity of existing infrastructure and identify improvements required to increase the design maximum month flow of the WWTP by 50,000 gpd to 0.50 million gallons per day (mgd). The increase of 50,000 gpd was identified as an expansion that would meet the short-term needs of the District and could be quickly implemented at a reasonable cost.

In January 2009, GHD completed the *"Evaluation to Assist Sewer Capacity Task Force"* utilizing information provided by the Town to project future capacity needs of Sewer District No. 2. The report also identified an economical approach to expanding plant design capacity from 0.45 mgd to 0.50 mgd by adding improvements to the ongoing construction contract. This approach was implemented with the understanding that additional measures may be necessary to meet long-term needs.

In September of 2010, performance testing of the nitrogen removal system was successfully completed and the WWTP began operating in compliance with the nitrogen limit that would go into effect in 2014. Engineering Report II, *"Evaluation of Nitrogen Treatment Capabilities,"* was submitted to NYSDEC in September 2011 in accordance with Consent Order requirements.

Following completion of the upgrade and successful demonstration of performance, the Town requested a SPDES permit modification to increase the flow limit of the plant from 0.45 to 0.50 mgd. The NYSDEC issued a new SPDES permit, effective on March 1, 2012, that increased the maximum month flow limit to 0.50 mgd. The limit on total nitrogen (TN) was not changed from that established by the Consent Order.

At the present time, construction of the WWTP upgrades is complete and the facility is operating in compliance with the existing SPDES permit.

In anticipation of continued growth within the Town and the District, in May 2013, the Town retained GHD to evaluate the existing WWTP, project future flows, and recommend necessary improvements to enable the WWTP to accommodate an increased flow rate. This effort is summarized in the "Sewer Capacity Study for Sewer District No. 2," August 2013.

The Town again retained GHD in October 2013 for assistance in evaluating and planning for improvements to accommodate a design capacity increase from both a maximum month flow of 0.60 mgd and also a maximum month flow of 0.70 mgd. The Town and GHD met with the NYSDEC in November 2013 to discuss NYSDEC's expectations and requirements associated with a permit modification to allow additional flow. The NYSDEC indicated such a permit modification would be considered, provided an engineering report is submitted demonstrating the WWTP can provide adequate capacity for the increase. NYSDEC also indicated that existing concentration-based limits, such as for BOD and TSS, may remain, thus allowing an increase in any associated mass-based limits. However, the existing 12-month rolling average mass-based limit for TN was highly unlikely to be increased, since it is inextricably linked to the TMDL for LIS Zone 7, and the approval of many stakeholders would be involved.

1.2 Purpose of Report

The purpose of this report is to provide assistance to the Town of North Castle in evaluating the Sewer District No. 2 WWTP for a design capacity maximum month flow of 0.60 mgd and 0.70 mgd, and identifying recommended improvements that may be required to provide adequate treatment for the increased flow and loading. This report provides information to assist the Town in identifying a revised flow limit that can be feasibly implemented. Once the Town has identified the desired flow limit, this report will serve as the basis for an engineering report supporting a formal request for a permit modification from the NYSDEC.

1.3 Scope of Study

The scope of this effort includes an evaluation of the existing Sewer District No. 2 WWTP capacity and identification of improvements necessary to accommodate a maximum month flow of 0.60 mgd and of 0.70 mgd, while meeting the existing limit for TN as well as the concentration-based limits in the existing SPDES permit.

2. Existing Conditions

2.1 Flows and Loading

Influent data was taken from WWTP daily monitoring reports for the period of September 2013 to August 2015 to reflect recent conditions. The data is presented in Table 2-1.

Table 2-1 Recent Influent Flows and Loading

Parameter	Recent Influent Data (September 2013 to August 2015)
Influent Flow Rate	
Average annual	0.362 mgd
Maximum month	0.427 mgd
Peak day	0.583 mgd(1)
Peak hour	0.82 mgd(2)
Peak flow after equalization	0.84 mgd(3)
CBOD Loading	
Average annual	863 lbs/day
Maximum month	1,185 lbs/day
TSS Loading	
Average annual	863 lbs/day
Maximum month	1,310 lbs/day
Ammonia Loading	
Average annual	69 lbs/day
Maximum month	94 lbs/day

(1) Peak day of data set was April 30, 2014. Precipitation of 3.26 inches was recorded.
(2) Peak hour is estimated by applying a diurnal peaking factor of 1.4 to the peak day flow.
(3) Based on the capacity of the equalization tank pump station.

2.2 WWTP Process Description

In 2010, construction was completed to implement nitrogen removal as well as other improvements (previously identified as “Priority 1” and “Priority 2”) at the WWTP. These upgrades improved the reliability and performance of the facility and provided a design capacity for a maximum month flow of 0.50 mgd. This section describes the facilities and recent upgrades. The following unit processes are currently utilized at the treatment plant:

1. Influent pump station.
2. Channel grinder/manual bar rack.
3. Equalization tank.
4. Equalization pump station.
5. Primary clarifiers.
6. Nitrifying rotating biological contactors (RBCs) with supplemental aeration.
7. Final clarifiers.

8. Filter feed pump station.
9. Denitrifying filter system.
10. Methanol storage and feed system.
11. Cloth filter (supplemental process).
12. Ultraviolet (UV) disinfection.
13. Post-treatment reaeration system.
14. Aerated sludge holding tanks.
15. Sludge thickener system.
16. Odor control units.

The following sections describe these processes and equipment.

2.2.1 Influent Pump Station and Influent Flow Meter

The influent pump station for the facility receives wastewater from two sanitary sewer interceptors. The pump station consists of three constant speed pumps rated for 460 gpm (0.66 mgd each). A magnetic flow meter is installed in the lift station valve pit to measure instantaneous and totalized pump flow. A circular chart recorder for this flow meter is located in the Control Building.

2.2.2 Preliminary Treatment

Preliminary treatment for the facility consists of a manual bar rack and a channel grinder installed during the Priority 1 upgrade project. Under normal conditions, wastewater is pumped from the influent pump station to the headworks channel, where it flows by gravity through the grinder and then to the equalization tank. If maintenance is to be performed on the grinder, the wastewater can be diverted to the bypass channel, which contains a manually cleaned bar rack.

2.2.3 Equalization Tank

Following preliminary treatment, flow from the headworks channel is discharged to an in-line equalization tank. The purpose of the equalization tank is to reduce the hourly variations of flows entering the plant and provide a more constant flow of wastewater through the plant. This improves the overall operation of the clarifiers, RBCs, and denitrifying filter; and reduces the peak flow to downstream equipment. Wastewater from the equalization tank is pumped to a concrete splitter box for distribution to the primary clarifiers.

The equalization tank also receives recycle flows from the aerated sludge holding tank, sludge thickener, denitrifying filter backwash, and plant drain system. Short-term flow variations are dampened in the tank, which is 36 feet in diameter with a sidewater depth of approximately 18 feet. The tank has an equalization volume of about 137,000 gallons and is aerated by coarse bubble diffusers to mix the wastewater and reduce the potential for odors. Air for the equalization tank is provided by two positive displacement blowers located in the basement of the plant Control Building. The tank is covered and actively vented to an activated carbon odor control unit.

2.2.4 Equalization Pump Station

Wastewater is pumped from the equalization tank to the primary clarifier distribution box. The pump station consists of two 584 gpm (0.84 mgd) submersible pumps controlled by variable frequency drives (VFDs) and a capacitance-type level sensing system. Pump speeds are automatically adjusted based on tank level. Peak hourly flows to downstream equipment are limited to 0.84 mgd by the equalization tank system. This reduces capacity requirements and provides a more constant flow rate, which improves process stability.

2.2.5 Primary Clarifiers

Two 16-foot diameter tanks with a sidewater depth of 10 feet provide primary clarification of the wastewater and the initial removal of suspended solids, BOD, and Total Kjeldahl nitrogen (TKN). Under normal operating conditions, both units are in operation.

Underflow (sludge) from the two clarifiers flows by gravity to a sludge wet well via a timer-operated automatic valve. Primary sludge is pumped from the wet well to the sludge holding tank for treatment and final disposal. Sludge is pumped out of the wet well using two float switch controlled, plunger-type pumps located in the basement of the Control Building. Under normal operating conditions, only one of the two sludge pumps operates at a time.

A deeper scum baffle was previously installed to improve operation and prevent floating material from passing under the baffle when sludge is being pumped. The primary clarifier drives were replaced by the Town in 2003.

2.2.6 RBC Distribution Box

There are eight RBCs arranged in four trains of two RBCs each, four of which were installed as part of the Priority 1 upgrade. Flow from the two existing primary clarifiers is piped to an RBC distribution box, which is equipped with five weirs of equal length and equal elevation to evenly divide the flow to each RBC train. The weirs are of equal length and elevation so the same amount of water flows over each weir. Two of the weirs direct flow to the original (1984) RBC trains, two weirs direct flow to the two newer (2006) RBCs trains, and the fifth weir is installed to support an additional train of RBCs should it be required in the future. If an RBC train must be taken out of service, an aluminum stop plate can be inserted to stop the flow to that specific train.

2.2.7 Nitrifying RBCs

The four trains of RBCs operate in parallel. Each train is equipped with two RBC shafts in series. The RBC process is an aerobic fixed-film process in which a biofilm, growing on plates of inert polyethylene media, is rotated through the wastewater. Oxygen transfer to the biofilm occurs as it is exposed to the atmosphere. Each shaft is equipped with a supplemental aeration system designed to improve performance during heavy loading conditions by enhancing sloughing and increasing dissolved oxygen in the wastewater. The biofilm removes CBOD from the wastewater by converting it to biomass that sloughs off and flows to the secondary clarifier for removal by sedimentation. The biofilm also removes ammonia from the wastewater by converting it to nitrate (nitrification). Each train is nearly equal in treatment capacity, and flow is equally distributed between trains. The water level in the RBCs is controlled by the elevation of the weirs in the downstream secondary clarifier distribution box.

Baffles are provided to separate the stages of the two RBCs in each train. The RBCs are provided with valves and interconnecting piping so a single RBC can be taken out of service. Each RBC is provided with a valved drain in the event the RBC must be drained for servicing.

2.2.8 Secondary Clarifier Distribution Box

Nitrified effluent from the four RBC trains is piped into a distribution box equipped with two equal length weirs. The purpose of the distribution box is to combine flow from the four RBC trains and equally distribute it to the two secondary clarifiers. If a secondary clarifier is taken out of service, an aluminum stop plate can be inserted and flow will not be discharged to that clarifier.

2.2.9 Final Clarifiers

Two 22-foot diameter clarifiers with a sidewater depth of 10 feet provide secondary clarification of the wastewater following RBC treatment. Wastewater flows to the clarifiers by gravity from the RBCs. In 2003, the final clarifier drives were replaced by the Town and a deeper scum baffle was installed to prevent floating material from flowing under the baffle when sludge is pumped.

2.2.10 Filter Feed Pump Station

Final clarifier effluent flows to a pump station and is then pumped to the denitrifying filter. There are two variable speed pumps with a capacity of 580 gpm each (0.84 mgd). This pump station, including pumps, check valves, and controls, was upgraded during the nitrogen removal project.

2.2.11 Denitrifying Filter (Nitrogen Removal) System

Deep bed granular media filters are used to denitrify and remove solids in the same process. After the nitrifying RBC process converts ammonia to nitrate, the nitrate-bearing wastewater is passed through a bed of granular media where an anoxic condition is maintained. A fixed-film biological process removes nitrate from the liquid. An external source of carbon (20 percent methanol) is injected into the wastewater immediately upstream of the filter to serve as a food source for the biogrowth. Since the media generates and captures solids, it must be periodically cleaned by backwashing. The solids-bearing backwash is recycled to the plant equalization tank.

Flow is from the top down through a 72-inch deep bed of coarse sand and gravel. Methanol addition is controlled by an automated system that monitors influent and effluent nitrate concentration and adjusts the methanol feed rate accordingly.

As denitrification proceeds, bubbles of nitrogen gas form in the bed. To prevent an accumulation of gas, the sand bed is periodically “bumped,” with a burst of filtered effluent provided from the clearwell by the backwash pumps.

As solids accumulate in the bed, the pressure drop increases. The filter goes through a backwash cycle based on a preset time interval or when the pressure drop increases to a predetermined setpoint. Filtered water is forced upward through the sand bed by backwash pumps. The solids-laden backwash water is discharged to a “mudwell.” Utilizing a mudwell dampens variation in flow associated with intermittent backwash cycles. Backwash volumes are typically less than 3 percent of forward flow. Backwash water is collected in a mudwell and returned by gravity or by pumping to the equalization tank.

The existing denitrification filter system consists of three filter/reactor cells, a mudwell, a clearwell, a methanol storage and feed system, and auxiliary process equipment. Major components of the

auxiliary equipment include two methanol feed pumps, two sample pumps, two backwash pumps, two mudwell pumps, two positive displacement-type blowers, an on-line chemical analyzer, piping, valves, instrumentation, and electrical equipment required to support their operation.

The filter, mudwell, and clearwell are combined into a single concrete structure. This approach minimizes the overall footprint, the quantity of concrete, and the formwork required for construction. This structure covers a 53-foot by 25-foot area. The filter height is approximately 22 feet. The filter/bioreactor consists of three 9.5-foot by 12-foot compartments, allowing for two active filters to meet design conditions and one standby for backup. Normally all three cells are maintained in operation. This is necessary to maintain the standby unit in a "ready" state should one of the three cells be removed from service. All tanks are covered by flat aluminum covers to exclude debris and control insects. The covers are hinged for access and equipped with screened vents to allow for pressure equalization.

A building adjacent to the filter houses the associated process equipment (not including the methanol system) and electrical equipment. The footprint of the building is 62 feet by 18 feet. One wall is common to the filter tankage structure. The mudwell and clearwell pumps are of the submersible type and are located in their respective tanks. The clearwell pumps provide filtered water for backwashing. The mudwell receives the dirty backwash water. If the mudwell fills to elevation 388 feet, additional influent will flow through a port in the wall, then by gravity to the plant equalization tank. Thus, operation of the mudwell pumps is not required, but may be utilized to control the flow of dirty backwash to the equalization tank.

The denitrification process requires a carbon source to complete the denitrifying biologically mediated reaction. Most of the carbon content of the filter influent wastewater has been removed by preceding treatment processes, so a supplemental source must be added to the denitrification process.

Methanol has a long history of use and is well studied as a carbon supplement in denitrification processes. However, it requires special handling. Typically, methanol is supplied as a 100 percent pure liquid. At the North Castle WWTP, 20 percent methanol (80 percent water) is utilized in order to mitigate hazardous properties to some degree.

2.2.12 Cloth Filter

A cloth filter was installed in 2005 to provide polishing of the effluent prior to discharge to the Wampus River. The cloth filter now serves as a supplemental process. It may be utilized at the discretion of the operator to augment the performance of the denitrifying filter. Valving is established to allow use of the cloth filter following the denitrifying filters in the process train. When the filter is in service, it will automatically clean itself by backwashing. This generates some recycle flow to the equalization tank. The cloth filter has not been operated since startup of the denitrifying filter in early 2010.

2.2.13 Disinfection

Following denitrification/filtration, the treated wastewater flows by gravity to three individual ultraviolet light (UV) disinfection units aligned in parallel configuration (two duty, one standby). Each unit is rated for a capacity of 350 gpm.

2.2.14 Reaeration

Filtered, disinfected effluent flows to the reaeration tank. One 2,500-gallon tank is used to aerate the wastewater to obtain a minimum dissolved oxygen level of 7.0 mg/L prior to discharge to the Wampus River. During the existing maximum monthly wastewater flow of 0.43 mgd, a detention time of approximately 8.3 minutes is provided in the existing reaeration tank. At a maximum month flow of 0.50 mgd, detention time is about 7.2 minutes. Two blowers (one active, one standby) located adjacent to the tank provide air to a retrievable fine bubble diffuser grid submerged in the tank.

2.2.15 Aerated Sludge Holding Tanks

The aerated sludge holding tanks are utilized to store sludge prior to thickening. Each aerated holding tank has a capacity of about 35,000 gallons. A blower and diffusers provide air for the tanks. The air is provided to prevent septic conditions and provide a degree of aerobic treatment. The tank is vented to an odor control system that utilizes an activated carbon bed. Approximately 30,000 gallons of dilute sludge are discharged to the sludge holding tanks per week.

Sludge is removed from the primary and secondary clarifiers when timers open a valve that allows sludge to flow into the sludge well. Sludge is then pumped to one of the sludge holding tanks. Sludge from the primary and secondary clarifiers is pumped directly to one sludge holding tank, where the two sludges are mixed together. Over a period of two to four days, the designated active tank fills. A level probe is provided in each tank with indication in the thickener room. The probes allow the operators to track the level of sludge in each tank and plan when thickening should occur. A level alarm is provided which includes a local light and audible alarm. The tanks are equipped with a decanter that directs supernatant to the equalization tank. Operation of the rotary drum thickener has reduced the volume of decanted liquid and eliminated recycle of solids from the holding tank.

Sludge is pumped directly from the aerated holding tank to the rotary drum thickener using one of the thickener feed pumps. A VFD is provided on the thickener feed pumps to maintain a constant flow. Since the pumps draw from a tank where the level can vary by 10 feet, changes in tank level can change the pump output. To compensate for this variation, the pump speed is adjusted with a variable speed drive to maintain a 50 gpm feed rate to the rotary drum thickener. A constant flow to the rotary drum thickener provides more effective dewatering and optimizes polymer dosing.

2.2.16 Rotary Drum Thickener

A rotary drum thickener removes water from the sludge and reduces hauling costs. Polymer is injected into the sludge upstream of the rotary drum thickener to aid in the separation of water during the thickening process. After polymer is added, sludge flows into the flocculation tank of the rotary drum thickener, where a mixer blends the polymer and sludge and initiates the water separation process.

From the flocculation tank, the polymer/sludge mixture flows into the rotary drum thickener. As the sludge moves through the thickener, free water passes through the stainless steel mesh of the thickener drum and sludge solids are retained inside the drum. Thickened sludge then drops into a discharge chute and falls directly into a thickened sludge tank. An 8-inch knife gate valve is provided on the discharge chute to prevent odors within the tank from passing through the chute and into the dewatering room when the thickener is not in operation.

2.2.17 Thickened Sludge Tank

The thickened sludge tank receives sludge output from the rotary drum thickener. To help control odors, the tank is aerated and vented to an activated carbon-type odor control unit. The thickener is operated five days per week. A level probe is also provided in the thickened sludge storage tank so the depth of sludge can be monitored and the sludge truck hauling company can be scheduled to remove the sludge. A high level alarm is provided for this tank.

Air from the thickened sludge tank is withdrawn through an activated carbon-type odor control unit. A 4-inch vent is provided to allow air to flow into the thickened sludge tank from the outside when the odor control unit is operating.

2.2.18 Aerated Sludge Holding Tanks Air Blowers

Two existing blowers provide air to the sludge holding tanks and thickened sludge tank. A butterfly valve with a position indicator is provided to control the flow of air to the thickened sludge tank.

2.2.19 Addition of Archaea Microbes

The Town initiated the addition of commercially purchased Archaea microbes in March 2005 with the intent of improving nitrogen removal with the existing treatment processes and improving characteristics of the waste sludge. The plant operator has observed that overall performance of the RBCs appears to have improved following the addition of Archaea to the RBC influent. Although addition of Archaea is considered to enhance plant performance, and the practice is planned to be continued, it is not considered to be required to meet permit conditions.

2.3 WWTP Capacity

Unit capacities are calculated based on several flow characterizations including average annual, maximum month, peak day and peak hour. Mass loadings may be considered as well.

Flow is reported on a monthly average basis, and the permit limit is based on the maximum month flow. Based on recent flow data presented in Table 2-1, the WWTP is not yet utilizing full capacity. The existing capacity of each unit process is adequate for a maximum month flow of 0.50 mgd. However, the primary clarifiers and rotary drum thickener are potentially limiting.

The primary clarifiers are marginally undersized for a maximum month flow of 0.50 mgd based on the Ten-States Standards. However, this has not been observed to create operational or performance issues and is not anticipated to do so at flows up to 0.50 mgd because the primary clarifiers are followed by RBCs, secondary clarifiers, and filtration.

Since going into service, the rotary drum thickener has produced excellent results and has reduced sludge disposal costs by about $100,000 per year. It is currently operated five days per week. Additional flow may require additional hours of operation or disposing of less concentrated sludge. A higher capacity thickener unit could reduce operation time and should be evaluated.

2.4 Effluent Limits

The WWTP is currently operated under SPDES Permit No. NY0109584, with effective date March 1, 2012 and expiration date February 28, 2017. The existing permit allows the facility to treat and discharge a maximum month wastewater flow of 500,000 gpd (0.50 mgd). Table 2-2 shows the

effluent limits currently in effect. A copy of the full SPDES discharge permit is included in Appendix A.

Table 2-2 SPDES Permit Effluent Limits

Parameter	Effluent Limit		
	Type	Limit	Limit
Flow	30-day average	0.50 mgd	
$CBOD_5$	Daily maximum	5.0 mg/L	21 lbs/day
Solids, settleable	Daily maximum	0.1 ml/L	
Solids, total suspended	Daily maximum	10.0 mg/L	42 lbs/day
pH	Range	6.5 – 8.5 SU	
Total ammonia (summer)	Daily maximum	1.18 mg/L	
Total ammonia (winter)	Daily maximum	2.20 mg/L	
Total nitrogen	12-mra		13 lbs/day(1)
Temperature	Daily maximum	Monitor ºF	
Dissolved oxygen	Daily minimum	7.0 mg/L	
Coliform, fecal	30-day geometric mean	200 (No./100 ml)	
Coliform, fecal	7-day geometric mean	400 No./100 ml)	
Chlorine, total residual	Daily maximum	0.1 mg/L	
Zinc, total	Daily maximum	100 µg/L	

(1) Became effective in 2014.

As discussed in Section 1, the NYSDEC issued Order on Consent No. CO3-20041207-3 to phase TN limits into the Town's effluent limits (a copy of the Order is included in Appendix B). Effluent TN is regulated as an aggregate limit. The aggregate includes discharge from the Blind Brook, Mamaroneck, New Rochelle, Port Chester, and North Castle WWTPs. The North Castle WWTP is the only plant in the aggregate that is not owned and operated by Westchester County.

The TN limit is mass-based and calculated based on a 12-month rolling average (12-mra). The monthly rolling average of effluent TN has been calculated since the startup of the nitrogen removal system. In October 2010, after the nitrogen removal system successfully passed performance testing, the NYSDEC reset the mra to the average value obtained for that month (7.2 lbs/day).

2.5 WWTP Performance and Effluent Quality

The WWTP has been operating in substantial compliance with the requirements of the existing SPDES permit. Effluent data for the period of September 2013-August 2015 was evaluated and is summarized in Table 2-3. The data compares favorably with the effluent requirements shown in Table 2-2 and in the plant SPDES permit.

Table 2-3 Recent Effluent Data

Parameter	Average Over Data Collection Period
Flow	0.36 mgd
CBOD	2.2 mg/L
Suspended solids	2.1 mg/L
Ammonia-N	0.2 mg/L
Total nitrogen	2.5 mg/L
pH (range)	6.8 to 8.1
Fecal coliform	<100/mL
Dissolved oxygen	8.3 mg/L
Zinc, total	26 µg/L

Total nitrogen is comprised of a mixture of ammonia, organic nitrogen, and inorganic nitrogen.

1. Ammonia – Ammonia nitrogen is present as ammonium ion or ammonia depending on the pH of the wastewater. Ammonia is removed from the wastewater by conversion to nitrite and nitrate in the RBC by an aerobic process known as nitrification.
2. Organic Nitrogen – Organic nitrogen is a mixture of organic nitrogen compounds, not including ammonia. Some of the organic nitrogen is converted to ammonia in the collection system and in the WWTP. A portion of the organic nitrogen is resistant to treatment and is characterized as “refractory” nitrogen. TKN represents the sum of ammonia and organic nitrogen.
3. Inorganic Nitrogen – Inorganic nitrogen is composed of nitrite and nitrate. Nitrite is an intermediate product in the oxidation of ammonia to nitrate. Nitrite is found in very low concentration because it is rapidly converted to nitrate. Nitrate is the end product of the oxidation of ammonia. It is typically not found in significant concentrations in WWTP influent. Nitrate is removed from the wastewater by an anoxic process known as denitrification, which converts it to gases. This transformation is affected by the denitrifying filter at the North Castle WWTP.

The nitrogen removal system is designed to produce an effluent TN concentration of 3.0 mg/L consisting of 1 mg/L ammonia-N, 1 mg/L inorganic-N, and 1 mg/L of organic nitrogen while operating at a flow of 0.50 mgd.

As seen in recent effluent data, ammonia concentration is less than the design basis, which indicates the ammonia removal process (RBC) is outperforming the design basis removal. Nitrate concentration is typically higher than the design basis, which indicates the nitrate removal process (denitrifying filter) has been underperforming. Effluent organic nitrogen is in alignment with the design basis.

3. Evaluation of WWTP Capacity for Increased Flow and Loading

This section presents an evaluation of the WWTP based on values for future design maximum month flows, selected by the Town, of 0.60 mgd and 0.70 mgd. The design flow value is established to accommodate the wastewater the WWTP will receive, process, and discharge. The effluent flow limit established by the WWTP SPDES permit is based on the design flow of the plant.

The existing SPDES permit limit for flow is based on a maximum monthly average. Flow is reported to the NYSDEC on a monthly basis. The total flow for each day is recorded and an average is calculated for the month. The average flow can vary from month to month, and the highest monthly average flow must remain below the permitted limit given in the SPDES permit. This method of characterizing flow is referred to as “maximum month” flow in the remainder of this report. Thus, the design basis maximum month flow is equivalent to the permitted flow.

Another method of characterizing plant flow is on an “average annual” basis. The average annual can be calculated by taking an average of the monthly flow averages for one or more years. The maximum month flow is typically greater than the average annual flow.

Flow may also be characterized on a “peak day” or “peak hour” basis. Although the SPDES permit does not directly regulate peak day or peak hour flow rate, many process units are rated based on the peak flow rate they may be required to process. Design standards for some equipment include peak flow as a parameter. Peak flow rate is also important in evaluating the hydraulic capacity of pumping equipment, pipes, and channels.

3.1 Capacity Evaluation for a Maximum Month Flow of 0.60 mgd

This section presents an evaluation of the WWTP based on a projected maximum month flow of 0.60 mgd. An evaluation based on a projected maximum month flow of 0.70 mgd is presented in Section 3.2.

3.1.1 Projected Influent Conditions Associated With 0.60 mgd Maximum Month Flow

As previously discussed, the maximum month flow for this evaluation was selected to be 0.60 mgd for planning purposes. To project the plant loading conditions associated with a 0.60 mgd maximum month flow, the existing influent concentrations for BOD, TSS, and ammonia were applied to the future projected average annual and maximum month flows. The results are presented in Table 3-1. This approach is based on the characteristics of future growth being consistent with the existing characteristics of the District.

Table 3-1 Projected Future Influent Flows and Loading Based on Maximum Month Flow of 0.60 mgd

Parameter	Projected Future Influent Flows and Loading
Influent Flow Rate	
Average annual	0.51 mgd
Maximum month (design flow)	0.60 mgd
Peak day	0.84 mgd
Peak hour	1.1 mgd
Peak flow after equalization	0.84 mgd
CBOD	
Average annual	1,000 lbs/day
Maximum month	1,400 lbs/day
TSS	
Average annual	1,000 lbs/day
Maximum month	1,600 lbs/day
Ammonia	
Average annual	82 lbs/day
Maximum month	110 lbs/day

3.1.2 Effluent Requirements Associated With 0.60 mgd Maximum Month Permitted Flow

Based on a 2013 meeting with the Town, the NYSDEC has expressed a willingness to modify the WWTP SPDES permit to allow increased flow and the associated increased loading of all existing parameters with the exception of TN. The existing SPDES permit includes a mass-based limit for TN of 13 lbs/day. NYSDEC has indicated the mass-based TN limit would not be increased. At a greater flow, the associated TN concentration must be lower in order to maintain an equivalent mass loading. TN is reported monthly, and the effluent limit is based on a 12-mra. Thus, design basis capacity calculations for TN may be based on average annual flow.The mass-based limit for CBOD and TSS would need to be increased from 21 and 42 lbs/day, to 25 and 50 lbs/day, respectively. The associated concentration limits (5.0 and 10.0 mg/L, respectively) would remain the same as currently regulated by the existing permit. Other parameters regulated by the existing permit are not currently limited on a mass basis and, based on input from the NYSDEC, this would likely remain as is.

3.1.3 Capacity of Existing Process Units

Table 3-2 compares the existing capacity of WWTP unit processes to the capacity that would be required for the projected future conditions associated with a maximum month flow of 0.60 mgd. Based on the data in the table, most processes appear to be adequate for a maximum month flow of 0.60 mgd. However, the following processes are further evaluated.

Flow Equalization

The flow equalization system limits the peak flow to downstream processes by receiving and storing wastewater from preliminary treatment and pumping it at a controlled flow rate to the primary clarifiers. The capacity of each downstream treatment process is evaluated based on the output of the equalization pumps.

Table 3-2 Process Unit Capacity Required For A Maximum Month Flow of 0.60 mgd

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.60 mgd Design Flow	Recommendation
Influent Pumps		1.3 mgd	1.1 mgd	No action required
Number of units	3 (2 duty, 1 standby)			
Type	Submersible			
Manufacturer	Flygt			
Model	NP 3102			
Capacity per pump	460 gpm (0.66 mgd) @ 16 feet TDH			
Motor HP	5 HP			
Drive type	Constant speed			
Channel Grinder		1.4 mgd	1.1 mgd	No action required
Number	1			
Maximum capacity	990 gpm (1.4 mgd)			
Design maximum daily flow	840 gpm (1.2 mgd)			
Maximum head drop	10 inches			
Continuous torque	1,000 in-lbs			
Momentary torque	3,280 in-lbs			
Manually Cleaned Bar Screen		>1.3 mgd	1.1 mgd	No action required
Spacing between bars	1 inch			
Channel width	12 inches			
Flow Equalization Facility		0.84 mgd	0.84 mgd	No action required
Flow Equalization Tank				
Diameter	36 feet			
Sidewater depth	18 feet			
Volume	137,000 gallons			
Required dissolved oxygen level	1 to 2 mg/L			
Equalization Pump Station				
Number of units	2			
Manufacturer	Flygt			
Model	NP 3102			
Type	Submersible			
Drive	Variable speed			
Motor HP	5 HP			
Capacity (each)	350 gpm (0.50 mgd) @ 21 feet TDH			

Table 3-2 **(continued)**

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.60 mgd Design Flow	Recommendation
Flow Equalization Facility (cont.) Equalization Basin Blowers Number Inlet capacity Discharge pressure Brake HP Mixing Equalization Bypass Pump Number Motor HP Capacity Equalization Tank Odor Control Type Air flow	 2 (1 duty, 1 standby) 155 cfm 7.0 psig 7.5 HP 2 cfm/1,000 gallons 1 3 HP 264 gpm Carbon filter 400 cfm			No action required
Primary Clarifiers Number Diameter Sidewater depth Surface area (each) Surface overflow rate @ design average flow Surface overflow rate @ design peak equalized flow	 2 16 feet 10 feet 200 SF 1,000 gpd/SF 2,000 gpd/SF	0.40 mgd average flow 0.80 mgd peak flow	0.51 mgd average flow 0.84 mgd peak flow	Construct additional primary clarifier
Rotating Biological Contactors Number of units Standard density, shafts High density, shafts Unit dimensions Diameter Length Total surface area of older units Standard density High density Total media area	 8 4 4 12 feet 20 feet 177,000 SF 239,000 SF 416,000 SF	2,100 lbs BOD/day 140 lbs ammonia/day 0.68 mgd	1,400 lbs BOD/day 110 lbs ammonia/day	No action required

Table 3-2 **(continued)**

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.60 mgd Design Flow	Recommendation
RBCs (cont.) Total surface area of newer units Standard density High density Total media area	 184,400 SF 224,800 SF 409,200 SF			No action required
Secondary Clarifiers Number of tanks Diameter Sidewater depth Surface area (total) Weir loading rate at design flow Maximum surface overflow rate @ design equalized peak	 2 22 feet 10 feet 760 SF 2,750 gpd/ft 1,200 gpd/SF	0.91 mgd	0.84 mgd	No action required
Filter Feed Pump Station Type Manufacturer Model Number of pumps Pump capacity (each) Motor HP Drive type	 Submersible Flygt NP 3127 2 (1 duty, 1 standby) 580 gpm at 21 feet TDH 7.5 HP Variable frequency	0.84 mgd	0.84 mgd	No action required
Denitrifying Filters Number of filters Type Filter area (each) Bed depth Media volume (each) Hydraulic loading (average) Hydraulic loading (peak) Nitrate loading	 3 (2 duty, 1 active standby) Downflow 114 SF 72 inches 684 CF 3 gpm/SF 7.5 gpm/SF 87 to 112 lbs/day/1,000 CF	0.50 mgd average 1.23 mgd peak	0.53 mgd average 0.84 mgd peak	Construct one additional filter cell
Cloth Filter Filter area Filter hydraulic loading Average Maximum	 108 SF 3.0 gpm/SF 6.0 gpm/SF	0.47 mgd average flow 0.93 mgd peak flow	0.53 mgd average flow 0.84 mgd peak flow	No action required; used as a supplemental treatment process only

Table 3-2 **(continued)**

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.60 mgd Design Flow	Recommendation
Ultraviolet Disinfection System		1.0 mgd	0.84 mgd	No action required
Number of units	3 (2 duty, 1 standby)			
Flow capacity	350 gpm each (0.50 mgd)			
Lamps (total)	40			
Reaeration System		0.84 mgd peak flow	0.84 mgd peak flow	No action required
Tank volume	2,500 gallons			
Blowers				
Number of units	2 (1 duty, 1 standby)			
Capacity	65 cfm at 5 psi			
Motor power	3 HP			
Aerated Sludge Holding Tank		N/A	N/A	No action required
Number of tanks	2			
Type	Concrete, rectangular			
Type of oxygen transfer	Diffused air			
Dimensions	20 feet by 20 feet by 12 feet each			
Volume	9,600 CF total (71,800 gallons)			
Air required	288 cfm to meet 30 cfm/1,000 CF			
Thickener Feed Pumps		50 gpm	50 gpm	Upgrade to reduce operating time
Type	Vertical centrifugal			
Number	2 (1 duty, 1 standby)			
Operating point	50 gpm @ 15 feet TDH			
Pump speed	1,700 rpm			
Rated motor HP	3			
Sludge Thickener		50 gpm	50 gpm	Upgrade to reduce operating time
Type	Rotary drum			
Feed solids	0.5 to 1.0 percent			
Hydraulic throughput	50 gpm			
Solids throughput	250 lb D.S./hr			
Thickened sludge	5.8 to 7.0 percent			
Polymer usage	6 to 8 lbs/ton TDS			

Table 3-2 **(continued)**

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.60 mgd Design Flow	Recommendation
Thickened Sludge Holding Tank		N/A	N/A	No action required
Number	1			
Dimensions				
Length	20 feet			
Width	10 feet			
Liquid depth	9 feet			
Storage capacity	1,800 CF (13,500 gallons)			
Air required	54 cfm to meet 30 cfm/1,000 CF			
Sludge Holding Tank Blowers		N/A	N/A	No action required
Type	Positive displacement			
Number	2			
Inlet air flow	500 cfm			
Aeration capacity	52 cfm/1,000 CF			
Discharge pressure	6.5 psig			
Brake HP	19 HP			
Thickener Building Odor Control System		N/A	N/A	No action required
Type	Carbon filter			
Air flow	600 cfm			
Carbon	1,125 lbs			

Flow Equalization (continued)

The existing duplex pump station is rated for 0.84 mgd (583 gpm) at 21 feet total dynamic head (TDH), based on one duty pump and one in standby. Should the influent flow exceed 0.84 mgd, 137,000 gallons of storage is available in the tank.

Based on recent flow data, the peak day flow associated with a maximum month flow of 0.60 mgd is 0.84 mgd (refer to Table 3-1), which is approximately equal to the rated capacity of the existing equalization pumping. The total flow received for the projected peak day is 0.84 mgd. However, due to diurnal flow variation, there are times during the peak day when the influent flow rate will be greater than 0.84 mgd, so storage is required.

In addition to plant influent and effluent flows, in-plant recycle flows returned to the equalization tank must be considered in evaluating equalization storage and pumping capacity. In-plant recycle flows are estimated to be as high as 30,000 gpd (0.03 mgd). While this flow does not contribute to the effluent volume and is not measured or included in the reportable flow, it may take up capacity in the equalization tank.

Based on an analysis of a typical diurnal pattern, 120,000 gallons of storage is required for buffering of the diurnal peak flow on a peak day flow of 0.84 mgd. Approximately 137,000 gallons of existing storage is available to accommodate the diurnal variation on the projected peak day; therefore, the existing equalization system is adequate for a maximum monthly flow of 0.60 mgd. Operational activities that generate return flow to the equalization tank should not be conducted during the peak flow hours of a peak flow day.

Since the volume of the equalization tank will remain the same, the existing blower and odor control system is anticipated to be adequate for future conditions.

Primary Clarifiers

Ten-State Standards requires that surface overflow rates not exceed 1,000 gpd/square foot at average flows and 2,000 gpd/square foot at peak hourly flows. The capacity of the existing primary clarifiers is shown in Table 3-2. Peak flow to the primary clarifiers is limited by the equalization pump station. The existing peak pumping rate of 0.84 mgd is about 5 percent greater than the rated peak flow capacity of the existing primary clarifiers.

Although the primary clarifiers are undersized based on Ten-States Standards, no operational or performance issues have been reported and none are anticipated during conditions associated with the existing design maximum month flow of 0.50 mgd. However, performance of the primary clarifiers may decline as the maximum month flow increases to 0.60 mgd in the future. A decline in clarifier performance could increase the loading on the secondary process. Construction of an additional primary clarifier is recommended.

Nitrifying RBC

There are four trains of existing RBCs. Each RBC train is equipped with two shafts in series. The first shaft consists of two stages of standard density media and is designed to remove CBOD. The total area of the existing standard density media is 361,400 square feet. The second shaft consists of two stages of high density media and is designed to perform nitrification (conversion of ammonia to nitrate). The total area of the existing high density media is 463,800 square feet.

Based on surface area and the conditions in Table 3-1, the existing RBCs are anticipated to produce CBOD of 5.0 mg/L and ammonia at or below 1.0 mg/L at a monthly average flow of

0.60 mgd. Based on recent data, the existing RBCs produce ammonia effluent at the detection limit of 0.2 mg/L or less at the existing maximum month flow. The addition of another RBC train should produce the same or better level of performance at an average annual flow of 0.51 mgd.

Denitrifying Filter

Ammonia is converted to nitrate by the RBC process. Nitrate is subsequently removed by the denitrifying filter. In addition to removing nitrate by converting it to gas, the denitrifying filter removes particulate matter. The denitrifying filter alone does not reduce soluble ammonia or dissolved organic nitrogen concentration.

Recent operating data indicates the system has been producing an average annual nitrate-N effluent of 1.3 mg/L. Since the effluent quality has been well within the permit limit, this performance has been acceptable. However, based on computer simulations and on start-up testing results, an effluent nitrate-N concentration of 1.0 mg/L is achievable at an average annual flow of 0.50 mgd with only two of the three existing filters in operation. Some adjustment to the existing controls may be necessary to achieve this performance.

The normal practice is to maintain all three filters in operation. This provides additional nitrate removal capacity as well as an active spare unit. The filter cells have proven to be reliable. Since commissioning, it has not been necessary to remove a filter from service except during a routine backwash, which occurs for a few minutes each day.

For this evaluation, the capacity of the denitrifying filter was calculated based on the conditions in Table 3-1 and the design basis of 1.0 mg/L effluent nitrate-N. The calculation was also performed based on an effluent nitrate-N target of 0.5 mg/L. The results are shown below.

Denitrifying Filter Requirements for 0.60 mgd Maximum Month Design Flow Conditions

No. of Filters Required to Achieve 1.0 mg/L NOx-N at 0.51 mgd	No. of Filters Required to Achieve 0.5 mg/L NOx-N at 0.51 mgd	No. of Filters Required to Achieve 1.0 mg/L NOx-N at 0.60 mgd	No. of Filters Required to Achieve 0.5 mg/L NOx-N at 0.60 mgd
3	3	3	4

Based on these calculations, there is a sufficient number of existing filters to achieve 1.0 mg/L nitrate-N or less at the 0.60 mgd maximum month design condition. However, the methanol feed rate would be greater and the capacity of the existing methanol metering pumps would need to be increased. Also, the existing design basis provides an active spare filter, since only two filters are required to meet effluent requirements based on the existing design basis conditions. Since three filters are required to operate to produce 1.0 mg/L nitrate-N for a 0.60 mgd maximum month design condition, it would be necessary to construct a new additional filter cell to provide a spare filter. During most conditions, all four filters would be in operation, potentially providing a lower nitrate-N concentration.

Rotary Drum Thickener

Since being put into service, the rotary drum thickener has produced excellent results and has reduced sludge disposal costs by about $100,000 per year. It is operated five days per week for

eight hours per day at the existing influent flow rate. At a greater plant influent flow, additional hours of operation would be required or a portion of the sludge would not be thickened and a higher unit cost for disposal would be incurred. A higher capacity unit would reduce operational effort and future sludge disposal costs and is recommended.

3.1.4 Nitrogen Removal Performance at a Maximum Month Flow of 0.60 mgd

The design of the existing nitrogen removal processes is based on producing an average concentration of 3.0 mg/L TN at an average annual flow of 0.50 mgd. At the existing design maximum month flow of 0.50 mgd, the projected average annual flow is 0.43 mgd. The design basis TN average concentration of 3.0 mg/L should produce a 12-mra of 11 lbs/day TN or less. This provides a margin of 2 lbs/day to compensate for limited instances of nitrogen removal under-performance should they occur.

Based on the data in Table 3 -1 and an average TN concentration of 3.0 mg/L, the 12-mra would be 12.8 lbs/day. This would meet the limit of 13 lbs/day; however, there would be little margin to compensate for instances of nitrogen removal under-performance, should they occur.

If an average TN concentration of 2.5 mg/L TN can be achieved the resulting 12-mra would be 10.6 lbs/day, which provides more margin than the existing design.

As discussed above, the addition of capacity to the RBC and denitrifying filter can achieve 0.5 mg/L ammonia and 0.5 mg/L nitrate at the average annual flow of 0.51 mgd that is associated with a maximum month flow of 0.60 mgd. In conjunction with 1.0 mg/L of organic nitrogen, this would result in a TN concentration of 2.0 mg/L and a 12-mra of 8.5 lbs/day.

Organic nitrogen may be in a solid form (suspended) or it may be dissolved (DON). Suspended organic nitrogen may settle in the clarifiers or be removed in the filter. DON remaining after the RBC process may be considered to be “refractory” and may be conserved, remaining in the plant effluent. Recent plant operating data support the design basis of 1.0 mg/L effluent organic nitrogen.

Recent pilot testing conducted at the plant indicates that some DON can be removed by adsorption with granular activated carbon (GAC). In order to provide more margin, an additional process could be added as a “polishing” step to further reduce the concentration of TN in the effluent. Several such technologies are available as described below.

Additional Nitrogen Removal Technologies

Microfiltration

Membrane microfiltration is a proven technology in common usage in the wastewater treatment industry and can produce water for reuse. Several wastewater treatment plants equipped with microfiltration exist within the New York City watershed.

This technology is intended to remove suspended solids that are small enough to pass through conventional sedimentation or conventional filtration. This is achieved by passing the wastewater through a membrane filter media with pores on the order of 0.5 microns. Generally, particles larger than 0.5-micron will be retained on the media while water passes through. The solids must be periodically backwashed and disposed of. The membranes themselves must be periodically

cleaned with chemicals, typically sodium hydroxide, sodium hypochlorite, and citric acid. Backwash flow and chemical cleaning waste can create a significant impact on in-plant recycle flows.

The membrane filters are skid mounted with valving and instrumentation. Auxiliary support equipment including dedicated blowers, compressors, and feed pumps would be required.

Microfiltration would reduce effluent TSS to near non-detectable concentrations. The portion of nitrogen and CBOD present in an undissolved form would also be removed by microfiltration. Fully dissolved chemical species would pass through the filter and appear in the effluent.

If implemented at the North Castle WWTP, the microfiltration system would be installed between the denitrifying filter and the UV disinfection system.

Reverse Osmosis

Reverse osmosis (RO) is similar to microfiltration, except that in addition to suspended solids, it will remove many dissolved species from the wastewater as well. The “pore” size of the filter media is on a molecular scale. This produces a very high quality effluent suitable for many reuse applications. RO is commonly utilized in desalination facilities for the production of potable water from seawater. It is a mature technology, and membrane configurations and sizes are largely standardized. There is a high headloss through the process and energy is a large component of operating costs.

The material that is separated from the RO effluent is referred to as “retentate,” as it is retained by the RO membrane as water passes through. Reject rates may be as high as 30 percent depending on system design, so the volume of retentate can have a significant impact on plant operation. If RO were to be implemented at the North Castle WWTP, It may be possible to return the retentate to the existing equalization tank, but this may require improvements to the plant hydraulics. Further, refractory materials, including some organic nitrogen, would accumulate in the plant, necessitating the need for periodic purging. Due to these factors, RO is not the optimal technology for this application.

Carbon Adsorption

Carbon adsorption is another proven process that can be utilized to remove many wastewater constituents including nitrate and organic nitrogen. The North Castle WWTP currently utilizes carbon adsorption systems for odor control.

Carbon adsorption equipment would likely consist of two or more vessels charged with GAC. As wastewater passes through the carbon bed, dissolved constituents, including nitrate and organic nitrogen, sorp to the surface of the carbon and are removed from the wastewater.

As time progresses, the bed becomes depleted of available adsorption sites and must be removed from service for regeneration. Carbon regeneration is typically done off site. Removal of the spent carbon and replacement with fresh carbon is performed by a vendor at the WWTP. This approach minimizes impact to the WWTP process that could otherwise be caused by backwash flow or chemicals associated with other processes.

Carbon adsorption would not require storage or use of chemicals. Periodic backwashing with treated effluent may be required to remove solids that may accumulate in the media over time.

Ion Exchange (IX)

Ion exchange is commonly utilized in water softening and production of deionized water. It is capable of producing extremely high purity water by passing the wastewater through a bed of material, upon which salt ions are exchanged for ions in solution. The ions are removed from the solution and fixed to the IX media.

The IX media must be regenerated once it is depleted. This process involves chemicals such as acid, alkalies, or salt. After the regenerant is passed through the IX media, it must be disposed of (i.e., treated at the WWTP). Alternatively, the media can be removed and regenerated off site similar to activated carbon.

Table 3-3 lists these processes and their relative advantages and disadvantages.

Table 3-3 Relative Ranking of Technologies

Process	Impact on Operations	Cost to Construct	Cost to Operate	Constructability
Microfiltration	High	High	High	Moderate
Reverse osmosis	High	Very high	Very high	Moderate
Carbon adsorption	Low to medium	Low	Medium	Easier
Ion exchange	Medium	Medium	Medium	Easier

3.1.5 Process Selection and Implementation

Selection of an appropriate technology is based on several factors, including analysis of the plant effluent, impact on operations, available space, cost to construct and operate, and operator preferences.

As an initial test, the existing plant effluent was sampled and analyzed. Sampled effluent was split and a portion was filtered. Both filtered and unfiltered portions were tested for organic nitrogen. Most of the organic nitrogen was present in dissolved (soluble) form. This finding is consistent with the understanding that the existing denitrifying filter currently provides a high degree of filtration.

Since most of the nitrogen in the existing treated effluent is in a dissolved state, absorptive separation-based technologies (IX, GAC) are preferred over filtration-based technologies (membrane filtration). GAC has an advantage over IX in that chemical regeneration (and associated on-site chemical handling and storage) is not required. Further, the operating staff has familiarity with GAC as it is currently utilized at the facility for odor control.

Subsequent to the initial sampling and analysis, a pilot test was conducted at the WWTP over the period March 2015-August 2015. Treated effluent was passed through a column of GAC. Influent and effluent was sampled and analyzed for TN. The TN concentration was reduced through the GAC by 0.4 mg/L on average. Data from this test is included in Appendix C of this report.

3.1.6 Recommendations for WWTP Improvements to Accommodate a Maximum Month Flow of 0.60 mgd

The recommended approach to improving the WWTP for a rated capacity of 0.60 mgd maximum month flow includes:

1. Construct one additional primary clarifier.
2. Construct a carbon adsorption (GAC) process.
3. Construct one additional denitrifying filter cell.
4. Replace the existing rotary drum thickener with a larger unit.
5. Construct related building and site improvements.

3.1.7 Preliminary Opinion of Cost for WWTP Improvements to Accommodate a Maximum Month Flow of 0.60 mgd

A preliminary opinion of cost was developed for implementation of the suggested WWTP improvements and is presented in Table 3-4.

Table 3-4 Preliminary Opinion of Cost for WWTP Improvements to Accommodate a Maximum Month Flow of 0.60 mgd

Cost Component	Installed Cost (Rounded)
Primary clarifier	$350,000
Rotary drum thickener	$530,000
Piping modifications	$350,000
Plant water system	$200,000
Carbon adsorption system	$650,000
Additional denitrifying filter cell	$500,000
Building and site improvements	$500,000
Subtotal	**$3,100,000**
Electrical allowance	$650,000
Contingency	$750,000
Fiscal, legal, administrative, engineering	$650,000
PROJECT COST	**$5,200,000**

3.2 Capacity Evaluation for a Maximum Month Flow of 0.70 mgd

This section presents an evaluation of the WWTP based on a projected maximum month flow of 0.70 mgd.

3.2.1 Projected Influent Conditions Associated With 0.70 mgd Maximum Month Flow

For planning purposes, the maximum month flow for this evaluation was selected to be 0.70 mgd. To evaluate the capacity of the WWTP process units, flow must be characterized on an average annual, maximum month, peak day, and peak hour basis. These conditions were projected from existing plant data on the basis that the characteristics of future additions to the District are consistent with the characteristics of the existing wastewater.

To project the plant loading associated with a 0.70 mgd maximum month flow, the existing influent concentrations for BOD, TSS, and ammonia were applied to the future projected average annual and maximum month flows. The results are presented in Table 3-5.

Table 3-5 Projected Future Influent Flows and Loading Based on Maximum Month Flow of 0.70 mgd

Parameter	Projected Future Influent Flows and Loading
Influent Flow Rate	
Average annual	0.60 mgd
Maximum month	0.70 mgd
Peak day	0.98 mgd
Peak hour	1.28 mgd
Peak flow after equalization	0.84 mgd
CBOD	
Average annual	1,200 lbs/day
Maximum month	1,700 lbs/day
TSS	
Average annual	1,200 lbs/day
Maximum month	1,800 lbs/day
Ammonia	
Average annual	97 lbs/day
Maximum month	130 lbs/day

The SPDES permit flow limit would be based on the maximum month flow of 0.70 mgd. Due to seasonal flow variation, the maximum month flow is greater than the average annual flow.

TN is reported monthly and the SPDES permit limit for TN is based on a 12-mra. Thus, design basis capacity calculations for TN may consider the average annual flow as well as the maximum month (0.70 mgd).

3.2.2 Effluent Requirements Associated With 0.70 mgd Maximum Month Permitted Flow

Based on a 2013 meeting with the Town, the NYSDEC has expressed a willingness to modify the WWTP SPDES permit to allow increased flow as well as the associated increased loading of all existing parameters with the exception of TN. NYSDEC has indicated the existing mass-based TN limit of 13 lbs/day would not be increased. At a greater flow, the associated TN concentration must be lower in order to maintain an equivalent mass loading.

The mass-based limit for CBOD and TSS would need to be increased from 21 and 42 lbs/day, to 29 and 59 lbs/day, respectively. The associated concentration limits (5.0 and 10.0 mg/L, respectively) would remain the same as currently regulated by the existing permit. Other parameters regulated by the existing permit are not currently limited on a mass basis, and this would likely remain as is based on input from the NYSDEC.

3.2.3 Capacity of Existing Process Units

Table 3-6 compares the existing capacity of WWTP unit processes to the capacity that would be required for the projected future conditions associated with a maximum month flow of 0.70 mgd. Based on the data in Table 3-6, the influent pumping and preliminary treatment processes are anticipated to be adequate for a maximum month flow of 0.70 mgd. However, peak flows associated with this maximum month flow exceed the existing capacity of some plant processes downstream of the equalization tank.

Table 3-6 Process Unit Capacity Required For A Maximum Month Flow of 0.70 mgd

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.70 mgd Design Flow	Recommendation
Influent Pumps		1.3 mgd	1.3 mgd	No action required
Number of units	3 (2 duty, 1 standby)			
Type	Submersible			
Manufacturer	Flygt			
Model	NP 3102			
Capacity per pump	460 gpm (0.66 mgd) @ 16 feet TDH			
Motor HP	5 HP			
Drive type	Constant speed			
Channel Grinder		1.4 mgd	1.3 mgd	No action required
Number	1			
Maximum capacity	990 gpm (1.4 mgd)			
Design maximum daily flow	840 gpm (1.2 mgd)			
Maximum head drop	10 inches			
Continuous torque	1,000 in-lbs			
Momentary torque	3,280 in-lbs			
Manually Cleaned Bar Screen		>1.3 mgd	1.3 mgd	No action required
Spacing between bars	1 inch			
Channel width	12 inches			
Flow Equalization Facility		0.84 mgd	0.84 mgd	Construct additional storage (40,000 gallons)
Flow Equalization Tank				
Diameter	36 feet			
Sidewater depth	18 feet			
Volume	137,000 gallons			
Required dissolved oxygen level	1 to 2 mg/L			
Equalization Pump Station				
Number of units	2			
Manufacturer	Flygt			
Model	NP 3102			
Type	Submersible			
Drive	Variable speed			
Motor HP	5 HP			
Capacity (each)	350 gpm (0.50 mgd) @ 21 feet TDH			

Table 3-6 **(continued)**

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.70 mgd Design Flow	Recommendation
Flow Equalization Facility (cont.) Equalization Basin Blowers Number Inlet capacity Discharge pressure Brake HP Mixing Equalization Bypass Pump Number Motor HP Capacity Equalization Tank Odor Control Type Air flow	 2 (1 duty, 1 standby) 155 cfm 7.0 psig 7.5 HP 2 cfm/1,000 gallons 1 3 HP 264 gpm Carbon filter 400 cfm			No action required
Primary Clarifiers Number Diameter Sidewater depth Surface area (each) Surface overflow rate @ design average flow Surface overflow rate @ design peak equalized flow	 2 16 feet 10 feet 200 SF 1,000 gpd/SF 2,000 gpd/SF	0.40 mgd average flow 0.80 mgd peak flow	0.60 mgd average flow 0.84 mgd peak flow	Construct additional primary clarifier
Rotating Biological Contactors Number of units Standard density, stages High density, stages Unit dimensions Diameter Length Total surface area of older units Standard density High density Total media area	 8 4 4 12 feet 20 feet 177,000 SF 239,000 SF 416,000 SF	2,170 lbs BOD/day 140 lbs ammonia/day	1,700 lbs BOD/day 130 lbs ammonia/day	Construct additional RBC train

Table 3-6 **(continued)**

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.70 mgd Design Flow	Recommendation
RBCs (cont.) Total surface area of newer units Standard density High density Total media area	 184,400 SF 224,800 SF 409,200 SF			No action required
Secondary Clarifiers Number of tanks Diameter Sidewater depth Surface area (total) Weir loading rate at design flow Maximum surface overflow rate @ design equalized peak	 2 22 feet 10 feet 760 SF 2,750 gpd/ft 1,200 gpd/SF	0.91 mgd	0.84 mgd	No action required
Filter Feed Pump Station Type Manufacturer Model Number of pumps Pump capacity (each) Motor HP Drive type	 Submersible Flygt NP 3127 2 (1 duty, 1 standby) 580 gpm at 21 feet TDH 7.5 HP Variable frequency	0.84 mgd	0.84 mgd	No action required
Denitrifying Filters Number of filters Type Filter area (each) Bed depth Media volume (each) Hydraulic loading (average) Hydraulic loading (peak) Nitrate loading	 3 (2 duty, 1 active standby) Downflow 114 SF 72 inches 684 CF 3 gpm/SF 7.5 gpm/SF 87 to 112 lbs/day/1,000 CF	0.50 mgd average 1.23 mgd peak	0.60 mgd average 0.84 mgd peak	Construct additional filter cell
Cloth Filter Filter area Filter hydraulic loading Average Maximum	 108 SF 3.0 gpm/SF 6.0 gpm/SF	0.47 mgd average flow 0.93 mgd peak flow	0.60 mgd average flow 0.84 mgd peak flow	No action required; supplemental process only

Table 3-6 **(continued)**

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.70 mgd Design Flow	Recommendation
Ultraviolet Disinfection System		1.0 mgd	0.84 mgd	No action required
Number of units	3 (2 duty, 1 standby)			
Flow capacity	350 gpm each (0.50 mgd)			
Lamps (total)	40			
Reaeration System		0.84 peak flow	0.84 peak flow	No action required
Tank volume	2,500 gallons			
Blowers				
Number of units	2 (1 duty, 1 standby)			
Capacity	65 cfm at 5 psi			
Motor power	3 HP			
Aerated Sludge Holding Tank		N/A	N/A	No action required
Number of tanks	2			
Type	Concrete, rectangular			
Type of oxygen transfer	Diffused air			
Dimensions	20 feet by 20 feet by 12 feet each			
Volume	9,600 CF total (71,800 gallons)			
Air required	288 cfm to meet 30 cfm/1,000 CF			
Thickener Feed Pumps		50 gpm	50 gpm	Upgrade to reduce operating time
Type	Vertical centrifugal			
Number	2 (1 duty, 1 standby)			
Operating point	50 gpm @ 15 feet TDH			
Pump speed	1,700 rpm			
Rated motor HP	3			
Sludge Thickener		50 gpm	50 gpm	Upgrade to reduce operating time
Type	Rotary drum			
Feed solids	0.5 to 1.0 percent			
Hydraulic throughput	50 gpm			
Solids throughput	250 lb D.S./hr			
Thickened sludge	5.8 to 7.0 percent			
Polymer usage	6 to 8 lbs/ton TDS			

Table 3-6 **(continued)**

Wastewater Treatment Facilities	Design Information	Existing Capacity	Capacity Requirement at 0.70 mgd Design Flow	Recommendation
Thickened Sludge Holding Tank		N/A	N/A	No action required
Number	1			
Dimensions				
Length	20 feet			
Width	10 feet			
Liquid depth	9 feet			
Storage capacity	1,800 CF (13,500 gallons)			
Air required	54 cfm to meet 30 cfm/1,000 CF			
Sludge Holding Tank Blowers		N/A	N/A	No action required
Type	Positive displacement			
Number	2			
Inlet air flow	500 cfm			
Aeration capacity	52 cfm/1,000 CF			
Discharge pressure	6.5 psig			
Brake HP	19 HP			
Thickener Building Odor Control System		N/A	N/A	No action required
Type	Carbon filter			
Air flow	600 cfm			
Carbon	1,125 lbs			

Flow Equalization

The existing process equipment located downstream of the equalization tank is designed for a peak flow of 0.84 mgd, as this is the maximum flow rate of the existing equalization pumping system. However, the existing equalization storage volume of 137,000 gallons is not sufficient to buffer the projected peak day flow (shown in Table 3-5) to 0.84 mgd. To accommodate the peak day flow volume that is projected when the maximum month flow is 0.70 mgd, it is necessary to increase the volume of the equalization storage tank so influent peaks can be buffered to 0.84 mgd.

The equalization system is intended to reduce peak flow to the downstream processes by temporarily storing wastewater and pumping to the primary clarifiers at a controlled rate. The existing storage volume is about 137,000 gallons. Additional storage of at least 30,000 gallons is required so as to not exceed the capacity of the downstream processes.

Space is available adjacent to the existing equalization tank (Figure 3-1) where additional tankage could be constructed. The new storage tank would be approximately 20 feet in diameter and 18 feet deep. This additional storage volume of about 40,000 gallons would increase the equalization capacity such that peak flows associated with a maximum month of 0.70 mgd could be buffered such that flow to downstream processes would not exceed 0.84 mgd. This approach would eliminate the need to increase the peak capacity of the equalization pump station and processes downstream of the equalization tank. Limitations associated with average flow rates and increased loading would still need to be addressed. This includes the primary clarifiers, the rotary drum thickener, and nitrogen removal systems.

Primary Clarifiers

As previously discussed, the performance of the primary clarifiers may decline as the maximum month flow increases to 0.70 mgd, possibly increasing the loading on the secondary process. Construction of an additional primary clarifier is recommended.

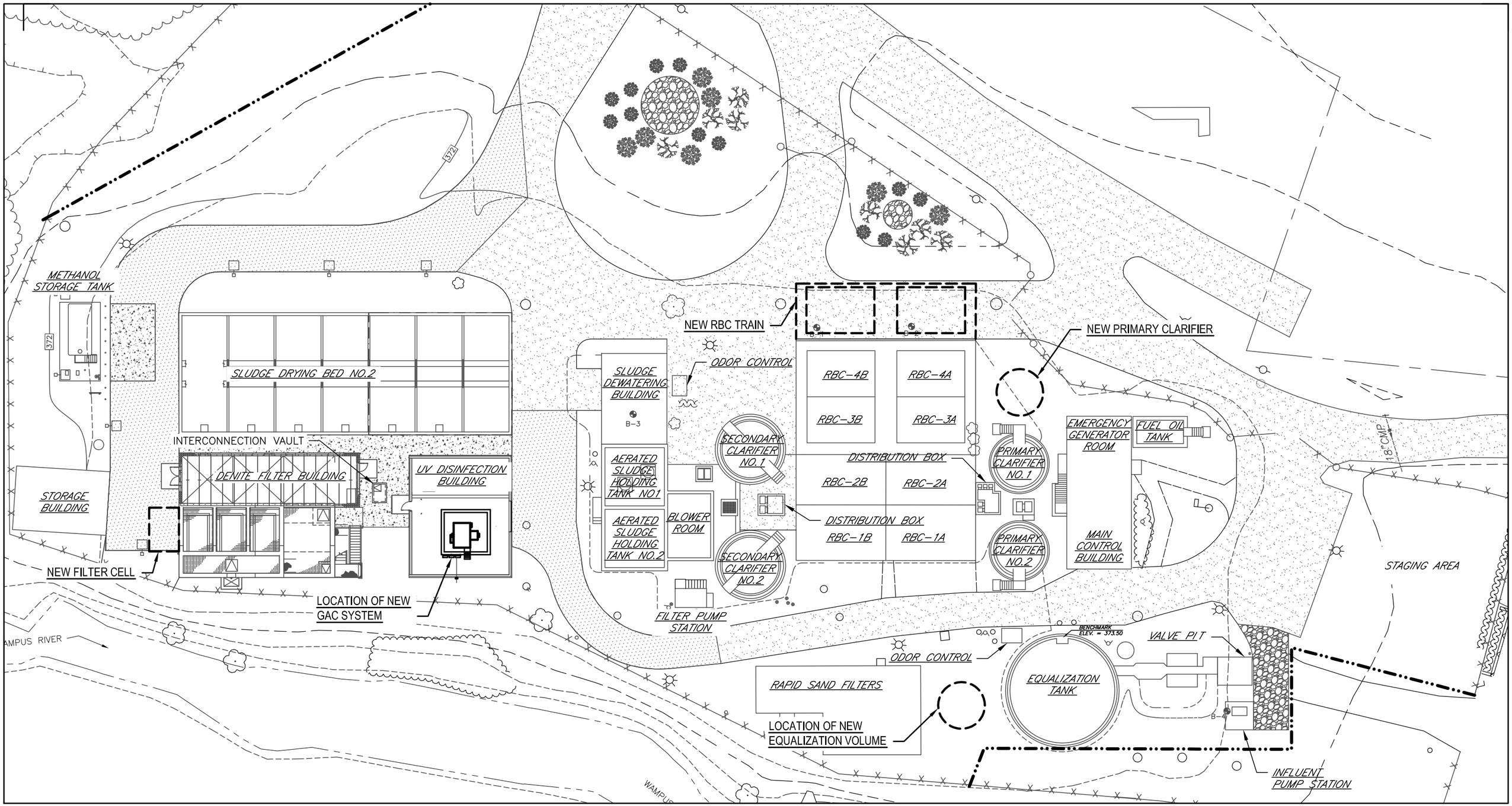
Nitrifying RBC

Based on surface area and the conditions in Table 3-5, the existing RBCs are anticipated to have the capacity to produce CBOD of 5.0 mg/L and ammonia at or below 1.0 mg/L at an average annual flow of 0.60 mgd .

Based on recent data, the existing RBCs produce ammonia effluent at the detection limit of 0.2 mg/L or less at the existing maximum month flow. By linear extrapolation, the addition of two RBC trains should produce the same or better level of performance as the four existing trains at an average annual flow of 0.60 mgd. The addition of three RBC trains should produce the same or better level of performance as the existing four trains at an average annual flow of 0.70 mgd.

Denitrifying Filter

For this evaluation, the capacity of the denitrifying filter was calculated based on the conditions in Table 3-5 and the existing effluent basis of 1.0 mg/L nitrate-N. The calculation was also performed based on an effluent nitrate-N target of 0.5 mg/L. The results are shown below.



TOWN OF NORTH CASTLE, NEW YORK

Job Number 37-11093
Revision A
Date 11/15

POTENTIAL LOCATION PLAN FOR ADDITIONAL PROCESS UNITS

Figure 3-1

One Remington Park Drive, Cazenovia NY 13035 USA **T** 1 315 679 5800 **F** 1 315 679 5801 **E** cazmail@ghd.com **W** www.ghd.com

Plot Date: 28 January 2016 - 2:14 PM Cad File No: G:\37\11093\CADD\Drawings\61202G03_NEWSITE.DWG

Denitrifying Filter Requirements for 0.70 mgd Maximum Month Design Flow Conditions

No. of Filters Required to Achieve 1.0 mg/L NOx-N at 0.60 mgd	No. of Filters Required to Achieve 0.5 mg/L NOx-N at 0.60 mgd	No. of Filters Required to Achieve 1.0 mg/L NOx-N at 0.70 mgd	No. of Filters Required to Achieve 0.5 mg/L NOx-N at 0.70 mgd
4	4	4	5

Based on these calculations, there are not enough existing filters to achieve 1.0 mg/L nitrate-N or less at the 0.70 mgd maximum month design condition. Also, the existing design basis provides an active spare filter, since only two filters are required to meet effluent requirements based on the existing design basis conditions. Since four filters are required to operate to produce 1.0 mg/L nitrate-N for a 0.70 mgd maximum month design condition, it would be necessary to construct two new additional filter cells (total of five) to provide a spare filter. In addition, the methanol feed rate would be greater and the capacity of the existing methanol metering pumps would need to be increased. During most conditions, the spare filter would be in operation, potentially providing a lower nitrate-N concentration

Rotary Drum Thickener

At a greater plant influent flow, additional hours of operation would be required or a portion of the sludge would not be thickened and a higher unit cost for disposal would be incurred. A higher capacity unit would reduce operational effort and future sludge disposal costs and is recommended.

3.2.4 Nitrogen Removal Performance at 0.70 mgd

Based on the data in Table 3-5, and an average TN concentration of 3.0 mg/L, the 12-mra would be 15 lbs/day. This would not meet the limit of 13 lbs/day.

If an average TN concentration of 2.5 mg/L can be achieved, the resulting 12-mra would be 12.5 lbs/day, providing a margin of 0.5 lbs/day, which is within the 13 lbs/day limit but with less margin than the existing design provides.

As discussed above, the addition of capacity to the RBC and denitrifying filter can achieve 0.5 mg/L ammonia and 0.5 mg/L. In conjunction with 1.0 mg/L of organic nitrogen, this would result in a TN design concentration of 2.0 mg/L for a 12-mra of 10.0 lbs/day TN.

3.2.5 Additional Nitrogen Removal

An average annual ammonia concentration of 1.0 or less can be achieved at a maximum month flow of 0.70 mgd if additional RBC capacity is provided. An average annual nitrate concentration of 1.0 mg/L or less can be achieved at a maximum month flow of 0.70 mgd if an additional denitrifying filter cell is provided and all four cells are operated. A fifth cell would be necessary to provide a spare.

Lower TN concentrations may be achievable with the addition of a new GAC adsorption process to act as a “polishing” step to further remove TN from the effluent. If the effluent TN is reduced to 2.5 mg/L, the 12-mra for a maximum month flow of 0.70 mgd would be 12.5 lbs/day. This would meet the permit limit of 13 lbs/day.

Additional capacity in the RBC and denitrifying filter processes could produce an average TN concentration of 2.5 mg/L which would meet the limit of 13 lbs/day on a 12-mra basis.

3.2.6 Recommendations for WWTP Improvements to Accommodate a Maximum Month Flow of 0.70 mgd

The recommended approach to improving the WWTP for a rated capacity of 0.70 mgd maximum month flow basis includes:

1. Construct additional equalization volume.
2. Construct one additional primary clarifier.
3. Construct one additional RBC train.
4. Construct two additional denitrifying filters.
5. Construct a carbon adsorption (GAC) process.
6. Replace the existing rotary drum thickener with a larger unit.
7. Construct related building and site improvements.

3.2.7 Preliminary Opinion of Cost for WWTP Improvements to Accommodate a Maximum Month Flow of 0.70 mgd

A preliminary opinion of cost was developed for implementation of the suggested WWTP improvements and is presented in Table 3-7.

Table 3-7 Preliminary Opinion of Cost for WWTP Improvements to Accommodate a Maximum Month Flow of 0.70 mgd

Cost Component	Installed Cost (Rounded)
Equalization	$300,000
Primary clarifier	$350,000
Nitrifying RBC train	$500,000
Denitrifying filter (2 new cells)	$900,000
Rotary drum thickener	$530,000
Piping modifications	$350,000
Plant water system	$200,000
Carbon adsorption (GAC)	$850,000
Building and site improvements	$1,000,000
Subtotal	**$5,000,000**
Electrical allowance	$1,500,000
Contingency	$1,200,000
Fiscal, legal, administrative, engineering	$1,200,000
PROJECT COST	**$9,000,000**

3.3 Additional Needs Associated with a WWTP Capacity Increase

3.3.1 Age and Condition-Related Improvements

Sections 3.1 and 3.2 discuss the design basis capacity ratings of plant equipment and outline the minimum improvements required for the evaluated capacity increases. In addition to these capital improvements, age and condition-related improvements to plant equipment and assets are required. Some identified areas include the following:

Plant Water System

The WWTP currently utilizes water from North Castle Water District No. 4 for in-plant use, which is estimated to be 3,000 to 4,000 gpd. Most of this usage is associated with the sludge thickening operation. Implementation of a plant water system that reuses treated effluent water would reduce the demand for public water supply. This would save costs by eliminating potable water demand by the WWTP and increase the available supply for off-site potable demand.

Site Lighting

Improvements to site lighting are recommended.

Existing UV Disinfection Building

The existing UV Disinfection Building, which is a converted greenhouse, is unheated and uninsulated. During the winter of 2013, snow load created a significant hole in the roof. If this building is to continue to be utilized as a process building, it should be converted to a permanent heated and insulated building in compliance with applicable codes.

Existing RBC Building[1]

Two of the existing RBC trains are housed in fiberglass covers and two are housed in an existing building from the original WWTP construction in 1984. The existing RBC Building is in poor condition and it is recommended it be demolished and fiberglass covers be placed over the RBCs similar to the newer RBC trains.

UV Disinfection System[1]

One of the three existing UV disinfection units was installed during the 2009 improvement project. The two other units, although still operating, have been in service for over 20 years and have reached the end of their useful life. It is recommended they be replaced.

Existing Clarifier Scum Boxes[1]

The existing primary and secondary clarifiers are equipped with scum collection equipment. Some of this equipment has reached the end of its useful life and should be replaced.

Odor Control Systems[1]

The existing odor control systems are approaching the end of their service life and are in need of improvement.

[1]Costs for these items are not included in Tables 3-4 and 3-7.

Existing Sludge Holding Tank Blowers[1]

The existing sludge holding tank blowers are approaching the end of their service life and are in need of improvement.

Administrative Office[1]

The existing administrative office is a trailer that was placed during construction of the WWTP in 1984. It was intended as a temporary building. It is recommended that a new, permanent Administration Building be constructed.

3.3.2 Operation and Maintenance Costs

As maximum month flow increases, WWTP operation and maintenance costs can also be anticipated to increase. This includes cost components for labor, electricity, solids disposal, chemical costs, laboratory fees. and administrative costs. If operation and maintenance costs are estimated as being proportional to plant flow, these costs can be anticipated to increase by 20 to 40 percent.

3.3.3 Staffing

Current regulations require a Grade 2 licensed Chief Operator and Grade 1 Assistant/Shift Operator based on the NYSDEC scoring system that considers the capacity and complexity of a WWTP. The proposed improvements are not anticipated to change this requirement. The minimum qualification would remain the same for a maximum month flow of both 0.60 mgd and 0.70 mgd. However, it is recommended that a licensed Grade 2 Chief Operator or Grade 1 Assistant Operator be dedicated to the WWTP on a full-time basis.

Appendices

Appendix A - SPDES Permit

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

Industrial Code:	4952	SPDES Number:	**NY 010 9584**
Discharge Class (CL):	07	DEC Number:	**3-5538-00066/00001**
Toxic Class (TX):	N	Effective Date (EDP):	**March 1, 2012**
Major Drainage Basin:	17	Expiration Date (ExDP):	**February 28, 2017**
Sub Drainage Basin:	02	Modification Dates:(EDPM)	
Water Index Number:	LIS-13-11		
Compact Area:	IEC		

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name: Town of North Castle
Attention: Supervisor and Town Board
Street: 15 Bedford Road
City: Armonk
State: NY
Zip Code: 10504

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: North Castle Sewer District #2
Location (C,T,V): North Castle (T)
County: Westchester
Facility Address: 15 Business Park Drive
City: Armonk
State: NY
Zip Code: 10504
NYTM -E:
NYTM - N:
From Outfall No.: 001 at Latitude: 41 ° 07 ' 12 '' & Longitude: 73 ° 42 ' 40 ''
into receiving waters known as: Wampus River
Class: C
and; (list other Outfalls, Receiving Waters & Water Classifications)

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1.2(a) and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: Town of North Castle Sewer District
Street: 15 Business Park Drive
City: Armonk
State: NY
Zip Code: 10504
Responsible Official or Agent: Sal Misiti, Superintendent
Phone: (917) 273-1882

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:

C.O. BWP – Permit Coordinator
RWE/RPA
EPA Region II - Michelle Josilo
NYSEFC
Westchester Co. Health Dept.
IEC

Permit Administrator: Kent P. Sanders	
Address: 625 Broadway Albany, NY 12233-1750	
Signature: Kent P. Sanders	Date: 2/2/2012

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.		

PARA-METER	EFFLUENT LIMIT	MINIMUM LEVEL (ML)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based limits, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the analytical method specified in the permit shall be used to monitor the amount of the pollutant in the outfall to this level, provided that the laboratory analyst has complied with the specified quality assurance/quality control procedures in the relevant method. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This ML can be neither lowered nor raised without a modification of this permit.	Action Levels are monitoring requirements, as defined below in Note 2, that trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, Temperature, concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Note 1: DAILY DISCHARGE.: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day.

DAILY MAX.: The highest allowable daily discharge. DAILY MIN.: The lowest allowable daily discharge.

MONTHLY AVG: The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week.

30 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of : the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

7 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar week.

RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown.

Note 2: ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL No.	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	[X] All Year [ ] Seasonally from __ to	Wampus River	EDPM	ExDP

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Influent	Effluent	
Flow	Monthly avg.	0.50	MGD			Continuous	Recorder	X		
$CBOD_5$	Daily Max.	5.0	mg/l	21	lbs/d	1/Month	6 hr. comp.	X	X	(1)
Solids, Settleable	Daily Max.	0.1	ml/l			1/Day	Grab		X	
Solids, Total Suspended	Daily Max.	10.0	mg/l	42	lbs/d	1/Month	6 hr. comp.	X	X	(1)
pH	Range	6.5 – 8.5	SU			1/Day	Grab		X	
Total Ammonia (summer)	Daily Max.	1.18	mg/l			1/Month	6 hr. comp.		X	(2)
Total Ammonia (winter)	Daily Max.	2.20	mg/l			1/Month	6 hr. comp.		X	(3)
Temperature	Daily Max.	Monitor	Deg. F			1/Day	Grab		X	
Dissolved Oxygen	Daily Min.	7.0	mg/l			1/Day	Grab		X	
Effluent Disinfection required: [X] All Year [ ] Seasonal from _____ to _____										
Coliform, Fecal	30 day geometric mean	200	No./ 100 ml			1/Month	Grab		X	
Coliform, Fecal	7 day geometric mean	400	No./ 100 ml			1/Month	Grab		X	
Chlorine, Total Residual	Daily Max.	0.1	mg/l			1/Day	Grab		X	(4)
Zinc, Total	Daily Max.	100	ug/l			1/Month	Grab		X	(5)

FOOTNOTES (1) and effluent shall not exceed 15 % and 15 % of influent concentration values for CBOD5 & TSS respectively.
(2) June 1 -October 31
(3) November 1 -May 31
(4) Applicable only if chlorine is used for disinfection.
(5) This is a modified effluent limitation in accordance with 6 NYCRR Part 702.16(b)(2)

Long Island Sound Management Zone 7 - (Blind Brook, Mamaroneck, New Rochelle, Port Chester & North Castle) Water Quality Based Effluent Limits and Monitoring - Phase I

OUTFALL NUMBER	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	[X] All Year [ ] Seasonal from _____ to	Long Island Sound Study Management Zone 7	August 1, 2004	July 31, 2009

PARAMETER	ENFORCEABLE EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS				Foot Notes
	Type	Limitation	Units	Limitation	Units	Sample Frequency	Sample Type	Location Influent	Location Effluent	
Total Nitrogen (LISS Zone 7 POTW Aggregate)	12 Month Rolling Average			3463	lbs/day	1/month	calculated		X	(1)(2)(3)
Total Nitrogen (LISS Zone 7 POTW Aggregate)	Monthly average			Monitor	lbs/day	1/month	calculated		X	(2)(3)
Total Nitrogen	12 Month Rolling Average			Monitor	lbs/day	1/month	calculated		X	(1)(3)(4)(5)
Total Nitrogen	Monthly average	Monitor	mg/l	Monitor	lbs/day	1/week	calculated	X	X	(3)
Nitrogen, Ammonia (as NH_3)	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrogen, TKN (as N)	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrate (NO_3) as N	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrite (NO_2) as N	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	

See FOOTNOTES on page 8.

Long Island Sound Management Zone 7 - (Blind Brook, Mamaroneck, New Rochelle, Port Chester & North Castle) Water Quality Based Effluent Limits and Monitoring - Phase II

OUTFALL NUMBER	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	[X] All Year [ ] Seasonal from _____ to	Long Island Sound Study Management Zone 7	August 1, 2009	July 31, 2014

PARAMETER	ENFORCEABLE EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS				Foot Notes
	Type	Limitation	Units	Limitation	Units	Sample Frequency	Sample Type	Location Influent	Location Effluent	
Total Nitrogen (LISS Zone 7 POTW Aggregate)	12 Month Rolling Average			2482	lbs/day	1/month	calculated		X	(1)(2)(3)
Total Nitrogen (LISS Zone 7 POTW Aggregate)	Monthly average			Monitor	lbs/day	1/month	calculated		X	(2)(3)
Total Nitrogen	12 Month Rolling Average			Monitor	lbs/day	1/month	calculated		X	(1)(3)(4)(5)
Total Nitrogen	Monthly average	Monitor	mg/l	Monitor	lbs/day	1/week	calculated	X	X	(3)
Nitrogen, Ammonia (as NH_3)	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrogen, TKN (as N)	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrate (NO_3) as N	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrite (NO_2) as N	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	

See FOOTNOTES on page 8.

Long Island Sound Management Zone 7 - (Blind Brook, Mamaroneck, New Rochelle, Port Chester & North Castle) Water Quality Based Effluent Limits and Monitoring - Phase III

OUTFALL NUMBER	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE
001	[X] All Year [ ] Seasonal from _____ to	Long Island Sound Study Management Zone 7	August 1, 2014

PARAMETER	ENFORCEABLE EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS				Foot Notes
	Type	Limitation	Units	Limitation	Units	Sample Frequency	Sample Type	Location Influent	Location Effluent	
Total Nitrogen (LISS Zone 7 POTW Aggregate)	12 Month Rolling Average			1780	lbs/day	1/month	calculated		X	(1)(2)(3)
Total Nitrogen (LISS Zone 7 POTW Aggregate)	Monthly average			Monitor	lbs/day	1/month	calculated		X	(2)(3)
Total Nitrogen	12 Month Rolling Average			Monitor	lbs/day	1/month	calculated		X	(1)(3)(4)(5)
Total Nitrogen	Monthly average	Monitor	mg/l	Monitor	lbs/day	1/week	calculated	X	X	(3)
Nitrogen, Ammonia (as NH_3)	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrogen, TKN (as N)	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrate (NO_3) as N	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	
Nitrite (NO_2) as N	Monthly average	Monitor	mg/l			1/week	24 hour composite	X	X	

See FOOTNOTES on page 8.

FOOTNOTES FOR LONG ISLAND SOUND WATER QUALITY BASED EFFLUENT LIMITS AND MONITORING

(1) The Long Island Sound Study (LISS) Management Conference has adopted *"Phase III Actions for Hypoxia Management"*. The States of New York and Connecticut have jointly established the *"Total Maximum Total Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound"* (TMDL) which was approved by the U.S. Environmental Protection Agency (EPA) on April 5, 2001. *Appendix C* of the TMDL establishes individual POTW Waste Load Allocations (WLAs) for LISS Management Zones. These WLAs will be further specified in the *"LISS Zone 7 Load Management Plan"*. The plan requires a reduction of 61% of total nitrogen from in-basin sources by August 1, 2014 (Phase III). An interim reduction of 40 percent of the 61% (24.4%) shall be accomplished by August 1, 2004 (Phase I). An interim reduction of 75 percent of the 61% (45.8%) shall be accomplished by August 1, 2009 (Phase II).

The LISS will formally review the basis for the nitrogen reduction targets no later than February, 2003. This evaluation may result in proposed modifications to the TMDL. If the TMDL is modified and approved by EPA, the Department may propose a modification to these effluent limits to reflect the WLAs in the approved modified TMDL. The permittee may request a modification to these limits to reflect the WLAs in the modified TMDL approved by EPA.

(2) LISS Management Zone 7 WPCP Aggregate - is defined as the sum of effluent discharges from the Blind Brook, Mamaroneck, New Rochelle, Port Chester and North Castle POTWs.

(3) Total Nitrogen = Total Kjeldahl Nitrogen (TKN) + Nitrite (NO_2) + Nitrate (NO_3).

(4) The Individual 12 month rolling average (12-MRA) is defined as the current monthly average value averaged with the eleven previous months for each facility in Zone 7. The individual 12-MRAs are then summed to calculate the Aggregate 12-MRA. The 12-MRA is enforced as a 30-day average limit, therefore any reported exceedance of the 12-MRA will be considered 30 days of violation. The permittees in Zone 7 shall calculate the Aggregate 12-MRA limit and the result shall be reported by each of the individual permittees on their own DMR. The permittee shall provide a copy of the portion of each of its DMRs pertaining to its individual 12-MRA value to each of the other dischargers listed above so that the aggregate 12-MRA may be calculated and reported by all of the permittees in Zone 7.

(5) If the aggregate twelve month rolling average limit for total nitrogen is exceeded, the individual waste load allocations shall be used, for purposes of compliance, to determine whether the permittee was the cause of the exceedance. The individual waste load allocations for this permittee, published in the *"Total Maximum Total Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound"*, are 25, 18, and 13 lbs/day for the periods August 1, 2004 through July 31, 2009, August 1, 2009 through July 31, 2014, and August 1, 2014 through ExDP, respectively.

DISCHARGE NOTIFICATION REQUIREMENTS

a) The permittee shall, except as set forth in (c) below, maintain the existing identification signs at all outfalls to surface waters, which have not been waived by the Department in accordance with 17-0815-a of the Environmental Conservation Law. The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address :

NYSDEC Division of Water Regional Phone: ( ) - ### -####

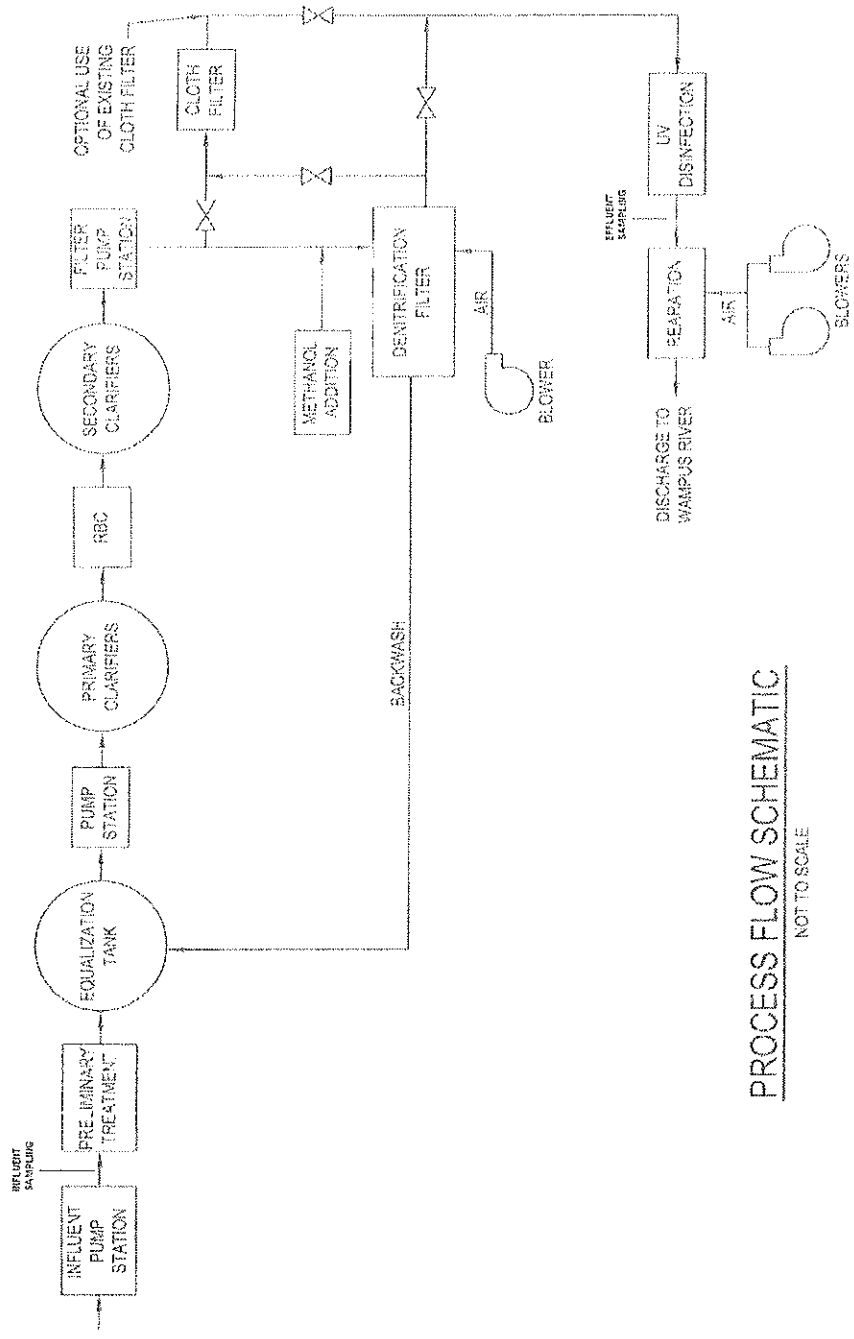
b) For each discharge required to have a sign in accordance with a), the permittee shall provide for public review at a repository accessible to the public, copies of the Discharge Monitoring Reports (DMRs) as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years.

c) If, upon November 1,1997, the permittee has installed signs that include the information required by 17-0815-a(2)(a), but do not meet the specifications listed above, the permittee may continue to use the existing signs for a period of up to five years, after which the signs shall comply with the specifications listed above.

d) The permittee shall periodically inspect the outfall identification signs in order to ensure that they are maintained, are still visible and contain information that is current and factually correct.

MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the location(s) specified below:



PROCESS FLOW SCHEMATIC

NOT TO SCALE

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

a) The permittee shall also refer to the effluent limitations and monitoring requirements page of this permit for additional information concerning monitoring and reporting requirements and conditions.

b) The monitoring information required by this permit shall be summarized, signed and retained for a period of three years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each 1 month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 each year and must summarize information for January to December of the previous year in a format acceptable to the Department.

[X] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:
[X] Regional Water Engineer and/or [X] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:

Department of Environmental Conservation
Division of Water, Bureau of Water Compliance
625 Broadway, Albany, New York 12233-3506
Phone: (518) 402-8177

Send the **first copy** (second sheet) of each DMR page to:

Department of Environmental Conservation
Regional Water Engineer, Region 3
100 Hillside Avenue, Suite 1W
White Plains, NY 10603-2860
Phone: (914) 428-2505

Send an **additional copy** of each DMR page to:

Westchester County Health Department
Bureau of Environmental Quality
145 Huguenot Street – 7th Floor
New Rochelle, NY 10801

c) Noncompliance with the provisions of this permit shall be reported to the Department as prescribed in the 6 NYCRR Part 750-1.2(a) and 750-2.

d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

e) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculations and recording of the data on the Discharge Monitoring Reports.

f) Calculation for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

g) Unless otherwise specified, all information recorded on the Discharge Monitoring Report shall be based uponmeasurements and sampling carried out during the most recently completed reporting period.

h) Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section five hundred two of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be sent to the Environmental Laboratory Accreditation Program, New York State Health Department Center for Laboratories and Research, Division of Environmental Sciences , The Nelson A. Rockefeller Empire State Plaza, Albany, New York 12201.

Fact Sheet
North Castle Sewer District #2 WWTP
SPDES Permit NY 0109584
October 25, 2011

The State Pollutant Discharge Elimination System (SPDES) Permit for the North Castle Sewer District #2 Wastewater Treatment Plant has been modified in accordance with a permittee initiated modification. The Town of North Castle submitted a July 15, 2011 request to modify the above referenced SPDES permit to increase the permitted average design flow of the treatment plant from 0.45 MGD to 0.50 MGD to accommodate increased flow from the proposed connection of unsewered properties and proposed development.

The North Castle Sewer District #2 Wastewater Treatment Plant was recently upgraded for improved performance and nitrogen removal. The upgraded facility is satisfactorily meeting SPDES permit limits including the 2014 total nitrogen limit. The Town submitted a June 2011 engineering report that evaluated the capacity of the wastewater treatment plant which concludes that the treatment plant is capable of handling the 0.50 MGD design flow.

The Department has considered the above request and agrees to modify the SPDES permit to account for the increased design flow. The following changes have been made to the permit:

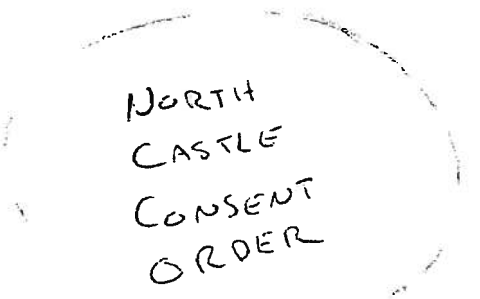
- The outdated permit limits, levels and monitoring tables on page 3 and 4 of the existing permit which reflected design flows of 0.38 MGD and 0.45 MGD have been removed and replaced with the permit limits, levels and monitoring table on page 3 that reflects the modified design flow of 0.50 MGD.

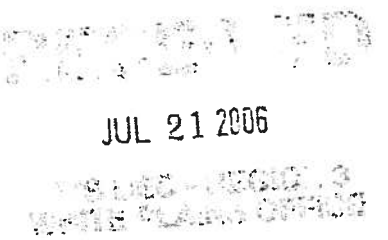
- The mass loading limits for $CBOD_5$ and total suspended solids on page 3 have been increased to 21 and 42 lbs/day, respectively, to account for the increased design flow.

- A schematic of the treatment plant has been added on page 9 of the draft permit to show the influent and effluent monitoring locations.

Appendix B - Consent Order

bcc: Meena George, DEC, White Plains
E. Armater, DEE
J. Battista/Chron
O/C File (w/original Order)
Case File





STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

---X

In the Matter of the Alleged Violations of Article(s) Article 17 of the Environmental Conservation Law ("ECL") and Part 750 et seq., of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York ("6 NYCRR") by

ORDER ON CONSENT

DEC Case No.:
CO 3-20041207-3

Town of North Castle,

Respondent(s).

---X

WHEREAS:

A. THE CLEAN WATER ACT AND ECL ARTICLE 17

1. The Federal Water Pollution Control Act of 1972, also known as the Clean Water Act ("CWA"), 33 U.S.C. § 1342 *et seq.*, authorizes the Administrator of the United States Environmental Protection Agency ("EPA") to establish and administer a National Pollutant Discharge Elimination System ("NPDES") program for discharges of pollution into the navigable waters of the United States.

2. The New York State Department of Environmental Conservation ("DEC"), through a partnership agreement with EPA, administers this program in New York State. Since 1973, DEC has conducted the State Pollutant Discharge Elimination System ("SPDES") permit program pursuant to Article 17, Titles 7 and 8 of the New York State Environmental Conservation Law ("ECL"). Among other things, a SPDES permit imposes limitations on the levels of pollutants that a source can lawfully discharge, and imposes sampling, recording, reporting, monitoring and operational requirements. A SPDES permittee is required to record the levels of discharged pollutants on Discharge Monitoring Reports ("DMRs"), which must be filed with the DEC.

3. Any violation of a SPDES permit condition or order entered under Article 17, constitutes a violation of ECL § 17-0803, 17-0807, 17-0815 and 6 NYCRR § 750-1.3(d).

4. Section 17-0501 of Article 17 of the ECL provides authority for the State to take enforcement against violations of any water quality standards ("WQS") adopted by DEC.

5. ECL § 71-1929 provides that a discharger who violates any obligation imposed by Titles 1-11 of Article 17, or the rules and regulations promulgated thereto, or the terms of any SPDES permit or order issued thereunder, shall be liable to pay a penalty not to exceed thirty-seven thousand five-hundred dollars ($37,500) per day for each violation.

6. CWA § 303(d)(1)(C), 33 U.S.C. § 1313(d)(1)(C) requires the states to promulgate, and EPA to approve, Total Maximum Daily Load waste allocations ("TMDLs") for water bodies for which the effluent limits promulgated pursuant to CWA § 301(b)(1)(A) and (B), 33 U. S .C. § 1311 (b)(1)(A) and (B), are not stringent enough to comply with any WQS applicable to that water body. TMDLs establish waste load allocations for individual pollutants, applicable for all discharges to the affected water body, in order to ensure that the combined effect of the discharges does not result in violation of the applicable WQS.

7. The Town of North Castle ("Respondent") owns and operates a publicly owned treatment plant located at 115 Business Park Drive, Armonk, NY 10504, which is the subject of this Consent Order, namely:

a. North Castle Wastewater Treatment Plant - SPDES Permit No. NY- 0109584 (hereinafter referred to as the "Facility").

B. THE LONG ISLAND SOUND STUDY AND HYPOXIA IN LONG ISLAND SOUND

1. In 1985, EPA and the States of New York and Connecticut began a program to research, monitor, and assess the water quality of the Long Island Sound, known as the Long Island Sound Study ("LISS").

2. In 1987, Long Island Sound was designated an "Estuary of National Significance" pursuant to CWA §320.

3. A Management Conference was convened in 1988 and charged with developing a Comprehensive Conservation and Management Plan ("CCMP") to protect and improve the environmental quality of Long Island Sound while ensuring compatible human uses.

4. In 1994, a CCMP was approved by the Governors of New York and Connecticut and the EPA.

5. One of the most pressing problems addressed by the Management Conference was hypoxia (generally defined as levels of dissolved oxygen of 3 mg/l or less), which affects a substantial portion of Long Island Sound in late summer.

6. Based on the LISS and other studies and research, it is now understood that the discharge of nitrogen from sewage treatment plants, industrial facilities, surface runoff and other anthropogenic point and non-point sources causes or contributes to periodic hypoxic conditions in some receiving waters bodies, including Long Island Sound.

7. When hypoxic conditions occur in Long Island Sound, the applicable WQSs for dissolved oxygen are violated.

8. The Long Island Sound Study CCMP addressed the hypoxia problem through a phased approach to nitrogen reduction.

9. In 1998, Connecticut, New York, and EPA adopted a Long Island Sound plan for *Phase III Actions for Hypoxia Management* including nitrogen reduction targets of 58.5% for the eleven designated management zones that comprise the Connecticut and New York portions of the Long Island Sound watershed.

10. On April 5, 2001, the EPA approved the TMDL for nitrogen for Long Island Sound established by New York and Connecticut, that mandates a 58.5% reduction of nitrogen from dischargers of nitrogen to Long Island Sound, such as the Respondent's Facility, and other sewage treatment plants that discharge to Long Island Sound, over 15 years.

11. The TMDL identifies eleven hypoxia management zones for Long Island Sound, and requires that nitrogen discharges be reduced in three five-year increments over a total of fifteen years, culminating in a 58.5% reduction in each zone.

12. The Facility discharges into the portion of Long Island Sound that is designated as Zone 7 in the TMDL.

13. The incorporation of SPDES permit limits to meet water quality standards and TMDLs is required by both New York State and Federal law: ECL §§17-0809, 17-0811, 6 NYCRR 750-1.1(a)(5)(ii); 33 U.S.C. §§1311(b)(1)(i), 1313(e)(3)(A) and 40 C.F.R. 122.42 (d)(1)(vii)(b). Through the SPDES Permit process DEC has imposed nitrogen limits reflecting the approved TMDL in the SPDES Permit for the Facility, and is in the process of imposing nitrogen limits in the SPDES Permits for all other such dischargers to Long Island Sound in New York State.

C. CURRENT NITROGEN CONTROL REQUIREMENTS IN THE FACILITY'S SPDES PERMIT

1. In May 2004, the DEC initiated a modification of the Facility's SPDES permit requiring the Facility to meet water quality standards and nitrogen TMDLs in accordance with New York State and Federal law.

2. As noted above, the Facility's SPDES permit requires monitoring and reporting of an individual 12-month rolling average ("12-MRA") discharge level of the total nitrogen discharge from the WWTP. The individual 12-MRA discharge level is defined as the monthly average nitrogen discharge for the current month, averaged with the eleven previous months' monthly average discharges at that WWTP.

3. Beginning on August 1, 2004, the 12-MRA Limit in the SPDES permit for the Facility is 25 lbs/day. Beginning on August 1, 2009, the 12-MRA Limit in the SPDES permit for the Facility will be 18 lbs/day. Beginning on August 1, 2014, the 12-MRA Limit ("the 2014 Limit") in the SPDES permit for the Facility will be 13 lbs/day.

D. ANTICIPATED NON-COMPLIANCE

1. 6 NYCRR Part 750 and the Special Conditions of the Respondent's SPDES permit require advance notice to DEC of anticipated non-compliance with permit requirements for the Facility

2. The Facility has been discharging treated effluent and has been in substantial compliance with the requirements of its SPDES permit prior to establishment of nitrogen TMDL SPDES permit limits.

3. In June 2004, the DEC requested the Respondent to initiate nitrogen sampling at the Facility to establish its current nitrogen discharges and ascertain the capability of the Facility to meets its first year increment of nitrogen reduction.

4. Based on the nitrogen sampling data, the Facility does not currently have the treatment capability to meet the 12-MRA limit when the modified SPDES permit becomes effective.

E. PAST NON-COMPLIANCE

Discharges from the Facility have resulted in occasional contraventions of the State's Water Quality Standards pursuant to ECL 17-0501, and the Discharge Monitoring Reports (DMRs) submitted for the Facility reflect that the Respondent has failed to comply with the provisions of its SPDES permit by having discharges in excess of effluent limits contained in the permit.

F. SUMMARY

1. The DEC and Respondent enter into this Order to ensure the most expeditious planning, design and construction of necessary facility improvements for meeting the nitrogen TMDL limits for Long Island Sound.

2. The parties hereto agree that the settlement of the matters referenced above by the entering of this Order without further litigation, hearing or adjudication of any issues of fact or law, is in the public interest.

IT IS HEREBY ORDERED AND DECREED:

I. CONSENT ORDER:

A. The parties hereto agree to abide by the terms, limits, provisions and requirements set forth in this Order. The parties hereto agree that the Order includes, by definition, any and all attached schedules and appendices, including any report(s), plan(s), proposal(s), schedule(s) and other submissions referenced therein or made, prepared or submitted pursuant thereto. All required submissions and/or any schedules or attachments that are not annexed to the Order as of the effective date of this Order shall be deemed incorporated into and made an enforceable part of this Order upon submission or, where DEC approval of such submission is required, upon DEC approval of such submission. All such schedules, attachments, appendices, report(s), schedule(s), and plans(s) shall be fully enforceable as part of this Order, along with any modifications hereto duly approved by the parties as provided for herein.

B. In furtherance of the goal of improving water quality and maximizing pollution abatement, the DEC and Respondent agree to enter into a Consent Order ("Order") pursuant to which, the Respondent shall undertake certain improvements at the Facility as may be necessary: (a) to meet the 2014 Limit; (b) to comply with certain Interim Limits as defined in Appendix B hereto; and (c) to make all best efforts to place into full operation all upgrades of the Facility as soon as they are available.

II. DEFINITIONS:

For purposes of this Order, the following definitions shall apply:

1. "Design Period" shall mean the period which commences upon the DEC's approval of Respondent's Engineering Plan and terminates with DEC's approval of the Design Report to be submitted by Respondent, as described herein.

2. "Notice to Proceed to Construction" ("NTPC"): Pursuant to the Wicks Law, all contracts consist of 4 elements: "G (general construction)," "P (plumbing)," "E (electrical)" and "H (heating, ventilation and air conditioning)." NTPC milestones shall be met when, at a minimum, the "G" element is noticed to proceed to construction and Respondent notifies DEC of such notice. The noticing of any and/or all the other elements of a contract shall not be considered compliance with an NTPC milestone, until the "G" element is noticed to proceed to construction.

3. "Construction Completion" shall mean that the process-related equipment and facilities are constructed in accordance with the approved plans and specifications and the approved Design Report.

4. "Interim 12-Month Rolling Average" ("Interim 12-MRA") shall mean the total nitrogen limit for the Facility to be imposed as the enforceable nitrogen discharge limits during the term of this Order.

III. CIVIL PENALTY:

In respect of the violations described above, a civil penalty in the amount of $5,000.00 is hereby assessed against Respondent, which amount shall be suspended provided that Respondent remain in compliance with the provisions of this Order and the Schedules of Compliance attached hereto. In the event Respondent violates any term of this Order, all, or any part of the suspended penalty may be assessed, in the Department's sole discretion. Should any portion of the suspended penalty be assessed, Respondent shall pay the assessed portion of the penalty within 20 days of receiving notification from the Department that the penalty is due. Such penalty shall be submitted to: G. Stephen Hamilton, Esq., Division of Environmental Enforcement, 625 Broadway, Albany, N.Y. 12233-5500. Any suspended penalty assessed shall be in addition to any stipulated penalties assessed pursuant to Paragraph V. below.

IV. INTERIM EFFLUENT LIMITS:

A. For the duration of this Order and until August 1, 2014, the Respondent shall meet the Interim Limits as provided for herein. While these Interim Limits are in effect, the terms and limits of this Order shall constitute the enforceable limits for the Facility.

B. If the Interim Nitrogen 12-MRA limit is adjusted pursuant to the Department's approval of Engineering Report I or II, and/or the milestone dates of August 1, 2009 and August 1, 2014 occur, the calculation of this limit shall be as follows:

For the first month after the effective date of the adjusted Nitrogen 12-MRA Limit and/or following the milestone dates of August 1, 2009 (limit is 18 lbs/day) and August 1, 2014 (limit is 13 lbs/day), only that month shall be used to calculate the 12-MRA. For each month following the first month and until the 12th month, the calculation will begin with the first month and include only those months following the first month.

V. STIPULATED PENALTIES:

A. In the event that Respondent fails to strictly and timely comply with any provision of this Order and the annexed Schedules of Compliance, or fails to meet any of the Milestone dates set forth in the approved Engineering Report and/or Design Report, the following stipulated penalties, for each day of violation, shall apply:

PERIOD OF NON-COMPLIANCE	PENALTY PER-DAY
1st day through 30th day	$ 1,000
31st day through 60th day	2,500
Each day beyond the 60th day	5,000

In the event that the Department determines that Respondent has violated any provision of this Order, the Department may serve upon the Respondent a notice of noncompliance as described in Paragraph VI. below which shall set forth the nature of the violation(s) and the calculation of stipulated penalties due. Such notice shall be deemed a part of this Order. Respondent shall deliver the full stipulated penalty amount to DEC within ten (10) business days after receipt of such notice. Neither the Department's demand for payment of a stipulated penalty, nor Respondent's payment thereof, shall discharge Respondent from the obligation to comply with any obligation established under this Order. The payment of stipulated penalties as set forth above shall not limit the Department's right to seek such other relief as may be authorized by law. Neither the Department's demand for payment of a suspended penalty, nor Respondent's payment thereof, shall discharge Respondent from the obligation to comply with any obligation established under this Order.

B. If Respondent fails to meet the Interim 12-MRA limit for the Facility as set forth in Appendix B hereto, a stipulated penalty of $30,000.00 per month, shall apply.

VI. Notice of Noncompliance: In the event that the Department determines, in the Department's sole discretion, that the Respondent has failed to timely and fully comply with any provision of this Order, the Department may serve upon the Respondent a notice of noncompliance setting forth the nature of the violation(s). Service of such notice may be by personal service or by certified mail return receipt requested (restricted delivery not required) at the Respondent's address as specified in Paragraph XXIV of this Order, or, if such service is refused or cannot be completed, by ordinary mail. Upon receipt of such notice, Respondent shall modify operations in such manner as may be specified in the notice

VII. Review of Notice of Noncompliance: If DEC issues a notice of noncompliance, DEC shall provide the Respondent the opportunity, upon written request made within ten (10) business days after the date of such notice, to meet with involved DEC staff to discuss the circumstances of issuance of the notice. A request for a meeting shall not suspend or otherwise affect Respondent's obligation to comply with all terms of this Order, including the notice of noncompliance, and shall not affect any obligation to pay penalties thereunder, which shall continue to accrue from the date of commencement of the violation for as long as the violation continues.

VIII. Full Settlement: Until fully remediated in accordance with this Order, all violations described above shall be considered continuing violations. The Department shall not institute any action or proceeding for penalties or other relief for the violations described above other than those actions and penalties set forth in this Order, for so long as Respondent remains in compliance with this Order. Any failure by Respondent to comply fully with the terms of this Order may subject the Respondent to further enforcement action for the violations described above. Compliance with this Order shall not excuse nor be a defense to charges of any violations of the ECL or any regulation or permit issued thereunder, which may occur subsequent to the date of this Order.

IX. Effect: This Order shall not create any presumption of law or finding of fact which shall inure to the benefit of any person other than the parties hereto.

X. Submissions: All reports and submissions herein required shall be made to the addresses provided in Paragraph XXIV. Respondent shall be responsible for the content of any submissions made pursuant to this Order. Submission of any material containing assertions of fact shall be considered an affirmative representation by Respondent of the truth of such assertions.

XI. Review of Submitted Remedial Plans and Proposals. After review of any plan or proposal required by this Order and its Schedules of Compliance, the Department shall notify Respondent, in writing, of its approval or disapproval of the submission. If the Department approves the submission, Respondent shall implement it in accordance with its schedule and terms, as approved. If the Department disapproves the submission, the Department shall provide to Respondent written notice of its disapproval, specifying with reasonable particularity the grounds for disapproval. Within 60 days after Respondent receives written notice of disapproval, Respondent shall submit a revised submission which fully responds to each of the Department's specified grounds for disapproval. After the Department's receipt of Respondent's revised submission, the Department shall notify Respondent, in writing, of its approval or disapproval. If

the Department approves the revised submission, Respondent shall implement it in accordance with its schedule and terms, as approved. If the revised submission is not approvable as submitted, the Department, at its option, may disapprove it or may approve it on condition that Respondent accept such modifications as may be specified by DEC to make it approvable. If the Respondent does not accept such modifications, the revised submission will be disapproved. If the Department disapproves the revised submission, the Respondent shall be in violation of this Order. Upon Department approval, a submission or revised submission shall be deemed incorporated into this Order.

XII. Notice of Work: Respondent shall provide notice to the Department of any excavating, drilling, sampling, construction or start-up of equipment to be conducted pursuant to the terms of this Order, if any, at least five (5) working days in advance of such activities.

XIII. Inspections & Access: For the purpose of insuring compliance with this Order, and with applicable provisions of the ECL and regulations promulgated thereunder, representatives of this Department shall be permitted access to the facility and to relevant records during reasonable hours to inspect and/or perform such tests which the Department deems appropriate to determine the status of Respondent's compliance.

XIV. Conveyance: In the event that Respondent proposes to convey the whole or any part of its ownership interest in the Facility, Respondent shall, not less than thirty (30) days prior to the consummation of such proposed conveyance, notify the Department in writing of the identity of the transferee and of the nature and date of the proposed conveyance. In advance of such proposed conveyance, Respondent shall notify the transferee in writing, with a copy to the Department, of the applicability of this Order.

XV. Other Approvals: Respondent shall be obligated to obtain whatever permits, easements, rights of entry, approvals or authorizations may be necessary in order to carry out its obligations under this Order. This Order shall not relieve the Respondent of the obligation to comply with any other laws, rules or regulations of the State of New York or any other governmental authority which are applicable to Respondent's activities, nor preclude or limit such enforcement action as may be authorized by law for any such violation.

XVI. Reservation of Rights: (a) Nothing contained in this Order shall be construed as barring, diminishing, adjudicating or in any way affecting (1) any legal, administrative or equitable rights or claims, actions, suits, causes of action or demands whatsoever that the Department may have against anyone other than Respondent; (2) the Department's right to enforce, administratively or at law or in equity, the terms, provisions and conditions of this Order against Respondent, its directors, officers, employees, servants, agents, successors and assigns in the event that Respondent shall be in breach of the provisions hereof; (3) the Department's right to bring any action, administratively or at law or in equity against Respondent, its directors, officers, employees, servants, agents, successors and assigns which the Department could otherwise maintain with respect to areas or resources that may have been affected or contaminated as a result of the release or migration of wastes from the site or from areas in the vicinity of the site, including natural resource damage claims, or to require that Respondent take such additional measures as may be necessary for the

protection of public health or the environment, including interim remedial measures; (4) the Department's right to commence any action or proceeding relating to or arising out of any disposal of hazardous wastes at the site, as those wastes are defined by applicable regulation; or (5) the Respondent's right to challenge any such action by the Department, whether by administrative hearing or otherwise, to the extent otherwise permitted by law.

(b) This Order shall not be construed to prohibit the Commissioner or the Commissioner's duly authorized representative from exercising any summary abatement powers, either at common law or as granted pursuant to statute or regulation.

XVII. Indemnification: Respondent shall indemnify and hold the Department, the State of New York, and their representatives and employees harmless for all claims, suits, actions, damages and costs of every name and description arising out of or resulting from the fulfillment or attempted fulfillment of the provisions hereof by Respondent, its directors, officers, employees, servants, agents, successors or assigns, except for those claims, suits, actions, and costs arising from the State's gross negligence or willful or intentional misconduct by the Department, the State of New York, and/or their representatives and employees during the course of any activities conducted pursuant to this Order. The Department will provide the Respondent with written notice no less than thirty (30) days prior to commencing a lawsuit seeking indemnification pursuant to this Paragraph.

XVIII. Force Majeure:

A. The Respondent shall not be in default of the provisions of this Order to the extent that its non-compliance is directly attributable to an Act of God, war, insurrection, strike, acts of terrorism, judicial injunction, failure of a federal or state agency or authority to issue any necessary permit in a timely fashion, provided that, the Respondent has timely submitted a complete application and all necessary supporting information and is otherwise entitled to such permit or approval, catastrophic condition, or other circumstance that is entirely beyond its control and where the Respondent has made all good faith efforts to comply with the provisions of this Order at issue ("force majeure"). If such a force majeure event occurs, the Respondent shall be entitled to an extension of the schedule milestone(s), limited to the period of time that such event placed compliance with a provision of this Order beyond the Respondent's control. Penalties for failure to satisfy any Order requirement can be excused only under the terms of this decretal paragraph, and only where the Respondent shows that it took all steps reasonably necessary to avoid or mitigate the delay, and that it strictly complied with the notice requirements of this paragraph, and that the delay is limited to an amount of time equal to the period of delay attributable to the force majeure. As a condition precedent to obtaining any relief under this provision, the Respondent shall notify the State in writing that a force majeure event has occurred, no later then twenty days after the date the Respondent knew or should have known of the occurrence of such force majeure event. The Respondent shall include in such notice the measures taken and to be taken by the Respondent to prevent or minimize any compliance delays and shall request an appropriate extension or modification of the applicable deadlines under this Order. Failure to give such notice within such twenty-day period constitutes a waiver of the ability to evoke force majeure as a defense to stipulated penalties.

B. Whenever a milestone is missed, pursuant to a force majeure event or otherwise, the Respondent shall exercise its best efforts to recoup all lost time.

XIX. **Modification:** This Order may not be modified except in a writing executed by the DEC Commissioner or the DEC Commissioner's authorized representative. If, following best efforts to implement nitrogen removal technologies, Respondent's Facility cannot meet limits, time frames for complying with such limits may be modified.

XX. **Default:** The failure of Respondent to comply fully and in timely fashion with any provision of this Order shall constitute a default and a failure to perform an obligation under this Order and under the ECL, and may constitute sufficient grounds for revocation pursuant to 6 NYCRR 621.14 of any permit, license, certification or approval issued to the Respondent by the Department.

XXI. **Entire Agreement:** The provisions hereof shall constitute the complete and entire Order between Respondent and the Department concerning the violations set forth above. No terms, conditions, understandings or agreements purporting to modify or vary the terms hereof shall be binding unless made in writing pursuant to Paragraph XIX hereof. No informal advice, guidance, suggestions or comments by the Department regarding reports, proposals, plans, specifications, schedules or any other writing submitted by Respondent shall be construed as relieving Respondent of its obligations to obtain such formal approvals as may be required by this Order.

XXII. **Binding Effect:** The provisions of this Order shall be deemed to bind the Respondent, its officers, directors, agents, employees, contractors, successors and assigns, and all persons, firms and corporations acting under or for it, including, without limitation, any subsequent operator of the Facility who may carry on activities now conducted by Respondent at the Facility, and any successor in title to the Facility or any interest therein. Respondent shall provide a copy of this Order (including any submissions incorporated herein) to any contractor or subcontractor hired to perform work required under this Order, and shall require compliance with this Order as a term of any contract for performance of work under this Order. Respondent shall nonetheless be responsible for ensuring that all work performed under this Order is in compliance with the terms of the Order.

XXIII. **Authority**. The individual signatories to this Order represent that they have authority to bind the respective parties by execution of this Order.

XXIV. GENERAL PROVISIONS

A. (1) All references to "days" herein are to calendar days unless otherwise specified.

(2) Any deadline specified herein which falls on a weekend or holiday shall be deemed to fall on the next following business day.

B. The paragraph or section headings set forth in this Order are included for convenience of reference only and shall be disregarded in the construction and interpretation of any of the provisions of this Order.

C. This Order and its Appendices shall apply to, and be binding upon the parties, their officers, agents, servants, employees, successors and assigns, and each of them, and upon all persons, firms and corporations acting under, through or for, in active concert or participation with, the parties.

D. This Order is an administrative consent order, not a SPDES or NPDES permit issued pursuant to ECL Article 17, Title 8, or 33 U.S.C. § 1342, respectively.

E. All notices and submittals of any nature to be submitted with regard to this Order shall be made in writing and sent by registered, certified, or overnight mail postage pre-paid, by regular mail or by hand delivery, to the respective addresses set forth below or to other such persons and addresses as the Respondent or the DEC may designate in writing:

To the DEC:

Chief, Waste Water Permits – South Section
NYSDEC
625 Broadway
Albany, NY 12233-3505
(2 copies)

NYSDEC Region 3 Water Engineer
100 Hillside Avenue, Suite 1W
White Plains, NY 10603
(2 copies)

G. Stephen Hamilton, Esq.
NYSDEC
625 Broadway – 14th Floor
Albany, NY 12233-5500
(2 copies)

To the Respondent:

Office of the Supervisor
Town of North Castle
15 Bedford Road
Armonk, NY 10504

With a copy to:

Office of the Town Attorney
Town of North Castle
15 Bedford Road
Armonk, NY 10504

XXV. EFFECTIVE DATE

The effective date of this Order is the date it is signed by the Commissioner of DEC or the Commissioner's designee.

Dated: New Paltz, New York
July 3, 2006

Denise M. Sheehan, Commissioner
New York State Department of Environmental Conservation

By: Marc Moran
Regional Director
NYSDEC Region 3

Schedule A

Respondent: Town of North Castle

Site or Facility: North Castle STP

WARNING: Respondent is required to self-certify timely completion of each of the activities required by this Order in accordance with Paragraph 1 of this Schedule.

1. Self-certification: Within fifteen (15) days after the passage of each of the milestone dates set forth in items B though J of Appendix A of this Order, Respondent shall submit to DEC a signed statement certifying that the work required was completed by that date, and that the work was done in the manner required by this Order.

Submission of the required certification shall be considered an affirmative representation by the Respondent of the truth of its contents. Any false statement made therein shall be punishable pursuant to Section 210.45 of the Penal Law, and as may be otherwise authorized by law.

Failure to submit a required certification by the due date shall be a violation of this Order, and shall establish a legal presumption that the Respondent has failed to comply with that requirement of the Schedule.

2. Remedial Activities and Milestones: Respondent shall timely perform the activities set forth in Appendix A of this Order in a good and workmanlike manner and supply all required labor, equipment and materials at Respondent's own cost and expense.

CONSENT BY RESPONDENT

Respondent hereby consents to the issuance and entry of this Order without further notice, waives its right to a hearing in this matter, and agrees to be bound by the terms, conditions and provisions of this Order.

Town of North Castle

By: Reese Berman

Title: Supervisor

Date: 6/8/06

ACKNOWLEDGMENT

On this 8 day of June, in the year 2006, before me, the undersigned, personally appeared Supervisor Reese Berman., personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies) as shown in the instrument, and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Ann Leber

Notary Public

ANN LESER
Notary Public, State of New York
No. 4918066
Qualified in Westchester Cty.
Commission Expires 6/6/10

APPENDIX A

Required Action	Deadline for Completion of Tasks and/or Submission to DEC
A. The Respondent shall submit progress reports in every quarter to the Department. In addition, Respondent shall schedule quarterly meetings with the DEC Regional Water Engineer within 30 days of submittal of each progress report.	Within 15 days of the end of the quarter (January 15, April 15, July 15 and October 15 of each year)
B. The Respondent shall submit an approvable Engineering Report I addressing all requirements under Note "A" below to the Department.	3 months from the effective date of this Order ("EDO")[1]
C. The Respondent shall submit an approvable Design Report I addressing all requirements under Note "B" below to the Department.	Date of submittal as defined in the Engineering Report I, but no later than 6 months after NYSDEC approval of the Engineering Report I.
D. NTPC I for the facilities described in the approved Design Report I.	12 months after NYSDEC approval of Design Report I.
E. Respondent shall: 1. Complete all construction set forth in the approved Design Report I and meet the 12 MRA nitrogen limit (August 1, 2009) of 18 lbs/day in SPDES permit No. NY 0109584. 2. Respondent shall commence operation of facilities and/or systems in accordance with the provisions of the Design Report I.	27 months after NYSDEC approval of Design Report I. modified to May 1, 2010
F. The Respondent shall submit an approvable Engineering Report II addressing all requirements under Note "A" below to the Department.	August 1, 2009 modified to Oct. 1, 2011
Respondent shall perform all requirements under G through J below if the approved Engineering Report II requires additional modifications to the facility in order to meet the August 1, 2014 nitrogen limit.	

[1]The Engineering Report will evaluate conventional nitrogen removal technolgies, as well as the effect of the addition of Arachaea microbes to the Facility's biological treatment processes. Using sampling data, a decision can be made regarding the benefit of Archaea and the neeed for additional nitrogen removal processes.

Required Action	Deadline for Completion of Tasks and/or Submission to DEC
G. The Respondent shall submit an approvable Design Report II addressing all requirements under Note "B" below to the Department.	Date of submittal as defined in the Engineering Report I, but no later than 9 months after NYSDEC approval of the Engineering Report II.
H. NTPC II for the facilities described in the approved Design Report II.	11 months after NYSDEC approval of Design Report II.
I. Respondent shall: 1. Complete all construction set forth in the approved Design Report II. 2. Respondent shall commence operation of facilities and/or systems in accordance with the provisions of the Design Report II.	25 months after NYSDEC approval of Design Report II.
J. Respondent shall be operating the facility and meeting the 12 MRA nitrogen limit (August 1, 2014) of 13 lbs/day in SPDES permit No. NY 0109584	29 months after NYSDEC approval of Design Report II, but in no event later than August 1, 2014.

NOTES:

A. Specifically, the Engineering Reports shall include:

<u>Engineering Report I</u>

a. an evaluation of nitrogen treatment capabilities at the Facility;

b. the development and analysis of nitrogen reduction alternatives;

c. a cost effectiveness analysis of alternatives;

d. a description of the recommended Program and the individual projects to be undertaken as part of same, including the technologies and processes to be installed under each project which will meet the August 1, 2014 nitrogen limit;

e. the preliminary bases of design for each project and the estimated construction cost of each project;

f. a preliminary construction and implementation schedule for the overall Program;

g. a date for submission of the Design Report.

h. Interim Nitrogen 12-MRA limits from approval of Engineering Report I (as defined in Appendix A, Section B) through approval of Engineering Report II (as

defined in Appendix A, Section F) .

Engineering Report II

a. an evaluation of nitrogen treatment capabilities at the Facility following construction of the facility upgrades as defined in Engineering Report I and Design Report I, which shall include optimizing performance and further operational enhancements which may be required to meet the August 1, 2014 nitrogen limit;

b. the development and analysis of nitrogen reduction alternatives; if the facility cannot meet the August 1, 2014 nitrogen limit;

c. a cost effectiveness analysis of alternatives;

d. a description of the recommended Program and the individual projects to be undertaken as part of same, including the technologies and processes to be installed under each project which will meet the August 1, 2014 nitrogen limit;

e. the preliminary bases of design for each project and the estimated construction cost of each project;

f. a preliminary construction and implementation schedule for the overall Program;

g. a date for submission of the Design Report.

h. Interim Nitrogen 12-MRA limits from approval of Engineering Report II (as defined in Appendix A, Section F) through Operation of Facility to meet August 1, 2014 nitrogen Limit (as defined in Appendix A, Section J).

B. Specifically, Design Reports I and II shall include:

a. detailed design information for all treatment units and/or processes to be installed at the Facility, including the bases of design and plans and specifications;

b. a final construction and implementation schedule with specific tasks, durations and milestone dates. The implementation schedule shall contain milestone dates for the NTPC and Construction Completion for each project Respondent is to perform.

c. proposed interim nitrogen discharge limits for the Facility during the construction phase.

i. The schedules to be submitted as part of Design Reports I and II will show sequential and parallel tasks to be conducted pursuant to this Order for the purposes of identifying critical junctions in the project schedule and avoiding conflicts that could lead to delays.

ii. Design Report I shall provide for the commencement of construction on or before January 30, 2008, completion of construction no later than June

modified to May 1, 2010

30, 2009, and compliance on or before August 1, 2014, irrespective of the availability of financial assistance from federal, State or other sources.

"EDO" stands for the effective Date of the Order

APPENDIX B
INTERIM EFFLUENT LIMITS

A. Interim Limits – North Castle WWTP

Parameter	Duration	Interim Limit
Interim Nitrogen 12-MRA	EDO through approval of Engineering Report I (as defined in Appendix A, Section B).	77 lbs/day
Interim Nitrogen 12-MRA	Approval of Engineering Report I (as defined in Appendix A, Section B) through approval of Engineering Report II (as defined in Appendix A, Section F) .	To be Specified in approved Engineering Report I
Interim Nitrogen 12-MRA	Approval of Engineering Report II (as defined in Appendix A, Section F) through Operation of Facility to meet August 1, 2014 nitrogen Limit (as defined in Appendix A, Section J)	To be Specified in approved Engineering Report II

New York State Department of Environmental Conservation
Office of General Counsel, 14th Floor
625 Broadway, Albany, New York 12233-1500
Fax: (518) 402-9018 or (518) 402-9019
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

February 17, 2009

Certified Mail
Return Receipt Requested
Roland A. Baroni, Jr.
Town Attorney
Stephens, Baroni, Reilly & Lewis, LLP
Northcourt Building
175 Main Street
White Plains, New York 10601

re: Order on Consent
Case No. CO 3-20041207-3

Dear Mr. Baroni:

Enclosed, please find the modifications to Order on Consent Case No. CO 3-20041207-3 executed by Regional Director, William Janeway, on February 10, 2009.

If you have any additional questions or concerns, please feel free to contact myself at (518) 402-9512. Thank you for your cooperation in the resolution of this matter.

Sincerely,

Carin E. Spreitzer
Senior Attorney

cc: William Janeway, Region 3, Regional Director, NYSDEC
Thomas Rudolph, Region 3, Regional Water Engineer, NYSDEC
Meena George, Region 3
Alan Fuchs, DOW, Director for the Bureau of Water Permits, NYSDEC
Cheryle Webber, DOW, Chief Permits South Section, NYSDEC
Reese Berman, Supervisor, Town of North Castle

EDMS#: 334065

New York State Department of Environmental Conservation
Office of General Counsel, 14th Floor
625 Broadway, Albany, New York 12233-1500
Fax: (518) 402-9018 or (518) 402-9019
Website: www.dec.ny.gov

Alexander B. Grann
Commissioner

January 7, 2009

Roland A. Baroni, Jr.
Town Attorney
Stephens, Baroni, Reilly & Lewis, LLP
Northcourt Building
175 Main Street
White Plains, New York 10601

Re: Order on Consent 3-20041207-3
Modification Request

Dear Mr. Baroni:

On September 26, 2008 you submitted a request for the Town of North Castle (Town), to the New York State Department of Environmental Conservation (Department) for modification of Order on Consent 3-20041207-3 (Order). Subsequent to your request, discussions between Department Staff and the Town's consulting engineers for the project, Steams & Wheeler, resulted in refined dates for modification of the Order. On December 23, 2008, you submitted a revised request to the Department for modification of the Order.

Pursuant to Paragraph XIX of the Order, the Order may only be modified in writing executed by the Department Commissioner or his/her authorized representative. William Janeway, Region 3 Director, is the Commissioner's authorized representative with respect to this modification request. After discussions between the parties, agreement was reached on the modifications contained in this letter. Upon execution of this letter agreement by the Department, the Order is modified as follows:

Appendix A, Item F: The milestone for submittal of "Engineering Report II" of August 1, 2009 is modified to October 1, 2011.

Appendix A, Note B.c.ii.: The milestone to Commence Construction of January 30, 2008 is modified to March 1, 2009. The milestone for Completion of Construction of June 30, 2009 is modified to May 1, 2010.

All other terms and conditions of the Order remain unchanged. Please have the Supervisor for the Town of North Castle execute this letter and return to my attention at the following address:

Office of General Counsel
625 Broadway, 14th Floor
Albany, New York 12233-1500.

Upon execution of this letter by Regional Director Janeway the Order will be modified as per the terms contained in this letter.

If you have any questions, please do not hesitate to contact me at (518) 402-9512. Thank you.

Sincerely,

Carin E. Spreitzer, Esq.
Senior Attorney

cc: William Janeway, NYSDEC Region 3, Regional Director
Thomas Rudolph, NYSDEC Region 3, Water Engineer
Cheryle Webber, NYSDEC Central Office, Chief Permits South Section
Meena George, NYSDEC Region 3
Reese Berman, Supervisor, Town of North Castle

EDMS#328524

CONSENT BY RESPONDENT

The Town of North Castle hereby consents to the issuance and entry of the foregoing modifications to Order on Consent 3-20041207-3, waives its right to a hearing herein as provided by law, and agrees to be bound by the provisions, terms and conditions contained herein, pursuant to the authorization of the Town of North Castle Town Board issued on January 14, 2009 by Resolution of the Town Board. The undersigned represents and affirms that they have the legal authority to bind Respondent to the terms and conditions of this Order.

Reese Berman
Reese Berman
Supervisor
Town of North Castle

ACKNOWLEDGMENT

State of New York)
County of WESTCHESTER) ss.:

On the 29 day of JANUARY, 2009 before me personally came Reese Berman to me known or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument, who being by me duly sworn did depose and say that he maintains an office at 15 Bedford Road in Armonk, New York and that he was duly authorized to execute the foregoing instrument and did so on behalf of the Town of North Castle.

RICHARD A. SAPONE, JR.
Notary Public, State of New York
No. 02SA6[illegible]4
Qualified in Westchester County
Commission Expires September 8, 2009

Notary Public

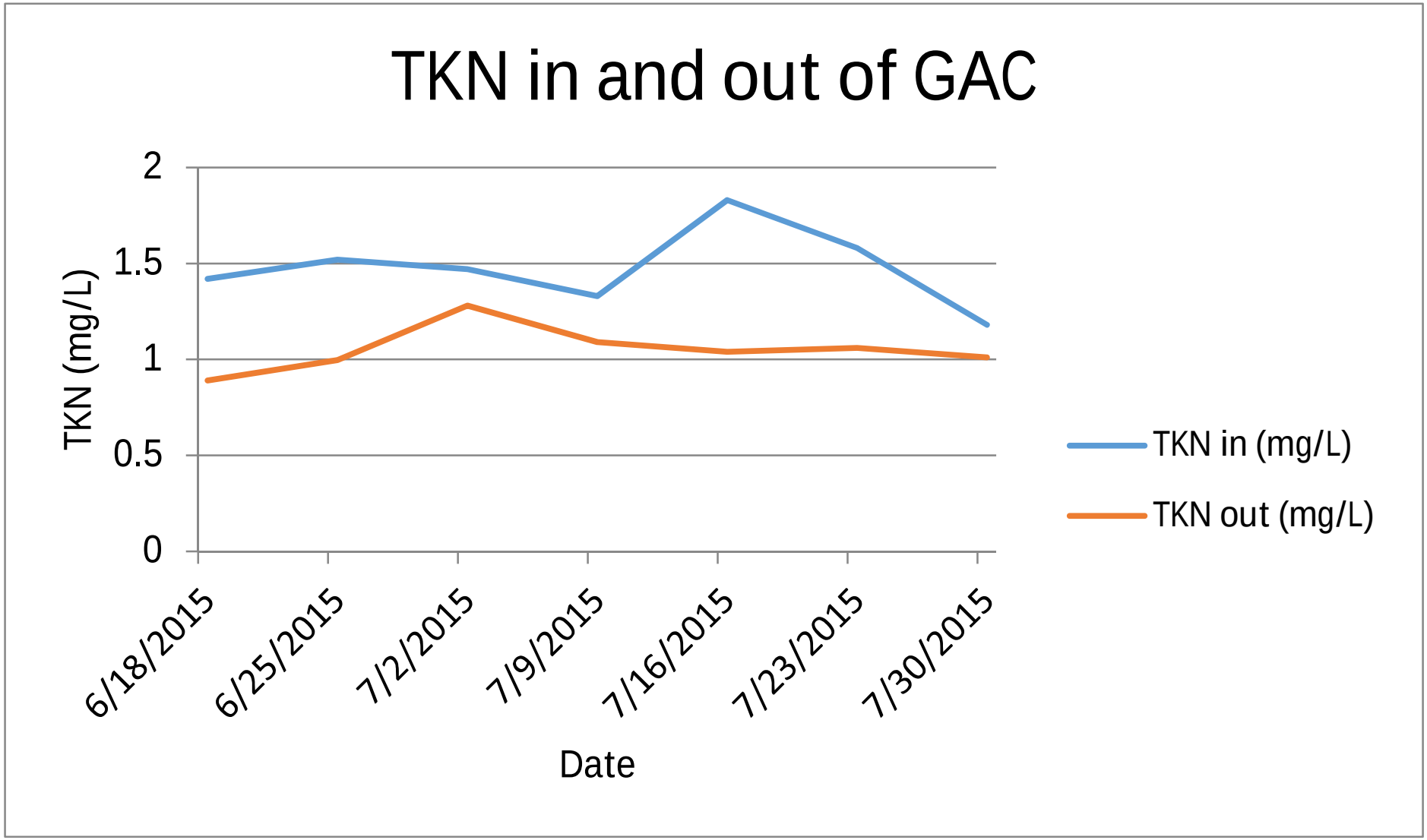
DATED: JANUARY 29, 2009

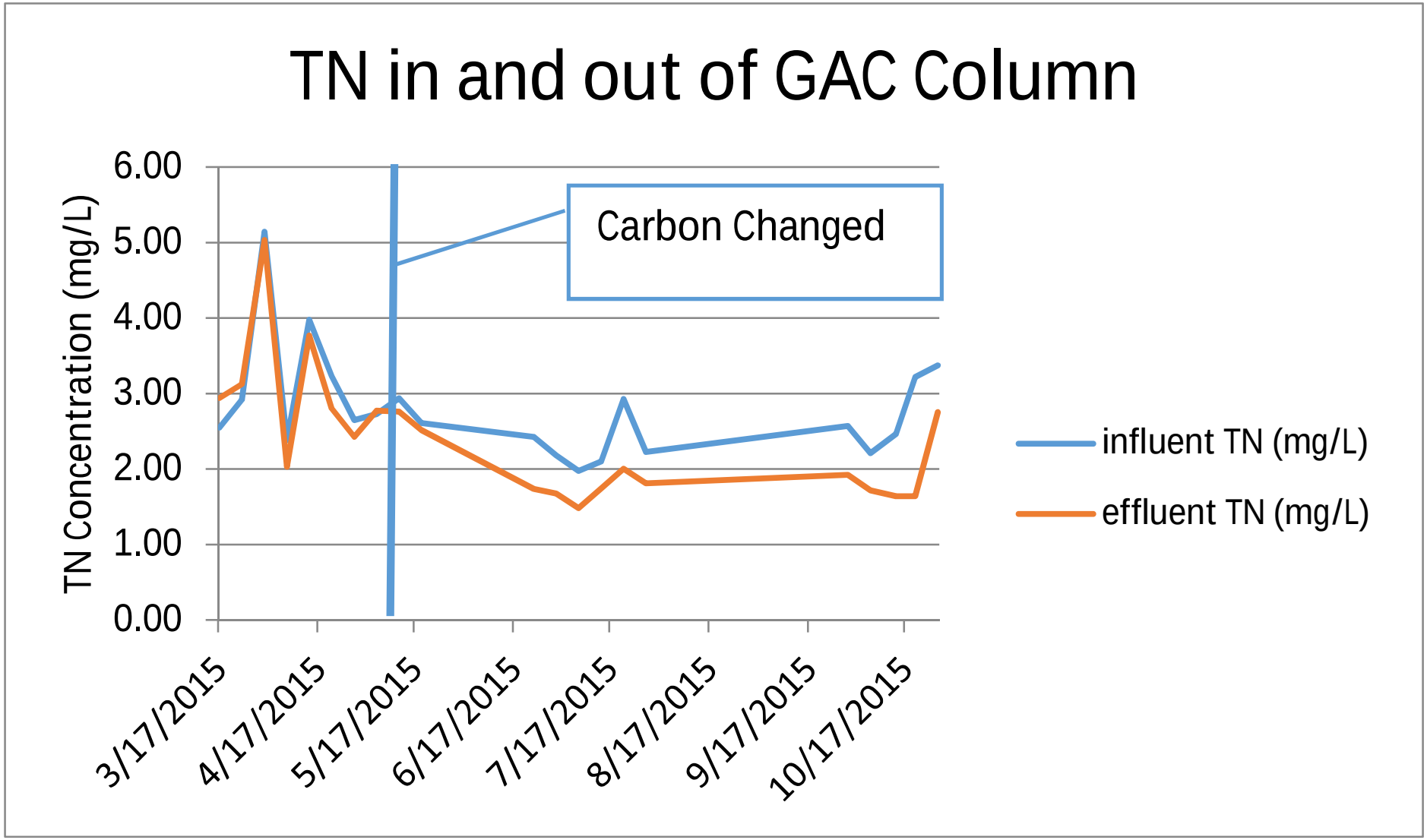
ARMONK, New York

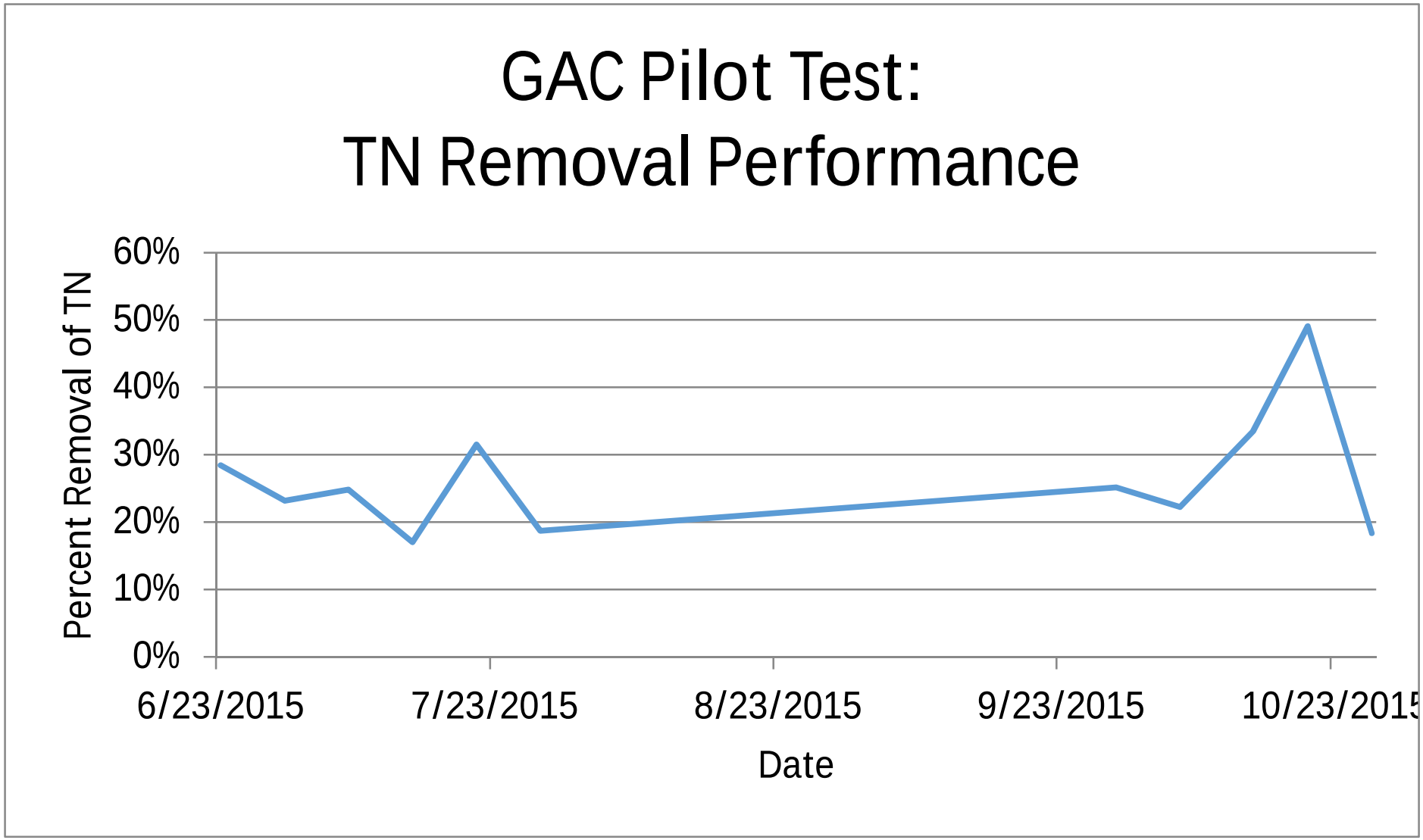
Alexander B. Grannis,
Commissioner,
New York State Department of
Environmental Conservation by:

William C. Janeway
Regional Director
NYSDEC Region 3 February 10, 2009

Appendix C - GAC Pilot Test Data


TKN in and out of GAC
2
1.5
1
0.5
0
TKN (mg/L)
6/18/2015
6/25/2015
7/2/2015
7/9/2015
7/16/2015
7/23/2015
7/30/2015
Date
TKN in (mg/L)
TKN out (mg/L)


TN in and out of GAC Column
TN Concentration (mg/L)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Carbon Changed
3/17/2015
4/17/2015
5/17/2015
6/17/2015
7/17/2015
8/17/2015
9/17/2015
10/17/2015
influent TN (mg/L)
effluent TN (mg/L)


GAC Pilot Test:
TN Removal Performance
Percent Removal of TN
60%
50%
40%
30%
20%
10%
0%
6/23/2015
7/23/2015
8/23/2015
9/23/2015
10/23/2015
Date

www.ghd.com