Onondaga County Department of
WATER ENVIRONMENT PROTECTION

Meadowbrook-Limestone (MBLS)
Wastewater Treatment Plant

Wet Weather Operating Plan

July 2014

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Section 1 – Introduction and Overview

Within the Meadowbrook Limestone (MBLS) Wastewater Treatment Plant (WWTP) service area, wastewater is collected throughout significant sections of the Towns of Dewitt and Manlius; along with smaller portions of the Town of Pompey and the City of Syracuse. Wastewater is transported via a series of pumping stations and gravity trunk sewers to the MBLS WWTP. The 48" Meadowbrook Trunk Sewer and the 18" Fremont Trunk Sewer enter the property via gravity feed and combine at Manhole No. 2, located off the Southeast corner of the Maintenance Garage. Wastewater influent is primarily from residential and commercial sources.

The MBLS WWTP has a design flow of 6.5 MGD and provides advanced secondary treatment of wastewater using an Extended Aeration Activated Sludge Process. The wastewater undergoes screening and grit removal in the Headworks Building, utilizing both a bar rack and a mechanical screen rake, followed by grit removal in an aerated grit head cell, which uses a EUTEK Systems, Inc., stacked tray vortex grit removal system. Wastewater is then pumped from the influent wet well into the aeration distribution box where it is mixed with Return Activated Sludge (RAS). The wastewater/sludge mixture is then split evenly in into (2) aeration tanks where the activated sludge treatment process occurs in a parallel configuration. The activated sludge then flows to the final clarifiers where sludge settling occurs. Activated sludge collected in the clarifiers is recirculated to the aeration tank distribution structure and/or wasted to the aerated sludge holding tank. Decanted sludge is thickened using a Rotary Drum Thickener (RDT), stored in a thickened sludge holding tank and hauled to the Metropolitan-Syracuse WWTP for further treatment. Effluent from the final clarifiers flows to the chlorine contact tank for disinfection, (seasonal) using Sodium Hypochlorite, before discharge to Limestone Creek. Total phosphorus is removed year round with the use of ferrous chloride. A one-million gallon tank is available for storage during high flow/wet weather events.

- *Plant Bypass* – MBLS WWTP has <u>no</u> capability to bypass flows around the treatment facility, all influent wastewater flows through the treatment process.

<u>Performance Goals</u>

The overall goal of the wet weather operating plan is to provide the best possible treatment to high flows in an effort to maintain SPDES compliance, minimize the impact of high flows on the treatment process and to resume full treatment quickly as wet weather conditions abate.

- Maintain SPDES compliance.
- Minimize impact on treatment process units.
- Return facility to full treatment capabilities as soon as possible.

<u>Utilization of the Manual</u>

The purpose of this manual is to provide a set of operating guidelines to assist the MBLS WWTP and collection system staff in making operational decisions which will best meet the performance goals and the requirements of the SPDES discharge permit.

Managing high influent wastewater flow effectively during a wet weather event requires numerous operational decisions. Multiple control structures, varying conditions of the treatment processes, equipment service status and varying degrees of intensity and duration of the storm/snowmelt make each event and the reactive operational strategy potentially unique. No manual can describe the decision making process for every possible operating scenario. However, this manual will serve as a useful reference for both new and experienced operators to utilize during wet weather events. Covered specifically are preparations for a pending wet weather event, strategies for processes control during the event and a checklist of critical steps involved to monitor and control processes during and after an event.

This manual is designed to allow use as a quick reference during wet weather events. It is broken down into sections which cover major unit processes at the MBLS facility. Each section includes the following information:

- Operational Description – Overview of the designated treatment process and associated equipment.
- Pre-Wet Weather Event Activities – Activities to be performed in anticipation of pending wet-weather event.
- During Wet Weather Activities – Major activities to be performed during the wet-weather event.
- Post Wet Weather Activities – Activities to be performed following the wet weather event, and in anticipation of future events.

This manual is a living document. Users of the manual are encouraged to identify new steps, procedures, and recommendations to improve the overall utility of the manual. All recommendations shall be submitted to the user's immediate supervisor for consideration for inclusion in the manual.

Section 2 - Wet Weather Operational Strategy

a. Wet Weather Operation Condition # 1

This occurs when conditions are otherwise dry yet a heavy rain has fallen over a two or three hour period and subsided. Subsequently, plant influent flows (monitored on-site or remotely via Metro Board) will increase sharply. When observed to trend upward to 10 – 11 MGD, proceed as follows:

1. Open air lines to the Wet Weather Storage Tank's air distribution grid and insure that the tank drain valve is closed.
2. Open the motor-actuated gate valve at the Aeration Distribution Structure's Wet Weather Diversion Box (the Wet Weather Diversion box will begin to empty into the Wet Weather Storage Tank and water will begin to flow through the "bending weir" into the box.
3. Put the actuator control switch to the "Remote" position (this will allow automatic closure of the valve when the storage tank signals a full condition). A portion of the flow

(about 25%) will now divert into the storage tank before entering down-stream processes. The reduction in flow rates will minimize or eliminate hydraulic overload for a period of about seven (7) hours. This should allow adequate time for flows to subside naturally.

b. Wet Weather Operation Condition # 2

With the onset of heavy rains or snowmelt accompanied by rain, Limestone Creek levels increase dramatically, and flooding of low-lying areas adjacent to the creek occurs. Influent flows at the plant increase rapidly into the low teens and shortly reach values of 20 MGD or more. Anticipating excessive flows to continue from 48 hours to several days, utilizing the Wet Weather Storage Tank (as outlined in Section 2.a) provides greater value when the flow begin to abate, rather than during the onset. If this condition is likely, proceed as follows:

1. Monitor influent flow rates carefully and as flows begin to reach 10 – 11 MGD, stop air feed to the aeration system (the biomass settles in the basins and retained).
2. Shut down the Ferrous Chloride feed (without aerating and mixing, it is ineffective).
3. Shut down the Effluent Water System (it will quickly clog if left to pump the degraded effluent).
4. If seasonal effluent disinfection is required, adjust Sodium Hypochlorite dosing rates accordingly.
5. Monitor influent wet well levels closely.
6. Monitor screening and grit removal systems closely as large amounts of solids may be flushed from the upstream sewer systems.

When the condition has abated and flows begin to trend downward and reach ~ 15 MGD, proceed as follows:

1. Open the Wet Weather Storage Tank (the Wet Weather Storage System can now be utilized as an effective buffer as outlined in Section 2.a).
2. Establish that hydraulic diversion is such that 9 or 10 MGD are entering the aeration system by comparing Influent flow against Effluent flow measurements.
3. When adequate diversion is established, turn on the aeration blowers to resume process air to the Aeration Tanks.
4. Restart Ferrous Chloride feed.
5. Restart the Effluent Water System (visual observation of the effluent quality will determine when to restart the Effluent Water System).
6. Monitor chlorine residuals and adjust accordingly.

c. Wet Weather Operation Condition # 3

This will occur with the onset of heavy extended rainfall coupled with a deep snowpack and rapid warming. Proceed to operate under Wet Weather Operations as described under Condition # 2. However, flows in this extreme may exceed the influent pumping capacity and flooding of the influent wet well can occur. Equipment installed in the wet well area is in danger of submergence. If this condition is imminent, proceed as follows:

1. Shut off power to the Grit system Control Panel (the breaker is located on the "normal power" side of the Control Building MCC).
2. Put the Screen Rake unit in the HOME position (top-most position) and turn the Bar screen Control panel's HAND/OFF/AUTO switch to the OFF position (this prevents the motor assembly from entering the flooded wet well).

Section 3 – Process Wet Weather Operation

In general, prior to any wet weather events, the operational staff monitors storm development via internet access to assist in predicting the onset of a wet weather event. This allows both the head operator and operator(s) the ability to review the personnel roster to ensure adequate staff is available and call in additional personnel as required. In addition, the monitoring of storm development allows the operational and maintenance staff to begin pre-wet weather activities as identified herein.

At this time, the Department does not have a policy, mechanism or corresponding procedure for issuing wet weather related advisories to the municipalities that discharge to the County's collection system. The current inter-municipal agreement does not grant the Department authority to minimize, reduce, or even require the implementation of Best Management Practices (BMPs) by the municipalities that discharge to the MBLS service area.

a. Screenings & Grit Removal - Headworks Building (HWB)

The screenings & grit removal occurs in the HWB which receives wastewater from two (2) gravity trunk sewers, which combine at Manhole No. 2 prior to entering the HWB. Wastewater flows into the HWB where it may pass an automated mechanical screen rake. The flow may also be directed to a parallel channel and flow through a manually cleaned bar rack for screenings removal. The wastewater then flows into two (2) aerated grit head cells, one (1) grit pump per cell. Grit removal is accomplished using a EUTEK Systems, Inc., stacked tray vortex grit removal system. These units deposit the solid grit in 4 cubic yard containers.

Wastewater is pumped to the Aeration Distribution Structure from the two (2) interconnected influent wet wells, via four (4) influent pumps (Lead; Lag 1; Lag 2; Standby) located in an adjacent dry well. When in the automatic mode of operation, the pump operation depends on the wastewater level in the wet well. Wet well set point is 9.0 feet, one (1) pump (Lead) is always running and is typically sufficient to handle plant design flow.

Pre-Wet Weather Event Activities

- Make sure both channels are operational.
- Verify that mechanical screen rake is operational.
- Verify EUTEK Grit Removal Systems are operational.
- Verify adequate dumpster capacity.

During Wet Weather Activities

- Automated screen rake may be put in "Hand-Continual Run" mode to avoid channel back-up during high flows. If flooding of the wet well area is likely, the screen rake may be shut down.
- EUTEK Systems are monitored continuously for plugging and cleared as necessary.
- Under normal conditions, de-gritted wastewater flows by gravity to the interconnected wet wells. When in the automatic mode of operation, the pump operation depends on the wastewater level in the wet well. Any combination of the four (4) influent pumps may be used as needed, depending on the wet well level and flow rate.
- If the Lead Influent Raw Sewage pump is not sufficient to maintain the wet well set point at 9.0 feet, a second pump (Lag 1) is activated. Generally, this occurs when the Lead pump has run at full speed (60 HZ) for 5-7 minutes and has not maintained the 9.0 feet set point. If these two pumps are not sufficient to keep the wet well at set point and the well continues to rise beyond a preset level (11.0 feet), a third pump (Lag 2) will be activated to run at full speed. If this is sufficient to meet or exceed the incoming flow rate, the well will begin to pump down. When the wet well descends to a preset level (8 feet) the Lag 2 pump is signaled to shut down. When (Lag 2) shuts down, the well will rise back to 11.0 feet, and trigger Lag 2 pump to start. This begins a continual cycle of the Lag 2 pump going on and off. To avoid this, put the **Standby** pump in **hand** mode and turn it on at the start button near the pump (the pump in **Standby** is not in sequence and will NOT be called for automatically*)*. Use the up-down arrows at the drive to control the speed (usually about 55 Hz). **Do this when the Lag 2 pump is in an "off" cycle.** The Lead and Lag 1 pumps can then operate as normal and will vary their speed to keep the well at set point. The **Lag 3** pump will also be available as normal. If it becomes necessary to use a fourth pump, put the **Lag 3** pump in hand and start it. Control the speed by hand. The two (2) pumps in auto mode will modulate to maintain set point.

Post Wet Weather Activities

- Return all equipment to dry weather operation.

b. Wet Weather Storage System

Under normal operating conditions, wastewater is pumped to the Aeration Distribution Structure. Within this structure the flow first passes through the main compartment of the Wet Weather Distribution Box, and then flows into the entire structure where the flow is split evenly and distributed into (2) Aeration Tanks. The Aeration Tanks utilize the Extended Aeration mode of the activated sludge process. The Wet Weather Diversion Box (within the Aeration Distribution Structure) is comprised of two (2) separate compartments, the main compartment and a smaller side compartment. Under normal operating conditions, the main compartment accepts all flow from the influent pump's 36"discharge pipe. This influent is channeled through the main compartment within the Aeration Distribution Structure via a 36" interconnection near the bottom of both boxes.

Here it is mixed with RAS, dosed with Ferrous Chloride and distributed evenly to the Aeration Tanks. The Wet Weather Storage System is initiated when the motor-actuated gate valve located in the Aeration Distribution Structure's Wet Weather Diversion Box (side compartment) is opened and the wastewater empties into the Wet Weather Storage Tank and begins to flow through the "bending weir" into the side compartment of the Wet Weather Diversion Box. A level sensor installed in the Wet Weather Storage Tank will signal the motor-driven gate valve to close when the tank is full. The Wet Weather Storage Tank is an aerated tank with an approximate capacity of one million gallons. Following any exposure to wastewater, the tank is hosed to remove accumulated material that may have settled during use.

Pre-Wet Weather Event Activities

- Verify the operation of Bending Weir and Motor-Actuated Gate Valve.
- Maintain the Wet Weather Storage Tank (i.e. cleaned, emptied)

During Wet Weather Activities

- Wet Weather Condition # 1 – maintain aeration in the Wet Weather Storage Tank and monitor progress.
- Wet Weather Condition # 2 – the wet weather storage system should only be utilized when flows trend to 15 mgd or below.
- Verify that all valves are operational.

Post Wet Weather Activities

- Return the distribution structure and diversion box to the normal operational position.
- Drain the Wet Weather Storage Tank.
- Conduct regular maintenance of the Wet Weather Storage Tank.

c. Activated Sludge System – Aeration Tanks

Under normal operating conditions, wastewater is pumped to the Aeration Tank Diversion Structure and Wet Weather Distribution Box (main compartment) where the flow is split evenly between two (2) Aeration Tanks. The Extended Aeration mode of the activated sludge process is utilized. Two Weir gates (one for each tank) in the distribution structure allow for flow balancing or isolation of the tanks. Ferrous Chloride introduced into the Aeration Tank distribution structure aids in phosphorous reduction. Ferrous Chloride dosing is flow-paced and concentration is adjusted as needed.

Pre-Wet Weather Event Activities

- None.

During Wet Weather Activities

- Wet Weather Condition # 1 – Maintain aeration and maintain Ferrous Chloride dosing as needed.
- Wet Weather Condition # 2 – Shut down the process air to the Aeration Tanks as indicated based on flow rates and weather conditions. Shut down the Ferrous Chloride feed until process air is re-established.
- Ferrous Chloride (for phosphorus reduction) is introduced into the common mixture of raw sewage and RAS just prior to overflowing the weir gates in the Aeration Distribution Structure. Ferrous Chloride dosing is flow-paced and therefore feed rates will increase as flow increases. A limit has been set on this system to pump no more than 20 GPH, regardless of flow rates. If air is stopped to the aeration tanks, as in Wet weather Condition #2, above, turn Ferrous Chloride feed off.

Post Wet Weather Activities

- Wet Weather Condition # 2 – Return process air to the Aeration Tanks as indicated based on flow rates and weather conditions. Re-start the Ferrous Chloride feed once process air is re-established. Adjust as needed.

d. Final Clarifier Treatment System

Aeration Tank Mixed Liquor is gravity-fed from each tanks 24"outlet pipe into a common 36" pipe and delivered to the Secondary Clarifier Distribution Structure. Two (2) weir gates (one for each tank) in the Distribution Structure allow for flow balancing or isolation of the tanks. Mixed Liquor flows via gravity to the center of the respective circular clarifiers, up into the center stilling well and transported to the tank near the surface. Settled activated sludge is collected and drawn from the clarifier via differential pressure tubes affixed to the lower collector and conveyed to a wet well adjacent to the sludge pumping station via piping. From the Sludge Pumping Station wet well, sludge is returned to the Aeration Distribution Structure and/or to sludge handling facilities to be wasted. Skimmer arms collect and channel floatable materials into a trough/pit system for later disposal. Treated/clarified water flows over a peripheral-mounted v-notch weir/lauder and channeled to each tanks effluent collection box. Tank No. 2 (East) effluent is gravity fed via a 24" line into Tank No. 1 effluent collection box and mixes there. Sodium Hypochlorite (if in use) is injected into Tank No. 1 effluent collection box. The mixed discharge from the # 1 collection box is gravity fed through a 36" line to the Chlorine Contact Tank distribution structure.

Pre-Wet Weather Event Activities

- Keep weir v-notches clear to prevent short-circuiting.
- Keep weir launders free of build-up.
- Insure that floatable and settleable collection mechanisms are in working order.

During Wet Weather Activities

- Optimal settling efficiency is limited to 5.5 MGD per clarifier.
- As needed, increase sludge withdrawal rates of Waste Activated Sludge (WAS).
- Increase performance monitoring (sludge depth gauging and visual observation).

Post Wet Weather Activities

- Keep weir v-notches clear to prevent short-circuiting.
- Keep weir launders free of build-up.
- Insure that floatable and settleable collection mechanisms are in working order.

e. Chlorine Contact Disinfection System

The Chlorine Contact Disinfection System receives treated effluent from the Final Clarifiers. The clarifier effluent gravity flows into the contact tank distribution box where it is split into two (2) parallel contact tanks. Sodium Hypochlorite is introduced via flow paced feed for the purpose of disinfection of the final effluent. The disinfection system consists of a chemical transfer system, chemical storage and containment system and a chemical feed building. Disinfection is required seasonally from May 15 to October 15. The plant effluent water system uses pre-chlorinated water drawn upstream from the contact tank, this water is used for various activities by operations staff.

Pre-Wet Weather Event Activities

- Ensure adequate supply of Sodium Hypochlorite during the disinfection season.
- Maintain weirs and side walls of tanks.

During Wet Weather Activities

- Administer Sodium Hypochlorite for chlorination and monitor the disinfection system for proper operation.
- Wet Weather Condition # 2 – shut down the Effluent Water System.

Post Wet Weather Activities

- Check disinfection system, chemical storage.
- Visual observation of the effluent.
- If effluent clarity is sufficient, restart the Effluent Water System.

f. Sludge Handling Facilities

Waste Activated sludge (WAS) is collected from the clarifiers and pumped to the Aerated Sludge Holding Tanks. The WAS is stored and aerated until it is transferred to a separate tank where it is decanted and then thickened in a Rotary Drum Thickener. Thickened sludge

is then hauled via tanker truck to the Metropolitan-Syracuse WWTP for further treatment.

Pre-Wet Weather Event Activities

- None.

During Wet Weather Activities

- During wet weather, additional sludge is removed from the clarifiers to help prevent rising sludge blankets, and minimize the loss of solids.

Post Wet Weather Activities

- None.

Appendix A

Meadowbrook-Limestone WWTP Site Plan with Sampling Locations

Meadowbrook-Limestone WWTP Site Plan Process Units and Sampling Locations