CITY OF WASHINGTON, ILLINOIS
Public Works Agenda Communication

Meeting Date: 02-01-2021

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Agenda Item: Overview of Public Works – Employee and Equipment Considerations

Explanation: The Public Works Department consist of the Public Works Director, Utilities Superintendent, Street Department, two Water Treatment Facilities, one Wastewater Treatment Facility (there were two until 2020), a Distribution and Collections Department and one Mechanic. In addition to the Public Works Director and Utilities Superintendent there are 21 full time employees, a seasonal Cemetery Sexton, 3 seasonal mowing employees, and anywhere from 2-5 short-term employees each year.

STREET DEPARTMENT

The Street Department consist of 8 full time employees, a seasonal Cemetery Sexton, 3 seasonal mowing employees, and 1-2 short-term employees. They are responsible for the maintenance of 79 miles of roadway, curb and sidewalk maintenance, street sweeping, 51 miles of storm sewer, 1816 stormwater inlets, detention basins, 600 storm water manholes, cemetery maintenance and sexton duties, mowing of city owned properties, snow removal, bi-annual brush pick-up, and hundreds of miscellaneous service requests each year.
At this time the department is staffed sufficiently with the addition of an eighth employee in 2020.

Project Considerations for the 21/22 FY Street Department Budget Include the Following:

- **Overlaying of cemetery alleyways** (In House)
- **Overlaying of various alleys** (In House)
- **Overlaying of Lawndale Lane** (In House)
- **Overlaying of Garfield Lane** (In House)
- **Asphalt overlay of gravel area at the end of Legion Road** (In House)
- **Replacement of curb and driveway approaches on Belaire** (Possibly through Concrete Assistance Commodities Bid)

Stormwater Considerations Include the Following:

- **Open cut or lining of storm sewer on Oakwood.** This was planned for the 20/21 budget but due to the Covid-19 was held off and funds were used for other projects such as the Gilman sump collection project. It was also thought some of these funds could be used for storm culverts under the railroad south of Hilldale, however after visual inspection of these culverts they have been deemed to be in good shape.
- **GIS Location of Utilities with GPS Unit/Storm sewer mapping, inspection and cleaning –** This will be used to create more accurate utility locations and mapping. The project needs to be completed to assess the condition of the storm sewer system for any future repairs or replacement.
- **Ditch cleaning and culvert replacement in Beverly Manor, Felker's Addition, and South Annex** (Most likely will only complete one of these projects due to scope). The ditches in these areas have been neglected for years and cleaning with possible culvert replacement is needed moving forward.

WATER TREATMENT

The Water Treatment Department consists of two Treatment Facilities with 3 full time employees. They are responsible for the production of water, sampling and testing to assure water quality, reporting to State Agency's, service request for residents, and plant maintenance. Water treatment requires a certified class B operator to be compliant with State regulations.

A third employee was added to this department in 2014 to help with weekend shift rotation and to assure the plant was staffed sufficiently when employees were on vacation or out for illness.

Staff is evaluating the possibility of better utilization of this third position to help in another department, specifically the Distribution and Collections Department. When the third position was created in 2014 it was also to be a floater between the street department and the water department, mainly for snow removal or other larger projects where additional help was needed.

The AMR project, meter replacement project by staff (partial completion), and filter and softener rehabilitation has kept this third employee busy but now these projects having been completed, staff is looking to better utilize this position in the Distribution and Collections department to help with work not being completed there and to be fiscally responsible with funds.

Below you will see that we have a Water Quality Study that includes the Nitrification Action Plan in the FY 21/22. This study will require additional testing by plant personnel which will hinder the ability to utilize the third employee in the Distribution department once implemented. (See attached NAP)

Projects Considerations for the 21/22 FY Water Treatment Budget include the following:

- **Paint Well houses and generator building, also tuck pointing –** With problems seen at treatment plant #2 staff recommends sealing these buildings and addressing any joint repairs at that time. May be able to complete painting in house.
- **Replacement of dehumidifier at treatment plant #2 –** Original to the plant construction this unit has failed and the cost of replacement is close to $80,000. Staff is looking at alternatives such as the portable units that have been used since the original unit failed.
- **Water Tower #1 and #2 Inspections –** Tower #1 is warrantied for one year; staff wants to have the tank inspected before that to assure there are no issues. Tower #2 has some areas where the paint has come off on the north side of the tank. Staff believes this is due to the tornado and wants to be sure the tank can be cleaned and touched up and not something more than that. It has been approximately 10 years since tower #2 was painted.
- **Water Quality Study which includes Nitrification Action Plan –** This is a recommendation in the CIP that will help the city determine if there are water quality issues lurking in the system.
- **Upgrades to SCADA Communications WTP #2 and Wells #11 & #12.** During the ice storm over the New Year's Holiday communications were lost which caused a ton of overtime by staff and repairs by a communications company to get this back up and running. Some of the equipment used when the well houses were constructed were not designed for the use it was performing. Also, the antenna is suspected as having failed. The project will make the communications more dependable.

WASTEWATER TREATMENT

The Wastewater Treatment Department consists of one Treatment Facility with 4 full time employees and 1 short-term employee. Until recently they operated 2 treatment facilities, the second plant was decommissioned in 2020. Plant personnel are responsible for sampling and testing, process control, sludge production and hauling, facility and grounds maintenance, and reporting to the IEPA. The wastewater treatment facility requires a class 1 wastewater certificate to be compliant with State regulations.
Staff feels this department is adequately staffed with the addition of tankage and equipment at plant two and the closure of plant one. It is likely that a short-term employee will not be needed in FY 21/22.

Project Considerations for the 21/22 FY Wastewater Treatment Budget Include the Following:

- **New generator –** The generator is original to the 1970's build and staff is being told that parts are harder to come by. This was identified in the CIP.

- **Phase 2B sanitary trunk line –** Seems like this project increases in cost every time we meet with the Consultant. The Engineering Department has taken control of this project and pending property easements should start to progress more quickly.
- **Clarifier #3 Cat Walk –** The catwalk needs to be installed for safety reasons. The edge of the clarifier tank is at ground level and is a hazard.
- **Demolition Work At WWTP#1 –** This work needs to be completed ahead of any Phase 2B work. Committee may recommend that all or part of this work be done.

DISTRIBUTION and COLLECTIONS

The Distribution and Collections Department consist of 5 full time employees and 1-2 short-term employees. They are responsible for infrastructure between the water treatment facility and the wastewater treatment facility.
On the Distribution side they are responsible for 85 miles of water main, 1315 valves, 672 hydrants, including hydrant maintenance which includes semi-annual flushing, service request for service interruptions, and main breaks.
On the Collections side they are responsible for 79 miles of sanitary pipe, 6 lift stations used for the conveyance of wastewater, jetting and TV inspection of sanitary lines for maintenance, sewer main breaks and inspection, maintenance on over 1600 manholes, and all JULIE locates in the corporate limits of Washington.
Staff recommends the addition of a floater this year, and consideration for a sixth employee in the department this year with consideration for an additional employee in **FY 22/23**. Staff also recommends purchase of a Wachs valve turning machine in **FY 22/23** to complete the valve turning in house and also to keep up with the recommendations to televise and clean the sanitary sewer system. The CIP recommends budgeting $215,000 this FY (Not budgeted) $215,000 in FY 21/22, $350,000 in FY 22/23, $215,000 in FY 23/24 and $215,000 in FY 24/25 to complete televising and cleaning. This will be ongoing and can be completed in house with the additional personnel requested. The cleaning and televising work to be done is part of the City's CMOM (See attached) program as outlined in the NPDES Permit for Wastewater Treatment Plant #2.

Project Considerations for the 21/22 FY Distribution and Collections Budget Include the Following:

- **Water Main Replacement –** This could be in-house if time allows or contracted for any problems in the heat map area.
- **Sewer Main Replacement and CIPP Main Lining –** Staff continues to inspect manholes and sanitary sewer lines to determine if pipes can be lined. This could save money on reconstruction if the sewer lines were lined so only water is left to be addressed in a reconstruction project.

- **GIS Location of Utilities with GPS Unit –** I believe this is also identified in the Engineer's report and is an important part of the Distribution and Collections Department. It gives us good data to use when planning projects.

FLEET MAINTENANCE

The City has 1 full-time mechanic whose is responsible for the maintenance and repair of all City vehicles including heavy equipment, police vehicles, and small equipment, there are approximately 64 cars and trucks, backhoes, skid steers, 8 mowers, and other numerous pieces of equipment in the fleet. The mechanic also assists other departments as needed and participates in the snow removal rotation.
Staff recommends getting help at this position, possibly by making the cemetery sexton's position fulltime, year-round. This would provide that someone is available for emergency repairs for PD and PW's fleet while the mechanic is off.
Other benefits of making the cemetery sexton's position full-time, year-round include another driver for plowing snow, perform light maintenance at both PD and City Hall, and the ability to have this position perform the duties of the cemetery year-round, not just April - November. Currently the street department handles the duties of the cemetery during the colder months of the year when the current sexton is not working. This has been problematic during winter storms when a grave has to be dug.
All departments are required to participate in the snow removal rotation.

Equipment Considerations for the FY 21/22 Budget Include the Following:

- **Asphalt Paver -** Public Works have rented a paver the last two years at a cost of approximately $25,000. Crews would be able to complete edge of pavement repairs in areas where spray patching and seal coat will not be done for several years possibly with this purchase. Other larger projects could be completed at any time of the year when asphalt plants are open.
- **Backhoe Lincoln #33 –** One of the Cat 420 backhoe extend a boom is in need of replacement/repair as the stops are broke and the whole boom will need to be removed to perform this. There has been an increase in repairs to the two backhoes that are due to be replaced in FY 22/23. These machines were originally a lease and were bought for $1 after five years. At that time, a replacement fund was started for their replacement. The MERF fund is sufficiently funded to allow for replacement of these two machines next year however the city mechanic recommends moving one of the backhoes ahead one year for replacement. Both of these backhoes were used during the tornado in 2013. One backhoe has a hydraulic hammer that was designed for an excavator. If approved, the excavator with the hydraulic hammer would be traded and the new backhoe would be purchased with a hydraulic hammer designed for the backhoe purchased.

- **Hydraulic Excavator –** Public Works has increasingly used a rented excavator to enter into creek beds to clear obstructions, repair eroded creek banks with riprap, repair damaged manholes in creek beds, and complete the annual brush burn at the Dieble Road Detention Facility. FY 20/21 budgeted approximately $7500 for excavator rental. These excavators are not always available on short notice so if there was an emergency, and an excavator is not available, a contractor would need to be called, this is likely to exceed the cost of the rental and the city has qualified operators if we owned our own equipment. Public works has a 20ton tag trailer capable of transporting an excavator to wherever it is needed.
- **Camera –** For televising sanitary sewers and manholes. The E-350 and camera were purchased in FY 10/11 however it is believed that the E-350 can be extended for 5 additional years due to the low miles and excellent condition. The camera should be replaced as we have had it sent in for repairs several times and also had the tail section re-wired three times. We have separated these two pieces of equipment in the MERF account.
- **New F-350** – Used at the cemetery and has low mileage. We have budgeted for a new dump box on this truck in the current FY however if this truck is replaced there is no need to do that. Staff recommends deferring the purchase of a new truck and replacing the box. Consideration should be made to convert the electric lift to hydraulic if possible.
- **Sewer Jetting Machine (Easement Machine)** – Used for rear yard sanitary sewer cleaning and other hard to access areas such as creek and wooded areas. This machine is 18 years old and has been deferred for 3 years. It is staff's opinion that the easement machine can again be deferred.
- **John Deere Mower 72" 1500** – This mower is used at the wastewater treatment plant and is backup for the street mowers. We may look to defer this purchase if possible as the WAM (Wide Area Mower) is in need of expensive repairs and is due for replacement in FY 22/23. It might make sense to move the WAM up a year and defer the 72" mower one year or more if possible. Moving forward we may have to tweak the replacement schedule to replace the mowers more often. These mowers are mowing approximately 80 acres a week, sometimes all summer, so they are getting heavy usage.
- **Hydraulic Hammer** – Used on one of the Cat backhoes, this was purchased used in 1996. If one of the Cat backhoes is replaced in FY 21/22, we would order it with a hydraulic hammer that is designed for the machine.
- **Planer/Milling Machine** – Used on one of the two Cat skid steers in the fleet. This was purchased in 1996 when the city purchased its first skid steer. The current milling head is only one foot so it is for very small jobs. Public Works intends to purchase at least a three-foot milling head. This will be absolutely necessary for asphalt work performed by Public Works employees. Currently we are renting a three-foot milling head to complete work.

Building Maintenance Considerations for the FY 21/22 Budget include the following:

- **Replace roof at the Legion Road Facility**. This roof is original to the 1970's build and it is important to keep this building in good shape as it will be used for many more years.
- **Replace roof at the old filter building located at the old wastewater treatment #1 treatment plant**. This building will have the interior tankage and equipment demoed with concrete work done to allow for indoor storage. It is believed this roof is original to the building. Consideration should also be made to paint this building.
- **Card Pass at the street department and wastewater treatment facility** – The idea is to install card pass at each department where practical so that clearance to the buildings can be denied after termination or when certain buildings are restricted.

Fiscal Impact: TBD

Recommendation/
Committee Discussion Summary: Staff is seeking feedback in making the Cemetery Sexton's position fulltime to provide much needed support to the City Mechanic's position as well as potentially providing building maintenance at city hall and the police department. This position would also be required to plow snow during the snow removal season and be responsible for the cemetery at all times of the year.
Staff is seeking feedback for adding one employee to the Distribution and Collections Department. This is in addition to having the third position at the water treatment plant provide support to this department at times during the years when projects like valve turning, sewer jetting and televising, manhole adjustments, hydrant painting, and any other projects are being done.
Staff feels the equipment listed above are needs that will allow us to do more work ourselves, when we need to, and allows us to not be dependent on if a piece of equipment is available for rent. Staff recognizes the need to be fiscally responsible and is deferring equipment that is scheduled for replacement when it is determined the piece of equipment is in good condition. Staff also feels that the projects listed above are a benefit to the residents and are also needed. Some of the projects are in the Capital Improvement Plan and some are projects that have been neglected for years such as ditch cleaning and culvert replacement.

Action Requested: Direction for submitting a budget with the items addressed in this memo.

for specific toxic pollutants. Modifications under this condition shall follow public notice and opportunity for hearing.

SPECIAL CONDITION 15. For the duration of this Permit, the Permittee shall determine the quantity of sludge produced by the treatment facility in dry tons or gallons with average percent total solids analysis. The Permittee shall maintain adequate records of the quantities of sludge produced and have said records available for U.S. EPA and IEPA inspection. The Permittee shall submit to the IEPA, at a minimum, a semi-annual summary report of the quantities of sludge generated and disposed of, in units of dry tons or gallons (average total percent solids) by different disposal methods including but not limited to application on farmland, application on reclamation land, landfilling, public distribution, dedicated land disposal, sod farms, storage lagoons or any other specified disposal method. Said reports shall be submitted to the IEPA by January 31 and July 31 of each year reporting the preceding January thru June and July thru December interval of sludge disposal operations.
Duty to Mitigate. The Permittee shall take all reasonable steps to minimize any sludge use or disposal in violation of this Permit.

Sludge monitoring must be conducted according to test procedures approved under 40 CFR 136 unless otherwise specified in 40 CFR 503, unless other test procedures have been specified in this Permit.
Planned Changes. The Permittee shall give notice to the IEPA on the semi-annual report of any changes in sludge use and disposal.

The Permittee shall retain records of all sludge monitoring, and reports required by the Sludge Permit as referenced in Standard Condition 25 for a period of at least five (5) years from the date of this Permit.

If the Permittee monitors any pollutant more frequently than required by this permit or the Sludge Permit, the results of this monitoring shall be included in the reporting of data submitted to the IEPA.

The Permittee shall comply with existing federal regulations governing sewage sludge use or disposal and shall comply with all existing applicable regulations in any jurisdiction in which the sewage sludge is actually used or disposed.

The Permittee shall comply with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish the standards for sewage sludge use or disposal even if the permit has not been modified to incorporate the requirement.

The Permittee shall ensure that the applicable requirements in 40 CFR Part 503 are met when the sewage sludge is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator.

Monitoring reports for sludge shall be reported on the form titled "Sludge Management Reports" to the following address:

Illinois Environmental Protection Agency
Bureau of Water
Compliance Assurance Section
Mail Code #19
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

SPECIAL CONDITION 16. The Permittee shall work towards the goals of achieving no discharges from sanitary sewer overflows or basement back-ups and ensuring that overflows or back-ups, when they do occur do not cause or contribute to violations of applicable standards or cause impairment in any adjacent receiving water. Overflows from sanitary sewers are expressly prohibited by this permit and by Ill. Adm. Code 306.304. As part of the process to ultimately achieve compliance through the elimination of and mitigating the adverse impacts of any such overflows if they do occur, the Permittee shall (A) identify and report to IEPA all SSOs that do occur, and (B) update the existing Capacity, Management, Operations, and Maintenance (CMOM) plan at least annually and maintain it at the facility for review during Agency Field Operations Section inspections. The Permittee shall submit copies of the CMOM to the IEPA upon written request. The Permittee shall modify the Plan to incorporate any comments that it receives from IEPA and shall implement the modified plan as soon as possible. The Permittee should work as appropriate, in consultation with affected authorities at the local, county, and/or state level to develop the plan components involving third party notification of overflow events. The Permittee may be required to construct additional sewage transport and/or treatment facilities in future permits or other enforceable documents should the implemented CMOM plan indicate that the Permittee's facilities are not capable of conveying and treating the flow for which they are designed.

The CMOM plan shall include the following elements:

A. Measures and Activities:

1. A complete map and system inventory for the collection system owned and operated by the Permittee;
2. Organizational structure; budgeting; training of personnel; legal authorities; schedules for maintenance, sewer system cleaning,

and preventative rehabilitation; checklists, and mechanisms to ensure that preventative maintenance is performed on equipment owned and operated by the Permittee;

3. Documentation of unplanned maintenance;
4. An assessment of the capacity of the collection and treatment system owned and operated by the Permittee at critical junctions and immediately upstream of locations where overflows and backups occur or are likely to occur; use flow monitoring and/or sewer hydraulic modeling, as necessary;
5. Identification and prioritization of structural deficiencies in the system owned and operated by the Permittee. Include preventative maintenance programs to prevent and/or eliminate collection system blockages from roots or grease, and prevent corrosion or negative effects of hydrogen sulfide which may be generated within collection system;
6. Operational control, including documented system control procedures, scheduled inspections and testing, list of scheduled frequency of cleaning (and televising as necessary) of sewers;

7. The Permittee shall develop and implement an Asset Management strategy to ensure the long-term sustainability of the collection system. Asset Management shall be used to assist the Permittee in making decisions on when it is most appropriate to repair, replace or rehabilitate particular assets and develop long-term funding strategies; and
8. Asset Management shall include but is not limited to the following elements:
   a. Asset Inventory and State of the Asset;
   b. Level of Service;
   c. Critical Asset Identification;
   d. Life Cycle Cost; and
   e. Long-Term Funding Strategy.

B. Design and Performance Provisions:

1. Monitor the effectiveness of CMOM;
2. Upgrade the elements of the CMOM plan as necessary; and
3. Maintain a summary of CMOM activities.

C. Overflow Response Plan:

1. Know where overflows and back-ups within the facilities owned and operated by the Permittee occur;
2. Respond to each overflow or back-up to determine additional actions such as clean up; and
3. Locations where basement back-ups and/or sanitary sewer overflows occur shall be evaluated as soon as practicable for excessive inflow/infiltration, obstructions or other causes of overflows or back-ups as set forth in the System Evaluation Plan.
4. Identify the root cause of the overflow or basement backup, and document to files;
5. Identify actions or remediation efforts to reduce risk of reoccurrence of these overflows or basement backups in the future, and document to files.

D. System Evaluation Plan:

1. Summary of existing SSO and Excessive I/I areas in the system and sources of contribution;
2. Evaluate plans to reduce I/I and eliminate SSOs;
3. Evaluate the effectiveness and performance in efforts to reduce excessive I/I in the collection system;
4. Special provisions for Pump Stations and force mains and other unique system components; and
5. Construction plans and schedules for correction.

E. Reporting and Monitoring Requirements:

1. Program for SSO detection and reporting; and
2. Program for tracking and reporting basement back-ups, including general public complaints.

F. Third Party Notice Plan:

1. Describes how, under various overflow scenarios, the public, as well as other entities, would be notified of overflows within the Permittee's system that may endanger public health, safety or welfare;
2. Identifies overflows within the Permittee's system that would be reported, giving consideration to various types of events including events with potential widespread impacts;
3. Identifies who shall receive the notification;
4. Identifies the specific information that would be reported including actions that will be taken to respond to the overflow;
5. Includes a description of the lines of communication; and
6. Includes the identities and contact information of responsible POTW officials and local, county, and/or state level officials.

Sample Collector's Handbook: Chapter 18 – Nitrification Action Plan

A Community Water Supply (CWS) that employs chloramination as a means of disinfection or a CWS that has source water containing ammonia is required to implement a Nitrification Action Plan (NAP) pursuant to Section 604.140 of Title 35 of the Illinois Administrative Code. The NAP is a tool for identifying areas of the distribution system that may experience nitrification issues resulting in depleted disinfectant residuals, potential biofilm growth, and bacteriological contamination.

The NAP should include specific monitoring requirements for various parameters to optimize the chloramination process and ensure that chloramine disinfection is successful in preventing and/or responding to nitrification events. The NAP should also include specific levels of monitoring parameters that trigger corrective actions and should delineate corrective actions that will be implemented when monitoring indicates that nitrification may be present.

What is Nitrification?

Nitrification is the microbial process of converting ammonia, or ammonium, into the nitrogen compounds of nitrite and nitrate. Ammonia may be present in drinking water through naturally-occurring processes or through ammonia addition in the formation and use of chloramines as a disinfectant in the water treatment process.

The first step in the nitrification process is the conversion of ammonia, or ammonium, into nitrite through oxidation. *Nitrosomonas* is the most identified genus associated with this process. The second step is the oxidation of nitrite to nitrate in the presence of *Nitrobacter*. *Nitrosomonas* and *Nitrobacter* are the most common bacteria present in the nitrification conversion process.

It is important to understand the chloramination process when ammonia is present during the treatment of water for potable usage. Ammonia can often be present in the source water, well or surface water, or can be added in the treatment scheme to produce chloramines as a disinfectant. Chloramines are often used as a disinfectant for controlling disinfectant by-products and because of the persistent nature of chloramines as a disinfectant.

However, improper monitoring and control of ammonia in a distribution system can result in detrimental health effects. Excess ammonia levels can result in the depletion of disinfectant residuals, promotion of biological growth, nitrite and nitrate formation, reduction in pH and alkalinity, and concerns related to taste and odor. It is important to note that Nitrite-N and Nitrate-N are regulated contaminants with acute maximum contaminant levels of 1 milligram per liter (mg/L) and 10 mg/L, respectively.

Who is required to implement a Nitrification Action Plan (NAP)?

Any CWS that adds ammonia in the treatment process to form chloramines as a primary disinfectant must develop and implement a NAP. In addition, a CWS that has ammonia in the source water must meet the

same requirements unless monitoring indicates that breakpoint chlorination is consistently achieved at the treatment application point.

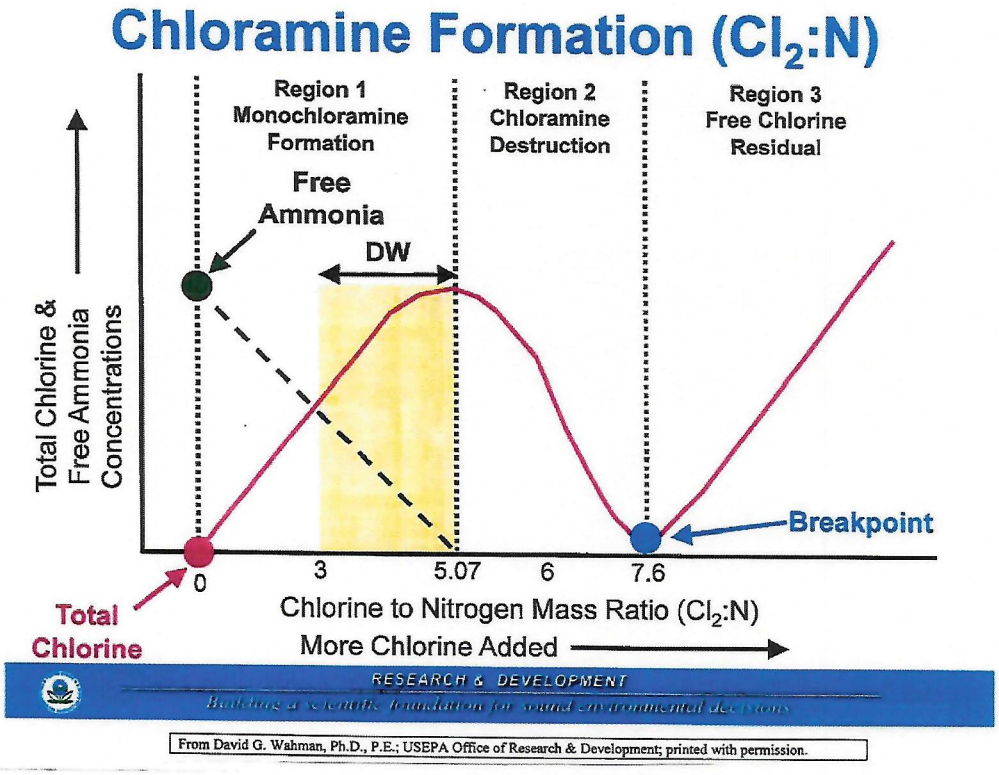
Monitoring of each raw water source must be conducted to determine presence and quantification of ammonia in the respective source waters. This includes monitoring of all wells and surface water sources at an appropriate frequency to reflect seasonal variations of the source water ammonia levels. Historical data, quantifying the ammonia concentrations, can also be evaluated using the Drinking Water Watch website at http://water.epa.state.il.us/dww/.

A CWS that purchases potable water for redistribution may be required to develop and implement the NAP based on the disinfection practices of the CWS that is providing the water. Specifically, if the CWS providing potable water is required to implement the NAP, the purchasing, or consecutive, CWSs will also be required to do the same.

Sampling Requirements

Identification of optimized chloramination disinfection treatment and distribution nitrification problems requires monitoring of several parameters. The quantification of these parameters is critical in understanding and optimizing the chloramination process and identifying areas within a distribution system where nitrification problems may exist. To implement the NAP, the CWS should monitor total ammonia-N, free ammonia-N, nitrite-N, nitrate-N, monochloramine residuals, dichloramine residual, and total chlorine residual. Understanding the chlorination curve (see Figure 18-1) and the relevance of these monitoring parameters provides the information necessary to make adjustments in the treatment scheme to optimize the chloramination process and minimize the risk of nitrification. Additional process management may include monitoring of free chlorine and pH. When nitrification is suspected to be present, speciation and quantification of the bacteria found can be used as a means of measuring the extent of nitrification.

Figure 18-1



Sampling Sites for the NAP

Sampling sites must be representative of the raw water source when determining if the presence of ammonia exists in the source water. Specifically, the sample tap of a source water, well or surface water, must be located prior to any disinfection application. When multiple wells are used simultaneously, the sample tap must be representative of the combined discharge of all wells being used. This information is particularly important in determining optimal chlorine and supplemental ammonia feed rates for obtaining the desired disinfection results.

In addition to source water quality monitoring, point-of-entry monitoring is necessary to establish water quality characteristics at all points subsequent to treatment and at the point-of-entry to the distribution system. Point-of-entry monitoring establishes a baseline of water quality entering the distribution system and can be used in a comparative analysis of water quality throughout the distribution system. It is important to note that when multiple treatment application points are provided, monitoring for each treatment application point is necessary. For systems that purchase water, water quality monitoring is required at each point of connection to the water supply provider(s).

Distribution monitoring requires careful consideration to properly assess impacts related to nitrification. Identification of sample sites should consider factors including water age, disinfectant residuals, and areas of overall water quality concerns. Typically, extended water age represents the most significant risk for nitrification occurring. Sample sites should be chosen that reflect areas in the distribution system where the residence time is the greatest. Distribution coliform sample sites can be used for NAP monitoring given that those sites should reflect water residing in the system the longest. In addition, sample sites should be chosen to reflect an "average" age of water. These average water age sites can be used in comparison with other distribution monitoring data for determining the locational extent of the nitrification and isolate where corrective actions must be implemented.

Sample sites should also be representative of all pressure zones within a distribution system. A hydraulic analysis of the system may be necessary to determine areas where an average water age and extended water age exists.

Sample Frequency

The NAP sample frequency for an effective and comprehensive strategy is dependent on numerous factors and can vary from system to system. Initial sampling frequency is critical in establishing a sufficient baseline of data that accurately characterizes water quality at the point-of-entry and distribution system. Additionally, sampling should account for temporal variance and reflect seasonal changes that may play a significant role maintaining consistent and adequate disinfectant residuals.

Upon establishing the characterization of water quality at the point-of-entry and the distribution system, a monitoring plan must be established for maintaining optimal disinfection practices while reducing the risk of nitrification occurring. Minimum sampling frequencies for maintenance monitoring are provided in Figure 18-2. Additional monitoring may be necessary where finished water storage facilities impact water quality or water quality variations indicate frequent changes occur in portions of the distribution system. Similar to any monitoring protocol, it is imperative that proper lab analyses and techniques are used, including appropriate calibration of monitoring equipment, to provide reliable and accurate monitoring data.

Figure 18-2

	Point of Entry	Distribution	Prior to and after any chlorine or ammonia injection points
Total Chlorine	daily	daily	**
Mono-chloramine	daily	weekly	**
Di-chloramine***	monthly	monthly	**
Free Ammonia	daily	weekly	**
Total Ammonia	daily	weekly	**
Nitrate and Nitrite	*weekly	monthly	**

* nitrate and nitrite monitoring can be reduced to monthly if source and treatment variations indicate minimal variations.
** monitoring of all parameters should be done prior to, and subsequent to making any feed rate adjustments to chlorine and/or ammonia
*** dichloramine can be determined using amperometric titration procedures or can be calculated as the difference between the total chorine and monochloramine residual.