NEWPCC Upgrade Site Info Tour – Spring 2017

April 19th 1pm, April 24th 1pm, April 27th 9am

Project: **North End Sewage Treatment Plant (NEWPCC) Upgrade – Bid-Op. 973-2016**

i. Introduction (AT FLAG)

a. *Introduce Tour guides*

b. Safety
   i. PPE: For this tour you are all required to wear the following PPE. Hard Hat, CSA approved steel toe boots, High Visibility vest and safety glasses
   ii. Please stay with the group
   iii. Give geese a wide berth.
   iv. In the event of an emergency, we travel as a group to the closest muster point.
   v. Please let us know if you have any mobility issues as this is an old plant and there are a lot of stairs.

c. This is an informational tour which focuses on the North End plant as it currently operates however I will be giving you a brief overview of work done to date to prepare for the DB project.

d. Format: We will be walking through the plant as a group. When we arrive to a specific process area, we will read a narrative. Following the narrative, you may look around for a few minutes if you wish. If you need us to repeat something, as it is loud in the plant, please let us know.

e. In your packet of material, there is an aerial view of the plant with all the major processes and buildings labeled. We will be following the order labeled. Additionally, there is an aerial photo of parcel B with directions to drive there. If attendees wish to see Parcel B, we will meet at the flag pole after the existing site tour.

f. We will not be answering any questions.

ii. WSTP (Winnipeg Sewage Treatment Program)

a. The NEWPCC Upgrade project is being delivered by the Winnipeg Sewage Treatment Program or (WSTP). The WSTP is a 30 year

partnership between the City of Winnipeg and Veolia which focuses on a number of initiatives the City is undertaking within its wastewater treatment system. Both the SEWPCC and NEWPCC upgrades and maintenance and operational readiness.

b. **Structure of the WSTP.**

There is a Program Leadership Team which is a combined City and Veolia Committee. Each Represents the organization's management and has the ability to make decisions for each partner organization.
There is a Program Management team made up of Senior City and Veolia managers that focus on the management of blended teams, addresses operational and organizational issues and has direct engagement with the teams.
There are task groups containing both City and Veolia staff that deal with Specific major capital projects , operational readiness, maintenance initiatives and ongoing new programs.

c. **Benefits to the City**

i. Some specific benefits of the WSTP include day to day in office peer support, development of long term initiatives and sharing of long term objectives
ii. City staff gain valuable experience while maintaining full ownership of Capital planning activities

iii. OA

a. For the NEWPCC Upgrade project, the WSTP has hired AECOM in association with Stantec as its Owners Advocate Engineer. AECOM is preparing an indicative design for City Budget purposes and facilitating the RFx packages.

iv. NEWPCC Upgrade

The intent is to post the RFQ for the Design Build of the Upgrade in the 4th quarter of 2017 or first quarter of 2018. The Main drivers for the upgrade are end of life equipment, providing a level of treatment for wet weather flow, and mandated biological nutrient removal. The City of Winnipeg city council has approved a budget of $795M Canadian dollars. With respect to the triple constraint of time- cost and quality, this project is weighted towards cost and quality with approximately 75% of the existing facility expected to be replaced.

a. **Work done to date**

i. Ongoing Development of Standards and Specifications including:

1. Automation Design Guide
2. HMI Layout and Animation Plan
3. Electrical Design Guide

4. Electrical Identification Standard
5. Civil Design Guideline
6. Structural Design Guideline
7. Architectural Design Guideline
8. Process Mechanical Design Guideline
9. Building Mechanical Design Guideline
10. Standardized E, I & C Equipment

b. **Other work includes**
   i. Development of Indicative Plan for the Upgrade
   ii. Pre selection of IFAS, HRC, STRUVITE recovery and Thermal Hydrolysis vendors. You can view any of these closed Bid Opportunities on our Materials management website.
   iii. We are Planning on having a co-location office with the OA, WSTP and DB
   iv. Geotechnical investigations
   v. Process Sampling and baseline data
   vi. Composite base plan and control points
   vii. Process stress testing
   viii. Power supply Upgrade – done as a design build. RFP out to pre-qualified proponents right now. Anticipated completion by 2019.

v. License Requirements (AT FLAG)

a. NEWPCC operates under the Environmental License 2684RRR (Updated June 2009). There are specific limits that the plant must meet which started Dec 30th 2014.
b. The details of the license can be found by searching the internet using search parameters “2684RRR 2009”

1. Hauled Liquid Waste and Leachate Facility (AT FLAG)

a. The site across the field is where the plant receives hauled septage, industrial waste and leachate generated from within the City and surrounding municipalities.
b. All hauled wastewater received at the NEWPCC (Lanes 1 to 3) are discharged automatically to the interceptor upstream from the main pump station by gravity.
c. All loads are logged and can be tracked. Facilities are equipped with online samplers and LEL detectors. If a flammable load is detected it can be isolated within the receiving tank and pumped out without impacting the process (except leachate)

d. Construction on this facility is almost complete. Once operational, a new dedicated lane will receive hauled leachate from the landfills and to improve the overall layout and controls.
e. When completed, there will be a total of 4 lanes

2. Administration Building (Reception Lobby)

a. The administration Building contains offices, main plant controls and the laboratory. Built in 1982-83, it added a control room, meeting room, washrooms and this lobby. In 1997, which was the last major renovation, mainly labs were renovated.
b. The administration building is connected to the Main Building, which is one of the oldest buildings at the NEWPCC. It includes the surge well, raw sewage pumps, and the discharge chamber. **(Walk toward Main Building)**

3. Main Building (Heat Pump Vestibule)

a. Component elements
    i. In 1936-37 it when it was built, this building contained raw sewage pumps, grit tanks, administration and a locker room
    ii. In 1963-65, old grit tanks were abandoned and covered, an elevator to the pump wells was installed and, a new lab and workshop were built.
    iii. Originally contained a chlorination system. However, this has been removed
b. Surge Well, Discharge Chamber and Raw Sewage Pumps
    ii. The Total Capacity of the plant is : 77 to 1060 MLD
    iii. Only 820 MLD can be fed to the grit building, the remainder must be bypassed to the outfall
    iv. Raw sewage from the main interceptor flows into the plant through the surge well which is divided into 2 raw sewage suction headers.
    v. Currently there are 6 pumps. The pumps are located in three parallel 17.4 m deep pump wells.
    vi. The raw sewage pumps lift the sewage into the discharge chamber and it flows by gravity through 2 underground conduits, into the Pre-Aeration and grit removal building. The required lift from the wet well to the discharge well is between 8 and 18m, depending on the surge well level.
    vii. If flows exceed the maximum capacity of the Pre-aeration and Grit Removal the excess sewage spills over a weir to an outfall and on to the river.
c. Raw Sewage pumps details (Top of pump wells)

i. Pumps 2, 3, 4 and 6 were installed in the 1960's. Pumps 3 and 6 are constant speed with a capacity of 188MLD. Pumps 2 and 4 are variable speed with a capacity of 77 – 188MLD. Pump 1 is a constant speed pump with a capacity of 109MLD and pump 5 is a two speed pump with a 150/195MLD capacity.
    - **Point out electrical room. Don't enter.**

4. Preliminary treatment (Outside southeast entrance to grit building)

a. Preliminary treatment occurs in the pre-Aeration and grit removal building
b. The sewage passes through bar screens and then into the grit tank where it is pre-aerated and the grit is removed.
c. Bar Screens
    - There are four climber bar screens with front raking mechanisms
    - Each screen has a capacity of 280 MLD for a firm capacity of 840 MLD with one out of service
    - Screenings are deposited onto the conveyor, which subsequently transfers the screening into a grit hopper container in the grit truck bay
    - The container is periodically taken to the landfill land and emptied
d. Grit Removal and Pre-Aeration
    - There are 4 parallel grit removal and pre-aeration tanks
    - 46 x 6.7m, 4.6m deep
    - Grit section is 21.5m
    - Pre-Aeration 24.5 m
    - The capacity is 280 MLD each which is the same as the screens
    - Grit is manually removed by clamshell and combined with the screenings. The grit tanks were designed to be covered with off-gas directed to the stack
    - Effluent from all grit tanks is directed into one common channel and flows to the primary clarifiers
e. The grit is trucked to the landfill for disposal.

WE WILL NOW WALK THROUGH THE GRIT BUILDING. IF YOU WISH, YOU MAY SPEND A FEW MINUTES EXAMINING THE BAR SCREENS AND CONVEYORS AS WE WALK THROUGH. THE AREA IS MONITORED FOR H2S WHICH IS A TOXIC GAS. IF A STROBE LIGHT BEGINS TO FLASH WE WILL LEAVE THE BUILDING IMMEDIATELY.

- **Point out level and time control for bar screens.**
- **Point out conveyor start with screen start.**
- **Point out air diffusers in process and rolling flow pattern.**

5. Electrical Supply (Grit Electrical Room)

a. The plant is currently fed at by two 66kV feeds and two 66kV:4160V 7.5MVA transformers owned by Manitoba Hydro and one 66kV:4165V 5MVA transformer owned by the city.
b. The power is distributed throughout the plant at 4160 V.
c. Most of the distribution at 4160Vand 600V has fully redundant feeders using a split bus and tie breaker system
d. A separate design build project is being tendered to replace the existing substation and switch gear with a new power supply which will be able to provide 30MVA of fully redundant power to be distributed in bulk at 12kV and 4160V.
    - **Point out feeder breakers and tie breakers.**

(Outside Southwest door of Grit Building)

- **Point out existing switchyard and site for new electrical building and switch yard.**

6. Junction Chamber (Outside southwest door of Grit Building)

a. This chamber enables the diversion of pretreated, primary or secondary effluents to different processes (primary clarifiers, secondary treatment, UV) in the plant or directly to the outfall. This allows operations to isolate portions of the process for irregular maintenance.
    - **Generally point out hatches for stop logs and valves.**

7. Primary Treatment (Still outside southwest door of Grit Building)

a. The primary treatment consists of 5 primary clarifier tanks, the sludge removal system, and the scum removal system. It has a total capacity of 840 MLD.
b. Rake systems at the bottom of the tanks slowly push the sludge to the suction point of the sludge pumps. Skimmer blades move along the surface of the tanks to push scum into scum collection troughs.
c. Waste Activated Sludge from the Secondary Treatment Process is pumped back to the head of the Grit tanks and co-settles in these tanks with the primary sludge.
d. The odour from clarifiers 4 and 5 is vented through a stack
e. The primary effluent flows to the secondary treatment process.
    - **Point out stack connection**
    - **Point out grit effluent channel and influent paths to clarifiers.**
    - **Point out primary effluent conduit.**
    - **Point out clarifiers and data from table. (walk around clarifiers)**

PC #	Size, m	Depth, m	% Flow	Covered, Y/N	Year
1	D 35	3.6	14	N	1937 (2010)
2	D 35	3.6	14	N	1937 (2010)
3	D 44	3.6	22	N	1956 (2010)
4	69 x 24	3.6	25	Y	1980
5	69 x 24	3.6	25	Y	1980

- **Point out centre ring and scum collection**

f. The pre-treatment effluent flows from the grit building in two conduits to feed the rectangular clarifiers and, from the centre ring, the three round clarifiers. The effluent from the round clarifiers is collected in the outer ring and flows through the primary effluent channel to the secondary treatment process.
g. The scum from the round primary clarifiers flows into the centre ring.
h. The sludge and the scum are pumped to the digesters. **(clarifier basement)**
i. The sludge is pumped through a density meter in a batch sequence that runs on time. A low density cut-off will cause the sequence to advance to the next sludge collection point when the sludge gets thin.
(Walk through primary clarifiers 4 & 5.)

8. Secondary Treatment: HPO Reactors (On Reactor Deck)

a. The secondary treatment consists of 6 high purity oxygen reactor tanks and 26 secondary clarifiers.
b. Mixing of the primary effluent, return activated sludge and high purity oxygen (HPO) to biologically remove organic material occurs in the reactor tanks.
c. High purity oxygen is produced onsite and by a cryogenic plant owned, operated and maintained by an external vendor.
d. The mixed liquor from the reactors flows into secondary clarifiers for settling.
e. The flow of oxygen into the reactor tanks is regulated to maintain a headspace pressure of 4”WC. The vent valves are regulated to maintain a vent gas oxygen purity of about 50% as determined by operational decisions for each reactor.
    - **Point out oxygen header**
    - **Point out mixers**
    - **Point out vent valves.**
    - **Point out Prax Air plant.**

9. Secondary Clarifiers: (Inside Clarifiers by steps down from Reactors)

a. Total of 26 (10 “squircles”, 16 rectangular) “Squircle” clarifiers are a hybrid of rectangular and circular clarifiers. They are square in shape but have radial flow pattern from central column out.

SC #	Type	Size, m	Depth, m
1 to 10	Squircle	D 24	3.6
11 to 18	Rectangular	70.5 x 9.1	3.6
19 to 26	Rectangular	70.5 x 9.1	3.6

b. The walkway between the squircles and rectangular secondary sits on top of three stacked channels. The primary effluent is directly under the walkway and flows to the HPO reactors. Below the primary effluent conduit is a RAS gallery, where the sludge from the secondary tanks is collected and pumped as returned activated sludge to the HPO reactors and some is pumped back to the head of the grit building to co-settle with the primary sludge. Beneath the RAS gallery is the Secondary effluent , which flows back toward the UV treatment and the river. At the side of the walkway are mixed liquor channels, which is the effluent of the HPO reactors and to influent of the secondary clarifiers.

c. Most of the sludge is automatically pumped back to the reactor tanks as return activated sludge (RAS) using three dedicated headers with Magflow meters. During normal operation RAS/Primary Effluent ratio is 0.3. There is one RAS pump per clarifier. Adjoining clarifiers can be twinned to a single pump for emergency service.

d. Scum is pumped to the digesters. Waste Activated Sludge is pumped back to the head of the Grit tanks to be co-settled in the Primary Clarifiers.

- **Point out sludge collection systems, (syphon and rake) point out scum collection systems.**
- **Point out the Secondary Effluent Conduit**

(Walk down to RAS Gallery)

- **Point out RAS Pumps, WAS Pumps, RAS headers, MLSS channel**

10. Maintenance Building (Basement)

a. This area is used for storage. It is the basement of the maintenance shop. The hatch above us is used with a bridge crane to shift equipment and materials up and down.

b. The Maintenance building is equipped to carry out mechanical, electrical and instrumentation related work necessary to maintain reliable operation of the plant.

c. We will go upstairs and have a quick look into the shop area.

(Enter in the bay of the building)

- **Point out crane, welding area, machining tools.**
- **Point out that Plumbers, Welders, Industrial Mechanics, Electricians and Instrumentation Technologists work from this area.**

11. Cryogenic Plant (outside door at parking lot of shop)

a. This is another look at the Cryogenic plant. It is owned and operated by a private company.
b. Across the road from us are the solids handling facilities.
c. Sludge from the clarifiers is anaerobically digested and dewatered. The centrate from the dewatered sludge is treated by the sequential batch reactor facility over there. That is where we will start next.

12. Centrate Treatment Facility (SBR Deck)

a. The Centrate Treatment Facility consists of sequencing batch reactors, blowers, soda ash feed system and methanol feed system. The centrate from the dewatering building is fed to the reactors for nitrogen removal. The two SBR tanks are aerated and not aerated; drained and filled in a sequence. Large hinged decanter arms move up and down with the level in the tank to collect treated centrate, which is discharged to main interceptor and back into the surge well. The sludge is pumped back to the head of the grit tanks to be co-settled in the primary clarifiers.
   - Point out decanter covers
   - Point out Soda Ash Silo
   - Point out methanol tanks
   - Point out blowers
   - Point out parcel B, radio tower and train tracks.
   - Point out biogas sphere and flares

13. Centrate Treatment Facility (SBR indoors)

- Walk through electrical room, control room, chemical room and blowers room.
- Point out DCS

14. Anaerobic Digestion System (SBR DECK)

a. Scum, primary sludge, co-settled with sludge from the secondary clarifiers and centrate treatment, as well as sludge from the SEWPCC, and WEWPCC are treated in mesophylic (~98deg F) anaerobic digester tanks and then stored and mixed in holding tanks. The digestion process produces flammable methane gas which is recirculated in the digesters to

aid mixing and is captured and used in the boiler process. The gas is stored in that large silver sphere. Gas production beyond the heating requirements of the plant and the storage capacity of the sphere is flared.

b. The stabilized digested sludge is pumped from the holding tanks to the dewatering facility.
c. We will now walk through the digester building and stop in at the boiler room.

(In Digester Complex)

d. Inside the heat exchangers, hot water piping heats up the colder sludge. The water does not come in contact with the sludge.

- **Point out the heat exchangers**

Tank number	Function	Diameter, m	Liquid volume, m^3	Bottom
9, 10, 11 and 12	Digesters	33.5	7,200	Flat
13 and 14	Digesters	33.5	8,000	Conical
5, 6, 7 and 8	Holding tanks	26	3,850	Conical
1	Emergency overflow	18	1,900	Conical
2	Leachate holding tank (not in use)	18	1,900	Conical
3 and 4	Not in use	18	1,900	Conical

15. Boiler Room (Outside Boiler Room)

a. The boiler room houses the central heating plant for the NEWPCC. The purpose is to provide the primary heat production and distribution for the entire site.
b. There are five boilers.
c. Boilers 1, 2 and 3 are water tube boilers that operate on either sludge gas or natural gas.
d. Boiler 4 is a fire tube boiler that was fitted to run on sludge gas but can only be operated on natural gas.
e. Boiler 5 is the most recent boiler. It is a water tube boiler, but like boiler 4, it was fitted for sludge gas and natural gas, but can only be run on natural gas. The sludge gas is too corrosive.
f. The boilers operate to maintain a combined system discharge temperature of 105C, allowing it to be operated with by Class 5 power engineers.
g. Nitrogen padding is used to maintain the system pressure.
h. A mixing tank blends the system flows.

i. Heat pumps send the heated water to the digester heat exchangers to maintain mesophylic digestion temperatures and throughout the plant for general heating.

(Walkway of Boiler room)

- **Point out boilers.**
- **Point out mixing tank**
- **Point out padding tank**
- **Point out heat pumps.**

(Walking to Dewatering)

- **Point out holding tanks, mixing pumps, transfer pumps.**

16. Sludge Dewatering Facility (Polymer pump room)

a. The Sludge Dewatering Facility consists of a polymer mixing and dosing process, centrifuges, centrate and thin sludge returns, and a loading system to load dewatered sludge cake into trucks. There are six centrifuges, each with a dedicated polymer pump, sludge feed pump, cake hopper and sludge cake pump. The primary role is to mechanically extract water from the stabilized digested sludge using centrifuges and polymer. The sludge cake is moved by hydraulic cake pumps into hopper bins which drop weight measured loads into semitrailers to be transported to the Brady Landfill. The centrate is sent to the centrate treatment facility. Thin sludge is returned to the holding tanks in the digesters.

- **Point out polymer mixing tanks**
- **Polymer pumps**
- **Sludge feed header**

We will have a look at the equipment in this facility. **(Proceed upstairs. Skip ground floor now)**

- **Point out centrifuges(Second Floor)**
- **Point out truck loading bins (third floor)**
- **Point out scales and loading procedures**

Walk into the control room

- **Point out PLC equipment**

Return to main floor

- **Point out sludge feed pumps.**
- **Point out cake pumps**
- **Point out dry polymer handling facilities**

17. Chemical Phosphorus Removal Facility (Dewatering Lab)

a. Phosphorus is captured by dosing ferric chloride into the sludge and centrate piping, creating a chemical reaction that precipitates phosphorus, allowing it to settle and be removed from the plant in the sludge cake.
b. Ferric chloride is also very effective in reducing the production of H2S in the digesters.
c. Ferric chloride is usually brought in to the plant by railcar. Tanker trucks could be used too.
d. Ferric chloride is highly corrosive. The holding tanks and unloading facility have full secondary containment.
    - We will have a quick look at the dosing pumps, holding tanks and rail car unloading.
        - **Point out dosing pumps**, **Point out storage tanks (dosing facility)**

Tour railcar receiving bay

18. Ultraviolet Disinfection Facility (At low lift pumps)

a. The secondary effluent has run out of hydraulic head here. It is pumped from the wet well into a channel, where the flow is spilt into 3 disinfection channels. Flows exceeding the capacity of the UV facility will flow over a weir and to the outfall.
b. UV facility constructed in 2007. It contains 1008 medium pressure UV lamps, grouped in 6 banks. There are 3 channels (2 banks per channel).
c. Treatment capacity 380 MLD and it treats only secondary effluent.
d. Secondary effluent is lifted 6 m by 5 pumps (operated in cascade mode)
e. All flows above 430 MLD backup and spillover to the primary effluent bypass
f. There is automatic UV intensity control and lamp cleaning
    - **We will have a look at the UV facility from the entrance area. We will not enter the area where UV eye protection is required.**

19. The Outfall (outside UV)

a. The outfall conveys fully treated, partially treated and bypassed sewage into the Red River.
b. It leaves the UV continues through the golf course to the river.
c. The Province of Manitoba monitors the quality of the effluent at the brick sampling building you can see over there.

20. Conclusion

a. “Parcel B” is on the other side of the railroad tracks and requires everyone to drive over there. This is only an open field and everyone will be allowed to wander the site for a limited time. This is not mandatory, please let us know if you are going to meet us over there, directions are on the handout. Drive Safe!
b. This is the end of the tour. From concern for fairness, we can’t respond to questions now but we sincerely hope this has been of value in helping you to understanding where the NEWPCC upgrade project will start from.
c. We recommend you continue to monitor the City of Winnipeg’s Materials Management website for update on the progress on the project Bid-Op 973-2016 , and we look forward to your participation in the procurement.