

Agenda – Standing Policy Committee on Water and Waste, Riverbank Management and the Environment – March 1, 2018

REPORTS

Item No. 1 Winnipeg Drinking Water Treatment Plant Deficiencies Review

WINNIPEG PUBLIC SERVICE RECOMMENDATION:

That this report be received as information.

Agenda – Standing Policy Committee on Water and Waste, Riverbank Management and the Environment – March 1, 2018

DECISION MAKING HISTORY:

STANDING COMMITTEE RECOMMENDATION:

On February 1, 2018, the Standing Policy Committee on Water and Waste, Riverbank Management and the Environment granted an extension of 30 days for the Winnipeg Public Service to report back on the matter.

On November 28, 2017, the Standing Policy Committee on Water and Waste, Riverbank Management and the Environment passed the following motion:

That the Winnipeg Public Service be requested to provide a summary of what operationally happened at the Deacon Water Treatment Plant, including an itemization of what was impacted, explanation of why it happened, and estimated repair costs, for report back in up to 60 days.

ADMINISTRATIVE REPORT

Title: WINNIPEG DRINKING WATER TREATMENT PLANT DEFICIENCIES REVIEW

Critical Path: Standing Policy Committee on Water and Waste, Riverbank Management and the Environment

AUTHORIZATION

Author	Department Head	A/CFO	CAO
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EXECUTIVE SUMMARY

The Winnipeg Drinking Water Treatment Plant ("Water Treatment Plant") has experienced deficiencies associated with: the roof on the main Water Treatment Plant Building, the roofs on the Chemical Storage and Sodium Hypochlorite Buildings, the onsite sodium hypochlorite generation system, the dewatering cells, the standby generators and the concrete tanks within the Water Treatment Plant.

None of the deficiencies identified have impacted the Water Treatment Plant's ability to provide potable water to the City. Water treatment has always remained in compliance with the City's Public Water System Operating License.

To date, Water and Waste has expended approximately \$615,200.00 to address the deficiencies at the Water Treatment Plant. Actions undertaken have included: repairs to the roofs on the main Water Treatment Plant and Chemical Storage and Sodium Hypochlorite Buildings, the retrofit of the backup bulk sodium hypochlorite system to allow for the commercial purchase of sodium hypochlorite on an ongoing basis, repair and retrofit of the standby generators and investigation of the surface distress on the concrete tanks within the Water Treatment Plant.

This report addresses the costs to date and the estimated known future costs related to the roof on the main Water Treatment Plant Building. Further investigations are required to determine what additional funding will be required to address the other noted deficiencies. There is potential for these costs to be substantive but will not be known until after the design studies are complete. When costs are known, they will be included in future budget estimates.

RECOMMENDATIONS

That this report be received as information.

REASON FOR THE REPORT

On November 28, 2017, the Standing Policy Committee on Water and Waste, Riverbank Management and the Environment requested that the Winnipeg Public Service provide a summary of what operationally happened at the Deacon Water Treatment Plant, including an itemization of what was impacted, explanation of why it happened, and estimated repair costs, for report back in up to 60 days.

IMPLICATIONS OF THE RECOMMENDATIONS

There are no implications arising from receiving this report as information.

The only costs associated with this report are for the investigation of deficiencies and repair of the leaking roof, based upon a class 5 estimate. Should the investigations of other noted deficiencies determine additional investments are required these costs will appear in future budget estimates.

HISTORY / DISCUSSION

The Water Treatment Plant has experienced deficiencies associated with: the roof on the main Water Treatment Plant Building, the roofs on the Chemical Storage and Sodium Hypochlorite Buildings, the onsite sodium hypochlorite generation system, the dewatering cells, the standby generators and the concrete tanks within the Water Treatment Plant.

None of the deficiencies identified have impacted the Water Treatment Plant's ability to provide potable water to the City. Water treatment has always remained in compliance with the City's Public Water System Operating License.

The following section provides a chronology of events from the initiation of the design of the Water Treatment Plant to when each deficiency was identified.

Chronology

August 30, 2004: The City and Earth Tech (Canada) Inc. (now AECOM Canada Ltd.) enter into a contract for design consultant services for the Water Treatment Plant.

September 4, 2004: The City and UMA Projects (CM) Ltd. (now AECOM Canada Projects (CM) Ltd.) enter into a contract for construction management services for the Water Treatment Plant.

May 2005: Construction of the Water Treatment Plant begins.

March 27, 2006: The City and Toromont Industries Ltd. enter into a contract for the supply of standby generators and electrical switchgear for the Water Treatment Plant under Bid Opportunity No. 682-2005.

May 26, 2006: The City and PCL Constructors Canada Inc. enter into a contract for the construction of the foundations and concrete structures for the main Water Treatment Plant under Bid Opportunity No. 583-2005.

May 30, 2006: The City and Hugh Munro Construction Ltd. enter into a contract for the construction of the dewatering cells at the Water Treatment Plant under Bid Opportunity No. 034-2006.

June 16, 2006: The City and Metcon Sales and Engineering Ltd. enter into a contract for the supply of an onsite sodium hypochlorite generation system under Bid Opportunity No. 049-2006. Metcon Sales and Engineering Ltd. enter into a contract with Severn Trent Water Purification Inc. for the supply of sodium hypochlorite generation equipment.

February 27, 2007: The City and Oakwood Roofing and Sheet Metal Co. Ltd. enter into a contract for the supply and installation of the roofing on the main Water Treatment Plant Building under Bid Opportunity No. 171-2006.

May 30, 2007: The City and Bird Construction Company Limited enter into a contract for the construction of the Chemical Storage and Sodium Hypochlorite Buildings, including the installation of the roofs under Bid Opportunity No. 792-2006. Bird Construction Company Limited enters into a contract with Comstock Canada Ltd. for the installation of the onsite sodium hypochlorite generation equipment.

February 4, 2008: A Certificate of Substantial Performance is issued for the onsite sodium hypochlorite generation system.

September 30, 2008: A Certificate of Substantial Performance is issued for the foundations and concrete structures for the main Water Treatment Plant.

October 10, 2008: A Certificate of Substantial Performance is issued for the dewatering cells.

January 19, 2009: A Certificate of Substantial Performance is issued for the roofs for the Chemical Storage and Sodium Hypochlorite Buildings.

May 29, 2009: A Certificate of Substantial Performance is issued for the roof on the main Water Treatment Plant Building.

June 2, 2009: A Certificate of Total Performance is issued for the foundations and concrete structures for the main Water Treatment Plant.

July 15, 2009: A Certificate of Substantial Performance is issued for the standby generators.

October 15, 2009: A Certificate of Total Performance is issued for the dewatering cells.

December 9, 2009: The Water Treatment Plant is put into operation.

December 14, 2009: A Certificate of Total Performance is issued for the roof on the main Water Treatment Plant Building.

January 6, 2010: A Certificate of Total Performance is issued for the roofs for the Chemical Storage and Sodium Hypochlorite Buildings. A Certificate of Total Performance is issued for the onsite sodium hypochlorite generation system.

January 18, 2010: Corrosion of concrete is observed by Water and Waste on a concrete trough within the Water Treatment Plant. The contractor (PCL Constructors Canada Inc.) and contract administrator (UMA Projects (CM) Ltd. now AECOM Canada Projects (CM) Ltd.) advise that the corrosion is from grinding and that no corrosive threat to the concrete is present.

March 2010: Roof leaks are identified on the main Water Treatment Plant Building. Repairs are conducted under warranty by the contractor (Oakwood Roofing and Sheet Metal Co. Ltd.).

April 15, 2010: A Certificate of Total Performance is issued for the standby generators.

June 2, 2010: The warranty period for the foundations and concrete structures expires.

September 19, 2010: The warranty period for the standby generators expires.

October 15, 2010: The warranty period for the dewatering cells expires.

December 14, 2010: The warranty period for the roof on the main Water Treatment Plant Building expires.

January 6, 2011: The warranty period for the roofs on the Chemical Storage and Sodium Hypochlorite Buildings and the onsite sodium hypochlorite generation system expires.

Spring, Summer and Fall 2011: Roof leaks are identified on the main Water Treatment Plant Building and Chemical Storage and Sodium Hypochlorite Buildings. Repairs are undertaken by City forces.

March 19, 2012: Additional roof leaks on the main Water Treatment Plant Building and the Chemical Storage and Sodium Hypochlorite Buildings are identified.

June 2012: Additional roof leaks are identified on the main Water Treatment Plant Building. Repairs are undertaken by City forces.

August 7, 2012: Performance issues associated with the dewatering cells are identified.

August 28, 2012: The first failure of the onsite sodium hypochlorite generation system occurs. Repairs are conducted by Water and Waste maintenance staff and the system is returned to service.

October 2012: Additional roof leaks are identified on the Chemical Storage Building. Repairs are undertaken by City forces.

February 3, 2013: The second failure of the onsite sodium hypochlorite generation system occurs. Water and Waste discontinues onsite production and retrofits the backup bulk sodium hypochlorite system to allow for the commercial purchase of sodium hypochlorite on an ongoing basis.

August 30, 2013: A failure of a standby generator occurs.

January 26, 2015: During the inspection of a filter tank within the Water Treatment Plant, surface distress of the concrete is identified.

For each major deficiency, the following sections outline: the description of the deficiency including why it occurred (if known) and its impact; the actions Water and Waste have taken to date to address the deficiency including costs incurred to date; and any further actions required to resolve the deficiency including future costs to be incurred.

Actions Undertaken to Date and Future Actions Required to Address Deficiencies

Roof on the main Water Treatment Plant Building

Description of issue: Roof leaks have occurred and resulted in water leaking into the main Water Treatment Plant building. The roof leaks have not impacted any of the Water Treatment Plant's water treatment processes. From initial inspection by Water and Waste staff, roof leaks may have resulted from a wrinkling in the roofing membrane, the roofing membrane pulling away from the roof parapets and heaving of the roofing system at various roof penetrations such as roof drains and vent pipes. The exact cause of the roof leaks has not been determined.

Actions taken to date: Internal City forces have repaired some of the obvious leaks.

Costs incurred to date: Approximately \$2,000.00 of the City's Operating Budget has been expended on the repairs undertaken by the City. This includes costs to repair individual leaks on the main Water Treatment Plant Building roof and the roofs for the Chemical Storage and Sodium Hypochlorite Buildings identified below.

Future actions required: Preliminary design is required to determine the recommended approach to address the roof leaks. The preliminary design work will examine potential repair options including partial or total replacement of the roof. Preliminary design will be followed by detailed design and the issuance of a bid opportunity for the selected option. Construction will then be undertaken for the roof repairs.

Future costs to be incurred: For Capital Budget planning purposes, Water and Waste has estimated that up to \$5,350,000.00 may be required to address this deficiency. This estimate is considered a Class 5 estimate and assumes that the entire main Water Treatment Plant Building roof will be removed and replaced. Preliminary design will be undertaken to determine the most appropriate repair strategy and a Class 3 cost estimate will be prepared prior to any construction activity. If the preliminary design reveals that the entire roof does not require replacement, the cost to address this deficiency could be reduced. The following Capital Budget requests have been identified: a 2018 Capital Budget request of \$125,000.00 for preliminary design, a 2019 Capital Budget request of \$575,000.00 for detailed design, and a 2020 Capital Budget request of \$4,650,000.00 for construction.

Roofs on the Chemical Storage and Sodium Hypochlorite Buildings

Description of issue: Roof leaks have occurred and resulted in water leaking into the Chemical Storage and Sodium Hypochlorite Buildings. The roof leaks have not impacted any of the Water Treatment Plant's water treatment processes. From initial inspection by Water and Waste staff, roof leaks may have resulted from a wrinkling in the roofing membrane, the roofing membrane pulling away from the roof parapets and heaving of the roofing system at various roof penetrations such as roof drains and vent pipes. The exact cause of the roof leaks has not been determined.

Actions taken to date: Internal City forces have repaired some of the obvious leaks. Repair and replacement of portions of the roofs for the Chemical Storage and Sodium Hypochlorite

Buildings was also undertaken as part a Capital project under Bid Opportunity No. 473-2014: Deacon Bulk Chemical Building Rail Shed Insulation.

Costs incurred to date: Approximately \$40,000.00 of the \$104,920.00 in Capital funds expended under Bid Opportunity No. 473-2014 was used to repair and replace portions of the roofs for the Chemical Storage and Sodium Hypochlorite Buildings. The costs associated with the repairs undertaken by City forces are included in the previous section describing the roof on the main Water Treatment Plant Building.

Future actions required: None. Issue has been resolved.

Future costs to be incurred: None.

Onsite Sodium Hypochlorite Generation System

Description of issue: Sodium hypochlorite is used for disinfection of water. The Water Treatment Plant was originally designed to generate sodium hypochlorite onsite using specialized sodium hypochlorite generation equipment. A failure of the onsite sodium hypochlorite generation equipment occurred during an equipment maintenance procedure. Repairs were conducted by Water and Waste maintenance staff and the system was returned to service. Less than six (6) months later, additional deficiencies were noted and a subsequent failure occurred. Further research by Water and Waste staff identified other North American utilities using similar equipment have also experienced similar failures. After the second system failure, the onsite production of sodium hypochlorite was discontinued and sodium hypochlorite in bulk was purchased commercially. The transition from onsite generation to commercial purchase of sodium hypochlorite has not impacted water quality at the Water Treatment Plant and the treated water has always remained in compliance with the City's Public Water System Operating License.

Actions taken to date: Water and Waste has discontinued the onsite production of sodium hypochlorite and has retrofitted the backup bulk sodium hypochlorite system to allow for the commercial purchase of sodium hypochlorite on an ongoing basis.

Costs incurred to date: Approximately \$30,000.00 of the City's Operating Budget has been used to retrofit the backup bulk sodium hypochlorite system. The system retrofit included: modifications to the dilution system, the installation of piping, wiring, instrumentation and the conversion of storage tanks to receive sodium hypochlorite via truck. A secondary bulk sodium hypochlorite dilution system was also added for redundancy.

Future actions required: Water and Waste will prepare a business case for the commercial purchase of sodium hypochlorite. The business case will examine the alternative to generate sodium hypochlorite onsite. Costs, benefits and risk will be examined in order to determine the most beneficial sodium hypochlorite alternative: generation or supply. If the business case analysis determines that sodium hypochlorite supply is the most advantageous option, the onsite sodium hypochlorite generation equipment will be decommissioned.

Future costs to be incurred: It is estimated that approximately \$21,000.00 of the City's Operating Budget may be used to decommission the onsite sodium hypochlorite generation equipment if the business case analysis determines that the commercial purchase of sodium hypochlorite is the preferred solution. This work will be completed as resources become available.

Dewatering Cells

Description of issue: Through the water treatment process, liquid waste streams containing high concentrations of solids are generated and are pumped to dewatering cells for processing. The dewatering cells were intended to promote separation of the solids from the liquid through natural freeze-thaw cycles. The design intent was for the liquid to be decanted and pumped to the sewer system for treatment and the solids to be harvested from the bottom of the cells periodically and directed to the landfill for disposal. The dewatering cells do not provide dewatering and solids recovery of the Water Treatment Plant's residuals stream as originally designed. The liquid from the dewatering cells is currently decanted and pumped to the sewer system for treatment, however limited to no solids recovery occurs. The exact cause of the performance issues of the dewatering cells has not been determined, however may be related to assumptions made during the design stage in terms of solids characteristics and quantities anticipated.

Actions taken to date: None. The dewatering cells continue to be used, however not as originally designed. The dewatering cells do however provide limited onsite storage capacity for the Water Treatment Plant's liquid residual streams in the event of a sewer system malfunction.

Costs incurred to date: None.

Future actions required: No action is currently required. If the need for land to accommodate expansion of the Water Treatment Plant or its supporting infrastructure is identified in the future, the partial removal of some of the dewatering cells may be considered. This work however is not considered necessary at this time.

Future costs to be incurred: None.

Standby Generators

Description of issue: Standby generators are required to provide power to essential treatment processes at the Water Treatment Plant in the event of a power failure. A bearing on one (1) of the three (3) standby generator engines failed resulting in mechanical damage to the engine. The cause of the failure of the bearing was determined to be stray electrical currents.

Actions taken to date: Repair of the damage to the standby generator engine due to the bearing failure, the insulation of bearings on all three (3) of the standby generator engines and the purchase of an extended warranty for all three (3) of the standby generators was undertaken through Bid Opportunity No. 646-2013.

Costs incurred to date: Approximately \$535,000.00 of the City's Operating Budget was expended to resolve this issue under Bid Opportunity No. 646-2013.

Future actions required: None. Issue has been resolved

Future costs to be incurred: None. Concrete Tanks

Description of issue: The pH of the raw water entering the Water Treatment Plant is lowered as a necessary step in the water treatment process. Near the end of the water treatment process, the pH of the water is raised to a level suitable for drinking. The Water Treatment Plant has experienced surface distress to concrete which has been exposed to water that has undergone pH suppression. The surface distress on the concrete tanks has not affected the Water Treatment Plant's treatment processes and the treated water has always remained in compliance with the City's Public Water System Operating License.

Actions taken to date: A visual condition assessment was undertaken by a structural engineer to assess the issue and provide recommendations for action. Recommended action included conducting further petrographic analysis. A specialist petrographer was also retained to assess the general characteristics of the concrete. The petrographer concluded that the surface distress was consistent with acid attack.

Costs incurred to date: Approximately \$2,000.00 of the City's Operating Budget was expended to retain the structural engineer. An additional \$6,200.00 of the City's Operating Budget was expended to retain the specialist petrographer.

Future actions required: Preliminary design is required to determine the recommended approach to address the surface distress of the concrete tanks. The preliminary design work will examine the extent and nature of the surface distress issue and identify any potential repair options.

Future costs to be incurred: Capital funds in the amount of \$265,000.00 are currently available to complete preliminary design work. Preliminary design will be undertaken to determine the most appropriate repair strategy and a Class 3 cost estimate will be prepared. The results of the preliminary design process will be considered in future budget processes.

This report addresses the costs to date and the estimated known future costs related to the roof on the main Water Treatment Plant Building. Further investigations are required to determine what additional funding will be required to address the other noted deficiencies. There is potential for these costs to be substantive but will not be known until after the design studies are complete. When costs are known, they will be included in future budget estimates. Awards for future work will be forwarded to the appropriate award authority.

FINANCIAL IMPACT

Financial Impact Statement

Date: **January 25, 2018**

Project Name: **First Year of Program** **2018**
WINNIPEG DRINKING WATER TREATMENT PLANT DEFICIENCIES REVIEW

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>
Capital					
Capital Expenditures Required	\$ 390,000	\$ 575,000	\$ 4,650,000	\$ -	\$ -
Less: Existing Budgeted Costs	390,000	575,000	4,650,000	-	-
Additional Capital Budget Required	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>
Funding Sources:					
Debt - Internal	\$ -	\$ -	\$ -	\$ -	\$ -
Debt - External	-	-	-	-	-
Grants (Enter Description Here)	-	-	-	-	-
Reserves, Equity, Surplus	-	-	-	-	-
Other - (Enter Description Here)	-	-	-	-	-
Total Funding	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>
Total Additional Capital Budget Required	<u>\$ -</u>				
Total Additional Debt Required	<u>\$ -</u>				
Current Expenditures/Revenues					
Direct Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Less: Incremental Revenue/Recovery	-	-	-	-	-
Net Cost/(Benefit)	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>
Less: Existing Budget Amounts	-	-	-	-	-
Net Budget Adjustment Required	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ -</u>
Additional Comments: The only costs associated with this report are for the investigation of deficiencies and repair of the leaking roof, based upon a class 5 estimate (as shown for 2018). Further investigations are required to identify additional costs to correct the other noted deficiencies. There is potential that these costs could be substantive in nature. They will be included in future capital budgets. This project is financed by Retained Earnings. Awards for any potential future work will be forwarded to the appropriate award authority.					

js/jl
25-Jan-18

"Original signed by W. Burns, CPA, CA"
Wanda Burns, CPA, CA
Acting Manager of Finance and Administration

CONSULTATION

In preparing this report there was consultation with:

N/A

OURWINNIPEG POLICY ALIGNMENT

Initiative 03-3 of the Sustainable Water and Waste Direction Strategy: Ensure the quality and safety of our existing drinking water.

This report supports the City's continued commitment to providing safe drinking water to the residents of Winnipeg.

SUBMITTED BY

Department: Water and Waste
Division: Engineering Services
Prepared by: A. Weiss, P. Eng.
Date: January 25, 2018
File No.: W-573(B)