
Raw Water Resiliency Study Findings

Recommendation

That the report of the Acting General Manager, Utilities & Environment Department dated April 1, 2019, be received as information.

Topic and Purpose

The purpose of this report is to present the findings of the Raw Water Resiliency Study which looks at ways the City of Saskatoon Water Treatment Plant (WTP) can increase its preparedness for a potential hydrocarbon spill in its raw water source, the South Saskatchewan River.

Report Highlights

1. Hydrocarbon spill modelling and analysis indicated that the most critical spill scenario would involve a pipeline rupture just north of Gardiner Dam.
2. A Powdered Activated Carbon dosing system was found to be the most feasible option to treat raw water containing hydrocarbons.
3. As part of the study, two alternative raw water sources were investigated: 1) the North Saskatchewan River, and 2) the local groundwater aquifers with neither option being feasible.
4. In-river upstream water quality monitoring is recommended as a cost effective action to provide an additional level of protection by ensuring a prompt emergency response in cases where a leak is not immediately identified.
5. An Emergency Response Plan, to be followed in the event of a hydrocarbon spill, was formulated and indicates the actions and communications to be made.

Strategic Goals

This report supports the Strategic Goal of Continuous Improvement by proactively investigating measures to mitigate the potential threats caused by a hydrocarbon spill. This report also supports the Strategic Goal of Environmental Leadership as early detection and prompt stakeholder notification in the case of a hydrocarbon spill would improve response time reducing the environment's exposure to spilled hydrocarbons in the river.

Background

In August of 2016, Saskatoon Water submitted a report to the Standing Policy Committee on Environment, Utilities and Corporate Services titled Contaminated Water Supply – Alternative Water Source. The report was in response to a recent oil spill in the North Saskatchewan River which caused the City of Prince Albert's raw water intake to be shut down and alternative sources utilized for a number of weeks.

Saskatoon Water issued a Request for Proposals for a study which would investigate alternative water sources, as well as technologies that would allow the WTP to continue

to produce potable water during a contamination event. Stantec Consulting Ltd. was the successful proponent.

Report

Hydrocarbon Spill Modelling and Analysis

The study investigated potential spill mechanisms including ground transportation and pipeline sources along the river upstream of the raw water intake. Currently, the most critical potential threat would be a pipeline rupture just downstream of Gardiner Dam where seven liquid petroleum pipelines cross the river. Modelling exercises indicated that, depending on the flow of the river at the time, a wide range of travel times and concentrations can be expected at the City's Raw Water Intake. This information was used throughout the study and will be valuable in the event of an emergency response.

Evaluation of Available Contamination Mitigation Technologies

Various technologies were investigated for effectiveness in providing additional protection to the water treatment process during a hydrocarbon contamination event. The most feasible option to address hydrocarbons is to install a Powdered Activated Carbon (PAC) dosing system. The system would consist of silos filled with PAC being located at the Raw Water Intake which would be fed into the raw water pipeline during a hydrocarbon contamination event. The activated PAC particles would work within the 3.2 km pipeline by attaching themselves to dissolved hydrocarbon particles for subsequent removal utilizing the WTP's existing processes. A summary of the technologies evaluated with approximate costs is provided in Attachment 1.

Evaluation of Alternate Raw Water Sources

As part of the study, two alternative raw water sources were investigated: 1) the North Saskatchewan River, and 2) local groundwater aquifers. The cost to install a permanent raw water intake and piping (50 km) is cost prohibitive (\$80 million). An option for a temporary raw water feed from the North Saskatchewan River was analyzed; however, the amount of material and time required to set this up in an emergency situation is excessive. Analysis of the nearby groundwater aquifers showed that some aquifers had water quality issues and others could not generate sufficient flow to meet demand even when the most stringent emergency water restriction is applied.

Proactive Raw Water Monitoring

The study identified that upstream real-time raw water quality monitoring would be an excellent first step in addressing raw water resiliency at the WTP. Raw water monitoring would allow the City to observe upstream hydrocarbon levels and provide an additional level of protection by ensuring a prompt emergency response in cases where a leak is not immediately identified.

Emergency Response Plan

An emergency response plan for the WTP was formulated and will form the basis of the steps to be taken in the event that an upstream spill is reported or detected. The response plan specifies stakeholder communications and notifications to be made with

regulators and the public, as well as emergency remedial measures to be taken at the WTP and the Raw Water Intake.

Future Capital Investment – Next Steps

Based on the recommendations put forward in the report, Saskatoon Water has developed the following implementation plan:

- Further investigation of a proposed PAC storage and dosing system at the Raw Water Intake.
- Identify raw water monitoring instrumentation that would function reliably throughout the year and possible upstream locations for establishment of raw water monitoring stations.

Saskatoon Water provided the Water Security Agency with a copy of this study for their information and indicated the City's intentions for addressing raw water contamination risks in the South Saskatchewan River going forward.

Financial Implications

The conceptual-level estimated cost for a PAC system is between \$3 million and \$5 million depending on the specifics of the application. In-river monitoring is expected to cost \$10,000 to \$50,000 for instrumentation procurement and implementation with operational costs in the range of \$5,000 per year. Saskatoon Water will approach other stakeholders such as the Water Security Agency and other river users to look at developing potential funding and administration strategies for implementing real-time raw water monitoring in the river. The feasibility of a PAC system at the Raw Water Intake will be investigated further prior to establishing a funding strategy.

Environmental Implications

The residuals that would be produced by the WTP's processes in the event of PAC hydrocarbon removal would be considered unfit for typical disposal (field application as a soil conditioner) and would require specialized handling and disposal techniques as determined by lab analysis.

The emergency response plan enables the City of Saskatoon to direct and coordinate the response with all identified stakeholders as promptly as possible. The centralization of contact information and a clearly articulated process will allow for a prompt, organized, coordinated response.

Other Considerations/Implications

There are no options, public and/or stakeholder involvement, communication, policy, privacy, or CPTED considerations or implications.

Due Date for Follow-up and/or Project Completion

The planning for the implementation of the aforementioned recommendations begin in mid to late 2019.

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Public Notice

Public Notice pursuant to Section 3 of Policy No. C01-021, Public Notice Policy, is not required.

Attachment

1. Hydrocarbon Mitigation Technologies Investigated

Report Approval

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