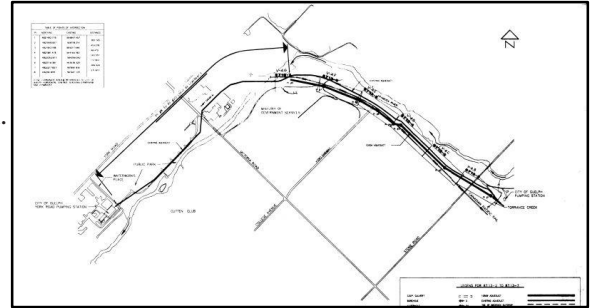


## City of Guelph - Arkell Aqueduct Emptying Analysis

### Project Overview

C3 Water completed an analysis to verify the feasibility of draining the Arkell aqueduct for the City of Guelph. The intent of the analysis was to calculate the time required to remove all water in the aqueduct which originates from groundwater under the influence of surface water (GUDIWEF) while simultaneously replacing it with water from groundwater sources.



This analysis becomes important in the event of loss of UV treatment capability at FM Woods Water Treatment Plant (WTP). The City required a contingency plan that would prevent the introduction of undertreated water into the distribution system.

In addition to the aqueduct emptying time the following criteria were calculated and assessed.

- Risk of overflows at the Scout Camp chamber, which has an aqueduct manhole overflow elevation of 315 m.
- Scouring velocity out of the 300 mm drain pipe which would be used to empty the aqueduct.

To complete the analysis construction drawings were consulted to develop an overall pipe profile for the aqueduct. Following the development of the profile, calculations were completed for draining of the aqueduct. Both full and partial pipe regimes were included in the initial volume calculation. Steady state was assumed and major and minor friction losses were accounted for.

Two scenarios were explored as a result of these calculations. Scenario 1 explored the time required in an emergency shutdown and Scenario 2 summarized the same parameters for a planned UV system shutdown. Finally a Process Control Narrative (PCN) was developed to be used by operators so that they would be able to calculate the required time given certain measurable parameters.

User Defined Inputs:	
Initial Well Field Flow =	300 L/s <i>(Enter flow between 0 - 807 L/s)</i>
Ground Water Fill/Empty Rate =	275 L/s <i>(Enter flow between 0 - 333 L/s)</i>
Calculation Output:	
Risk of Overflow at Scout Camp :	<b>Not Likely</b>
Steady State Driving Water Elevation =	313.8 m
Scout Camp Overflow Elevation =	315.0 m
Scouring Velocity at Drain Pipe Outlet =	3.9 m/s
<b>TIME TO EMPTY =</b>	<b>3.6 hours</b>