



## STAFF REPORT ACTION REQUIRED

### Sole Source Authority - Filter Underdrain Systems Supplier in Construction Tender Documents for R. L. Clark Water Treatment Plant Process Equipment Upgrade

<b>Date:</b>	April 15, 2009
<b>To:</b>	Public Works and Infrastructure Committee
<b>From:</b>	General Manager, Toronto Water Acting Director, Purchasing and Materials Management
<b>Wards:</b>	Ward 6 - Etobicoke-Lakeshore
<b>Reference Number:</b>	P:\2009\Cluster B\TW\pw09010

#### SUMMARY

---

The purpose of this report is to seek authority to specify a Sole Source supplier, Anthratch Western Inc. (AWI), for the provision of eighteen (18) low profile filter underdrain systems, installation, supervision, and field testing services in the construction tender documents for the R. L. Clark Water Treatment Plant (WTP) Process Equipment Upgrade project.

#### RECOMMENDATIONS

---

**The General Manager of Toronto Water and Acting Director of Purchasing and Materials Management recommend that:**

1. City Council grant authority that Anthratch Western Inc. (AWI) be specified as the Sole Source supplier for the provision of eighteen (18) new Pheonix low profile filter underdrain systems, including supply and delivery of all materials, equipment, components, and accessories, as well as installation and related field services (supervision and testing), in the construction tender documents for the R. L. Clark WTP Process Equipment Upgrade Project.

#### Financial Impact

There is no direct financial impact as a result of this report. The cost of procurement of the filter underdrains will be formally accounted for during the construction phase of the Process Equipment Upgrades, where a general contractor will be selected through the competitive tendering process. The supply and installation of the underdrain system will be named within the overall construction specification.

It is estimated that the filter underdrains will cost \$19,700,000 net of GST (and no contingency) for eighteen (18) filter underdrain systems, including supply, delivery, installation, supervision, and performance testing services. The cash flow requirement for this project would include \$4,378,000 net of GST in 2011, \$8,756,000 net of GST in 2012, and \$6,566,000 net of GST in 2013.

The R. L. Clark WTP Process Equipment Upgrade project is currently forecasted in the 2010-2013 Capital Plan for Toronto Water under WBS Element CPW063-10 and will be included in Toronto Water's 2010 Capital Budget Submission. .

The Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

## **DECISION HISTORY**

As outlined below, three similar sole source awards have been made to AWI for the supply, delivery, and installation of new filter underdrain systems in the City's other water treatment plants.

At the Island WTP, the underdrains for filters #1, #3, and #5 were replaced with AWI filter underdrain systems through an Emergency Sole Source procurement process in February 2008 in accordance with Section 195-10(F), Municipal Code, Chapter 195, and reported to the Public Works and Infrastructure Committee meeting of June 4, 2008. A link to the staff report is as follows:

<http://www.toronto.ca/legdocs/mmis/2008/pw/bgrd/backgroundfile-13480.pdf>

At its meeting of October 29 and 30, 2008, City Council adopted a motion approving a Sole Source Purchase Order to AWI for the supply, delivery, and installation of the Island WTP's remaining filter underdrain systems (filters #2, #4, and #6), associated piping, and appurtenances. A link to the staff report is as follows:

<http://www.toronto.ca/legdocs/mmis/2008/pw/bgrd/backgroundfile-16028.pdf>

In addition, at its meeting of June 23 and 24, 2008, City Council adopted a motion approving AWI as the sole supplier of filter underdrains, including all materials, equipment, components, and related services, for the F. J. Horgan WTP capacity expansion. A link to the staff report is as follows:

<http://www.toronto.ca/legdocs/mmis/2008/pw/bgrd/backgroundfile-13479.pdf>

## **ISSUE BACKGROUND**

The R. L. Clark Water Treatment Plant (WTP) was constructed in 1962 and completed in 1968. It is a conventional water filtration plant, rated at 615 million litres per day, supplying

approximately 24% of the City's total water demand. The Plant's existing filter system, consisting of eighteen (18) dual media filters, is beyond its life cycle and in need of rehabilitation.

Associated Engineering (Ont.) Ltd. (AE) was engaged through a competitive process to provide the detailed design, engineering, and construction administration services for Process Equipment Upgrades project. A significant portion of AE's role in the upgrade project is to design and retrofit for new high-rate deep-bed filtering systems with low profile underdrain systems. Such a design will allow for higher filter rates at the Clark WTP, ultimately reducing energy costs while maintaining filtered water quality.

Underdrain systems are extremely critical components of the filtration process, essential to water treatment filters, for they are the permanent physical structure supporting the more fluid filter media above. Fundamentally, underdrain systems are highly engineered structures that ensure water flow is evenly distributed throughout the filter, thus permitting the production of high quality filtered water. The systems are also required to deliver controlled water and air flows during filter backwash cycles such that the filters are well cleaned and, simultaneously, void of filter media losses. Installation of an inadequate or faulty underdrain system could have serious consequences to Plant production capability, operating costs, or potentially to water quality.

For example, during the Winter of 2008 at the Toronto Island WTP a catastrophic failure of a filter underdrain structure and deterioration of two other filters resulted in a two month Facility shutdown. This incident required Sole Source approval on an emergency purchasing basis to have the failed filter underdrains replaced with AWI underdrain systems.

The R.L. Clark WTP's existing eighteen (18) filter underdrain systems are of similar age and type as those that failed at the Toronto Island WTP. This failure, coupled with the previously assessed depleted life-cycle of the Clark's filters (the primary rationale for the upgrade project), strongly suggest the need to replace the filter underdrain systems before a similar potentially catastrophic failure occurs.

## **COMMENTS**

The existing filters at the R. L. Clark WTP are aged and experience rapid pressure losses (indicating inefficient filtering). The entire filter system requires overhauling, with a full replacement being the only viable option to bring it up to current day standards and to improve both its hydraulic capability and process capacity.

A well engineered filter underdrain system is critical to the proper operation of water treatment filters and thus to the production of safe drinking water. Filters are the most important physical barrier to removing dangerous micro organisms from the water supply. Significant Plant production outages, treatment capacity reduction and compromised water quality could result in the event of faulty or inadequate underdrain system design or installation.

Based on the criticality of the filter underdrain systems, the City requested that Associated Engineering (AE) undertake a pilot filter study as a part of the design scope of work. This study included an investigation of high-rate deep-bed filter performance specific to the R. L. Clark footprint in order to provide an empirical basis for developing recommendations for the full-scale

filter upgrade. The results of the pilot study support a design that uses deep-bed filters with coarser media to achieve longer filter runs, higher filtration rates, and sustained high filtered water quality.

AE identified three underdrain manufacturers capable of retrofitting the R. L. Clark WTP's existing filter boxes to deep-bed filters with a low-profile underdrain technology. However, based on their analysis, AE recommends that the low profile underdrain system be supplied by Anthratch Western Inc. (AWI) - based in Calgary, AB - on the basis that their technology best satisfies the performance and design compliance requirements for the Plant's needs.

AWI holds the licence to the Pheonix Underdrain System technology. While other manufacturers are licensed to use earlier versions of the Pheonix Underdrain System, AWI has improved upon the equipment in its current exclusive design. Also, only the AWI arrangement allows for additional media to be installed between the underdrain laterals, thus yielding a larger volume of media that can be installed above the top of the underdrain and consequently maximizing the filtration capacity and performance. Finally, for this custom retrofit work, only AWI offers a multi-staged approach to both air and water hydraulic testing during the design (in-house computational fluid dynamic modelling), fabrication (in-house flow distribution testing in each lateral), and installation (hydraulic testing prior to media placement) phases.

Given the key role that the underdrains play in the overall filter system, it is critical to choose one specific technology in advance of the larger design. That is, the designer must design around a specific underdrain system (the "nucleus" of the filter) in order to properly size and specify associated auxiliary equipment such as blowers, backwash pumps, piping, valving, and flow meters. It should be noted that a tangible benefit of this tighter design point is the efficiency brought to the design process, reducing design costs and time. The pre-selection of a specific underdrain system is key in ensuring that the City's rigid water quality parameters and Plant flow distribution and pressure loss requirements are met.

As discussed above, two of the City's other water treatment Plants have recently installed or single-named AWI filter underdrain systems. In terms of both operations and maintenance, there are continuities and efficiencies to be gained in being able to standardize equipment so that Plant staff are trained on a common platform. Such consistency enhances Operations staff in their ability to move seamlessly between Plants without retraining. It also means that spare parts can be interchanged across the four water treatment plants thus reducing inventory costs and increasing parts availability.

It should also be noted that AE further recommends the low profile underdrain system be solely supplied by AWI due to their niche knowledge and expertise, proven track record for design and installation, experience with similar sized filters, and superior product quality.

In keeping with the unit pricing of the previous two installations for Toronto Water, the estimated price obtained from AWI for the R. L. Clark WTP represents a competitive and fair market price. Specifically, at the Toronto Island WTP, a similar AWI turn-key underdrain system cost approximately \$1,151,787 per filter. Comparatively, the R. L. Clark WTP's turn-key price is \$1,094,444 per filter. Alternatively, at the F. J. Horgan WTP (where only supply, installation supervision, and commissioning were procured from AWI), the unit cost of this base service was

\$461,538 per filter. If the R. L. Clark's estimated price is broken down to this base level, then the cost compares at \$394,444 per filter. Price differences are relative to the mechanical piping arrangements at each Facility, modest differences in filter areas, changes in stainless steel commodity costs, and Canadian dollar fluctuations.

Additionally, AE has compared the price to that of two other similar upgrade projects that they have lead (City of Calgary Glenmore and Bearspaw WTPs) and have determined that the estimate is comparable.

The overall Process Equipment Upgrade project will be undertaken by a general contractor to be selected through the competitive tendering process. The supply and installation of the said underdrain system would be single named within the larger construction specification to AWI.

## **CONTACT**

Niall Robertson, P. Eng.  
Senior Engineer  
R. L. Clark Water Treatment Plant  
Telephone: 416-397-0476  
Fax: 416-392-9815  
Email: [nrobert@toronto.ca](mailto:nrobert@toronto.ca)

David Ferguson  
Manager of Construction Services  
Purchasing and Materials Management  
Telephone: 416-392-7323  
Fax: 416-397-7779  
Email: [dfergus4@toronto.ca](mailto:dfergus4@toronto.ca)

Mauro Fabbro, P. Eng.  
Plant Manager  
R. L. Clark Water Treatment Plant  
Telephone: 416-392-8837  
Fax: 416-392-9815  
Email: [mfabbro@toronto.ca](mailto:mfabbro@toronto.ca)

## **SIGNATURE**

---

Lou Di Gironimo  
General Manager  
Toronto Water

---

Victor Tryl  
Acting Director  
Purchasing & Materials Management