From: Dave Underwood <dunderwood@true.bc.ca>
Sent: Thursday, April 1, 2021 5:01 PM
To: Bob Payette; Ian Crosson
Subject: Barriere Well Construction Update to April 1

- A grant application was submitted in October 2020 titled "District of Barriere Water Treatment Upgrades". The scope of the project included:
    - Drilling / completion of two new supply wells at Spruce Crescent site (DW3 and DW4)
    - GUDI / GARP assessment
    - Conversion of existing filter vessels to biological filtration system targeting manganese reduction for a flow rate of 600 USgpm
    - Construction of an expansion to the existing water treatment plant to double the treatment capacity available (an additional 600 USgpm)
- The total project cost was estimate to be $3,870,360
- The District identified that it would apply $450,000 towards the project
- The District has decided to apply its $450,000 contribution toward the drilling / completion of DW3
- A Request For Proposal was prepared by Western Water Associates for selection of a contractor to drill and test DW3
- Two proposals were received (Drillwell $135,690 and A&H $147,820). Drillwell was selected.
- Drilling was completed from January 27 and 28, 2021 to a depth of 53m (175 ft)
- Despite being only 5m from DW2, the DW3 lithology has some differences in comparison to DW2
    - A thin till/clay layer was encountered that corresponds to the middle of the DW2 screen (see well profiles attached)
- A screening system was designed in an effort to maximize the well's productivity.
    - A two-tier well screen was designed that included a 3m blank section to straddle the till/clay layer
    - The bottom of the well screen is positioned at a depth of 168 ft, which is 25 ft higher than the top of the well screen at DW1
    - A 37 ft long well screen was designed (compared to 25 ft originally planned)
    - The well screen was ordered for fabrication in early February
- The well screen was installed by Drillwell on February 18 and well development commenced shortly thereafter
- The District switched to its Bradford Wells for supply during well development / testing
- Well development proceeded from February 18 to February 24
- Pump testing was commenced by Monashee Aquifer testing on March 1
    - During testing, it was found that turbidity was observed at pump start up and persisted for several minutes before clearing up
    - A camera inspection was completed on March 4 and the likely source of the turbidity was found (silt embedded to inside of screen)
    - Air jetting of the well screen was completed by Drillwell on March 18
    - Pump testing resumed March 24 and was completed on March 25. The well continues to experience turbidity issues on startup (but to a lesser degree). The well is quite productive.
- An early indication of water quality is such that all parameters are below the Maximum Acceptable Concentration

- Water quality for key parameters (iron/manganese) summary is as follows:

		Iron, total (mg/L)	Manganese, total (mg/L)
	MAC		**0.12**
	AO	**0.3**	**0.02**
PW 1	27-Apr-17	0.102	0.083
	30-May-19	0.06	0.0985
	22-Apr-20	0.255	0.104
PW 3	17-Aug-17	0.773	0.106
	30-May-19	0.191	0.0713
	6-Oct-19	0.138	0.0615
	21-Jul-20	0.256	0.0755
DW1	8-Oct-13	0.661	0.121
	13-Oct-15	0.682	0.14
DW2	8-Oct-13	<0.030	0.0058
	13-Oct-15	<0.030	0.0052
DW3*	4-Mar-21	0.092	0.0582

*blend from top and bottom screens

- There are two options available to the District in completing DW3:
    1. Manage the turbidity / water quality produced at well startup by discharging to waste on pump startup until turbidity is reduced
    2. Blind off the lower section of the screen since it is suspected that this is where the turbidity is originating
- In order to make a decision related to the well completion options above, more information is required:
    - Water quality from upper screen
    - Expected well yield (both screens)
    - Expected well yield (upper screen only)
- Additional testing is required to capture this information. The additional testing will be completed at the end of April. In the meantime, DW2 can be put back into service immediately.
- The information collected will allow a decision to be made:
    1. Design an engineered pump-to-waste system and work with IHA on approvals of this system
    2. Focus on upper screen, blind off the lower screen (maximize water quality)
- A request for quotation has been sent to three contractors. The scope of work is to complete the well with pump, drop pipe, etc, connect to pumphouse electrical and controls, and physically connect well to distribution system. The results of the RFQ pricing are as follows:

Proponent	Subtotal (excl GST & contingency)
Spooner Industrial	$183,304.00
Rivermist Excavating	$216,024.00
Bree Contracting	$223,716.00

- It is recommended that the District advise Spooner Industrial that they are the preferred proponent. This will allow TRUE to work with Spooner to identify the long-lead items (such as pitless adapter ~16 weeks) such that this equipment can be ordered ASAP
- Next steps:
    - Shop drawing review/ordering of long-lead items
    - Additional well testing
    - Well completion design finalization
    - IHA source water approval
    - IHA construction approval
    - Well completion construction

Submitted by: Dave Underwood, TRUE Engineering