TETRA TECH

OQM | Organizational Quality Management Program

November 5, 2020

Via Email: ASharma@GOV.NU.CA

Community & Government Services
Government of Nunavut
P.O. Box 490, Rankin Inlet
Nunavut, X0C 0G0

Attention: Ashwani Sharma
Project Manager

Subject: Chesterfield Inlet Overland Water Re-supply Pipeline (Contract 18310-0544) - Certificate of Substantial Completion

I, David Moschini, P. Eng., of Tetra Tech Inc., 1000 – 885 Dunsmuir Street, Vancouver, British Columbia certify that the Chesterfield Inlet Water Transmission Line was substantially completed on October 5th, 2020. We believe the Contractor has met the contractual obligations set in Contract number 18310-0544. The new pipeline and pump station were working as intended and were successful in supplying water to the Hamlet of Chesterfield Inlet's reservoir.

The land affected includes a 3.26 kilometre corridor between Fish Lake and the Water Reservoir in *Chesterfield Inlet, Nunavut.* The project was awarded to Inukshuk Construction Ltd.

In summary the improvement included the construction of the following:

- A 3.26-kilometre water transmission line connecting Fish Lake to the Chesterfield Inlet Water Reservoir with accompanying gravel base pad and anchoring berms,
- A new diesel-powered pumping system including a fuel containment pumping pad; and
- Drainage improvements along the pipe corridor including multiple 300mm and 600mm culvert installations.

Tetra Tech's site inspector witnessed the commissioning of the full pump and pipeline system on October 5th, 2020 and compiled a deficiency list detailing the outstanding work at the time of commissioning. The commissioning was successful, with the Hamlet Foreman noting the time to fill the pipeline was approximately 24 minutes, compared to up to 2 hours for the existing deficient pump and pipeline system. The newly commissioned pump and pipeline were also used to top off the reservoir level for the upcoming winter as requested by the Hamlet Foreman. Full details of the commissioning can be found in the October 5th Daily Inspection Report attached with this letter. Tetra Tech has also completed a drone video along the constructed pipeline as a record of the completed work, which were submitted separately to the GN through the project's E-Builder Portal on November 3rd, 2020.

Table 1 summarizes the deficiencies that have been addressed as of October 20th, 2020. The certification for the holdback release and deficiencies completion are summarized in a separate Holdback Release Letter prepared by Tetra Tech.

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Table 1 – Summary of Deficiencies

Pay Item #	Deficiency Description	Location	Reference	Estimated Value ($)	Date Initiated	Comments
1-12	Install pipe casings and re-instate access at four crossings requested by Hamlet.	0+100, 0+530, 2+130, 2+430	ICL's Schedule of Values	$10,780.00	08-Oct-20	Hamlet Foreman did drive through of pipeline with John Winters (ICL) on Sep 30, 2020 to point out crossings that Hamlet wanted to re-instate.
	Repair eroded pad and install riprap at drain outlet at 0+130	0+130	ICL's Schedule of Values	$1,825.00	08-Oct-20	Minor erosion caused by discharge from partial pump commissioning on Sep 28, 2020
1-8	Repair eroded pad and install riprap at drain outlet at 0+340	0+340	ICL's Schedule of Values	$1,825.00	08-Oct-20	Minor erosion caused by discharge from partial pump commissioning on Sep 28, 2020
1-8	Repair eroded pad and install riprap at drain outlet at 0+740	0+740	ICL's Schedule of Values	$1,825.00	08-Oct-20	Minor erosion caused by discharge from partial pump commissioning on Sep 28, 2020
1-8	Install riprap at drain outlet at 1+530	1+530	ICL's Schedule of Values	$500.00	08-Oct-20	Toe of outlet drain requires riprap
1-2	Complete berm placement between 1+850 and 1+925	1+850 to 1+925	ICL's Schedule of Values	$5,000.00	08-Oct-20	Berm placement and pipe anchoring was delayed until additional pipe section was added to get pipe back onto alignment around the bend.
1-4	Install air-release valve box at 1+925	1+925	ICL's Schedule of Values	$2,800.00	08-Oct-20	Installation of valve box delayed until additional pipe section was added to get pipe back onto alignment around the bend.
1-11	Install pipe anchor at 1+350	1+350	ICL's Schedule of Values	$1,010.00	08-Oct-20	
1-11	Install pipe anchor at 2+350	2+350	ICL's Schedule of Values	$1,010.00	08-Oct-20	

1-11	Install pipe anchor at 2+460	2+460	ICL's Schedule of Values	$1,010.00	08-Oct-20	
1-11	Install pipe anchor at 3+160	3+160	ICL's Schedule of Values	$1,010.00	08-Oct-20	
1-11	Install pipe anchor at 3+260	3+260	ICL's Schedule of Values	$1,010.00	08-Oct-20	
1-2	Repair eroded pad between 3+220 and 3+250	3+220 to 3+250	ICL's Schedule of Values	$1,000.00	08-Oct-20	Minor erosion caused by discharge from pump commissioning on Oct 5th, 2020

We trust this letter meets your present requirements. If you have any questions or comments, please contact the undersigned.

Sincerely,

David Moschini, P.Eng.
Senior Project Manager
Phone: 604.685.0275
David.Moschini@TetraTech.com

Attachment:

- Tetra Tech October 5th, 2020 Daily Inspection Report

DAILY INSPECTION REPORT

Project: Water Transmission Line Replacement – Chesterfield Inlet, NU
Owner: Government of Nunavut
Contractor: Inukshuk Construction Limited. (ICL)
Inspector: Marc Lau (Tetra Tech Canada Inc.)

Date: Oct 5 2020		
Time	**Weather Conditions**	**Temp C**
8:00 AM	Partly sunny, wind 32km/h	-2
12:00 PM	Partly sunny, wind 38km/h	-1
4:00PM	Light clouds, wind 35km/h	-1

Time	Activity
08:30	- Heater brought to pump to ensure pump is free of ice for upcoming afternoon commissioning test. Crew performs walkthrough of pipeline to ensure all drain valves are closed.
10:00	- Berm placement and anchor installation continues from station 3+000 to 3+220. 1 drain valve box installed at station 3+110 before noon. Progress rate slower here due to extra precaution taken to maneuver excavator and dump truck around rocky terrain.
12:00	- Lunch time.
13:10	- Hamlet foreman arrives on-site for walkthrough of pipeline start-up procedure with ICL's heavy mechanic. Factory-optimized operating speed and flow rate were discussed, along with pre-startup procedures, and troubleshooting for common errors. Pump is started, and flow begins at 1:11 pm. - Walkthrough of pipeline done with John Winters (ICL) during pipeline filling stage. Special attention taken to air-release valve at station 0+220, which again showed some relatively minor discharge of water through the vent for the first 15-20 minutes of pump operation.
13:35	- Water reaches flushing discharge point at station 3+260 in approximately 24 minutes from beginning of pumping, at 1:35 pm. Pipeline is flushed for 1 full hour after filling.
14:35	- After 1 full hour of pipeline flushing, pump is stopped, and the final pipe section leading up to the reservoir is drained in order for crew to replace flexible Camlock hose (used for flushing phase) with a bolted flange connection HDPE pipe to extend the line to the reservoir basin. - Pumping directly into the reservoir begins, as requested by the Hamlet, to top up the winter water reserve.
18:00	- Berm placement and pipe anchor installation reaches station 3+220 by end of day, with 5 anchors installed between station 3+000 and 3+220, and 1 drain valve box installed at station 3+110.
19:00	- Pumping into the reservoir is stopped at 7:00pm, with a total of 759,859 liters of water added. - Crew drains pipeline in sections, beginning from the upstream reservoir end and finishing with the draining of the pump at the intake.

Summary of witness points, hold points, and other inspection activities performed this day:

Witnessed pump commissioning test for full length of pipeline. Performed pre-test inspection of pump to ensure pump was levelled and intake hose was adequately submerged. Inspected pipe intake for signs of inadequate suction, cavitation, leakage, and any other unusual behavior of pump during start-up. Performed full walkthrough of pipeline during pipe filling phase to check for potential leaks, proper functioning of air-release valves, and signs of potential blockages in line. Took notes of pump startup procedure and observed effects of changing pump speed from lowest speed to highest speed in available speed range. Recorded flow rates at multiple points during test, and final water volume added to reservoir.

Spot-checked berm placement and valve box installation for acceptable depth of cover, width, and length between station 3+000 and 3+220.

Status and/or descriptions of deviations or non-conforming conditions:

Some minor erosion was noted during the flushing phase of the pump commissioning between station 3+220 to 3+250. This was due to the length of flexible Camlock hose not being able to extend past the local rocky depression containing the gravel pad. Thus, water draining to the low-lying area to the south caused some sloughing of the pad embankment. ICL was instructed to repair the eroded section at a later date.

Air-release valve at station 0+220 had some minor water discharge through the vent during the pipe filling stage for the first 15-20 minutes of pump operation, similar to the previous partial commissioning of the pump. This air-vent was swapped with a spare from inventory, as it was suspected it was a defective unit. However, after discussion with John Winters (ICL), it is now suspected this may be regular behavior of the air-release valve, as some discharge through the air vent during pipe filling was noted during previous hydrostatic leak tests as well.

Unusual occurrences, stoppages, or delays:

Berm placement rate slower from section 3+000 to reservoir due to extra precaution taken to maneuver excavator and dump truck around rocky terrain.

Remarks:

Hamlet foreman was impressed with the performance of pump and pipeline, noting that previous pump would take up to 3 hours to fill pipeline.

Discussion with John Winters (ICL) about water discharge through air vent at station 0+220. It was earlier thought this was a defective air vent, and so the vent was swapped with a spare in inventory. John brought up that the air vent has leaked in the same fashion during filling of pipe sections for the previous hydrostatic leak tests, and that this may be normal behavior for the vent. Leakage appears to stop after approximately 15-20 minutes once pipe is so filled, after which venting of air was heard with no water discharge through the vent.

Equipment and Work Force Report	Hours	Contractor	Position
John Winters	10	Inukshuk Co. Ltd.	Surveyor and Site Supervisor
John Rogers	10	Inukshuk Co. Ltd.	Heavy Mechanic
Jake Torraville	10	Inukshuk Co. Ltd.	Heavy Equipment Operator (Backhoe Loader and Skid Steer)
Jim Humpheries	10	Inkshuk Co. Ltd.	Heavy Equipment Operator (Excavator)
Kenny Putulik	10	Inkshuk Co. Ltd.	Dump Truck Operator
William Katteatsiok	10	Inkshuk Co. Ltd.	Laborer
Justin Padluk	10	Inkshuk Co. Ltd.	Laborer
Brandon Ipkarnnerk	10	Inkshuk Co. Ltd.	Laborer

Equipment Description	Use (hr)	Stdby (hr)	Contractor	Remarks
	2	0	Inukshuk Co. Ltd.	CAT 42E Backhoe Loader In use to transport heater to pump in morning.
	8	2	Inukshuk Co. Ltd.	CAT 289D Track Skid Steer In use to move pipe anchors and valve boxes from stockpile to placement sites.
	8	2	Inukshuk Co. Ltd.	CAT 320C Excavator In use for berm placement and pipe anchor installation from station 3+000 to 3+220.
	0	0	Inukshuk Co. Ltd.	CAT 950G Front End Loader Not in use. Select-fill material production will resume if necessary.
	0	0	Inukshuk Co. Ltd.	CAT CS-323C Drum Roller Compactor Not in use for today's activities.
	8	2	Inukshuk Co. Ltd.	Dump Truck (1) 1 dump truck operational today to haul select-fill material from stockpiles to berm placement and pipe anchor installation sites.

Progress Summary:

- Pump commissioning for full-length of pipeline successfully completed.
    - After approximately 25 mins to fill pipe, 1 hour of flushing was performed.
    - After 1 hour of flushing was performed, pump ran for 4.5 hours until 7:00 pm to top up reservoir levels at the request of the Hamlet. 759,859 liters of water were added to the reservoir by the end of pumping.
    - Pump was then drained from upstream reservoir end down to the pump.
- Berm placement and pipe anchor installation completed from station 3+000 to 3+220.
- One drain valve box installed at station 3+110.
- Five pipe anchors installed between station 3+000 to 3+220.

Photographs:

Photo 1: 08:30 am – Heater was installed to ensure pump is ice-free for this afternoon's pump commissioning.

Photo 2: 10:00 am – Photo taken at station 3+000, facing southeast. Berm placement and anchor installation continues from station 3+000. Progress rate slower here due to extra precaution taken to maneuver excavator and dump truck around rocky terrain. By end of day, berm placement and anchor installation reaches station 3+220, with 1 drain valve box installed at station 3+110.

Photo 1:10 pm – Photo taken at pump at station 0+0000. Walkthrough of pump startup procedures with Don, Hamlet Foreman takes place with ICL's mechanic. Factory-optimized operating speed and flow rate were discussed, along with pre-startup procedures, and troubleshooting for common errors. Pumping began at 1:11 pm.

Photo 4: 2:15 pm – Photo taken a station 3+200, facing east. Water first reaches the reservoir-end of pipeline at approximately 1:35 pm. Camlock hose installed on pipe end before reservoir for pipeline flushing was not long enough to extend past the local rocky depression containing the gravel pipe base. Some sloughing of the embankment was noted, and ICL was instructed to repair embankment at a later date.

Photo 5: 05:00 pm – Photo taken at reservoir-end pipe outlet. After 1 hour of flushing, crew connected final section of HDPE pipe to the reservoir, and at the request of the Hamlet, pumping proceeded until 7:00 pm to top up the reservoir level. By end of day, 759,859 liters of water were added to the reservoir.