APPENDIX B

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M.D. of Bonnyville

Ardmore and Fort Kent Rural Servicing

Final Report

Prepared by:

AECOM Canada Ltd.
101 – 18817 Stony Plain Road NW
Edmonton, AB T5S 0C2
Canada

T: 780 486 7000
F: 780 486 7070
www.aecom.com

Prepared for:

M.D. of Bonnyville
4905 – 50 Avenue
Bag 1010
Bonnyville, AB T9N 2J7

Date: February 2021

Project #: 60637422

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AECOM Canada Ltd.
101 – 18817 Stony Plain Road NW
Edmonton, AB T5S 0C2
Canada

T: 780 486 7000
F: 780 486 7070
www.aecom.com

Bryan Bespalko
Manager of Infrastructure & Utilities
M.D. of Bonnyville
4905 – 50 Avenue
Bag 1010
Bonnyville, AB T9N 2J7

February 18, 2021

Project #
60637422

Dear Mr. Bespalko:

Subject: Ardmore and Fort Kent Rural Servicing
Final Report

We are pleased to submit the final report of the Ardmore and Fort Kent Rural Servicing study for the M.D. of Bonnyville.

Should you have any questions or concerns, please feel free to contact us to discuss.

Sincerely,
AECOM Canada Ltd.

Kristin St. Louis, P.Eng.
Senior Water Resources Engineer
Kristin.stlouis@aecom.com

/ks

cc: Abid Malik, M.D. of Bonnyville
Steven Pickle, AECOM

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AECOM: 2015-04-13

Authors

Report Prepared By:

Kristin St. Louis, P.Eng.
Senior Water Resources Engineer

Report Reviewed By:

Steven Pickle, M.Sc., P.Eng.
Water/Wastewater Manager, Northern Alberta

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1. Introduction

The Cold Lake Regional Utility Services Commission (CLRUSC) presently provides water to the City of Cold Lake, 4 Wing Cold Lake, Cold Lake First Nation, and the Hamlets of Ardmore and Fort Kent. CLRUSC commissioned AECOM Canada Ltd. (AECOM) to perform a Feasibility Study in 2006 regarding an expansion to the system to service a number of additional customers in two phases. CLRUSC is currently implementing Phase 1 of the Regional Water Supply Expansion (RWSE) with AECOM as the consultant.

The first phase of the Regional Water Services Expansion (RWSE) is now complete and includes a new water transmission main from the Cold Lake Water Treatment Plant (WTP) to a transfer station located outside of Cold Lake South. The transfer station serves as the point of custody transfer between CLRUSC and the newly formed Bonnyville Regional Water Services Commission (BRWSC). From the transfer station, a new water transmission main has been installed to the Town of Bonnyville, with connections to Cold Lake First Nation, the Hamlet of Ardmore and the Hamlet of Fort Kent.

Reservoirs in the Hamlets of Ardmore and Fort Kent are currently supplied through an existing 250 mm water line from the CLRUSC WTP, with 16 rural users being fed upstream of the two reservoirs. Users are located between Cold Lake South and Ardmore, as well as between Ardmore and Fort Kent. Fill connections have been installed from the new transfer station as part of the Phase 1 RWSE.

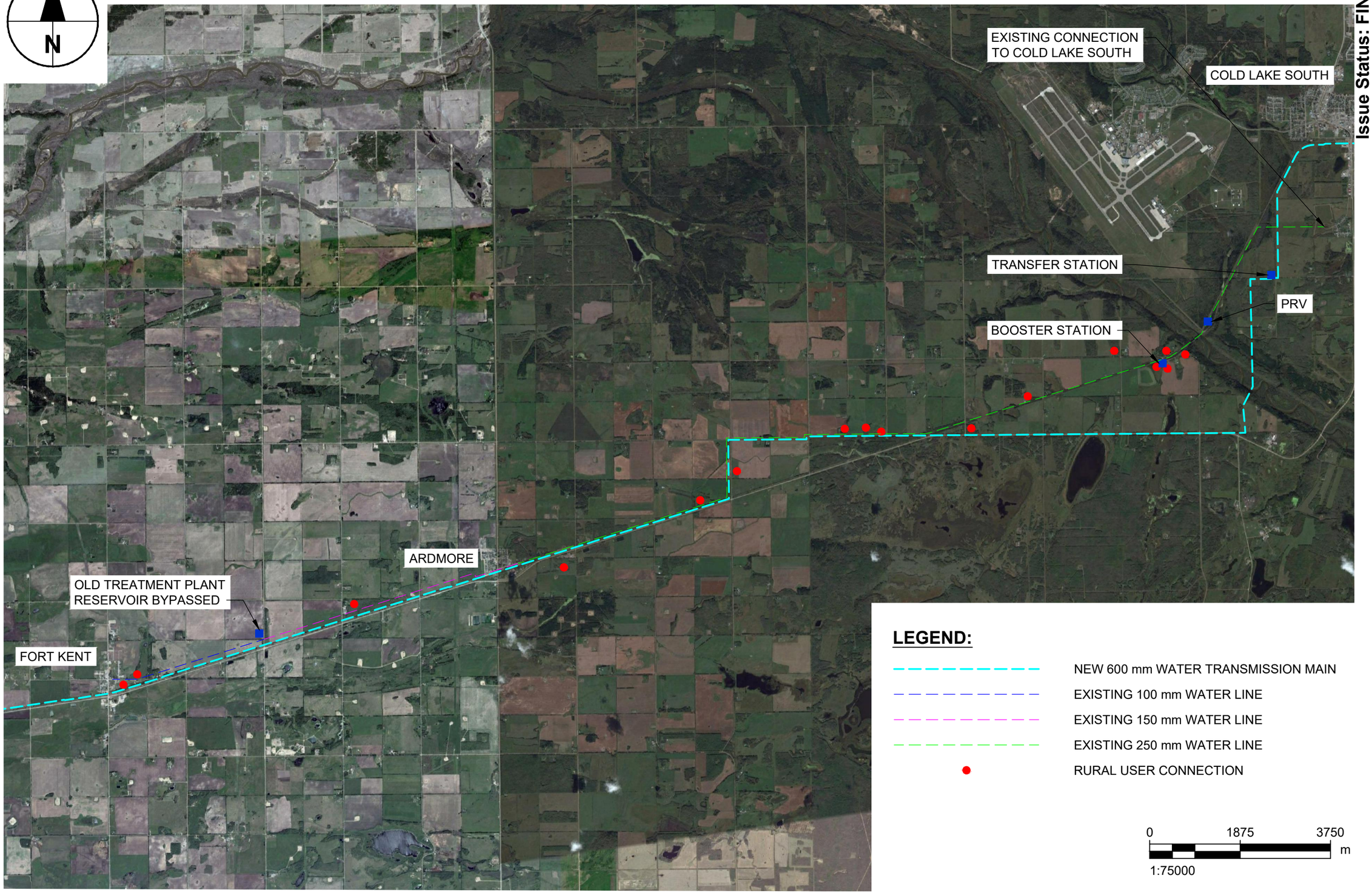
After the transfer station is commissioned, both the Ardmore and Fort Kent reservoirs can be filled directly from the new transmission line to the Town of Bonnyville. Transmission line filling will lower the water age in the reservoirs and reduce disinfection byproduct (DBPs) in the Hamlet distribution systems. Water from the transfer station will have chloramines in it as opposed to the free chlorinated water in the existing 250 mm water line.

Space for pumps and piping to allow for the installation of a dedicated water line that would connect to the existing 250 mm supply line north of the Beaver River has been accommodated in the transfer station. A penetration and pipe stub has been incorporated into the transfer to allow for a future line. A new 100 mm diameter HDPE line has been installed along the transmission line route and stubbed at Ardmore and Fort Kent. The purpose of this line is to ultimately replace the distribution line between Ardmore and Fort Kent.

Although supply from the transfer station will improve the water quality in the reservoirs, continued service to the existing rural users upstream of the reservoirs must be managed. Filling the Ardmore and Fort Kent reservoirs from the transfer station eliminates the primary demands on the 250 mm water line, which will extend the water age and exacerbate existing water quality issues. Backfeeding the rural users from the Ardmore and Fort Kent systems will result in the undesirable mixing of chloraminated and chlorinated water without isolation of the line from Cold Lake.

The transfer station and new transmission main to the Town of Bonnyville are anticipated to be commissioned in Fall 2020. Users within the M.D. of Bonnyville, including the rural users and the Hamlets of Ardmore and Fort Kent will continue to receive service through the existing water main, serviced from the City of Cold Lake, until a servicing alternative for the rural users is determined. While these users are serviced through Cold Lake South, they are subject to potential DBPs from the chlorinated water and are customers of CLRUSC rather than the BRWSC.

The Municipal District of Bonnyville No. 87 (M.D. of Bonnyville) retained AECOM to evaluate alternatives for the continued provision of potable water to rural users currently supplied by an existing 250 mm water line. The existing water servicing system is illustrated in Figure 1.1, including the location of the individual rural users.



Issue Status: FINAL

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Figure: 1.1

EXISTING WATER SERVING

ARDMORE / FORT KENT
RURAL SERVICING
MUNICIPAL DISTRICT OF BONNYVILLE NO. 87
Project No.: 60637422 Date: 2021-02-12

2. Water Servicing

2.1 Water Transmission System

In 2001, a water transmission main was installed from the Cold Lake South to the southwest, providing service to the Hamlets of Ardmore and Fort Kent, as well as individual rural water users along the line. The existing water line is a 250 mm diameter pipe from Cold Lake South to Ardmore. West of Ardmore, the water line reduces to a 150 mm line for 5 km, then reduces further to a 100 mm line to Fort Kent. There is a pressure reducing valve (PRV) station located upstream (northeast) of the Beaver River, with a booster pumping station and rechlorination system located downstream (southwest) of the Beaver River. The PRV reduces pressure in the water main for the Beaver River crossing so that the pressures do not exceed the structural limitations of the pipe. Water to the existing transmission main is supplied from the CLRUSC WTP through a direct connection to the Cold Lake South water distribution system.

There are 16 rural users with connections to the existing water line to Ardmore and Fort Kent, shown in Figure 1.1 in the previous section. The users are located between the Beaver River and Fort Kent. There is a cluster of five users near the booster station, eight users between the booster station and Ardmore, one user located on the 150 mm water main west of Ardmore, and two users located just east of Fort Kent on the 100 mm water main.

As part of the Phase 1 RWSE, the following infrastructure has been constructed:

- An expansion of the CLRUSC WTP.
- A new transfer station, located south of Cold Lake South.
- New transmission mains, connecting the WTP to the transfer station (600-750 mm diameter), and connecting the transfer station to the Town of Bonnyville (600 mm diameter).
- There are connections to the reservoirs in Ardmore and Fort Kent along the new transmission main as well as provisions to add temporary piping across the Beaver River in an emergency scenario.

The water transmission system is managed by two separate commissions. CLRUSC owns and operates all infrastructure up to and including the transfer station. The BRWSC owns and operates the infrastructure downstream of the transfer station.

The WTP supplies chlorinated water to the customers of the CLRUSC. At the transfer station, ammonia is added to convert the free chlorine to chloramines. This reduces DBPs in the line and maintains a longer residual than chlorinated water. BRWSC customers are supplied with chloraminated water.

As indicated in Section 1, Phase 1 RWSE is anticipated to be fully commissioned in Fall 2020. Users serviced from the existing transmission main will continue to be serviced from the City of Cold Lake, until a servicing alternative for the rural users is determined.

2.2 RWSE Water Projections

The Phase 1 RWSE was sized considering further system expansions for a 25-year demand projection. The future Phase 2 RWSE involves expansion to nine additional communities, including the Hamlet of Cherry Grove and the Elizabeth Metis Settlement. Maximum day demand (MDD) water consumption projections for the base (2019) scenario, as well as 15-year and 25-year scenarios for Phases 1 and 2 are summarized in Table 1.

Table 1: Projected Water Consumption Rates

Community/Municipality	2019 (Base Year) MDD (L/s)	2034 (15 Year) MDD (L/s)	2044 (25 Year) MDD (L/s)
Phase 1			
Cold Lake North	71.5	103.5	132.5
Cold Lake South	64.0	92.7	118.6
4 Wing Cold Lake	19.1	27.6	35.4
Cold Lake IR 149	9.7	13.0	15.9
Cold Lake IR 149A	0.7	1.0	1.2
Cold Lake IR 149B	2.4	3.3	4.0
Hamlet of Ardmore	2.9	3.9	4.8
Hamlet of Fort Kent	1.8	2.4	2.9
16 Individual Service Connections (MD of Bonnyville)	0.4	0.4	0.4
Town of Bonnyville	66.3	89.3	108.8
Contingency Allocation	19.0	25.6	31.2
Subtotal Phase 1	**257.8 (22.3 ML/d)**	**362.7 (31.3 ML/d)**	**455.7 (39.4 ML/d)**
Phase 2			
Kehewin First Nation	11.3	15.2	18.6
Elizabeth Metis Settlement	6.5	8.7	10.6
Village of Glendon	4.9	6.7	8.1
Hamlet of La Corey	0.6	0.8	0.9
Hamlet of Cherry Grove	3.9	5.3	6.4
Hamlet of Therien	0.7	0.9	1.1
Summer Village of Pelican Narrows	1.6	2.2	2.7
Summer Village of Bonnyville Beach	1.0	1.3	1.6
Moose Lake Area Shadow Population	13.4	18.0	22.0
Contingency Allocation	4.6	6.2	7.6
Subtotal Phase 2	**48.5 (4.2 ML/d)**	**65.3 (5.6 ML/d)**	**79.6 (6.9 ML/d)**
TOTAL	**306.3 (26.5 ML/d)**	**428.0 (36.9 ML/d)**	**535.3 (46.3 ML/d)**

2.3 Existing Servicing

As water age in the line is a primary issue, the existing water demands were considered. Meter readings from 2017 to 2020 were reviewed. Due to variances noted with the meter readings such as vacant properties, rental properties, and winter vacationers, as well as seasonal fluctuations in water use, the maximum water demand was considered rather than an average. The total average day demand of the rural users is 0.11 L/s. A summary of the existing water demands is provided in Table 2.

Table 2: Existing Water Demands

Connection Location	Demand (L/s)				
	2017	**2018**	**2019**	**2020**	**Maximum**
NE 17-62-2-W4	0.000	0.000	0.001	0.035	0.035
NW 17-62-2-W4	0.004	0.002	0.002	0.002	0.004
SE 19-62-2-W4	0.004	0.008	0.001	0.000	0.008
SE 20-62-2-W4	0.008	0.007	0.009	0.009	0.009
SE 20-62-2-W4	0.003	0.000	0.003	0.003	0.003
SE 13-62-3-W4	0.007	0.003	0.004	0.004	0.007
SW 13-62-3-W4	0.003	0.003	0.003	0.003	0.003
SE 15-62-3-W4	0.003	0.001	0.002	0.001	0.003
SE 15-62-3-W4	0.002	0.001	0.001	0.000	0.002
SW 15-62-3-W4	0.008	0.011	0.010	0.009	0.011
NW 9-62-3-W4	0.002	0.003	0.001	0.000	0.003
SE 8-62-3-W4	0.003*	0.003	0.003	0.003	0.003
NE 1-62-4-4	0.002	0.002	0.001	0.001	0.002
NW 34-61-4-W4	0.002	0.000	0.000	0.000	0.002
022 1214;2;1	0.009	0.008	0.009	0.007	0.009
082 7385;1;1	0.006	0.007	0.006	0.005	0.007
TOTAL	**0.066**	**0.060**	**0.056**	**0.081****	**0.111**

*2017 data for this user was corrected to eliminate one abnormally high meter reading. Corrected to align with 2018 meter readings.
**2020 data was provided for January to June 2020

A spreadsheet calculation was completed to estimate water age, assuming the rural users are the only water draws on the existing water line, with the reservoirs at Ardmore and Fort Kent filled from the new 600 mm transmission main. There are five users close to the booster station / rechlorinating station; if these demands of these five users are removed for the water age analysis in the line, the average day demand drops to approximately 0.05 L/s. The demands further reduce along the length of the water main, dropping to 0.02 L/s past Ardmore.

The estimated water age in the line takes approximately 170 days to reach Ardmore, and approximately 250 days by the time the water reaches the last user near Fort Kent. Typically, 14 days is taken as a reasonable decay tie for chloramines. Without the terminal users of Ardmore and Fort Kent, the existing 250 mm line is too large to feasibly service rural users without water quality concerns.

2.4 Water Servicing Concepts

Several water servicing concepts were considered to provide continued water service to the rural users serviced by the existing water line. Alternatives were developed that considered water quality while leveraging the use of the new infrastructure. Five alternatives were considered feasible and are described in detail below.

- Pumped supply from transfer station using existing 250 mm line (Alternatives 1 and 5).
- Flow through supply at transfer station to allow custody transfer without pumping (Alternative 2).
- Supply from Hamlets (Alternative 3).
- Reconnect rural users to the new 600 mm transmission line (Alternative 4).

2.4.1 Alternative 1

Rural users would continue to the be serviced from the existing water line. The 250 mm water line would be disconnected from Cold Lake South and reconnected to the new CLRUSC transfer station. This line would have a separate pump in the transfer station that could supply the existing water line as a separate pressure zone (Zone 2) from the new 600 mm transmission main. Provision for Zone 2 pumps (2 x 7.5 HP) was included in the design of the transfer station.

The existing PRV station could potentially be decommissioned as the pressure could be monitored and maintained at the transfer station. The chlorine injection system at the booster pump station would also need to be modified or decommissioned as the water supply would be chloraminated from the transfer station.

In Alternative 1, the Hamlets of Ardmore and Fort Kent would fill their reservoirs through the new 600 mm transmission main. With the existing 250 mm water line providing service to only the rural users, the water age in the line would be in excess of 200 days due to the low flow rates. To mitigate water quality issues, another truck fill station near Fort Kent would be required.

A schematic of Alternative 1 is shown in Figure 2.1.

2.4.2 Alternative 2

Alternative 2 follows the same servicing scheme as Alternative 1; however, the Zone 2 pump would not be required at the transfer station. The existing 250 mm water line would be reconnected to the fill line within the transfer station. A meter would be required to provide a custody transfer between CLRSUC and BRWSC. With a connection to the fill line, the existing water line would need to be considered as a separate customer to the CLRUSC. Pumping to the line would come from the Cold Lake WTP.

Similar to Alternative 1, the Hamlets of Ardmore and Fort Kent would fill their reservoirs through the new 600 mm transmission main, and the water age in the line would be in excess of 200 days due to low flow rates. Another truck fill station near Fort Kent would be required. As the water supply would come from the fill line in the transfer station, the water supply be chlorinated.

There is less flexibility to jointly service other users in the area with Alternative 2. As demands in the regional system decrease, pressure in the fill line to the transfer station decrease. By the Phase 2, 25-year scenario, the pressure in the fill line could be ~200 kPa, pending overall demands in the system. Service could be extended to Cherry Grove; however, further extension to the Elizabeth Metis Settlement would require repumping.

A schematic of Alternative 2 is shown in Figure 2.2.

2.4.3 Alternative 3

For Alternative 3, supplying the rural users from the Hamlets was considered. The reservoirs at Ardmore and Fort Kent would be filled from the new 600 mm transmission main with chloraminated water. The topography generally slopes towards the Beaver River; therefore, the Ardmore distribution system would have the ability to back-feed the existing water transmission main. The existing 250 mm line would need to be capped after the last user, and the portion of the line from the Beaver River to Cold Lake South would be decommissioned along with the PRV. To maintain water quality, a truck fill could be added near the existing booster pump station near the Beaver River.

There are two users with connections north east of the booster pump station that could still have issues with water quality. The 250 mm line could be decommissioned, with a 50 mm service line extended to those two properties.

Between Ardmore and Fort Kent, the existing transmission line could be supplied from both Hamlets. Two users are located in close proximity to the Hamlet of Fort Kent. These users could potentially be reconnected to be serviced from the Fort Kent distribution system. This would allow for the majority of the existing 100 mm transmission main to be decommissioned. However, this would result in a long dead-end service to the one user located west of Ardmore.

A schematic of Alternative 3 is shown in Figure 2.3.

2.4.4 Alternative 4

For Alternative 4, complete decommissioning of the existing water line was considered. All customers would be reconnected to the new 600 mm water transmission main.

This alternative would resolve the water quality issues to the rural users as there is sufficient turn-over in the new water transmission main. However, lengthy service connections would be required at some properties where the existing and new transmission mains are not paralleled.

A schematic of Alternative 4 is shown in Figure 2.4.

2.4.5 Alternatives 5/5A

Alternative 5 is a similar servicing option to Alternative 1. The existing 250 mm water line would be disconnected from Cold Lake South and reconnected to the transfer station. The Zone 2 pump would be installed in the transfer station to supply the existing water line. In addition to supplying the rural users, the existing line would continue to be used to supply the reservoirs at Ardmore and Fort Kent. Adding the larger water demands for the Hamlets mitigates the water age issues in the existing transmission main.

As the water is supplied through the transfer station, Ardmore and Fort Kent would receive chloraminated water instead of the chlorinated water that was previously supplied through the City of Cold Lake. The connections to the new 600 mm line would be closed; however, the connection piping could be rechlorinated and opened for emergency use.

Alternative 5a is a sub-option of Alternative 5, with a modification to how the reservoirs are filled. In Alternative 5a, there would be flexible operations at the Ardmore and Fort Kent reservoirs, alternating supply from the existing and new transmission mains. Fill from the existing transmission main could be done on a set schedule to maintain turnover in the line, mitigating water quality issues to the rural users.

A schematic of Alternatives 5 and 5A are shown in Figure 2.5.

2.4.6 Alternative Summary

Table 3 provides a summary of the advantages and disadvantages of each alternative.

Table 3: Alternative Summary

Alt	Description	Advantages	Disadvantages
1	Add Zone 2 pump to transfer station and connect to the existing 250 mm water main.	- Provides flexibility for connecting to other users in the area (Cherry Grove and nearby country residential users). - Supplies users with chloraminated water, reducing the DBPs. - Could decommission the PRV and control pressure at the Beaver River Crossing from the transfer station. - Migrates MD customers onto BRWSC from CLRUSC supply.	- Repumping at transfer station not required to service rural users along the existing line, resulting in unnecessary capital and O&M costs. - Requires modifications to existing chlorination system at Booster Station west of the river, as water would be chloraminted at the transfer station. - With the removal of services to Ardmore and Fort Kent, water age in the line is 200+ days, and addition of a truck fill near Fort Kent or chloramine boosting stations would be required.
2	Connect the existing 250 mm water main to the fill line in the transfer station.	- Avoids repumping at the transfer station. - No modifications to the existing system would be required. - Migrates MD customers onto BRWSC from CLRUSC supply.	- Less flexibility than Alternative 1 to jointly service other users in the area. Service could be extended to Cherry Grove; however, extension to Elizabeth Metis Settlement would require repumping. - With the removal of services to Ardmore and Fort Kent, water age in the line is 200+ days, and addition of a truck fill near Fort Kent or chlorine boosting stations would be required. - Pumping would come from the WTP, requiring a second metered connection to the BRWSC in the transfer station, potentially unacceptable to CLRUSC. - Water would be chlorinated; concerns with DBPs not addressed.

Alt	Description	Advantages	Disadvantages
3	Supply from Hamlets	- Supplies users with chloraminated water, reducing the DBPs. - Minimizes the capital costs by eliminating the connection to the new transfer station. - Existing topography slopes from Ardmore to the Beaver River, so minimal pumping is required. - The existing Beaver River crossing and 250 mm water main east of the Beaver River could be decommissioned, including the PRV and booster station. - A portion of the 100 mm waterline east of Fort Kent could be decommissioned. - Migrates MD customers onto BRWSC from CLRUSC supply.	- No provision for servicing additional users in the area. - Water age in the line is 100+ days, and addition of a truck fill near the existing booster station would be required. - Modifications would be required in the Ardmore and Fort Kent pumphouses to reconnect the existing fill line to distribution.
4	Direct individual connections from transmission main downstream of the transfer station.	- Minimizes the capital costs by eliminating the connection to the new transfer station. - Satisfies water age concerns. - Supplies users with chloraminated water, reducing the DBPs.	- Changes the definition of the new water line from transmission to distribution. - Would require approval from other stakeholders, creating schedule risk.
5	Continue to fill Ardmore and Fort Kent off the existing 250 mm line, pumped from the transfer station. Close connections to new line.	- Satisfies water age concerns - Supplies users with chloraminated water, reducing the DBPs. - Could decommission the PRV and control pressure at the Beaver River Crossing from the transfer station.	- Repumping at transfer station not required to service rural users along the existing line, resulting in unnecessary capital and O&M costs. - Requires modifications to existing chlorination system at Booster Station west of the river. - Connections between the new transmission main and the Ardmore and Fort Kent reservoirs would need to be recommissioned if needed.
5a	Flexible operations between the 250 mm line and the 600 mm line to flush 250 mm line for quality.	- Satisfies water age concerns. - All infrastructure is operational. - Supplies users with chloraminated water, reducing the DBPs. - Could decommission the PRV and control pressure at the Beaver River Crossing from the transfer station.	- Repumping at transfer station not required to service rural users along the existing line, resulting in unnecessary capital and O&M costs. - Requires modifications to existing chlorination system at Booster Station west of the river. - Strict adherence to the operating procedure would be required to maintain water age in the existing 250 mm line.

2.5 Evaluation of Alternatives

The alternatives were evaluated for the following considerations:

- Schedule implications.
- Regulatory considerations.
- Maintenance of water quality to rural users.
- Compatibility with future supply expansion (e.g. Cherry Grove, Elizabeth Metis Settlement).
- Emergency supply options to the Town of Bonnyville from the transfer station.
- Conceptual costs.

A decision matrix scoring methodology for examining the servicing alternatives is presented in Table 4. Scores on a scale of 1 to 5 were assigned to the various criteria, with 5 indicating a higher value.

Table 4: Decision Matrix Scoring Criteria

Criteria	Score				
	1	2	3	4	5
Schedule Implications	> 2 Years	1-2 Years	1 Year	6-12 Months	< 6 Month
Regulatory Considerations	Significant regulatory considerations	n/a	Some regulatory considerations	n/a	No regulatory considerations
Stakeholder Acceptability	Anticipate significant objection	Anticipate moderate objection	Anticipate minimal objection	Anticipate little objection	Anticipate no objection
Maintenance of Water Quality	Water quality is unacceptable	Significant water quality issues; can be mitigated	Water quality is improved from existing condition	Water quality issues to majority of users resolved	Water quality concerns to all users resolved
Compatibility with Future Expansion	Provides no compatibility for extension to future BRWSC customers	n/a	Provides limited compatibility for extension to future BRWSC customers	n/a	Provides compatibility for extension to future BRWSC customers
Emergency Supply Options to Town of Bonnyville	No additional provisions for emergency water supply to Bonnyville	n/a	Some provisions for emergency water supply to the Town	n/a	Provides an emergency supply option to the Town

Table 5 shows the evaluation of the six potential alternatives which were developed. Refer to Section 2.4 for additional details on the potential servicing alternatives. As indicated in Table 5, Alternative 5A has the highest total score.

Table 5: Alternative Score Summary

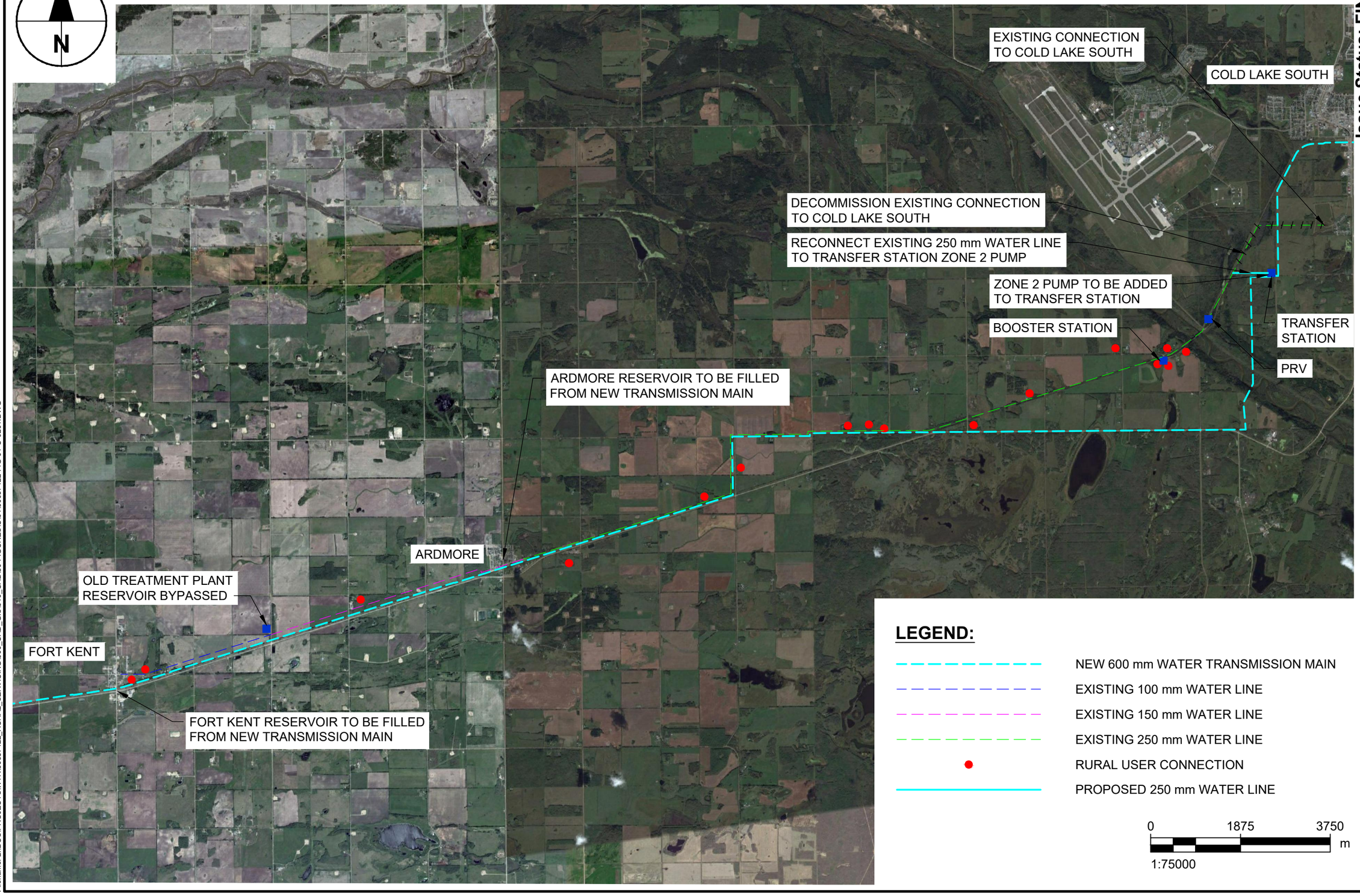
Criteria	Score					
	Alt 1	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 5A**
Schedule Implications	2	2	2	3	3	3
Regulatory Considerations	5	5	5	3	5	5
Stakeholder Acceptability	5	1	3	2	4	4
Maintenance of Water Quality	3	2	2	5	4	5
Compatibility with Future Expansion	5	3	1	1	5	5
Emergency Supply Options to Town of Bonnyville	5	3	1	1	3	5
Total Score	**25**	**16**	**14**	**14**	**24**	**27**

Conceptual costs were developed for each alternative for evaluation purposes, summarized in Table 6. The cost estimates considered capital costs associated with each option, including a 40% contingency. The cost estimates included:

- Supply and install 250 mm water main to reconnect the existing 250 mm main to the transfer station (Alt 1, 2, 5, and 5A).
- Supply and install 50 mm and 100 mm water main to provide rural users with a smaller diameter service (Alt 3) or to reconnect to the new transmission main (Alt 4).
- Supply and install Zone 2 pumps at the transfer station (Alt 1, 5, and 5A).
- Transfer station pipe modifications to connect to new Zone 2 pumps (Alt 1, 5, and 5A) or tie into fill line (Alt 2).
- Modifications at the Hamlets distribution pumphouses to reverse flow direction in the 250 mm main (Alt 3).
- Construction of new truck fill either near Fort Kent (Alt 1 and 2) or near the booster station (Alt 3).
- Decommission and bypass the PRV (Alt 1, 5, and 5A).
- Plug and decommission the existing 250 mm water main up to the transfer station (Alt 1, 2, 5, and 5A), up to and including the Beaver River Crossing (Alt 3), or the entire length of the 250 mm, 150 mm and 100 mm water mains to Fort Kent.
- Reconnect individual users to the new transmission main (Alt 4).

Table 6: Alternative Cost Summary

Description	Cost					
	Alt 1	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 5A**
Supply and Install 250 mm Water Main	$510,000	$510,000	-	-	$510,000	$510,000
Supply and Install 100 mm Water Main	-	-	-	$1,000,000	-	-
Supply and Install 50 mm Water Main	-	-	$200,000	$400,000	-	-
Supply and Install Zone 2 Pumps	$150,000	-	-	-	$150,000	$150,000
Transfer Station Piping Modifications	$150,000	$150,000	-	-	$150,000	$150,000
Hamlet Pumphouse Modifications	-	-	$300,000	-	-	-
New Truck Fill	$1,400,000	$1,400,000	$1,400,000	-	-	-
Decommission and Bypass PRV	$20,000	-	-	-	$20,000	$20,000
Decommission Existing Water Main	$70,000	$70,000	$250,000	$350,000	$70,000	$70,000
User Connections	-	-	-	$600,000	-	-
Total	**$2,300,000**	**$2,130,000**	**$2,150,000**	**$2,350,000**	**$900,000**	**$900,000**



Issue Status: FINAL

AECOM

Figure: 2.1

WATER SERVING ALTERNATIVE 1

ARDMORE / FORT KENT
RURAL SERVICING
MUNICIPAL DISTRICT OF BONNYVILLE NO. 87
Project No.: 60637422 Date: 2021-02-12

Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm

Last saved by: ANDREW.FLECK (2021-02-11) Last Plotted: 2021-02-11
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N

EXISTING CONNECTION TO COLD LAKE SOUTH

COLD LAKE SOUTH

DECOMMISSION EXISTING CONNECTION TO COLD LAKE SOUTH

RECONNECT EXISTING 250 mm WATER LINE TO FILL LINE WITHIN TRANSFER STATION

BOOSTER STATION

TRANSFER STATION

PRV

ARDMORE RESERVOIR TO BE FILLED FROM NEW TRANSMISSION MAIN

ARDMORE

OLD TREATMENT PLANT RESERVOIR BYPASSED

FORT KENT

FORT KENT RESERVOIR TO BE FILLED FROM NEW TRANSMISSION MAIN

LEGEND:

- NEW 600 mm WATER TRANSMISSION MAIN
- EXISTING 100 mm WATER LINE
- EXISTING 150 mm WATER LINE
- EXISTING 250 mm WATER LINE
- RURAL USER CONNECTION
- PROPOSED 250 mm WATER LINE

0 1875 3750 m

1:75000

Issue Status: FINAL

AECOM

Figure: 2.2

WATER SERVING ALTERNATIVE 2

ARDMORE / FORT KENT
RURAL SERVICING
MUNICIPAL DISTRICT OF BONNYVILLE NO. 87
Project No.: 60637422 Date: 2021-02-12

N

EXISTING CONNECTION TO COLD LAKE SOUTH

COLD LAKE SOUTH

TRANSFER STATION

DECOMMISSION EXISTING 250 mm WATER LINE FROM COLD LAKE SOUTH TO SOUTHWEST SIDE OF BEAVER RIVER

PRV

BOOSTER STATION

POTENTIAL TRUCK FILL LOCATION

EXISTING 250 mm WATER LINES TO BE BACK FED FROM FORT KENT AND ARDMORE

EXISTING 100 mm AND 150 mm WATER LINES TO BE BACK FED FROM FORT KENT AND ARDMORE

ARDMORE

OLD TREATMENT PLANT RESERVOIR BYPASSED

FORT KENT

ARDMORE RESERVOIR TO BE FILLED FROM NEW TRANSMISSION MAIN

FORT KENT RESERVOIR TO BE FILLED FROM NEW TRANSMISSION MAIN

LEGEND:

- NEW 600 mm WATER TRANSMISSION MAIN
- EXISTING 100 mm WATER LINE
- EXISTING 150 mm WATER LINE
- EXISTING 250 mm WATER LINE
- RURAL USER CONNECTION
- PROPOSED 250 mm WATER LINE

0 1875 3750 m

1:75000

Issue Status: FINAL

AECOM

Figure: 2.3

WATER SERVING
ALTERNATIVE 3

ARDMORE / FORT KENT
RURAL SERVICING
MUNICIPAL DISTRICT OF BONNYVILLE NO. 87
Project No.: 60637422 Date: 2021-02-12

Project Management Initials: ____ Designer: ____ Checked: ____ Approved: ____ ANSI B 279.4mm x 431.8mm

Last saved by: ANDREW.FLECK (2021-02-11) Last Plotted: 2021-02-11
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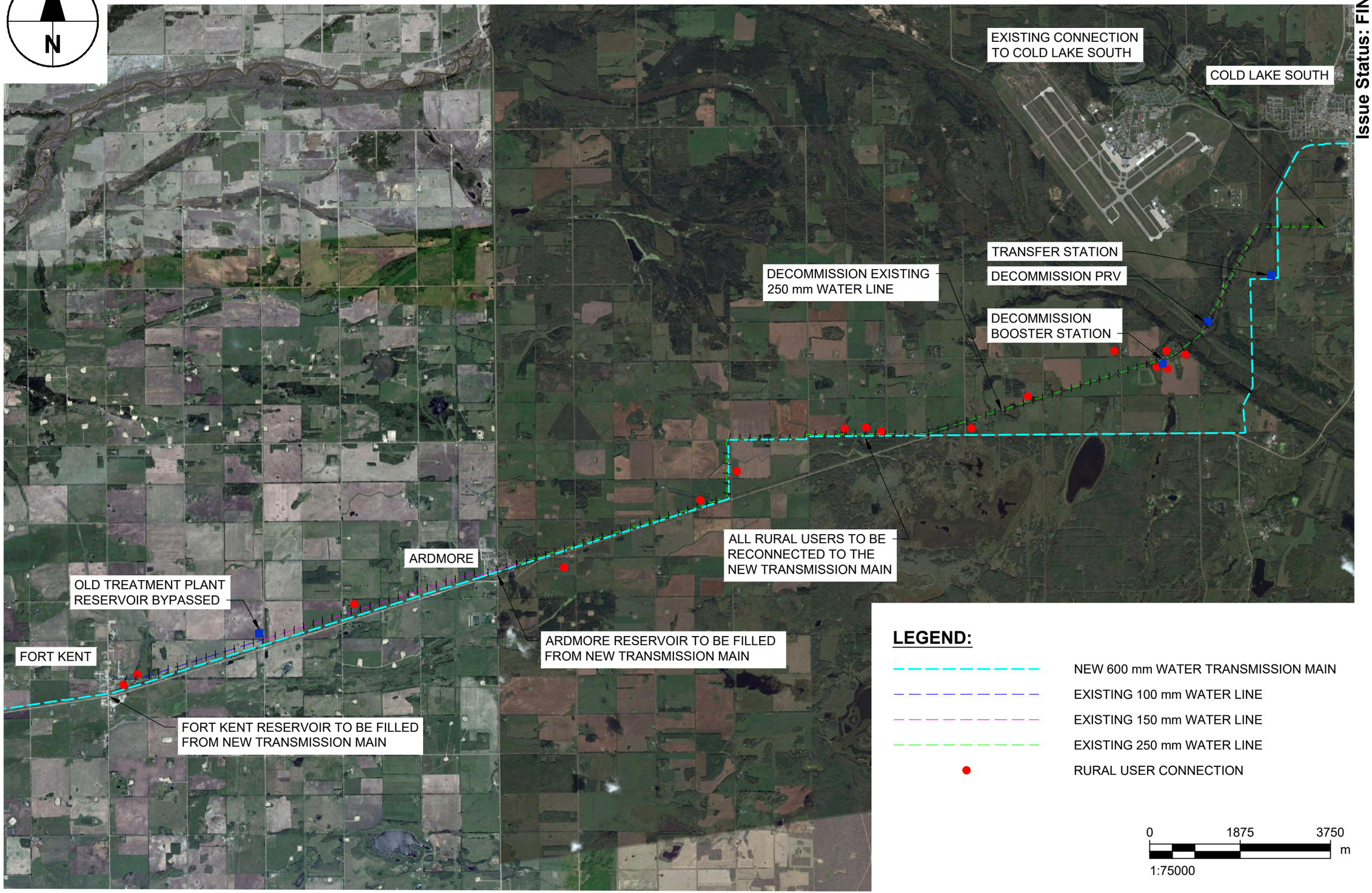

Issue Status: FINAL

AECOM

Figure: 2.4

WATER SERVING
ALTERNATIVE 4

ARDMORE / FORT KENT
RURAL SERVICING
MUNICIPAL DISTRICT OF BONNYVILLE NO. 87
Project No.: 60637422 Date: 2021-02-12

Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm

Last saved by: ANDREW.FLECK (2021-02-11) Last Plotted: 2021-02-11
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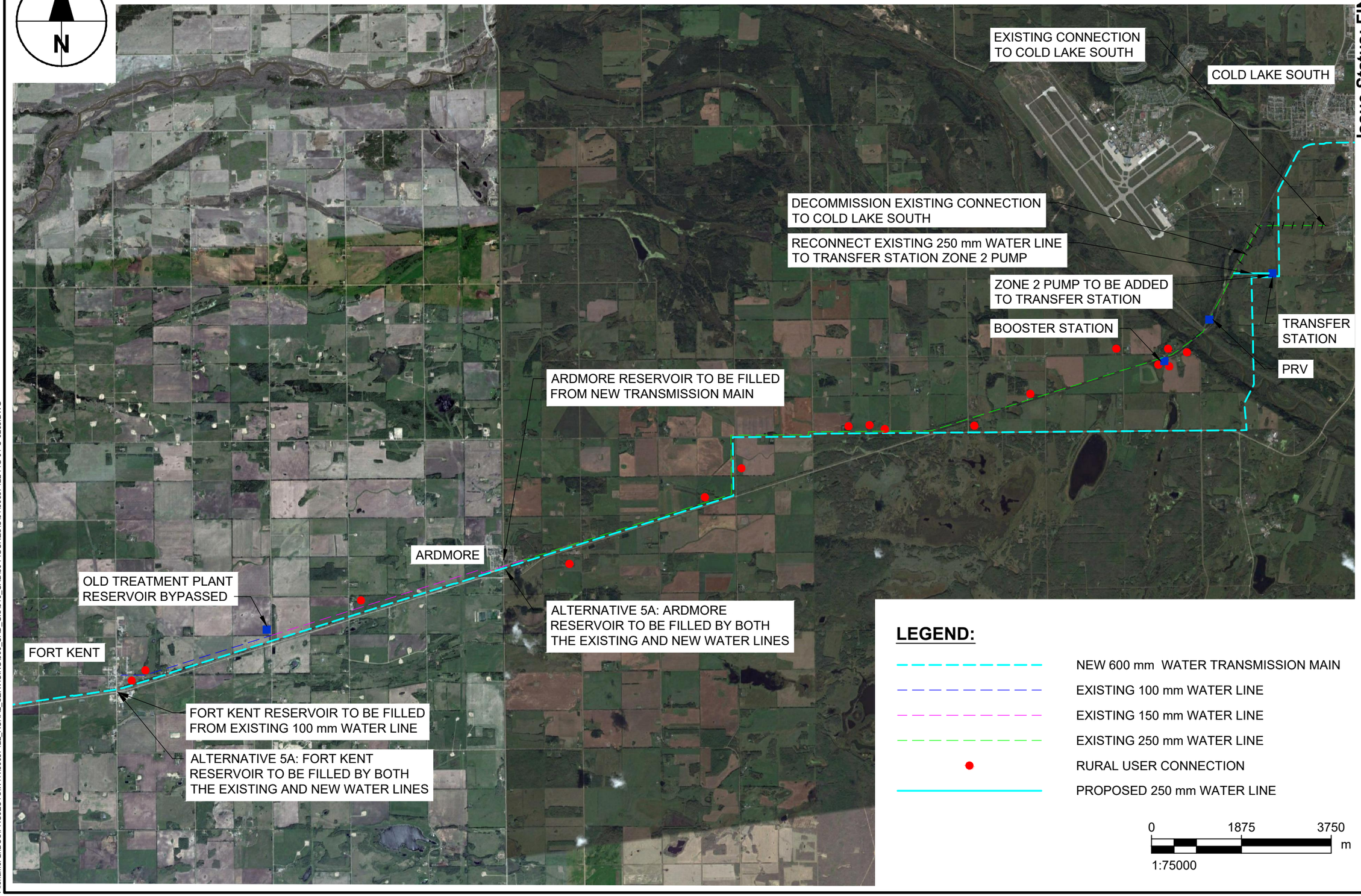

Issue Status: FINAL

AECOM

Figure: 2.5

WATER SERVING ALTERNATIVE 5

ARDMORE / FORT KENT
RURAL SERVICING
MUNICIPAL DISTRICT OF BONNYVILLE NO. 87
Project No.: 60637422 Date: 2021-02-12

Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm

Last saved by: ANDREW.FLECK (2021-02-11) Last Plotted: 2021-02-11
Filename: L:\DCS\PROJECTS\WTR\60637422_RURAL_SERVICING\900_CAD_GIS\910_CAD\30-FIGURES\C\0160637422-FIG-01-C-0205.DWG

3. Recommended Servicing

3.1 Recommended Concept

Alternative 5A is the recommended servicing concept for supplying water to the rural users. Alternative 5A involves supplying the existing 250 mm water main from the transfer station and filling the Ardmore and Fort Kent reservoirs alternately from the existing and new transmission mains. The existing 250 mm water line would be plugged at Cold Lake South and decommissioned from Cold Lake South to the Township Road 624, west of the transfer station.

The new pump (2 x 7.5 HP) would be installed in the transfer station, and a new water main would need to be installed along Township Road 264 to connect the transfer station to the existing 250 mm water main along the Iron Horse Trail. The existing pressure reducing valve located northeast of the Beaver River Crossing could be bypassed and decommissioned. Pressure in the existing line could be monitored and maintained at the transfer station to remain within the structural limitations of the existing pipe under the Beaver River.

As the water is supplied through the transfer station, Ardmore and Fort Kent would receive chloraminated water instead of the chlorinated water that was previously supplied through the City of Cold Lake. Therefore, rechlorinating at the existing booster station southwest of the Beaver River would no longer be required.

All service connections to the rural users would remain the same. In addition to supplying the rural users, the existing line would be used on an alternating schedule to supply the reservoirs at Ardmore and Fort Kent. Maintaining the larger water demands for the Hamlets on the existing water line mitigates the water age issues to the rural users. An operating procedure would need to be developed to maintain turnover in the existing line, considering fluctuations on the water demands over time. The primary fill to the Hamlet reservoirs could be from the new 600 mm transmission main. Alternating the supply to the Hamlet reservoirs between the two transmission mains provides operational flexibility within the system, while also providing an emergency allowance to provide water to the Town of Bonnyville.

3.2 Regulatory and Schedule Considerations

No major regulatory issues are anticipated with the recommended servicing concept. The threshold for distribution system registration is not met; therefore, there are no additional requirements. The proposed 250 mm water line extension will not require a Conservation and Reclamation approval as it does not meet the criteria of a Class I pipeline project, having an index (length in kilometers times approximate diameter in millimeters) less than 2690, as outlined in Alberta Environment's Conservation and Reclamation Information Letter 94-5. A code of practice notification will be required to be made to Alberta Environment advising them of the system modifications.

It is anticipated that the required system modifications could be completed within a one-year time frame, subject to funding constraints. The connection from the transfer station to the existing 250 mm water main could be completed within the right of way of the township road, and additional land acquisition should not be required. Coordination with the concurrent study to service Cherry Grove should be undertaken by the M.D. to make sure that the schedules and approaches are in alignment.

Until a plan is formulated, the rural users, as well as the Hamlets of Cherry Grove and Ardmore should continue getting fill from CLRUSC to prevent water age issues.

3.3 Conceptual Cost Estimates

The cost estimates for the recommended water servicing alternative 5A are summarized in Table 7. The costs are in 2020 dollars and include 40% for contingency.

Table 7: Conceptual Cost Estimate Summary

Description	Unit Cost	Quantity	Total
Supply and Install 250 mm Water Main	$425/m	850 m	$361,250
Supply and Install Zone 2 Pumps (2 x 7.5 HP) and Transfer Station Piping Modifications	$200,000	L.S.	$200,000
Plug and Decommission Existing 250 mm Water Main	$50,000	L.S.	$50,000
Decommission and Bypass PRV	$10,000	L.S.	$10,000
Sub-Total			$621,250
40% Contingency			$248,500
Total			**$900,000**

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