APPENDIX E DFO NEED FOR DEVELOPMENT REPORT

Need for Development

East Yellowhead Area

October 24, 2017

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Executive Summary

FortisAlberta Inc. (FortisAlberta) is requesting system access service to address existing reliability and predicted distribution system capacity concerns at the Pinedale 207S substation.

Load growth in the East Yellowhead area is producing a number of concerns related to the adequacy of the existing transmission and distribution facilities to meet customer needs.

Load studies indicate that the occurrence of a single (N-1) contingency affecting the transformer at Pinedale 207S substation would result in customer loads that cannot be restored by switching only, referred to as “unsupplied load” further in the need document. This violates FortisAlberta planning criteria for electrical load restoration.

In addition, the Pinedale 207S substation transformer is predicted to experience load levels in excess of its rated capacity starting in 2021. This exceeds the FortisAlberta planning criteria for substation transformer loading.

Further, the load on the 25 kV distribution feeder 207S-2228L is predicted to exceed 13.0 MVA starting in 2017. This exceeds the FortisAlberta planning criteria for feeder loading.

Potential solutions were assessed to address the reliability concerns in the East Yellowhead area. Based on information available to FortisAlberta, technical merit and distribution capital cost, the FortisAlberta preferred solution was identified.

FortisAlberta’s preferred solution involves the installation of one On-Load Tap Changer (LTC) source transformer and one 25 kV breaker at the Pinedale 207S substation.

The estimated transmission capital costs associated with FortisAlberta’s preferred alternative will be provided by the Transmission Facility Owner (TFO), AltaLink Management Limited (AltaLink).

The estimated distribution capital costs associated with this alternative is $0.45 million (±30%, 2018$).

The requested In-Service Date (ISD) for the Pinedale 207S facility upgrade is November 1, 2018.

If FortisAlberta's preferred alternative is approved by the AUC, FortisAlberta will request an increase to the Demand Transmission Service (DTS) contract at the Pinedale 207S substation of 3.9 MW, resulting in a DTS of 21.1 MW.

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1. Background

The East Yellowhead area is located to the east of the Town of Edson. The area follows along the Yellowhead highway, extends approximately 23 km south and 30 km north of the Yellowhead highway and to the east is bound by the community of Nojack located approximately 57 km away from the Town of Edson. The distribution deficiencies driving the need identified by the FortisAlberta in this application are located within the described geographical area and are localized at the Pinedale 207S substation.

The existing distribution system in the area of the identified need supplies residential, farm, commercial, and industrial loads. It is served by the Edson 58S, Pinedale 207S, and T.M.P.L Niton 228S substations. These substations are the only distribution substations close enough to the identified deficiencies driving the need to be able to potentially provide support and solution to the need. The Fickle Lake 406S, Deerhill 1012S and Cynthia 178S substations are the closest distribution substations outside of the boundary of the area of the identified need. See Figure A-1, Appendix A for a simplified sketch of the existing transmission substations and distribution systems in the area.

The Edson 58S substation is located at LSD 12 SEC 18 TWP 53 RGE 17 W5M approximately 5 km to the west of the Town of Edson and approximately 25 km west of the Pinedale 207S substation. The substation has two 138/24.94 kV 25/33/42 MVA LTC source transformer supplying five 25 kV feeders. The distribution system supplied by the Edson 58S substation only has three-phase distribution feeder ties with the adjacent Fickle Lake 406S, Deerhill 1012S, and Pinedale 207S substations.

The Pinedale 207S substation is located at the LSD 1 SEC 28 TWP 53 RGE 15 W5M approximately 20 km to the east of the Town of Edson. The substation has one 138/26.5 kV 15/20/25 MVA LTC source transformer supplying two 25kV feeders. The distribution system supplied by the Pinedale 207S substation only has three-phase distribution feeder ties with the adjacent Edson 58S, and TMPL Niton 228S substations.

The TMPL Niton 228S substation is located at the LSD 4 SEC 34 TWP 53 RGE 13 W5M approximately 40 km to the east of the Town of Edson and approximately 20 km east of the Pinedale 207S substation. The substation has one 138/24.94 kV 15/20/25 MVA Off-Load Tap Changer (OCTC) source transformer paired with the 23.9 kV 15 MVA regulator supplying three 25 kV distribution feeders. The distribution system supplied by the TMPL Niton 228S substation only has three-phase distribution feeder ties with the adjacent Pinedale 207S substation.

The Cynthia 178S substation is located at the LSD 12 SEC 1 TWP 50 RGE 12 W5M approximately 14 km to the west of the Hamlet of Cynthia and approximately 49 km to the southeast of the Pinedale 207S substation. The substation has one 138/24.9 kV 25/28 MVA OCTC source transformer paired with the 24.9 kV 28/37.2 MVA voltage regulator supplying three 25 kV distribution feeders. The distribution system supplied by the Cynthia 178S substation does not have any three phase ties with the distribution substations within the area of the identified need.

The Fickle Lake 406S substation is located at the LSD 2 SEC 22 TWP 51 RGE 19 W5M approximately 26 km to the southwest of the Town of Edson and approximately 43 km to the southwest of the Pinedale 207S substation. The substation has one 138/26.5 kV 15/20/25 MVA LTC source transformer supplying one 25 kV feeder. The distribution system supplied by the Fickle Lake 406S substation only has three-phase distribution feeder tie with the adjacent Edson 58S substation.

The Deer Hill 1012S substation is located at the LSD 6 SEC 33 TWP 55 RGE 18 W5M approximately 26 km to the northwest of the Town of Edson and approximately 38 km to the northwest of the Pinedale 207S substation. The substation has one 138/26.5 kV 25/33/42 MVA LTC source transformer supplying three 25 kV feeders. The distribution system supplied by the Deer Hill 1012S substation has three-phase distribution feeder tie with the adjacent Edson 58S substation.

The Cynthia 178S, Fickle Lake 406S, and Deer Hill 1012S substation are located outside of the identified area of the need, have no direct three-phase distribution tie lines to the Pinedale 207S substation and are incapable of providing direct solution to the identified deficiencies. Therefore, the load tables for these substations are not shown in this Need for Development (NfD) document. No other distribution substations in the area are close enough to provide any support to the substations located in the area of the need.

2. Criteria

The analysis for the existing system and alternative solutions in the East Yellowhead area has been conducted based upon the following criteria:

- The maximum normal loading of FortisAlberta 25 kV distribution feeders is 13.0 MVA.

- FortisAlberta planning criteria for electrical load restoration requires that adequate backup supply for contingency situations be available subject only to switching time. Backup capability refers to the ability to restore service after an interruption without necessarily first repairing the cause of the interruption.

- Transmission equipment must not be operated at load levels in excess of the equipment ratings.

3. Existing System Assessment

The existing substations and distribution systems in the East Yellowhead area are shown in Figure A-1 in Appendix A.

3.1 Load Forecast

Table 3-1 provides FortisAlberta historical and forecast peak load levels for the substations and feeders in the East Yellowhead area. The load forecast is based on historical data, expected development trends and contracted new loads. This load forecast was used to assess the existing system in this Need for Development document.

Table 3-1: FortisAlberta Historic and Forecast Load: Existing System

				RECORDED - MVA LOADING						PREDICTED - MVA LOADING									
			W	2012	2013	2014	2015	2016		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
SUB		CAPACITY	or	Peak	Peak	Peak	Peak	Peak		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
No	Feeder	T/R MVA	S	MVA	MVA	MVA	MVA	MVA	PF	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
058S	Edson (T1)	T1 25/33/ 42	W	18.0	16.7	16.7	16.3	17.0	98%	21.5	21.7	21.9	22.1	22.3	22.6	22.8	23.0	23.3	23.5
058S	334LW		W	10.5	11.0	9.2	9.5	9.6	98%	14.0	14.1	14.3	14.5	14.7	14.9	15.1	15.3	15.5	15.7
058S	377LE		W	8.2	8.1	8.7	7.9	8.1	99%	8.9	8.9	9.0	9.0	9.1	9.1	9.2	9.2	9.3	9.3
058S	Edson (T2)	T2 25/33/ 42	W	24.7	24.6	26.6	21.8	24.0	94%	29.8	30.3	30.5	30.8	31.1	31.4	31.7	32.0	32.3	32.6
058S	153LW (Load)		W	12.4	12.9	13.0	7.8	8.4	91%	9.3	9.4	9.5	9.6	9.8	9.9	10.0	10.2	10.3	10.5
058S	155LE		W	8.4	8.7	6.9	6.8	8.3	98%	9.5	9.8	9.8	9.8	9.9	9.9	10.0	10.0	10.1	10.1
058S	376LS		W	5.5	6.1	8.2	8.8	8.5	95%	12.9	13.1	13.2	13.3	13.4	13.6	13.7	13.9	14.0	14.1
058S	Total Station		W	35.3	39.9	41.7	36.9	40.6	96%	48.2	48.8	49.3	49.7	50.2	50.7	51.2	51.7	52.3	52.8
207S	Pinedale	T1 15/20/ 25	W	17.7	16.8	18.4	17.5	17.3	96%	24.2	24.4	24.7	24.9	25.2	25.5	25.7	26.0	26.3	26.5
207S	2247L	LTC	W	8.1	8.4	9.9	9.5	9.0	94%	10.3	10.5	10.6	10.8	11.0	11.1	11.3	11.5	11.7	11.9
207S	2228L		W	9.9	9.3	9.4	9.2	8.6	97%	14.6	14.7	14.8	14.9	15.0	15.1	15.2	15.3	15.4	15.5
228S	T.M.P.L Niton	TX 15/20/ 25																	
228S		VR1 15	W	7.9	7.6	7.8	5.8	7.0	100%	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.8	11.9	12.0
228S	369LN		W	3.8	3.8	3.9	3.5	3.8	100%	4.1	4.1	4.2	4.2	4.2	4.2	4.2	4.3	4.3	4.3
228S	370LS		S/W	4.8	4.8	4.3	2.5	3.3	100%	4.6	4.7	4.8	4.8	4.9	5.0	5.1	5.1	5.2	5.3
228S	TMPL		W	0.1	0.1	0.1	0.0	0.0	90%	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Total Area Load:				60.9	64.3	67.9	60.2	64.9		83.6	84.6	85.3	86.2	87.0	87.8	88.7	89.6	90.5	91.3

Load Additions (MW)		
To:	MW	Year
58S-334LW	4.3	2017
58S-377LE	0.5	2017
58S-153LW	0.8	2017
58S-155LE	1.2	2017
58S-155LE	0.2	2018
58S-376LS	4.2	2017
207S-2247L	1.2	2017
207S-2228L	5.9	2017
228S-369LN	0.3	2017
228S-370LS	1.3	2017
228S-TMPL	2.9	2017

N-1 Contingency at 207S	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total Load:	17.3	24.2	24.4	24.7	24.9	25.2	25.5	25.7	26.0	26.3	26.5
N-1 Capacity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Back-up from 58S	8.2	6.3	6.3	6.1	5.9	5.7	5.5	5.3	5.1	4.9	4.5
Back-up from 228S	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
N-1 Unsupplied Load	6.8	15.6	15.8	16.3	16.7	17.2	17.7	18.1	18.6	19.1	19.7

The East Yellowhead area was assessed with the following reliability concerns observed from Table 3-1:

- In 2016, a reliability concern exists at the Pinedale 207S substation. The level of the unsupplied load at the Pinedale 316S substation, under N-1 contingency, could be as high as 6.8 MVA. If left unaddressed, it is predicted to increase to 19.7 MVA by 2026. The unsupplied areas are located to the east and the west of the substation. This exceeds FortisAlberta planning criteria for electrical load restoration.

The East Yellowhead area was assessed with the following capacity concerns observed from Table 3-1:

- The load on the 25 kV distribution feeder 207S-2228L is predicted to exceed the 13.0 MVA distribution planning criteria in 2017. This exceeds the FortisAlberta planning criteria for feeder loading.
- The load on the transformer T1 at the Pinedale 207S substation is predicted to exceed the equipment rating by 2021. This exceeds FortisAlberta planning criteria for transmission equipment loading.
- The load on the 25 kV distribution feeder 58S-334LW is predicted to exceed the 13.0 MVA distribution planning criteria in 2017. This exceeds the FortisAlberta planning criteria for feeder loading.
- The load on the 25 kV distribution feeder 58S-376LS is predicted to exceed the 13.0 MVA distribution planning criteria in 2018. This exceeds the FortisAlberta planning criteria for feeder loading.

4. Alternatives Analysis

A number of alternatives were considered and based on information available to FortisAlberta, technical merit and distribution capital cost, two alternatives are presented in this document. Other options considered either did not resolve the existing and predicted concerns or involved excessive costs and are not presented in this document.

4.1 Alternative 1: Distribution Upgrades and Load Shifting

4.1.1 Description

As per Section 5.1.1, upgrades to the 25 kV distribution tie lines between the adjacent substations and load shifting would be insufficient to address the identified distribution deficiencies driving the need.

For the distribution alternative to be technically acceptable, it would have to resolve the existing and predicted unsupplied load at the Pinedale 207S

substation. The work would include distribution upgrades to improve the load transfer capability to the adjacent substations. In addition, the adjacent substations would need enough transformation capacity to support the loads currently supplied by the Pinedale 207S substation.

To resolve the predicted transformer capacity concern at the Pinedale 207S substation, load shifting would be required to offload the transformer.

Finally, to resolve the 207S-2228L feeder capacity concern, it would be necessary to transfer loads to other feeders, which would involve upgrading existing lines and/or creating new distribution tie lines.

Since this is not technically acceptable alternative, the load forecast and cost for this alternative have not been included.

4.2 Alternative 2: Upgrades at the Pinedale 207S substation

4.2.1 Description

The 2018 transmission upgrades at the Pinedale 207S substation are:

- Add one source transformer
- Add one 25 kV feeder breaker
- Other associated upgrades as required

Distribution upgrades associated with this alternative include upgrading the bypass arrangement outside of the Pinedale 207S substation to allow the load transfers between the two transformers at Pinedale 207S and installation of approximately 1.5 km of new 750 MCM underground feeder cables.

Refer to Appendix B, Figure B-1 showing Alternative 2 system development.

All 25 kV overhead conductors, new and existing, exiting the substation and distribution feeder ties shall be 477 MCM. All underground feeder cables, new and existing, shall be 750 MCM. All transmission components on the secondary side of the 25 kV source transformers, new and existing, shall be sized to enable the feeders to simultaneously supply 26 MVA per feeder. All 25 kV feeder breakers shall be equipped with associated equipment to enable under-frequency load shedding.

Transmission facilities must be equipped with the appropriate equipment for interconnection with FortisAlberta's Automated Metering system. Provisions

should be made for interconnecting the substation transformer neutrals with the distribution line neutrals as per the AltaLink Management Limited (AltaLink) standard.

All 138 kV and 25 kV buses shall have adequate switch points and protection to minimize frequency and duration of outages associated with the maintenance or failure of substation components upstream of the 25 kV bus. Failure of such upstream components must not result in a total substation outage.

4.2.2 Load Forecast

The load forecast resulting from Alternative 2 is provided in Table 4-1.

Table 4-1: Alternative 2 – Upgrades at the Pinedale 207S

					RECORDED - MVA LOADING						PREDICTED - MVA LOADING									
				W	2012	2013	2014	2015	2016		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
SUB		CAPACITY		or	Peak	Peak	Peak	Peak	Peak		Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
No	Feeder	T/R	MVA	S	MVA	MVA	MVA	MVA	MVA	PF	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
058S	Edson (T1)	T1	25/33/ 42	W	**18.0**	**16.7**	**16.7**	**16.3**	**17.0**	**98%**	**21.5**	**21.7**	**21.9**	**22.1**	**22.3**	**22.6**	**22.8**	**23.0**	**23.3**	**23.5**
058S	334LW			W	10.5	11.0	9.2	9.5	9.6	98%	14.0	14.1	14.3	14.5	14.7	14.9	15.1	15.3	15.5	15.7
058S	377LE			W	8.2	8.1	8.7	7.9	8.1	99%	8.9	8.9	9.0	9.0	9.1	9.1	9.2	9.2	9.3	9.3
058S	Edson (T2)	T2	25/33/ 42	W	**24.7**	**24.6**	**26.6**	**21.8**	**24.0**	**94%**	**29.8**	**30.3**	**30.5**	**30.8**	**31.1**	**31.4**	**31.7**	**32.0**	**32.3**	**32.6**
058S	153LW (Load)			W	12.4	12.9	13.0	7.8	8.4	91%	9.3	9.4	9.5	9.6	9.8	9.9	10.0	10.2	10.3	10.5
058S	155LE			W	8.4	8.7	6.9	6.8	8.3	98%	9.5	9.8	9.8	9.8	9.9	9.9	10.0	10.0	10.1	10.1
058S	376LS			W	5.5	6.1	8.2	8.8	8.5	95%	12.9	13.1	13.2	13.3	13.4	13.6	13.7	13.9	14.0	14.1
058S	Total Station	Coincident peaks		W	**35.3**	**39.9**	**41.7**	**36.9**	**40.6**	**96%**	**48.2**	**48.8**	**49.3**	**49.7**	**50.2**	**50.7**	**51.2**	**51.7**	**52.3**	**52.8**
207S	Pinedale	T1	15/20/ 25	W	**17.7**	**16.8**	**18.4**	**17.5**	**17.3**	**96%**	**24.2**	**14.5**	**14.6**	**14.8**	**15.0**	**15.1**	**15.3**	**15.5**	**15.6**	**15.7**
207S	2247L		LTC	W	8.1	8.4	9.9	9.5	9.0	94%	10.3	10.5	10.6	10.8	11.0	11.1	11.3	11.5	11.7	11.9
207S	2228L			W	9.9	9.3	9.4	9.2	8.6	97%	14.6	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.3
207S	Pinedale	T2		W						97%		**10.3**	**10.4**	**10.5**	**10.6**	**10.7**	**10.8**	**11.0**	**11.1**	**11.2**
207S	2236L	New		W						97%		10.3	10.4	10.5	10.6	10.7	10.8	11.0	11.1	11.2
207S	Total Station			W	**17.7**	**16.8**	**18.4**	**17.5**	**17.3**	**96%**	**24.2**	**24.4**	**24.7**	**24.9**	**25.2**	**25.5**	**25.7**	**26.0**	**26.3**	**26.5**
228S	T.M.P.L Niton	TX	15/20/ 25																	
228S		VR1	15	W	**7.9**	**7.6**	**7.8**	**5.8**	**7.0**	**100%**	**11.2**	**11.3**	**11.4**	**11.5**	**11.6**	**11.7**	**11.8**	**11.8**	**11.9**	**12.0**
228S	369LN			W	3.8	3.8	3.9	3.5	3.8	100%	4.1	4.1	4.2	4.2	4.2	4.2	4.2	4.3	4.3	4.3
228S	370LS			S/W	4.8	4.8	4.3	2.5	3.3	100%	4.6	4.7	4.8	4.8	4.9	5.0	5.1	5.1	5.2	5.3
228S	TMPL			W	0.1	0.1	0.1	0.0	0.0	90%	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Total Area Load:					**60.9**	**64.3**	**67.9**	**60.2**	**64.9**		**83.6**	**84.6**	**85.3**	**86.2**	**87.0**	**87.8**	**88.7**	**89.6**	**90.5**	**91.3**

Load Transfers (MVA)

From:	To:	
207S-2228L	207S-2236L	10.3

N-1 Contingency at 207S	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total Load:	**17.3**	**24.2**	**24.4**	**24.7**	**24.9**	**25.2**	**25.5**	**25.7**	**26.0**	**26.3**	**26.5**
N-1 Capacity	0.0	0.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Back-up from 58S	8.2	6.3	6.3	6.1	5.9	5.7	5.5	5.3	5.1	4.9	4.5
Back-up from 228S	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
N-1 Unsupplied Load	**6.8**	**15.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

- The predicted capacity concern at the 25 kV distribution feeder 58S-334LW will be addressed by another transmission and/or distribution project.
- The predicted capacity concern at the 25 kV distribution feeder 58S-376LS will be addressed by another transmission and/or distribution project.

4.2.3 Cost Estimate

If Alternative 2 is selected, AltaLink will prepare a facility application for the requested transmission upgrades. This facility application will include an estimate of the transmission capital cost.

The distribution capital cost for Alternative 2 is estimated to be $0.45 million (2018$, ±30%).

5. Alternatives Assessment

The following section presents the technical and economic analysis of the alternatives considered in this Need for Development.

5.1 Technical and Economic Analysis

5.1.1 Alternative 1 – Distribution Upgrades and Load Shifting

The predicted transformer capacity concern at the Pinedale 207S substation can be resolved by shifting load to the adjacent substations. However, distribution upgrades alone cannot fully resolve the existing and predicted unsupplied load at the Pinedale 207S substation for the following reasons.

To fully resolve existing and predicted unsupplied load at the Pinedale 207S substation, sufficient transformation capacity would have to exist in the area close enough to the identified deficiencies for the distribution upgrades to be able to utilize this capacity.

TMPL Niton 228S is predicted to be able to provide only 3.0 MVA of backup capacity to the Pinedale 207S substation in 2026 due to limited transformation capacity remaining at the substation transformer. Offloading TMPL Niton 228S to provide additional capacity is not a viable option, because TMPL Niton 228S has no three-phase ties to any substation other than the Pinedale 207S substation. Apart from Pinedale 207S, the closest substation to the TMPL Niton 228S is the Cynthia 178S substation which is located approximately 40 km away when measured in a straight line. There are no roads in the area that would connect TMPL Niton 228S substation with the Cynthia 178S substation in a straight path, increasing the length of the potential distribution line between them to approximately 49.4 km. Even if three-phase ties were to be established between the TMPL Niton 228S and Cynthia 178S substations, the Cynthia 178S substation could not accept any of the TMPL Niton 228S substation load due to the voltage violations associated with the long distance separating them. As a result, this would leave approximately 23.5 MVA of the predicted load, including

approximately 12.5 MVA of loads to the north, south and east of the Pinedale 207S substation, to be supported by the Edson 58S substation in 2026.

In 2026, the Edson 58S substation is predicted to have enough transformation capacity to be able to theoretically support the additional load of 23.5 MVA. However, no amount of distribution upgrades can resolve the voltage violations associated with the long distance, preventing the Edson 58S substation from serving as a backup to the loads located to the north, south and east of the Pinedale 207S substation. In other words, the loads to the north, south and east of the Pinedale 207S substation would have to be supplied by a sufficiently sized source, with at least 12.5 MVA of capacity available, located closer to the Pinedale 207S substation than the Edson 58S substation and preferably to the east of the Pinedale 207S substation. The only source to the east of the Pinedale 207S substation is the TMPL Niton 228S substation which was established as having only 3.0 MVA of spare capacity available in 2026. Therefore, due to the voltage violations associated with the long distances separating the existing substations and lack of other existing distribution substations in the area, distribution upgrades and load shifting would not be able to address all existing and predicted reliability concerns at the Pinedale 207S substation.

As a result, Alternative 1 is not a technically acceptable alternative.

5.1.2 Alternative 2 – Upgrades at the Pinedale 207S Substation

The addition of one 138/25 kV source transformer and one 25 kV feeder breaker, plus associated distribution upgrades and load transfers can address the existing reliability and predicted capacity concerns at the Pinedale 207S substation. The new source transformer provides the needed transformation capacity to supply loads fed by the Pinedale 207S substation, and the associated distribution upgrades provide the required capability to transfer loads between the two transformers in case of N-1 contingency.

From an economic perspective, the distribution costs associated with this alternative are minimal. The transmission upgrade costs will be provided by the TFO.

As a result, Alternative 2 is technically and economically acceptable and is the FortisAlberta preferred alternative.

6. Conclusion

After considering the alternatives to address the existing reliability and predicted capacity concerns in the East Yellowhead area, Alternative 2 is preferred by FortisAlberta as it

provides a complete and cost effective solution to the existing reliability and predicted capacity concerns. Alternative 2 includes transmission upgrades at the Pinedale 207S substation:

- Installation of one source transformer;
- Installation of one 25 kV breaker;
- Other associated upgrades as required.

An estimate for the transmission system capital cost will be provided by the TFO, AltaLink.

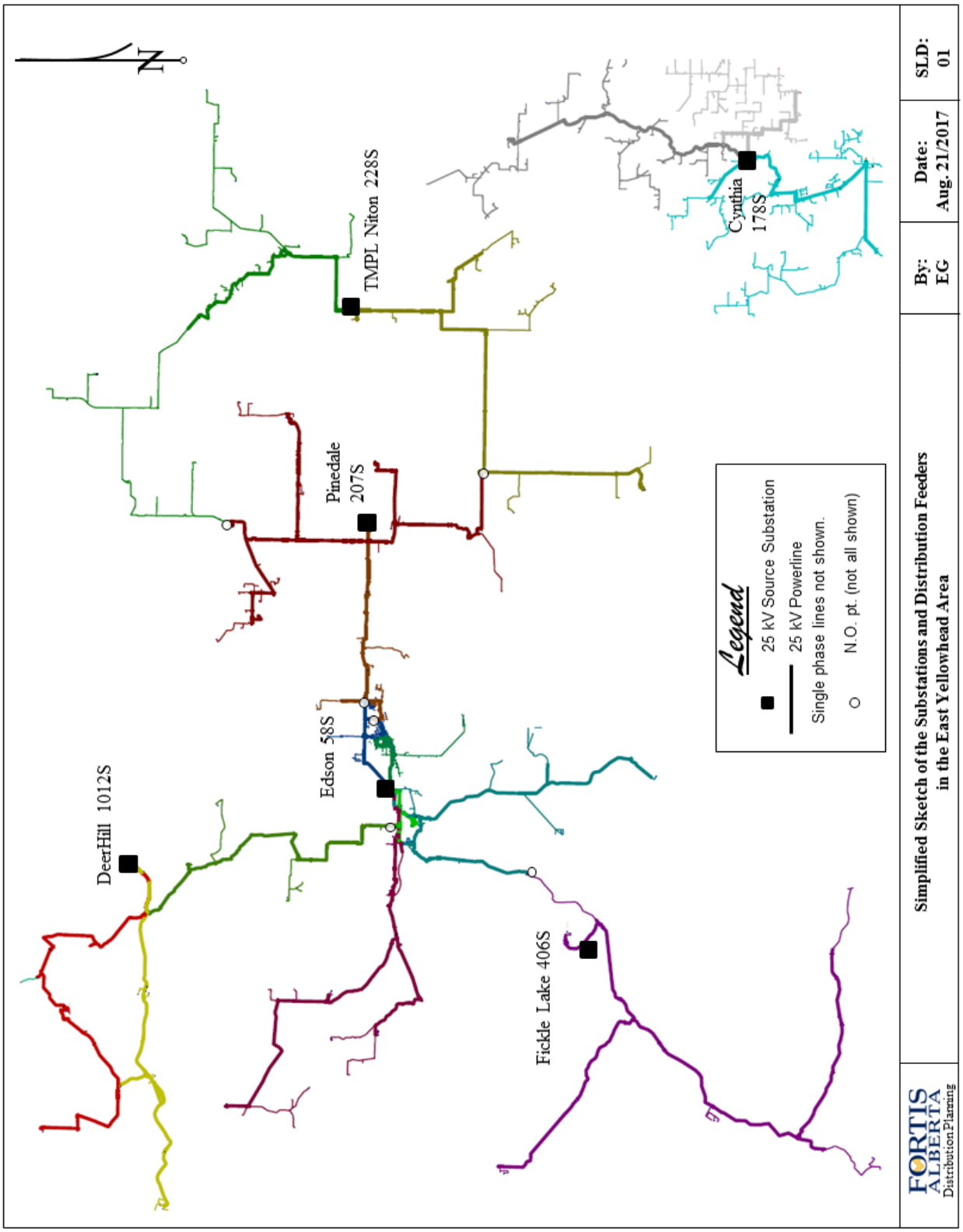
The estimated distribution capital cost associated with this preferred alternative is $0.45 million (±30%, 2018$).

The requested ISD for the Pinedale 207S substation upgrade is November 1, 2018.

If FortisAlberta's preferred alternative is approved by the AUC, FortisAlberta will request an increase to the Demand Transmission Service (DTS) contract at the Pinedale 207S substation of 3.9 MW, resulting in a DTS of 21.1 MW.

Appendix A – Existing System

Figure A-1: Existing System



Appendix B – Alternative 2 – Upgrades at the Pinedale 207S Substation

Figure B-1: Alternative 2: Upgrades at the Pinedale 207S Substation