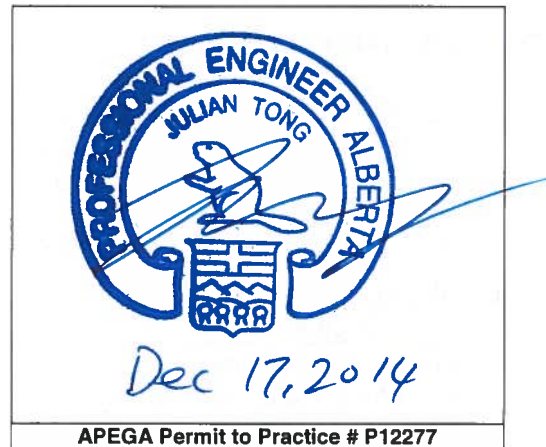


## **APPENDIX E    DFO STATEMENT OF NEED REPORT**



## Distribution Deficiency Report (DDR)

### Spirit River New Point of Delivery (POD)



Approvals		Signature	Date
Prepared By	Julian Tong		Dec 17, 2014
Engineer, Planning	Maria Estela Zavala		DEC 17, 2014
Supervising Engineer, POD Planning	Tom Greenwood-Madsen	Matt S. for TGM	
Manager, Distribution Planning	Matt Sveinbjornson		Dec 17/2014

December 17, 2014

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### Revision History:

R0	Original	Erin Ebbers	May 6, 2014
R1	Load updates	Sonya Wallbank	November 5, 2014
R2	New POD load corrected	M E Zavala	December 8, 2014
R3	Implementing comments	Julian Tong	December 16, 2014

## **1 Executive Summary**

In 2014, ATCO Electric has received numerous applications from industrial customers in the Spirit River district. Over 61 load interconnections, totaling approximately 23.3 MW in load additions, have been requested.

To serve the requested loads ATCO Electric Distribution Division considered the following alternatives:

- Alternative 1: Capacity Upgrades at Rycroft 730S, Ksituan River 754S, and Saddle Hills 865S; or,
- Alternative 2: Construct a new area POD; or,
- Alternative 3: Capacity Upgrades at Ksituan River 754S and Saddle Hills 865S.

Based on the analysis outlined in this report, ATCO Electric Distribution Division recommends Alternative 2 to serve the requested loads and continue the strategic and orderly development of the interconnected electrical system in NW Alberta.

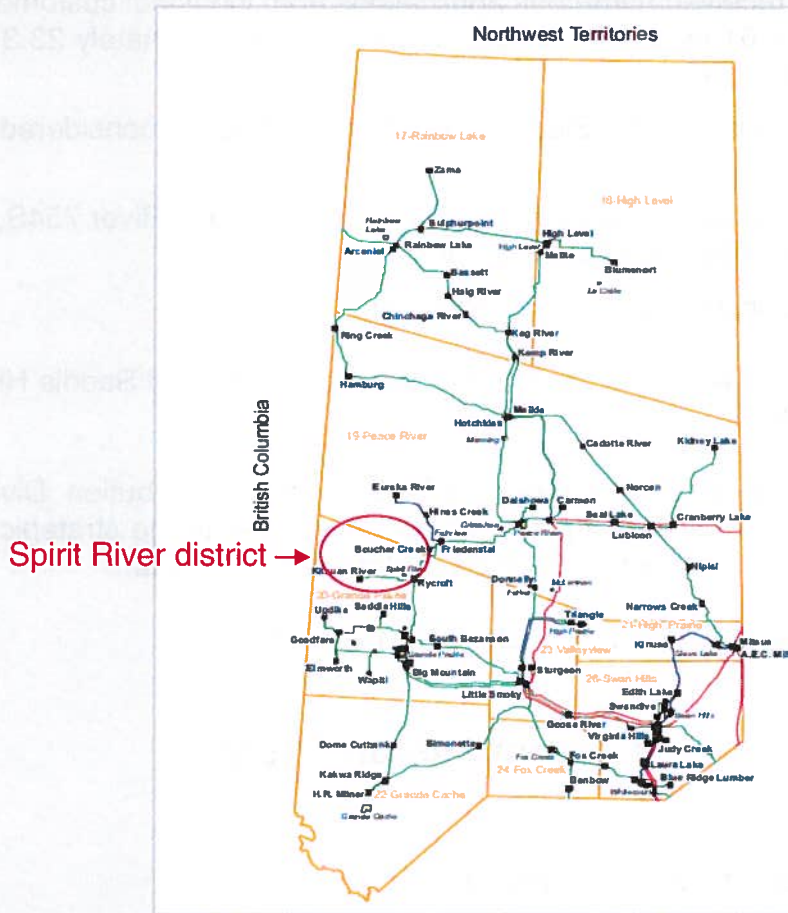
This new POD is requested to be in-service on January 1<sup>st</sup>, 2017

## **2 Existing Distribution and Transmission System Assessment**

### **2.1 Existing Transmission System**

The Spirit River district is locating in northwestern Alberta. The area is between AESO's Grande Prairie 20 and Peace River 19 planning areas. Figure 2.1-1 shows the Spirit River district in relation to AESO's Figure 7.3.6-1 Existing Northwest Region Transmission System of the AESO 2013 Long-term Transmission Plan.

Figure 7.3.6-1: Existing Northwest Region Transmission System



Northwest Planning Region

	Forecast Winter Peak Load (AIL)
2012 Actual	1,233 MW
Near term	1,249 MW
Medium term	1,376 MW
Long term	1,583 MW

Figure 2.1-1 – Spirit River district

Figure 2.1-2 shows the transmission system serving the Spirit River district in northwest Alberta. Ksituan River 754S is radially connected via the 144kV transmission line 7L10 to Rycroft 730S at the east. Rycroft 730S, in turn, connects to Boucher Creek 829S at the north via the 144 kV line 7L73 and Clairmount Lake 811S at the south via the 144kV

line 7L68. Saddle Hills 865S is “T” tapped to 7L22 between Clairmount 811S and Poplar Hill 790S.

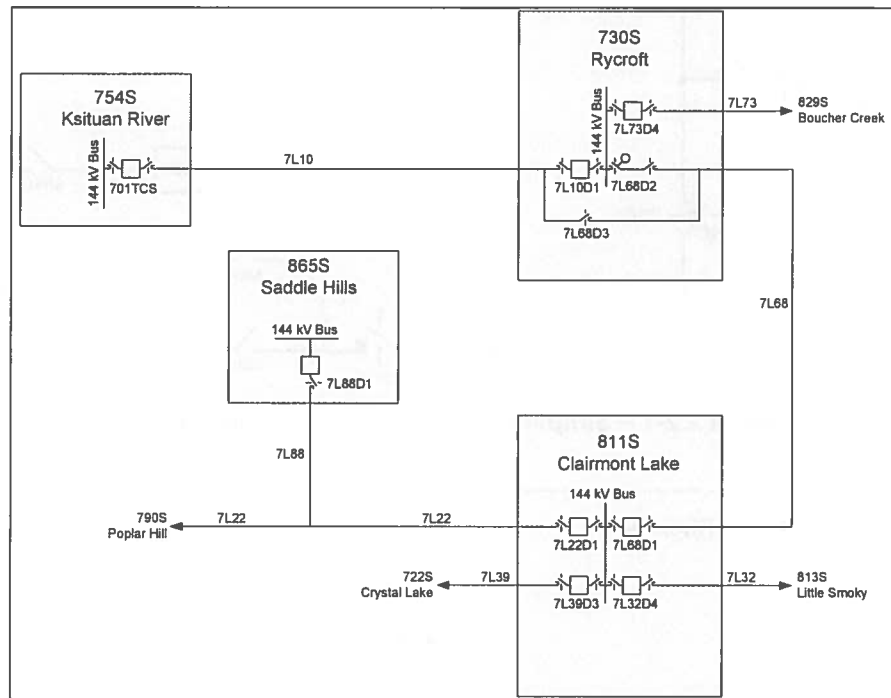


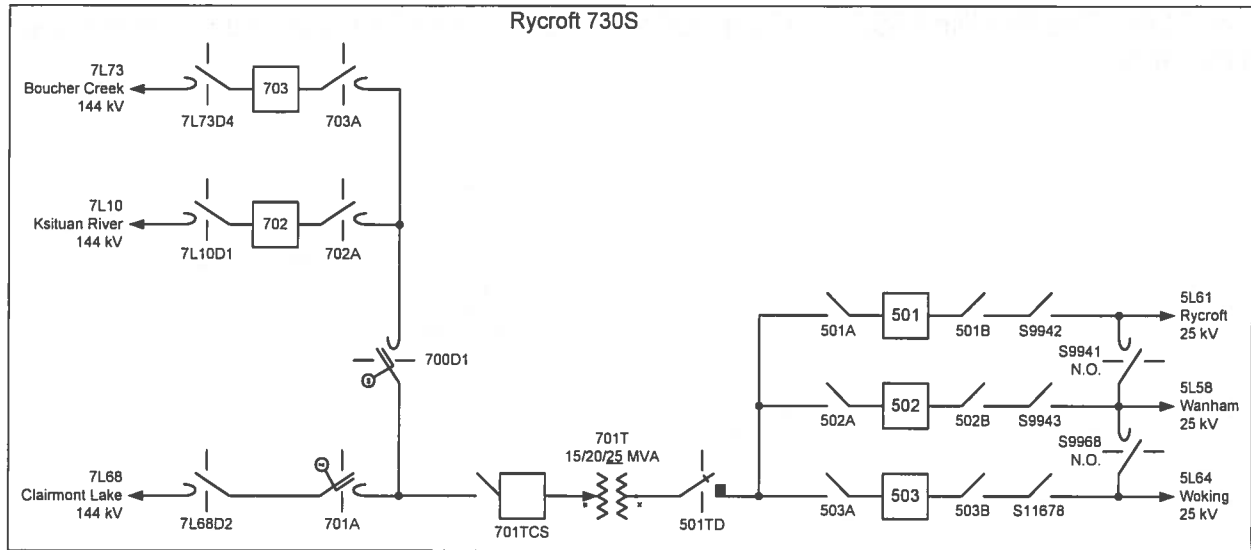
Figure 2.1-2 – Existing Area Transmission System

## 2.2 Existing Distribution System

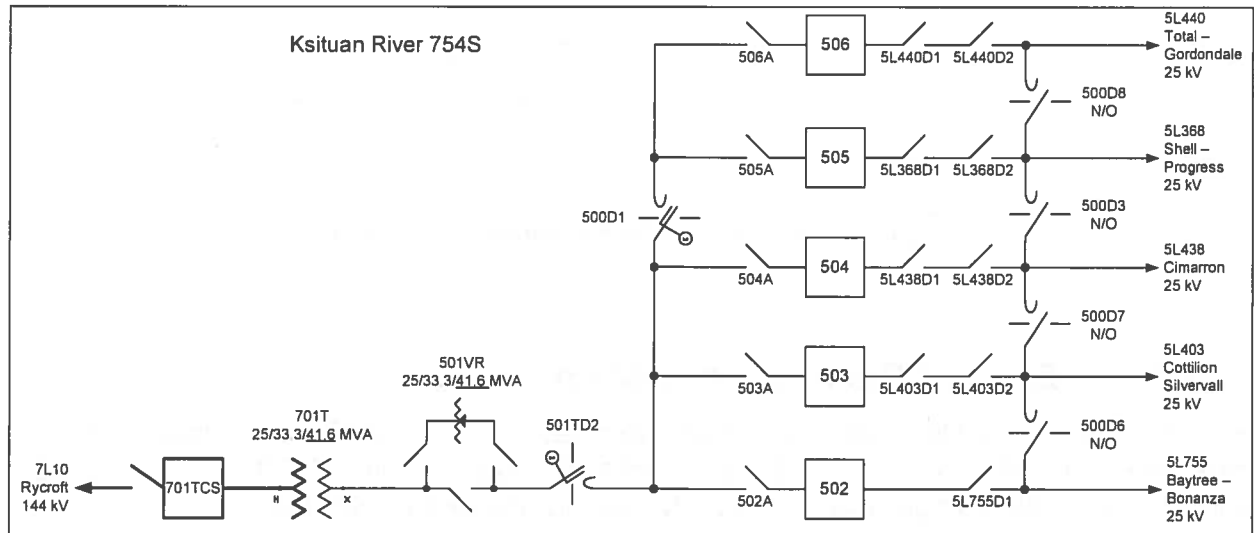
Presently, three PODs provide electrical services to the Spirit River district. They are Ksituan River 754S, Rycroft 730S and Saddle Hills 865S. Figure 2.2-1, 2.2-2, and 2.2-3 show the simplified single line diagrams (SLDs) for these three PODs.

In term of the POD capacities, the current load forecast without the requested loads are shown in Table 2.2-1, 2.2-2 and 2.2-3 for Rycroft 730S, Ksituan River 754S, and Saddle Hills 865S respectively, in Appendix A.

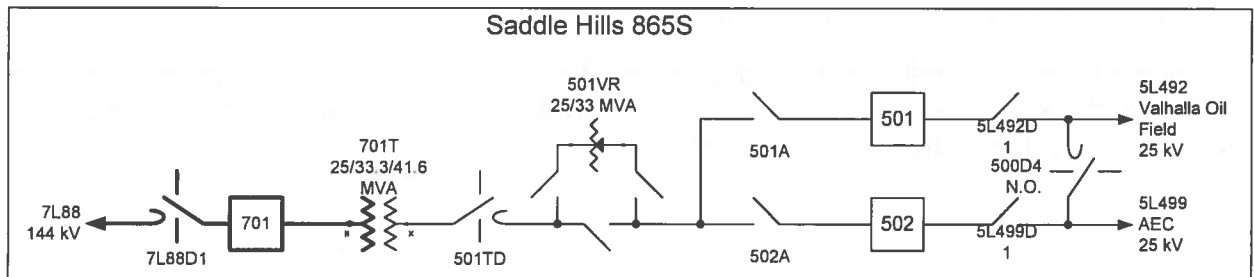
As shown in the current load forecasts, both Rycroft 730S and Ksituan River 754S are expecting to exceed 90% of the POD capacity in 2015. Saddle Hills 865S is expected to exceed 80% of the POD capacity in 2015.



**Figure 2.2-1 – Simplified SLD of existing 730S Rycroft**



**Figure 2.2-2 – Simplified SLD of existing Ksituan River 754S**



**Figure 2.2-3 – Simplified SLD of existing Saddle Hills 865S**



### 3 Need for Development

#### 3.1 Customer Requests

ATCO Electric has received numerous applications from industrial and oilfield customers in the Spirit River district in 2014. Over 61 load interconnections totaling approximately 23.3 MW in load additions have been requested. Table 3.1-1 summarizes the load additions.

Locations	Request Load (MW)	Number of Sites	In-service Date
Mulligan Load Center	7.9	16	Jan 2017
Spirit River Load Center	15.4	45	Jan 2017

Table 3.1-1 Requested Loads

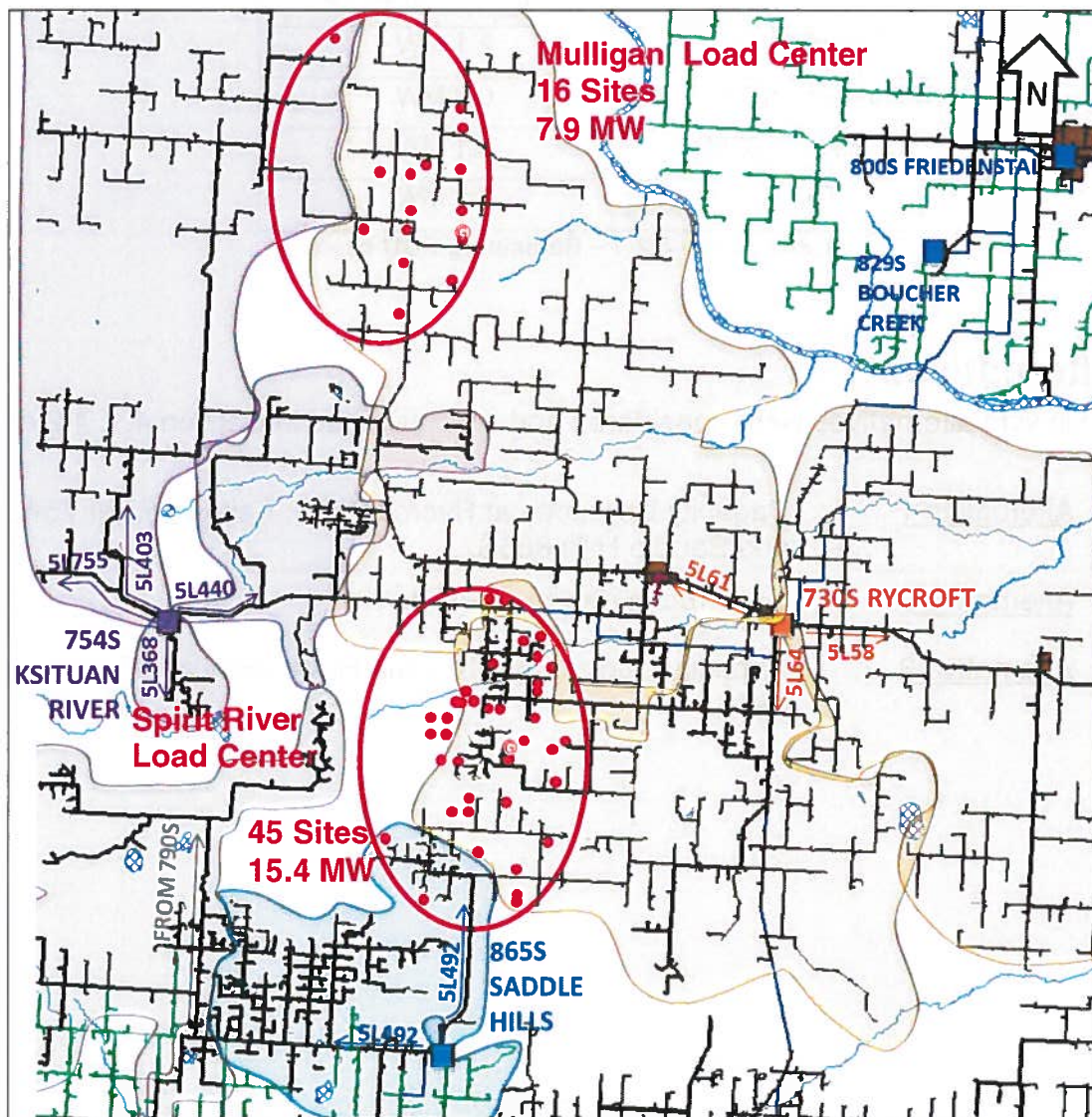


Figure 3.1-2 – Requested Load Locations with Respect To the Existing PODs



Figure 3.1-2 shows the locations of the requested loads in relation to 730S Rycroft, 754S Ksituan River, and 865S Saddle Hills as the distribution system currently serves the area. The requested customer loads are shown in red.

### 3.2 Distribution Deficiency

The requested load is 23.3 MW. There is only 7.2 MW of capacity available at the existing distribution system. The breakdown of the available capacity is shown in Table 3.2-1 below. An outstanding 16.1 MW of load requires transmission system development to provide the required capacity.

POD	Remaining POD capacity in 2015
Rycroft 730S	2.1 MW
Ksituan River 754S	0.0 MW
Saddle Hills 865S	5.1 MW
Total	7.2 MW

**Table Figure 3.2-1 – Remaining POD capacity**

## 4 Alternatives

The following alternatives were considered and are described in Section 4.1, 4.2 and 4.3.

- |                      |   |
|----------------------|---|
| <u>Alternative 1</u> | Capacity Upgrades at Rycroft 730S, Ksituan River 754S, and Saddle Hills 865S. |
| <u>Alternative 2</u> | Construct a new area POD.   |
| <u>Alternative 3</u> | Capacity Upgrades at Ksituan River 754S and Saddle Hills 865S.                |

#### **4.1 Alternative 1: Capacity Upgrades at Rycroft 730S, Ksituan River 754S, and Saddle Hills 865S**

For this alternative, all three existing substations require changes. The high level scope of is list below for each substations.

##### **Project Description**

The proposed changes at Rycroft 730S include:

- Expansion of the substation,
- Dismantle one (1) 15/20/25 MVA LTC transformer,
- Install one (1) 25/33.3/41.6 MVA LTC transformer.

The proposed changes at Ksituan River 754S are as follows:

- Expansion of the substation,
- Install one (1) 25 kV motorized disconnect switch,
- Install one (1) 25/33.3/41.6 MVA LTC transformer,
- Install one (1) 144 kV breaker comes with ganged disconnect switch,
- Install one (1) 144 kV line gang switch.

The proposed changes at Saddle Hills 865S are as follows:

- Dismantle one (1) 25/33 MVA 25 kV voltage regulator,
- Dismantle one (1) 25/33.3/(prov.41.6) MVA transformer,
- Install one (1) 30/40/50 MVA LTC transformer.

## System SLDs

Figures 4.1-1, 4.1-2, and 4.1-3 show the simplified SLDs of the proposed system development.

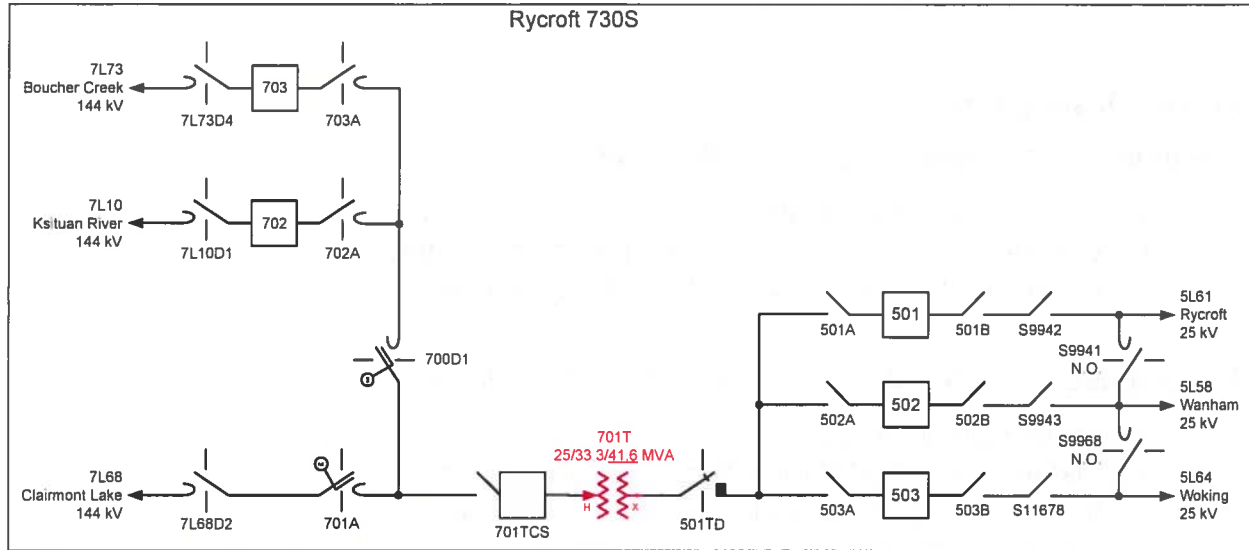


Figure 4.1-1 – Simplified SLD of Rycroft 730S, Alternative 1

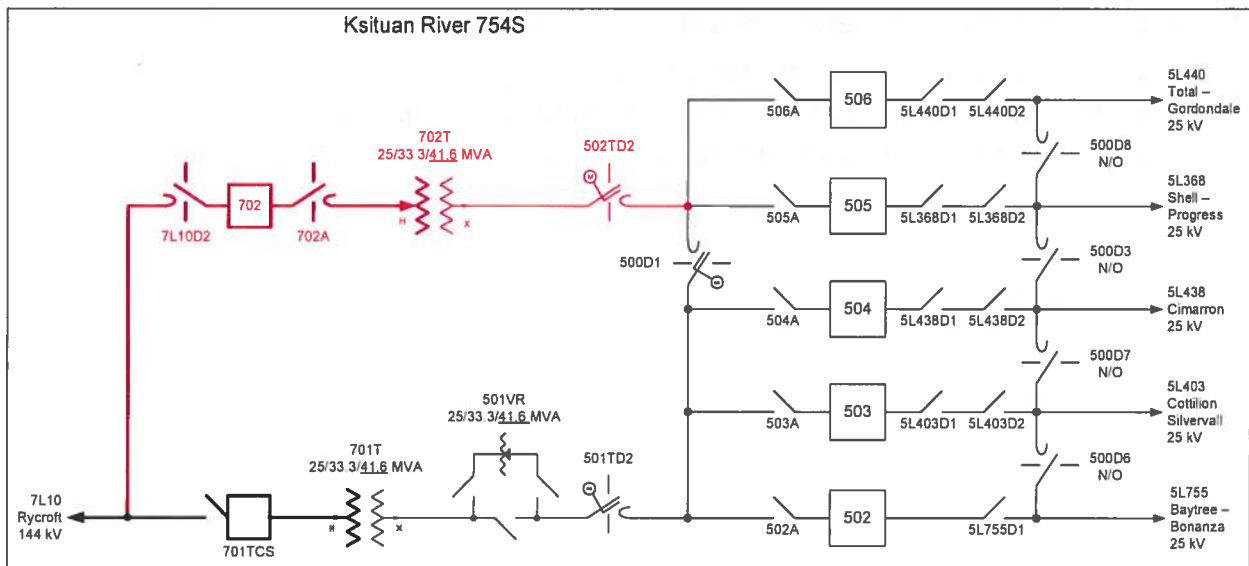
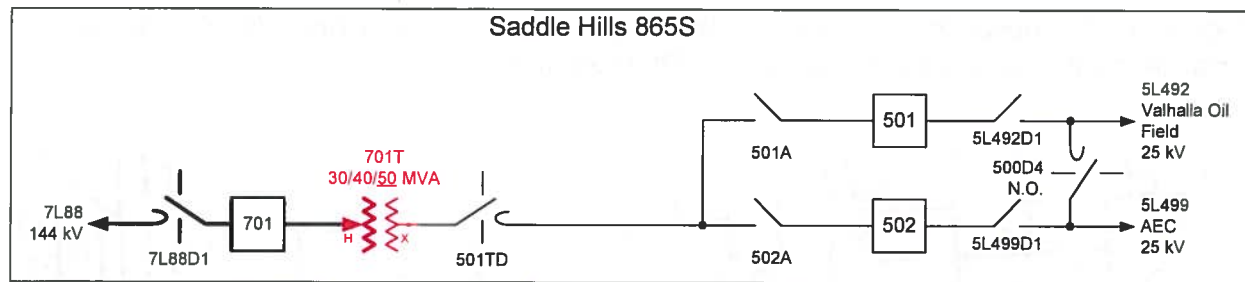


Figure 4.1-2 – Simplified SLD of Ksituan River 754S, Alternative 1 and 3



**Figure 4.1-3 – Simplified SLD of Saddle Hills 865S, Alternative 1 and 3**

## Load Forecast

Table 4.1-1, in Appendix A, shows the load forecasts resulting from this alternative.

## Assessment

Alternative 4.1 will provide sufficient POD capacity to the Spirit River district to serve the requested loads. However, the maximum requested loads that can be added to Rycroft 730S is 3.7 MW at either the Mulligan or the Spirit River load center. This limitation is due to normal operating voltage constraint on the distribution system. The normal operating voltage at the requested load sites will be running at 0.97 p.u. (ATCO Electric's minimum acceptable voltage level).

## 4.2 Alternative 2: Construct a new area POD (Mowat 2033S)

### Project Description

For this alternative, a new Mowat 2033S POD would be located in the vicinity of NW10-78-7-W6M.

Tap transmission line 7L10 and install a new Mowat 2033S substation complete with:

- One (1) 144 kV breaker c/w ganged disconnect switch,
- One (1) 30/40/50 MVA, 144 to 25 kV LTC transformer,
- One (1) 25 kV motorized disconnect switch,
- Four (4) 25 kV breakers comes with disconnect switches and instrument transformers,
- Three (3) 144 kV line gang switches,
- Associated protection and metering.

Figure 4.2-3 shows the locations of the requested loads and new distribution system arrangement in respect to the proposed POD location.

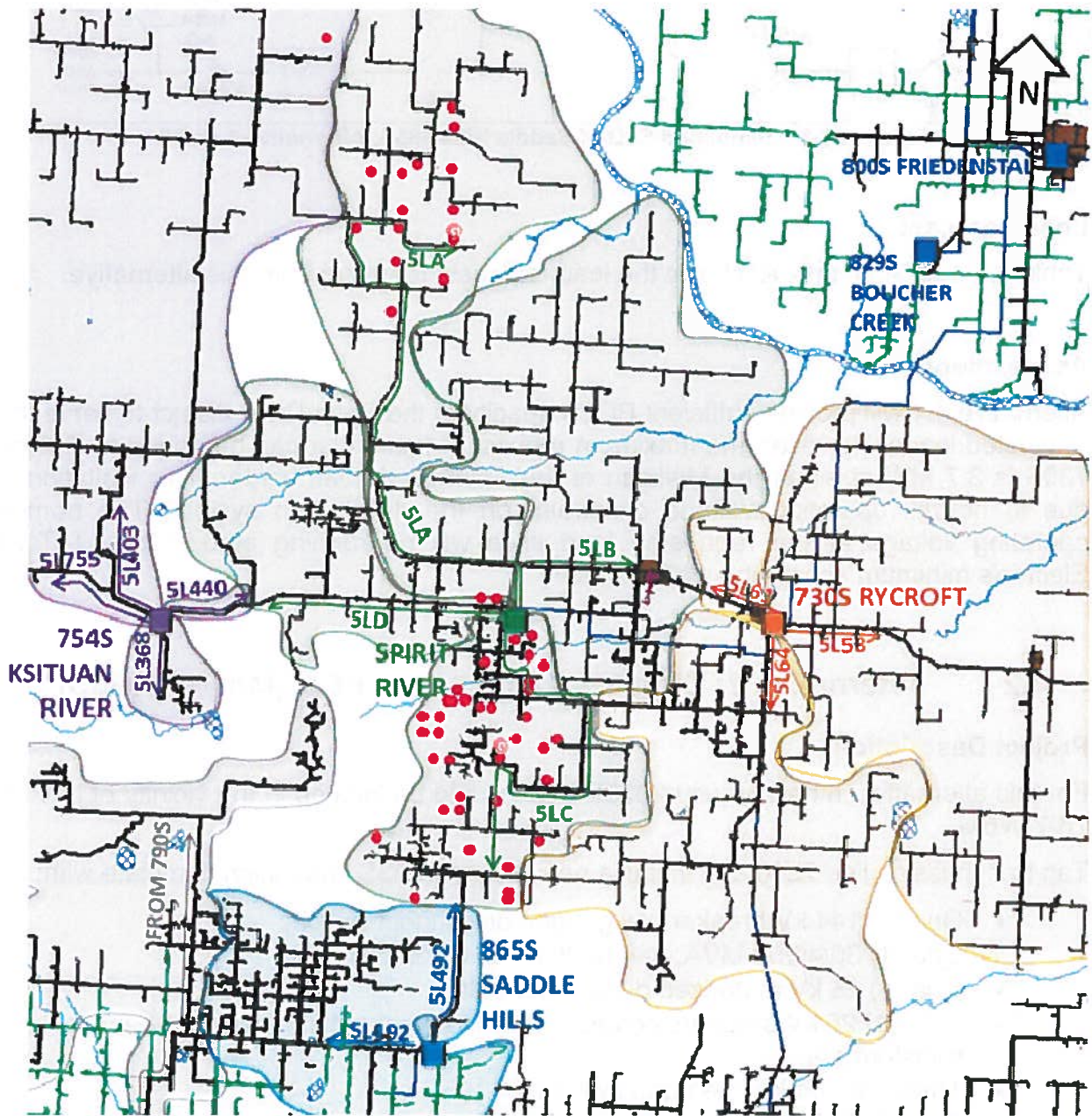


Figure 4.2-3 – Distribution system arrangement after new POD is energized

## System SLDs

Figures 4.2-1 and 4.2-2 show the simplified SLDs of the proposed system development.

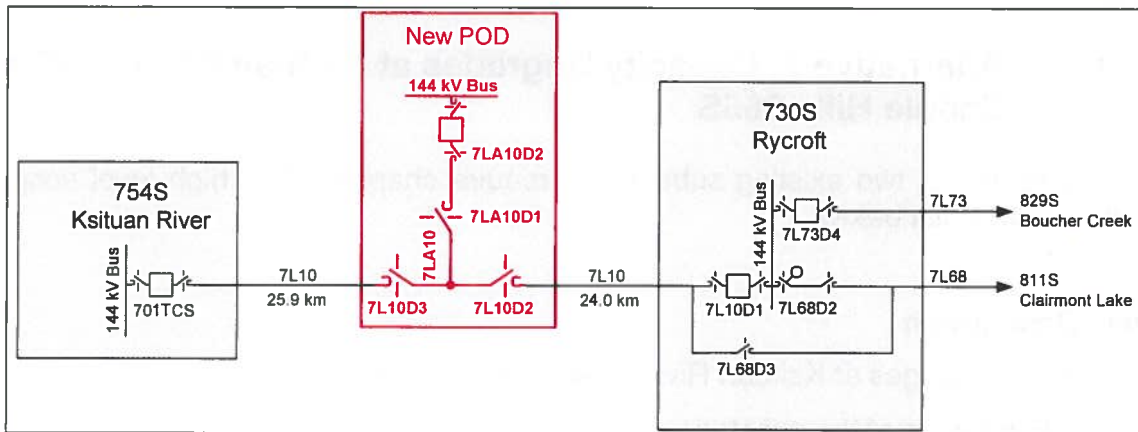


Figure 4.2-1 – Simplified SLD of the proposed Transmission System, Alternative 2

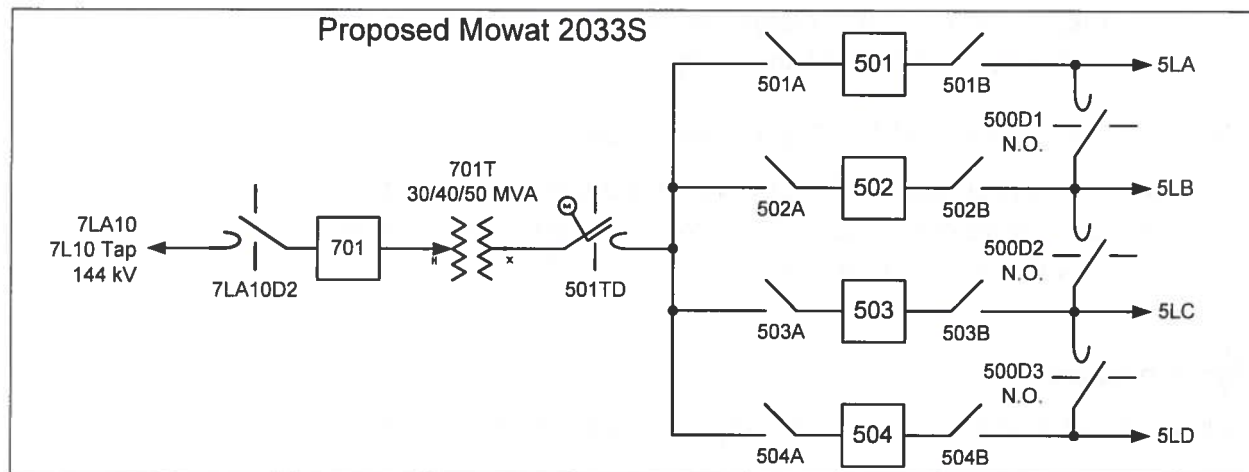


Figure 4.2-2 – Simplified SLD of the proposed Mowat 2033S, Alternative 2

## Load Forecast

Table 4.2-1, in Appendix A, shows the load forecasts resulting from this alternative.

## Assessment

Alternative 4.2 will be able to serve the requested loads and accommodate existing loads to alleviate upgrade/expansion to Rycroft 730S and Saddle Hill 865S. The new POD will be able to offload 7.9 MVA from Rycroft 730S, 3 MVA from Ksituan River 754S, and 0.9 MVA from Saddle Hills 865S. The upgrade of Ksituan River 754S is necessary regardless of the load addition in this DDR. The need for Ksituan River 754S upgrade is driven by the load growth in the west and northwest of Ksituan River POD.

In addition, the new POD provides a second source to serve the Town of Spirit River and other communities in the Spirit River district during a single (N-1) contingency condition.

### **4.3 Alternative 3: Capacity Upgrades at Ksituan River 754S and Saddle Hills 865S**

For this alternative, two existing substations require changes. The high level scope of this alternative is list below.

#### **Project Description**

The proposed changes at Ksituan River 754S are as follows:

- Expansion of the substation,
- Install one (1) 25 kV motorized disconnect switch,
- Install one (1) 25/33.3/41.6 MVA LTC transformer,
- Install one (1) 144 kV breaker c/w ganged disconnect switch,
- Install one (1) 144 kV line gang switch.

The changes at Saddle Hills 865S are as follows:

- Dismantle one (1) 25/33 MVA 25 kV voltage regulator,
- Dismantle one (1) 25/33.3/(prov.41.6) MVA transformer,
- Install one (1) 30/40/50 MVA LTC transformer.

#### **System SLDs**

Figures 4.1-2 and 4.1-3 show the simplified SLDs of the proposed system development.

#### **Load Forecast**

Table 4.3-1, in Appendix A, shows the load forecasts resulting from this alternative.

#### **Assessment**

Alternative 4.3 will be able to serve the requested loads. However, this alternative doesn't have the ability to provide a second source to the Town of Spirit River and other communities during the N-1 contingency condition.



## 5 Recommendation

Alternative 2 is the preferred development to address the need identified in this DDR. ATCO Electric is recommending this alternative for the following reasons:

- The new Mowat POD will be able to serve the requested loads.
- The new Mowat POD will have the ability to offload Rycroft 730S and alleviating the need to expand and upgrade this facility.
- The new Mowat POD provides a second source to the Town of Spirit River and other communities in the Spirit River district during N-1 contingency.
- With the Mowat POD addition, the expansion and upgrade of Saddle Hills is not necessary.
- The new Mowat POD will offload approximately 3 MW of load East of Ksituan River 754S, which allows future load growth west and northwest of Ksituan River.
- Address the Ksituan River 754S upgrade via a separate DDR.

ATCO Electric is requesting an in-service date of Jan 1, 2017 for the new Mowat POD.

## Appendix A – Load Forecasts

Note: ATCO Electric Distribution Division guidelines indicate that a capacity upgrade should occur when the remaining POD capacity is either 10% or less of the rated capacity or 2 MVA or less.

**Table 2.2-1 – 730S Rycroft Current Load Forecast without requested loads**

Existing System				Recorded					Predicted										
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
Sub No.	Feeder	Capacity	PF	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
730S	Rycroft	701T	98%	16.7	16.5	16.2	17.0	17.9	19.8	22.4	22.6	22.8	23.0	23.2	23.4	23.7	23.9	24.1	24.3
	5L58	15/20/25 MVA	100%	6.4	6.1	6.1	5.5	5.3	6.3	6.5	6.5	6.6	6.7	6.8	6.9	6.9	7.0	7.1	7.2
	5L61		98%	6.3	5.7	5.6	6.2	5.8	5.5	7.8	7.9	7.9	8.0	8.1	8.1	8.2	8.2	8.3	8.4
	5L64		96%	4.9	5.1	5.9	6.4	7.1	8.3	8.4	8.5	8.6	8.6	8.7	8.8	8.9	8.9	9.0	9.1
730S	Total Station		98%	16.7	16.5	16.2	17.0	17.9	19.8	22.4	22.6	22.8	23.0	23.2	23.4	23.7	23.9	24.1	24.3
Notes: A coincidence factor of 0.984 was applied to the feeders Capacity upgrade recommended is highlighted in yellow																			

**Table 2.2-3 – 754S Ksituan River Current Load Forecast without requested loads**

Existing System				Recorded					Predicted														
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW			
				2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024				
Sub No.	Feeder	Capacity	PF	754S	Ksituan	701T	94%	22.7	24.7	24.0	27.4	28.2	34.8	39.3	39.9	40.4	40.9	41.4	41.9	42.4	42.9	43.4	43.9
	5L368	25/33.3/41.6 MVA	89%	10.4	10.9	10.7	11.4	11.3	10.5	10.7	10.8	10.9	11.0	11.2	11.3	11.4	11.5	11.6	11.7				
	5L403		96%	5.9	5.8	5.3	11.1	6.1	9.6	9.9	10.1	10.3	10.5	10.6	10.8	11.0	11.2	11.4	11.6				
	5L438		93%	4.4	5.5	5.6	3.1	2.9	3.6	6.4	6.4	6.4	6.5	6.5	6.5	6.6	6.6	6.6	6.7				
	5L440		99%	3.5	3.6	3.5	3.9	4.0	7.7	8.6	8.7	8.7	8.8	8.8	8.8	8.9	8.9	9.0	9.0				
	5L755		98%					5.7	6.0	6.5	6.9	7.1	7.2	7.4	7.6	7.8	7.9	8.1	8.3				
754S	Total Station		94%	22.7	24.7	24.0	27.4	28.2	34.8	39.3	39.9	40.4	40.9	41.4	41.9	42.4	42.9	43.4	43.9				
Notes:																							
A coincidence factor of 0.936 was applied to the feeders																							
Transformer capacity violation is highlighted in pink																							
Capacity upgrade recommended is highlighted in yellow																							

**Table 2.2-3 – 865S Saddle Hills Current Load Forecast without customer loads**

Existing System				Recorded					Predicted										
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
Sub No.	Feeder	Capacity	PF	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
865S	Saddle Hills	701T	92%	18.3	18.5	19.3	18.3	19.2	25.1	25.5	25.7	25.9	26.0	26.2	26.4	26.6	26.8	27.0	27.2
	5L492	25/33.3/41.6 MVA	98%	5.8	6.0	5.8	5.7	5.6	5.6	5.8	5.8	5.9	5.9	6.0	6.1	6.1	6.2	6.2	6.3
	5L499		91%	13.8	13.4	14.8	14.4	15.1	21.2	21.5	21.6	21.8	21.9	22.1	22.2	22.4	22.5	22.7	22.8
865S	Total Station		92%	18.3	18.5	19.3	18.3	19.2	25.1	25.5	25.7	25.9	26.0	26.2	26.4	26.6	26.8	27.0	27.2
Notes: A coincidence factor of 0.939 was applied to the feeders																			

**Table 4.1-1 – Alternative 1 Load Forecast**

AItnative 1				Recorded					Predicted										
				Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
Sub No.	Feeder	Capacity	PF	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
730S	Rycroft	701T	98%	16.7	16.5	16.2	17.0	17.9	19.8	22.4	22.6	22.8	23.0	23.2	23.4	23.7	23.9	24.1	24.3
	5L58	25/33.3/41.6 MVA	100%	6.4	6.1	6.1	5.5	5.3	6.3	6.5	6.5	6.6	6.7	6.8	6.9	6.9	7.0	7.1	7.2
	5L61		98%	6.3	5.7	5.6	6.2	5.8	5.5	7.8	7.9	9.4	9.5	9.6	9.6	9.7	9.7	9.8	9.9
	5L64		96%	4.9	5.1	5.9	6.4	7.1	8.3	8.4	8.5	10.1	10.1	10.2	10.3	10.4	10.4	10.5	10.6
730S	Total Station		98%	16.7	16.5	16.2	17.0	17.9	19.8	22.4	22.6	25.8	26.0	26.2	26.4	26.7	26.9	27.1	27.3
754S	Ksituan	702T	94%	22.7	24.7	24.0	27.4	28.2				25.9	26.1	26.2	26.3	26.5	26.6	26.8	26.9
	5L368	25/33.3/41.6 MVA	89%	10.4	10.9	10.7	11.4	11.3	10.5	10.7	10.8	10.9	11.0	11.2	11.3	11.4	11.5	11.6	11.7
	5L440		99%	3.5	3.6	3.5	3.9	4.0	7.7	8.6	8.7	16.6	16.7	16.7	16.7	16.8	16.8	16.9	16.9
		701T	94%						34.8	39.3	39.9	22.4	22.8	23.1	23.5	23.8	24.2	24.5	24.9
	5L403	25/33.3/41.6 MVA	96%	5.9	5.8	5.3	11.1	6.1	9.6	9.9	10.1	10.3	10.5	10.6	10.8	11.0	11.2	11.4	11.6
	5L438		93%	4.4	5.5	5.6	3.1	2.9	3.6	6.4	6.4	6.4	6.5	6.5	6.5	6.6	6.6	6.6	6.7
	5L755		98%					5.7	6.0	6.5	6.9	7.1	7.2	7.4	7.6	7.8	7.9	8.1	8.3
754S	Total Station		94%	22.7	24.7	24.0	27.4	28.2	34.8	39.3	39.9	48.3	48.8	49.3	49.8	50.3	50.8	51.3	51.8
865S	Saddle Hills	701T	92%	18.3	18.5	19.3	18.3	19.2	25.1	25.5	25.7	25.9	26.0	26.2	26.4	26.6	26.8	27.0	27.2
	5L492	30/40/50 MVA	98%	5.8	6.0	5.8	5.7	5.6	5.6	5.8	5.8	18.3	18.3	18.4	18.5	18.5	18.6	18.6	18.7
	5L499		91%	13.8	13.4	14.8	14.4	15.1	21.2	21.5	21.6	21.8	21.9	22.1	22.2	22.4	22.5	22.7	22.8
865S	Total Station		92%	18.3	18.5	19.3	18.3	19.2	25.1	25.5	25.7	38.3	38.4	38.6	38.8	39.0	39.2	39.4	39.6
Notes:																			
Transformer capacity violation is highlighted in pink																			
Capacity upgrade recommended is highlighted in yellow																			

**Table 4.2-1 – Alternative 2 Load Forecast**

Alternative 2				Recorded					Predicted										
Sub No.	Feeder	Capacity	PF	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW	Peak MW
				2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
730S	Rycroft	701T	98%	16.7	16.5	16.2	17.0	17.9	19.8	22.4	22.6	15.0	15.2	15.4	15.6	15.8	16.1	16.3	16.5
	5L58	15/20/25 MVA	100%	6.4	6.1	6.1	5.5	5.3	6.3	6.5	6.5	6.6	6.7	6.8	6.9	6.9	7.0	7.1	7.2
	5L61		98%	6.3	5.7	5.6	6.2	5.8	5.5	7.8	7.9	3.2	3.3	3.4	3.4	3.5	3.5	3.6	3.6
	5L64		96%	4.9	5.1	5.9	6.4	7.1	8.3	8.4	8.5	5.5	5.6	5.6	5.7	5.8	5.8	5.9	6.0
730S	Total Station		98%	16.7	16.5	16.2	17.0	17.9	19.8	22.4	22.6	15.0	15.2	15.4	15.6	15.8	16.1	16.3	16.5
754S	Ksituan	701T	94%	22.7	24.7	24.0	27.4	28.2	34.8	39.3	39.9	37.4	37.9	38.4	38.9	39.4	39.9	40.4	40.9
	5L368	25/33.3/41.6 MVA	89%	10.4	10.9	10.7	11.4	11.3	10.5	10.7	10.8	10.9	11.0	11.2	11.3	11.4	11.5	11.6	11.7
	5L440		99%	3.5	3.6	3.5	3.9	4.0	7.7	8.6	8.7	5.7	5.8	5.8	5.8	5.9	5.9	6.0	6.0
	5L403		96%	5.9	5.8	5.3	11.1	6.1	9.6	9.9	10.1	10.3	10.5	10.6	10.8	11.0	11.2	11.4	11.6
	5L438		93%	4.4	5.5	5.6	3.1	2.9	3.6	6.4	6.4	6.4	6.5	6.5	6.5	6.6	6.6	6.6	6.7
	5L755		98%					5.7	6.0	6.5	6.9	7.1	7.2	7.4	7.6	7.8	7.9	8.1	8.3
754S	Total Station		94%	22.7	24.7	24.0	27.4	28.2	34.8	39.3	39.9	37.4	37.9	38.4	38.9	39.4	39.9	40.4	40.9
865S	Saddle Hills	701T	92%	18.3	18.5	19.3	18.3	19.2	25.1	25.5	25.7	25.9	26.0	26.2	26.4	26.6	26.8	27.0	27.2
	5L492	25/33.3/41.6 MVA	98%	5.8	6.0	5.8	5.7	5.6	5.6	5.8	5.8	5.0	5.1	5.1	5.2	5.2	5.3	5.4	5.4
	5L499		91%	13.8	13.4	14.8	14.4	15.1	21.2	21.5	21.6	21.8	21.9	22.1	22.2	22.4	22.5	22.7	22.8
865S	Total Station		92%	18.3	18.5	19.3	18.3	19.2	25.1	25.5	25.7	25.9	26.0	26.2	26.4	26.6	26.8	27.0	27.2
New POD	New POD	701T	97%									34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9
	5LA	30/40/50 MVA	97%									8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
	5LB		97%									3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
	5LC		97%									13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
	5LD		97%									8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
New POD	Total Station		97%									34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9

Table 4.3-1 – Alternative 3 Load Forecast

Alternative 3				Recorded					Predicted										
Sub No.	Feeder	Capacity	PF	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
730S	Rycroft	701T	98%	16.7	16.5	16.2	17.0	17.9	19.8	22.4	22.6	22.8	23.0	23.2	23.4	23.7	23.9	24.1	24.3
	5L58	15/20/25 MVA	100%	6.4	6.1	6.1	5.5	5.3	6.3	6.5	6.5	6.6	6.7	6.8	6.9	6.9	7.0	7.1	7.2
	5L61		98%	6.3	5.7	5.6	6.2	5.8	5.5	7.8	7.9	7.0	7.1	7.2	7.2	7.3	7.3	7.4	7.5
	5L64		96%	4.9	5.1	5.9	6.4	7.1	8.3	8.4	8.5	5.5	5.5	5.6	5.7	5.8	5.8	5.9	6.0
	<b>Total Station</b>		<b>98%</b>	<b>16.7</b>	<b>16.5</b>	<b>16.2</b>	<b>17.0</b>	<b>17.9</b>	<b>19.8</b>	<b>22.4</b>	<b>22.6</b>	<b>18.8</b>	<b>19.0</b>	<b>19.2</b>	<b>19.4</b>	<b>19.7</b>	<b>19.9</b>	<b>20.1</b>	<b>20.3</b>
754S	Ksituan	702T	94%	22.7	24.7	24.0	27.4	28.2				26.8	26.9	27.1	27.2	27.4	27.5	27.6	27.8
	5L368	25/33.3/41.6 MVA	89%	10.4	10.9	10.7	11.4	11.3	10.5	10.7	10.8	10.9	11.0	11.2	11.3	11.4	11.5	11.6	11.7
	5L440		99%	3.5	3.6	3.5	3.9	4.0	7.7	8.6	8.7	17.5	17.6	17.6	17.6	17.7	17.7	17.8	17.8
		701T	94%						34.8	39.3	39.9	22.4	22.8	23.1	23.5	23.9	24.2	24.6	24.9
	5L403	25/33.3/41.6 MVA	96%	5.9	5.8	5.3	11.1	6.1	9.6	9.9	10.1	10.3	10.5	10.6	10.8	11.0	11.2	11.4	11.6
	5L438		93%	4.4	5.5	5.6	3.1	2.9	3.6	6.4	6.4	6.4	6.5	6.5	6.5	6.6	6.6	6.6	6.7
	5L755		98%					5.7	6.0	6.5	6.9	7.1	7.2	7.4	7.6	7.8	7.9	8.1	8.3
754S	<b>Total Station</b>		<b>94%</b>	<b>22.7</b>	<b>24.7</b>	<b>24.0</b>	<b>27.4</b>	<b>28.2</b>	<b>34.8</b>	<b>39.3</b>	<b>39.9</b>	<b>49.2</b>	<b>49.7</b>	<b>50.2</b>	<b>50.7</b>	<b>51.2</b>	<b>51.7</b>	<b>52.2</b>	<b>52.7</b>
865S	Saddle Hills	701T	92%	18.3	18.5	19.3	18.3	19.2	25.1	25.5	25.7	25.9	26.0	26.2	26.4	26.6	26.8	27.0	27.2
	5L492	30/40/50 MVA	98%	5.8	6.0	5.8	5.7	5.6	5.6	5.8	5.8	24.4	24.4	24.5	24.6	24.6	24.7	24.7	24.8
	5L499		91%	13.8	13.4	14.8	14.4	15.1	21.2	21.5	21.6	21.8	21.9	22.1	22.2	22.4	22.5	22.7	22.8
865S	<b>Total Station</b>		<b>92%</b>	<b>18.3</b>	<b>18.5</b>	<b>19.3</b>	<b>18.3</b>	<b>19.2</b>	<b>25.1</b>	<b>25.5</b>	<b>25.7</b>	<b>44.4</b>	<b>44.5</b>	<b>44.7</b>	<b>44.9</b>	<b>45.1</b>	<b>45.3</b>	<b>45.5</b>	<b>45.7</b>
<b>Notes:</b> Transformer capacity violation is highlighted in pink Capacity upgrade recommended is highlighted in yellow																			

**ATCO Electric Limited  
Spirit River New POD  
Project #1618**

**Alternative Selection Background**

**Alternative 1:** This alternative involves capacity upgrades at Rycroft 730S, Ksituan River 754S and Saddle Hills 865S. Due to site specific issues Rycroft 730S would need to be relocated and Ksituan River 754S would need to be expanded.

Although this alternative could meet the forecasted load growth it is not recommended for the following reasons:

- The load growth is occurring in an area that is at the fringes of the distribution network of the existing PODs. To serve the new load from these will result in higher losses and require additional distribution system upgrades.
- The effort and cost required to relocate Rycroft 730S involves build new and dismantle existing, which will be higher than that to build a new POD. (NOTE: Due to the topology of the existing distribution network it is not effective to relocate the rebuilt Rycroft substation in a location to serve both existing and new load.)
- Because it involves alterations at three existing PODs, this alternative will create the most operating risk during the execution phase.
- Of the PODs in this area, Rycroft has the highest component of critical load. Currently during an extended POD transformer outage ATCO Electric is unable to restore this critical load in the four hour window as recommended in our distribution planning guideline. This load includes the Town of Spirit River and other small communities. This alternative does not address the issue.
- Load west and south of Ksituan River is forecast to grow and this POD is best situated to meet the demand. Therefore utilizing Ksituan River capacity to serve the growth in the Spirit River area limits its effectiveness to meet this other growth.

**Alternative 2:** This alternative involves constructing a new substation in the vicinity of NW10-78-7-W6M, connected to 7L10 with a T-tap.

This alternative will meet the forecasted load growth and it is recommended for the following reasons:

- Because it involves greenfield transmission construction only, the cost and effort to construct will be lower than the other alternatives, which involve work at multiple sites.
- Because it involves a single location and does not impact any operating facilities, this alternative has the lowest level of operating risk during construction.

- Because it will be located central to the largest portion of the new load growth this alternative will integrate well into the existing distribution network, have the lowest losses and require less distribution system upgrades.
- After energization of this POD, there will be capacity available at Rycroft 730S and Saddle Hills 865S to meet growth.
- Once energized the new POD can be used to pick up critical load from Rycroft during transformer contingencies.

**Alternative 3:** This alternative involves capacity upgrades at 754S Ksituan River and 865S Saddle Hills. Due to site specific issues Ksituan River 754S would need to be expanded.

Although this alternative could meet the forecasted load growth it is not recommended for the following reasons:

- The load growth is occurring in an area that is at the fringes of the distribution network of the existing PODs. To serve the new load from these will result in higher losses and require distribution system upgrades.
- Because it involves alterations at two existing PODs this, alternative will create more operating risk during the execution phase than the recommended alternative.
- Of the PODs in this area, Rycroft has the highest component of critical load. Currently during an extended POD transformer outage ATCO Electric is unable to restore this critical load in the four hour window as recommended in our distribution planning guideline. This load includes the Town of Spirit River and other small communities. This alternative does not address the issue.
- Load west and south of Ksituan River is forecast to grow and this POD is best situated to meet the demand. Therefore utilizing Ksituan River capacity to serve the growth in the Spirit River area limits its effectiveness to meet this other growth.

