

## RiflePS-Parachute 230kV Line No. 2 Preliminary Investigation

Last Revised: January 26, 2011

### A. Executive Summary

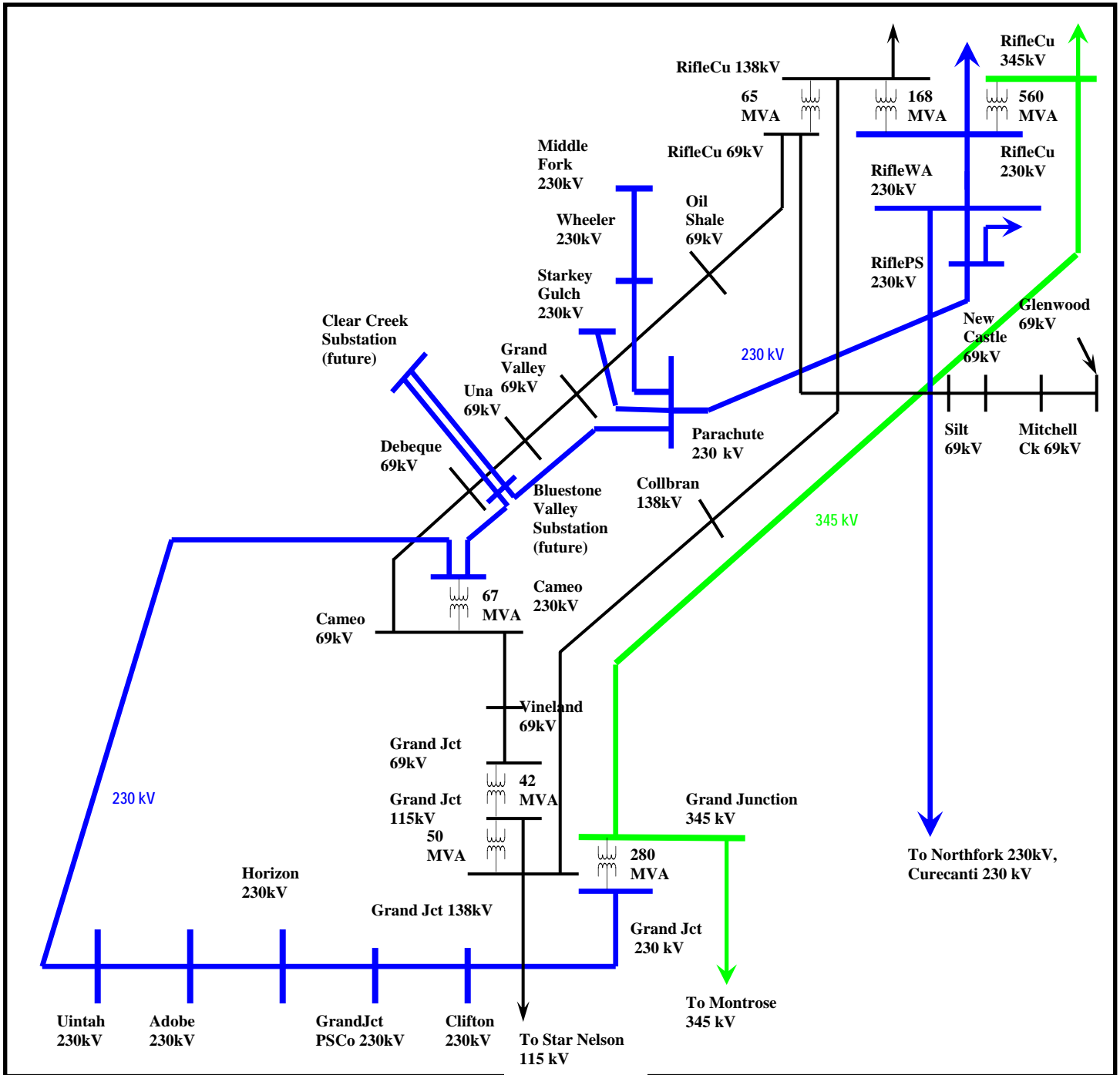
The purpose of this study was to determine the best alternative to serve projected load growth in western Colorado. The load growth consists primarily of natural gas developers that require transmission service to electric motor driven gas compressors for natural gas gathering and gas compression applications in Mesa and Garfield counties. The anticipated demand increase in PSCo's system between Rifle Substation and the Cameo Substation is over 170 MW by 2019. In order to serve this new load growth, PSCo Transmission Planning studied its transmission system in western Colorado to ensure reliability. To ensure system reliability, PSCo is considering the construction of a second 230 kV transmission line between PSCo's Rifle (RiflePS) Substation and Parachute Substation. The RiflePS-Parachute Line #2 would be approximately twenty-one miles long and use 1-1272 kcmil conductor strung on 230kV single circuit structures with a 576 MVA rating. The existing 230 kV structures between Public Service's Rifle and Parachute substations are single circuit capable. Rebuilding them to double circuit capable (to string the new line on one side and string existing line on the other side) is not possible due to construction outage limitations; therefore, the new line will be built on a new right-of-way. The Parachute Substation will be converted to a breaker-and-a-half substation configuration to accommodate the termination of the new line, and to comply with the substation design standards. Required substation transmission facilities will be installed at the RiflePS and Parachute Substations. This project will be located in Garfield County, Colorado and is expected to cost approximately \$27.2 million with a tentative in-service date of May 1, 2015.

The study determined that a RiflePS-Parachute 230kV Line #2 would be required in order to avoid overloading of the existing RiflePS-Parachute 230 kV Line for certain single contingency outages (under anticipated demand and transfer conditions). The study also considered terminating the RiflePS-Parachute 230kV Line at the Ute Rifle (RifleCu) Substation as this would decrease the transmission line requirement by approximately 3.4 miles and would have less impact on the RiflePS-RifleWA 230kV bus tie for high TOT2A (north-to-south) transfer scenarios thus allowing for a slightly larger load-serving capability. Neither the ability of PSCo to terminate the RiflePS-Parachute 230kV Line #2 at the Ute Rifle (RifleCu) Substation nor its full financial impact to PSCo have been determined but will be evaluated in the engineering and siting process.

## B. Background

The Western Slope of Colorado is a region of large natural gas supplies that are under development. Over the last ten to fifteen years, natural gas developers have begun using electric motor driven gas compressors for natural gas gathering and gas compression applications. This has been especially true in the Piceance Basin of northwestern Colorado. The Piceance Basin contains reserves of coal, natural gas, and oil shale. The basin can be found in Garfield, Mesa, and Rio Blanco counties (and four other Colorado counties). PSCo serves electric motor driven gas compressors from the Una Substation, Starkey Gulch Substation, and Parachute Substation. Load expansion is being planned for Una, Starkey Gulch, and Middle Fork (Bench) Substation (served from Parachute Substation) as well as new locations proposed by the natural gas developers. In addition, Grand Valley Power plans to provide transmission service to a retail customer that would interconnect at the proposed Bluestone Valley Substation (a tap on the Parachute-Cameo 230kV Line). A reliable bulk power system is one that is able to meet the electricity needs of its customers even when unexpected equipment failures or other factors reduce the amount of available electricity. To ensure system reliability, PSCo has conducted studies of its Colorado Western Slope and the results are provided in this report. Figure 1 below provides a description of the study area.

**Figure 1. Conceptual One-Line of the Study Area (not geographical)**



### C. Study Criteria

#### Category A – System Normal

“N-0” System Performance Under Normal (No Contingency) Conditions  
(Category A)  
NERC Standard TPL-001-0

Voltage:	0.95 to 1.05 per unit
Line Loading:	100 percent of continuous rating
Transformer Loading:	100% of highest 65 °C rating

#### Category B – Loss of generator, line, or transformer (Forced Outage)

“N-1” System Performance Following Loss of a Single Element  
(Category B)  
NERC Standard TPL-002-0

Voltage:	0.90 to 1.10 per unit
Line Loading:	100 percent of continuous rating
Transformer Loading:	115% of highest 65 °C rating for load-serving transformers

#### Category C – Loss of Bus or a Breaker Failure (Forced Outage)

“N-2 or More” System Performance Following Loss of Two or More Elements  
(Category C)  
NERC Standard TPL-003-0

Voltage and Thermal:	Allowable emergency limits will be considered as determined by the affected parties and the available emergency mitigation plan. Curtailment of firm transfers, generation re-dispatch, and load shedding will be considered if necessary.
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### D. Study Case Development

The Western Electricity Coordinating Council (WECC) 2016 Heavy Summer (2016 HS2A) base case was used for the study. The 2016 heavy summer base case reflects system conditions projected for the on-peak conditions anticipated for the summer of 2016. The study area is a summer-peaking system. Study cases were developed that reflect high TOT2A conditions and anticipated demand increases. The following changes (modifications and assumptions) were made to the base case:

1. Added a Cameo 230kV 45 MVAR capacitor bank
2. Added a Parachute 230kV 45 MVAR capacitor bank
3. Added a Bluestone Valley 230kV 45 MVAR capacitor bank
4. Added two Una 69kV 7.5 MVAR capacitor banks. The second 69kV 7.5 MVAR bank will be needed in future years to support heavy demands at high TOT2A north-to-south transfers.
5. Revised the RiflePS-Parachute 230kV impedance data to reflect a 20.78 mile length.
6. Revised the Parachute-Cameo impedance data to reflect a 31.46 mile length.
7. Assumed the Bluestone Valley Substation will be located approximately halfway between the Parachute Substation and the Cameo Substation. Assumed the Bluestone Valley Substation is arranged as a 230kV breaker-and-a-half station with nine circuit breakers terminating four 230kV transmission lines, a 230-69kV transformer, and a 45 MVAR capacitor bank.
8. Assumed a Starkey Gulch 230kV total demand of 50 MVA (with a 95% lagging power factor). This includes the existing 15.4 MVA load (at an 81% lagging power factor). The study assumes the customer will improve the load power factor to at least 95%.
9. Assumed the Una Orchard demand has increased an additional 7.2 MVA from the existing 14.5 MVA (at an 87% lagging power factor). The study assumes that Customer will improve the load power factor to at least 95%.
10. Assumed a Middle Fork 230kV (Bench) demand increase of 50 MVA (at 95% power factor) above the existing 44.8 MVA (at a 90% lagging power factor) for the proposed South Middle Fork load. The study assumes the customer will improve the load power factor to at least 95%.
11. Assumed a Clear Creek demand of 80 MW (at 95% load power factor). At present, the load is expected to go in-service in May 2016 at 20 MW, increasing 20 MW per year until 2019. The Bluestone Valley Substation has an in-service date (per the PSCo capital budget) of November 1, 2014. The in-service date was tentatively moved out to May 2015. The RiflePS-Parachute 230kV Line #2 has an in-service date of May 2016. The Parachute-Cameo 230kV Line #2 has an in-service date (per the PSCo budget) of December 2019. The RiflePS-Story Gulch 230kV Line has an in-service date (per the PSCo budget) of December 2019.
12. Assumed a Craig-RifleWA 230kV up-rate to 637 MVA (WAPA spring project in 2012).
13. Assumed a Curecanti-Montrose 115kV rating increase to 137 MVA (WAPA recent thermal review).
14. Assumed the Uintah-Adobe-Horizon 230kV de-rate to 239 MVA will be mitigated by 2016 restoring the line to its thermal rating.

15. Assumed the use of 1-1272 kcmil (Bittern) ACSR conductor with 45/7 stranding AL/ST for 230kV and 345kV transmission lines. The 1-1272 kcmil ACSR is used to control corona noise. The study assumes single circuit 230kV transmission lines are strung on 6.402R towers. The 345kV alternatives assume 7.26W towers.
16. Assumed the Parachute-Cameo 230kV Line #2 Project will not be represented in the study cases as the project has an in-service date of December 2019.
17. Assumed the RiflePS-Story Gulch 230kV Line will not be represented as a stand-alone project in the study cases as the project has an in-service date of December 2019. This line was incorporated as part of Alternative 5 (RiflePS-Story Gulch-Middle Fork(Bench)-Wheeler 230kV Line).
18. Assumed the Bluestone Valley-Clear Creek 230kV transmission line is strung on 230kV double circuit towers using 1-1272 kcmil conductor.
19. Assumed the WheelerPS-Parachute 230kV has a base case limitation of 120 MVA due to metering unit CT's at Parachute. The 3.07-mile line (Ckt No. 5507) was constructed with 1033.5 kcmil (Ortolan) conductor on 6.403R towers (wood h-frame) with a thermal rating of 506 MVA. The study assumed the line rating will be increased sufficiently to prevent a contingency violation for an outage of the RiflePS-Parachute 230kV line.

The benchmark case was modified to reflect transmission line modeling corrections and these are listed in Table 1. Twelve alternatives were developed for this study and the modeling assumptions for the alternatives are listed in Table 1.

**Table 1. Study Assumptions for the Study Case and Alternative Cases**

Branch	Line #	Conductor Type	Tower Type	Miles	Thermal Rating (MVA)	Corrected "R"	Corrected "X"	Corrected "B"
RiflePS-Parachute 230kV	5205	1-795 kcmil (Drake)	6.402R	20.78	439	0.00490	0.03090	0.05960
Parachute-Bluestone Valley 230kV	5509	1-795 kcmil (Drake)	6.402R	15.73	439	0.00375	0.02365	0.04455
Bluestone-Cameo 230kV	5509	1-795 kcmil (Drake)	6.402R	15.73	439	0.00375	0.02365	0.04455
Branch	Line #	Conductor Type	Tower Type	Miles	Thermal Rating (MVA)			
Parachute-Wheeler 230kV	5507	1-1033.5 kcmil (Ortolan)	6.403R	3.07	506			
Parachute-Starkey Gulch 230kV	5505	2-954 kcmil (Cardinal)	6.401R	4.8	978			
Rifle-Collbran 138kV	3014	1-477 kcmil (Hawk)	6.301Y	41.2	191			
Collbran-Grand Junction	3015	1-477 kcmil (Hawk)	6.301Y	22.9	191			
Transformer 556 MVA 345-230kV					560			
Branch	Line #	Conductor Type	Tower Type	Miles	Thermal Rating (MVA)	R	X	B
ALT#1 RiflePS-Parachute 230kV #2		1-1272 kcmil (Bittern)	6.401R	20.78	576.4	0.00299	0.03088	0.06038
ALT#1A RiflePS-Parachute 230kV #2 on 345kV structures		1-1272 kcmil (Bittern)	7.26W	20.78	576.4	0.00300	0.03195	0.05869
ALT#2 RifleCu-Parachute		1-1272 kcmil (Bittern)	6.401R	17.38	576.4	0.00250	0.02583	0.05050
ALT#3 RifleCu-Parachute 345kV		1-1272 kcmil (Bittern)	7.26W	17.38	864.7	0.00111	0.01188	0.11044

ALT#4 RiflePS- Bluestone Valley 230kV		1-1272 kcmil (Bittern)	6.401R	36.5	576.4	0.00525	0.05424	0.10606
ALT#5 RiflePS-Story Gulch 230kV		1-1272 kcmil (Bittern)	6.401R	25.0	576.4	0.00360	0.03715	0.07265
ALT#5 Story Gulch- Middle Fork 230kV		1-1272 kcmil (Bittern)	6.401R	9.0	576.4	0.00130	0.01338	0.02615
ALT#5 Middle Fork-Wheeler		1-1272 kcmil (Bittern)	6.401R	6.8	576.4	0.00098	0.01011	0.01976
ALT#6 MKRF_TAP- Story Gulch 230kV		1-1272 kcmil (Bittern)	6.401R	9.0	576.4	0.00130	0.01338	0.02615
ALT#7 RiflePS- Starkey Gulch		1-1272 kcmil (Bittern)	6.401R	24.0	576.4	0.00345	0.03567	0.07845
ALT#8 Collbran- Parachute 138kV on 230kV structures		1-1272 kcmil (Bittern)	6.401R	14.0	345.9	0.00560	0.05780	0.01464
ALT#9 RifleCu- Collbran 230kV		1-1272 kcmil (Bittern)	6.401R	41.2	576.4	0.00592	0.06117	0.11977
ALT#9 Collbran- Grand Junction 230kV		1-1272 kcmil (Bittern)	6.401R	22.9	576.4	0.00329	0.03400	0.06657
ALT#10 Collbran- Parachute 230kV		1-1272 kcmil (Bittern)	6.401R	14.0	576.4	0.00202	0.02081	0.04068
ALT#11 RFGJ345Tap- Parachute 230kV		1-1272 kcmil (Bittern)	6.401R	4.0	576.4	0.00058	0.00595	0.01162
ALT#12 RFGJ345Tap- Bluestone Valley 230kV		1-1272 kcmil (Bittern)	6.401R	4.0	576.4	0.00058	0.00595	0.01162

The loads in the benchmark case reflect the anticipated 2016 summer on-peak demand levels. In addition, the demands at the Starkey Gulch 230kV, Middle Fork (Bench) 230kV, Clear Creek 230kV, and Una Orchard 69kV load busses were increased to reflect projected demand increases. The results are listed in Table 2.

**Table 2. Loads in the Study Area**

Bus No.	Bus Name	ID	IS	Pload (MW)	Qload (MVAR)	Bus No.	Bus Name	ID	IS	Pload (MW)	Qload (MVAR)
70268	ADOBE 230.00	GV	1	11.7	-2.2	70233	HORIZON 230.00	P2	1	26.2	13.1
70268	ADOBE 230.00	WA	1	0.4	-0.1	70288	MITCHLCR 69.000	GW	1	7.6	1.8
70541	ASPEN_PS 115.00	AS	1	11.0	3.6	70288	MITCHLCR 69.000	PM	1	0.0	0.0
70541	ASPEN_PS 115.00	WM	1	0.0	0.0	70288	MITCHLCR 69.000	WM	1	0.4	0.1
70541	ASPEN_PS 115.00	HC	1	21.1	-3.2	70525	MTHARRIS 138.00	YV	1	9.3	0.7
70541	ASPEN_PS 115.00	WA	1	1.1	-0.2	70525	MTHARRIS 138.00	WA	1	0.8	0.1
79092	AVON 115.00	HC	1	9.3	0.1	70296	NEWCASTL 69.000	P1	1	1.3	0.5
79092	AVON 115.00	WA	1	0.6	0.0	70296	NEWCASTL 69.000	P2	1	4.4	1.6
70540	BASLTDST 115.00	HC	1	8.3	0.6	70309	PARACHUT 230.00	P1	1	10.5	4.1
70540	BASLTDST 115.00	WA	1	0.4	0.0	70309	PARACHUT 230.00	HC	1	5.3	0.6
79006	BEAVERCU 115.00	HC	1	15.3	-2.2	70309	PARACHUT 230.00	WA	1	0.3	0.0
79006	BEAVERCU 115.00	WA	1	0.9	-0.1	79056	RIFLE_CU 138.00	P1	1	7.2	1.7
70357	BENCH 230.00	IN	1	85.5	28.1	79056	RIFLE_CU 138.00	P5	1	0.0	0.0
70076	CAMEO 69.000	P4	1	0.9	0.3	79056	RIFLE_CU 138.00	HC	1	3.5	0.3
70089	CARBNDAL 115.00	P2	1	6.8	-1.9	79056	RIFLE_CU 138.00	WA	1	0.2	0.0
70080	CLEARCRK 230.00	SS	1	76.0	25.0	79056	RIFLE_CU 138.00	TS	1	0.0	0.0
70113	CLIFTON 230.00	P1	1	17.0	-0.9	70363	ROARNGFK 69.000	GW	1	8.7	0.0
70113	CLIFTON 230.00	P2	1	11.0	-1.1	70363	ROARNGFK 69.000	PM	1	0.0	0.0
79047	COLBRAN 138.00	GV	1	5.2	1.5	70363	ROARNGFK 69.000	WM	1	0.4	0.0
79047	COLBRAN 138.00	WA	1	0.1	0.0	70385	SHOSHA&B 4.0000	P5	1	0.0	0.0
70535	COOLEYMA 230.00	HC	1	16.4	-1.8	70542	SNOWMASS 115.00	HC	1	7.8	-1.3
70535	COOLEYMA 230.00	WA	1	0.9	-0.1	70542	SNOWMASS 115.00	WA	1	0.4	-0.1
70009	CRAIG_YV 230.00	WA	1	2.2	0.1	79065	STEAMBT 230.00	YV	1	31.2	-0.8
79018	CRYSTLPS 115.00	HC	1	8.0	2.4	79065	STEAMBT 230.00	WA	1	2.2	-0.1
79018	CRYSTLPS 115.00	WA	1	0.5	0.1	70299	STKGULCH 230.00	IN	1	47.5	15.6
70140	DEBEQUE 69.000	P1	1	1.6	0.6	70437	UINTAH 13.800	GV	1	0.8	0.2
70140	DEBEQUE 69.000	GV	1	10.1	3.3	70437	UINTAH 13.800	WA	1	0.0	0.0
70140	DEBEQUE 69.000	WA	1	0.0	0.0	70438	UINTAH 230.00	P1	1	24.2	10.8
70183	FRUITA 69.000	P1	1	9.8	4.2	70438	UINTAH 230.00	P3	1	9.4	3.8
70183	FRUITA 69.000	GV	1	1.7	0.5	70436	UINTAH 69.000	GV	1	8.3	1.6
70183	FRUITA 69.000	WA	1	0.1	0.0	70436	UINTAH 69.000	WA	1	0.3	0.1
70201	GLENNWD 69.000	GW	1	7.7	3.2	70109	UNA_ORCH 69.000	IN	1	20.7	6.8
70201	GLENNWD 69.000	PM	1	0.0	0.0	79066	VAIL 115.00	HC	1	10.9	-1.6
70201	GLENNWD 69.000	WM	1	0.4	0.2	79066	VAIL 115.00	WA	1	0.7	-0.1
70214	GRANDJCT 69.000	GV	1	20.6	4.0	70454	VINELAND 69.000	P1	1	5.3	2.2
70214	GRANDJCT 69.000	WA	1	0.7	0.1	70454	VINELAND 69.000	NT	1	-0.8	-0.3
70206	GRANDJPS 230.00	P1	1	40.3	-2.4	70356	WEELERPS 230.00	IN	1	3.0	0.2
70206	GRANDJPS 230.00	P2	1	43.5	-3.5	79069	WOLCOTT 230.00	HC	1	11.3	-6.4
70233	HORIZON 230.00	P1	1	18.1	6.0	79069	WOLCOTT 230.00	WA	1	0.7	-0.4

The generation levels in the benchmark case were not modified from the 2016 heavy summer base case. These generation levels are reflected in Table 3 below.

**Table 3. Generation in the Study Area**

Bus No.	Bus Name	ID	IS	Pgen (MW)	Pmax (MW)
79157	BMESA1-2 12.500	1	1	39.5	43.2
79157	BMESA1-2 12.500	2	1	39.5	43.2
79015	CRAIG 1 22.000	1	1	451.0	470.0
79016	CRAIG 2 22.000	1	1	451.0	470.0
79017	CRAIG 3 22.000	1	1	456.5	470.0
79162	CRYSTAL 12.500	1	1	27.4	27.5
79154	FLGORG1 12.500	1	1	50.0	50.0
79155	FLGORG2 12.500	1	1	50.0	50.0
79156	FLGORG3 12.500	1	1	50.0	50.0
79123	FONTNLE 4.2000	1	1	10.0	10.0
70180	FRUITA 13.800	G1	1	18.5	20.0
79040	HAYDEN1 18.000	1	1	212.0	212.0
79041	HAYDEN2 22.000	1	1	286.0	286.0
79176	MCPHEE 2.4000	1	1	1.3	1.3
79166	MOLINA-L 4.2000	1	1	4.9	4.9
79172	MOLINA-U 4.2000	1	1	8.6	8.6
79019	MORRO1-2 12.500	1	1	80.0	80.0
79019	MORRO1-2 12.500	2	1	80.0	80.0
79158	NUCLA 1 13.800	1	1	14.0	14.0
79159	NUCLA 2 13.800	1	1	14.0	14.0
79160	NUCLA 3 13.800	1	1	14.0	14.0
79161	NUCLA 4 13.800	1	1	58.0	68.0
79251	QFATLAS1 13.800	1	1	31.0	31.2
79251	QFATLAS1 13.800	2	1	18.0	18.2
79252	QFATLAS2 13.800	3	1	18.0	18.2
79252	QFATLAS2 13.800	4	1	18.0	18.2
70385	SHOSHA&B 4.0000	H1	0	7.0	7.0
70385	SHOSHA&B 4.0000	H2	0	8.0	8.0
79164	TOWAOC 6.9000	1	1	12.0	12.0

The “16HSB3\_T2A+500PS” benchmark case was developed from the Western Electricity Coordinating Council (WECC) approved 2016 heavy summer base case (2016 HS2A). The case reflects on-peak summer demand in 2016 and the projected demand increases at the Starkey Gulch 230kV, Middle Fork (Bench) 230kV, Clear Creek 230kV, and Una Orchard 69kV load busses. The TOT2A north-to-south transfer level was increased to 500 MW by scheduling from Western-RMR (Area 73) to New Mexico (Area 10) using the San Juan and Shiprock phase-shifting transformers to control schedules. The El Paso Tap-Glade Tap 115kV Line was opened for this condition. Capacitor banks were represented in the case at Cameo 230kV (45 MVAR), Parachute 230kV (45 MVAR), Bluestone Valley 230kV (45 MVAR) and Una Orchard 69kV (two at 7.5 MVAR). Outage simulations were performed on the benchmark case and revealed potential issues with the system that would require mitigation. The RiflePS-Parachute 230kV contingency line flow reached 103.1% of its 439 MVA rating for an outage of the RifleCU-Grand Junction 345kV Line. Contingency low voltages occurred in study area as seen at Bench 230kV (0.87 p.u.), Bluestone Valley 230kV (0.89 p.u.), Cameo 230kV (0.87 p.u.), Clear Creek 230kV (0.89 p.u.), Debeque 69kV (0.87 p.u.), Grand Valley 69kV (0.89 p.u.), Parachute 230kV (0.88 p.u.), Starkey Gulch 230kV (0.88 p.u.), Una Orchard 69kV (0.87 p.u.), Vineland 69kV (0.88 p.u.) and WheelerPS 230kV (0.88 p.u.) for loss of the RiflePS-Parachute 230kV Line. The RifleCu-Oil Shale-Grand Valley-Una 69kV line flow reached 105.0% of its 55.9 MVA rating for an outage of the RiflePS-Parachute 230kV Line. Because of the contingency overload of the RiflePS-Parachute 230kV Line and the numerous criteria violations that occur of an outage of the RiflePS-Parachute 230kV Line, the need for system upgrades to address these criteria violations was pursued.

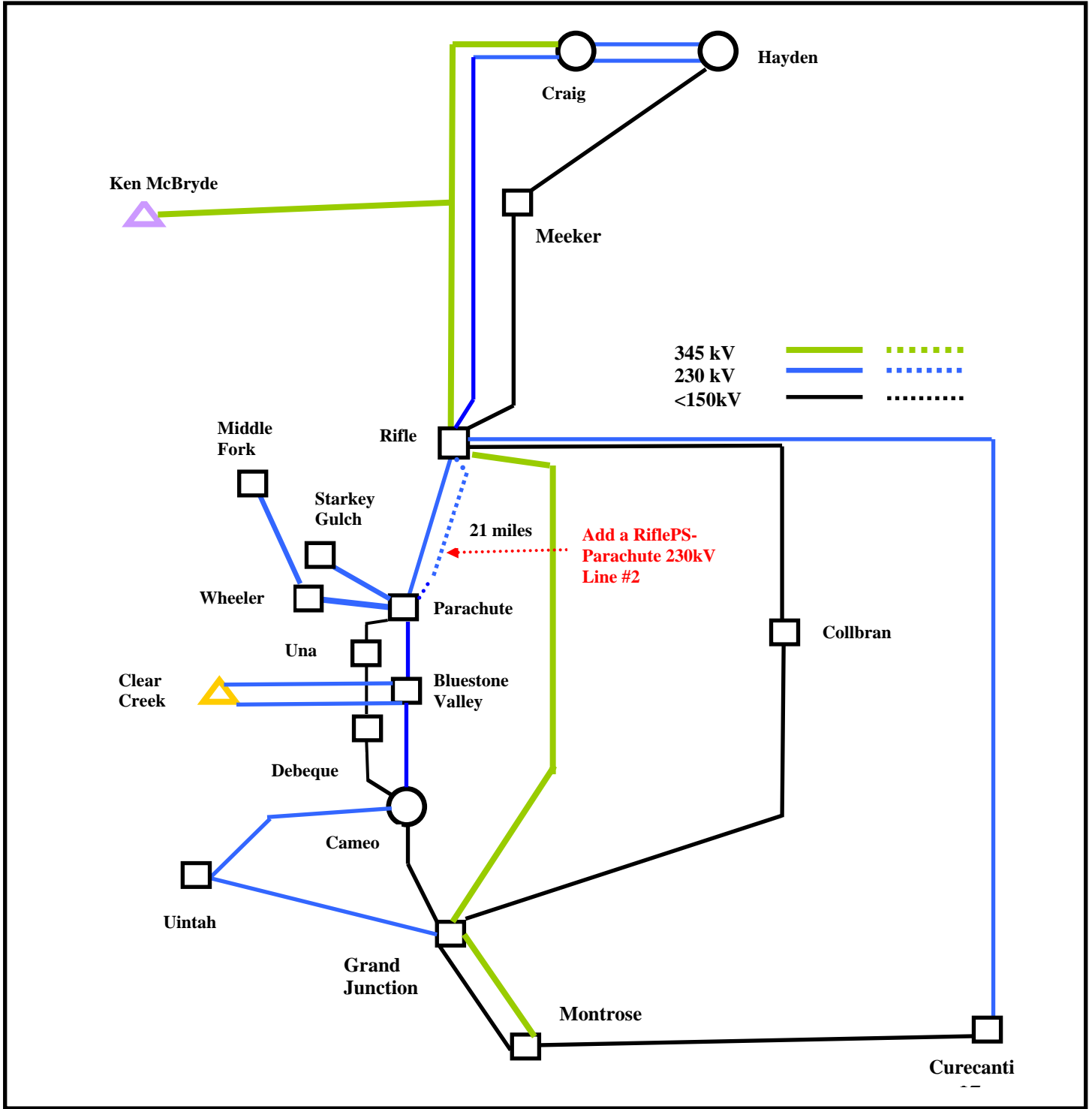
Twelve alternatives were studied to mitigate these criteria violations and the results of simulation studies are listed in the following sections of the report. Tables representing facility overload conditions for the benchmark case and the twelve alternatives are listed in the Appendix.

**E. Alternatives**

**1. Alternative 1**

RiflePS-Parachute 230kV Line #2.

**Figure 2 – Alternative 1**

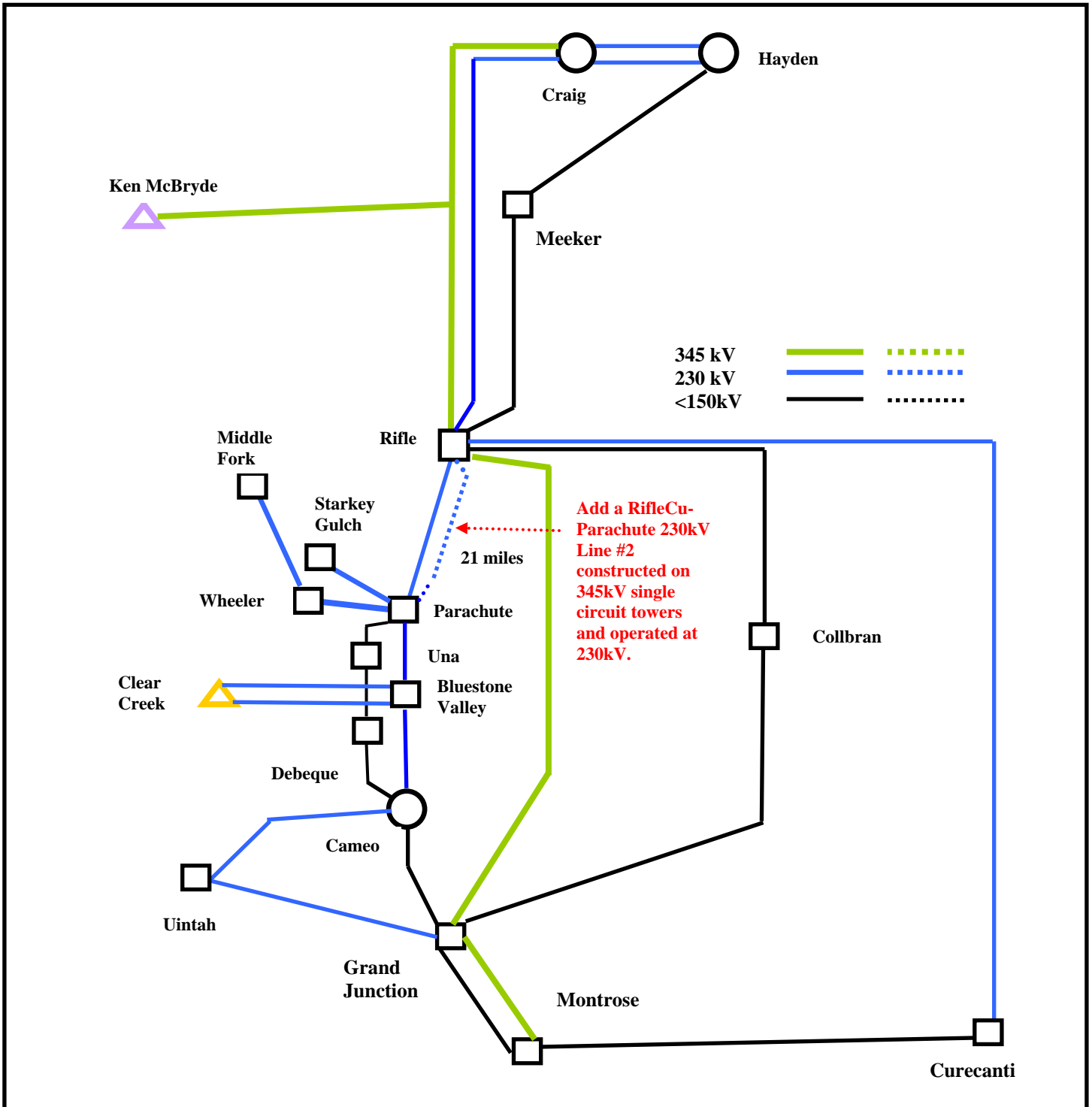


Alternative 1 consists of constructing a second RiflePS-Parachute 230kV Line. The new line would be approximately 21 miles (20.78 miles) long. The new line was modeled and added to the benchmark case "16HSB3\_T2A+500PS.sav". Facility outages were simulated. The study determined that the addition of the RiflePS-Parachute 230kV Line #2 mitigates the contingency criteria violations observed in the benchmark case. The indicative cost estimate for this project is \$27.2 million.

**2. Alternative 1A**

RifleCu-Parachute 230kV Line #2 (345kV structures operated at 230kV).

**Figure 3 – Alternative 1A**

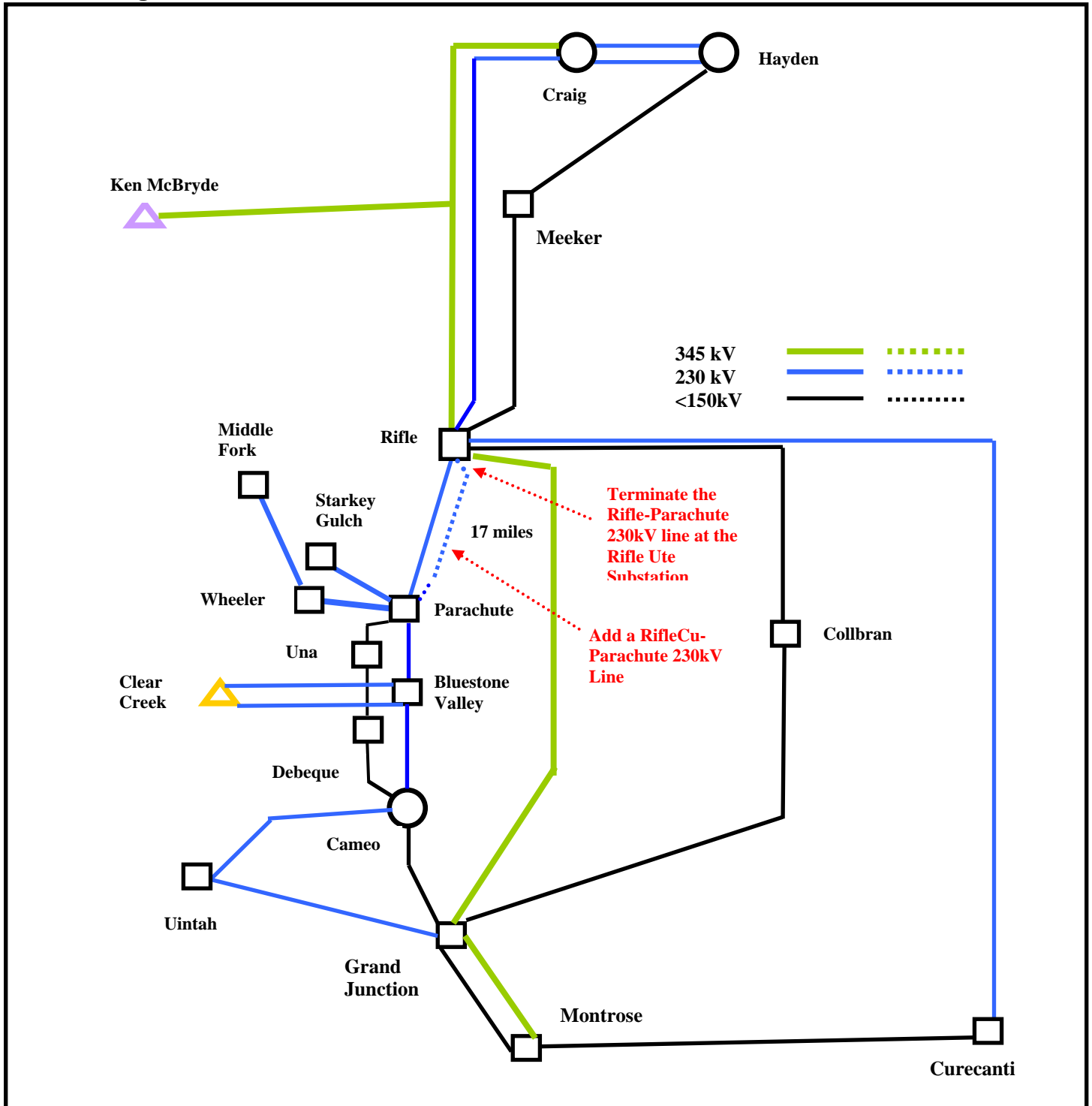


Alternative 1A consists of constructing a RifleCu-Parachute 230kV Line #2 on 345kV structures operating the line at 230kV. The new line would be approximately 21 miles (20.78 miles) long. The project was modeled in the benchmark case and outages were simulated. The results of the outage simulations demonstrate that the addition of the RiflePS-Parachute 230kV Line #2 (constructed with 345kV structures) mitigates the criteria violations of the benchmark case. The indicative cost estimate for this project is \$46.7 million.

### 3. Alternative 2

RifleCu-Parachute 230kV Line #2 (terminate at the Ute Rifle Substation instead of PSCo's Rifle Substation adjacent to the Rifle WAPA Substation).

Figure 4 – Alternative 2



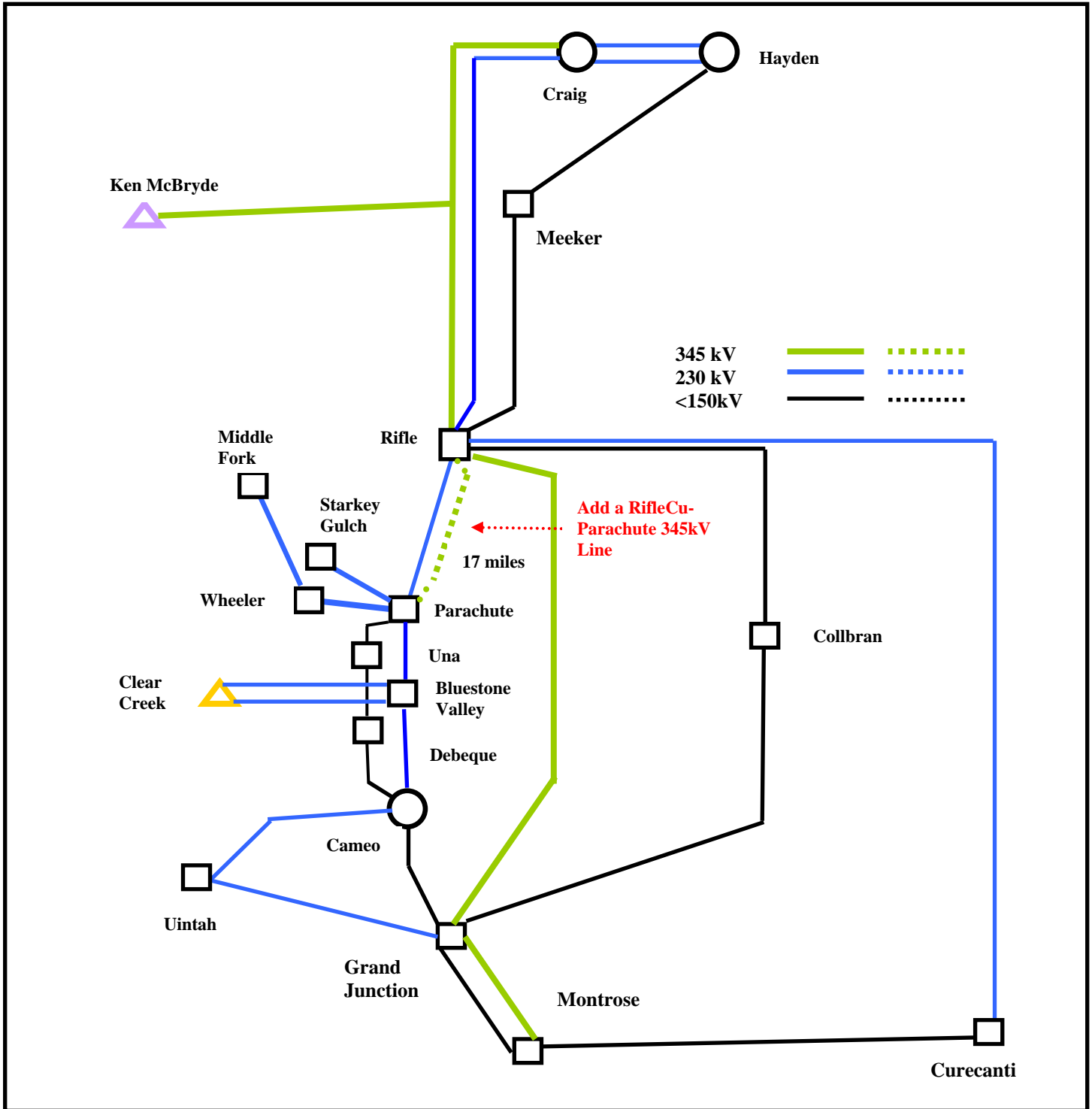
Alternative 2 consists of the construction of a RifleCu-Parachute 230kV Line. The new line would be approximately 17 miles (17.38 miles) long. The line would be terminated at the Ute Rifle (RifleCu) Substation instead of PSCo's Rifle Substation. PSCo's Rifle Substation (RiflePS 230kV bus) is adjacent to WAPA's Rifle Substation (RifleWA 230kV bus). The substations are laid out as main-and-transfer configurations with the busses connected. The busses area constructed with 1033.5 kcmil "Ortolan" conductor rated at 500 MVA. WAPA's Rifle Substation connects to the Colorado-Ute Substation (RifleCu 230kV bus) through a 3.4-mile 230kV transmission line (1272 kcmil conductor with a 574 MVA capacity). The RifleWA-RifleCu 230kV Line is jointly owned among PSCo, Tri-State G&T, and Platte River Power Authority. The distance to Parachute from the Rifle Colorado-Ute Substation is 3.4 miles closer than the distance to Parachute from PSCo's Rifle Substation.

Alternative 2 mitigates the criteria violations in the benchmark case. The indicative cost estimate for this alternative is \$23.6 million. The ability to terminate the RiflePS-Parachute 230kV Line at the UteRifle Substation has not been determined. The financial impacts of this termination have not been evaluated. These issues will be investigated by engineering and siting as the project progresses.

**4. Alternative 3**

RifleCu-Parachute 345kV Line.

**Figure 5 – Alternative 3**

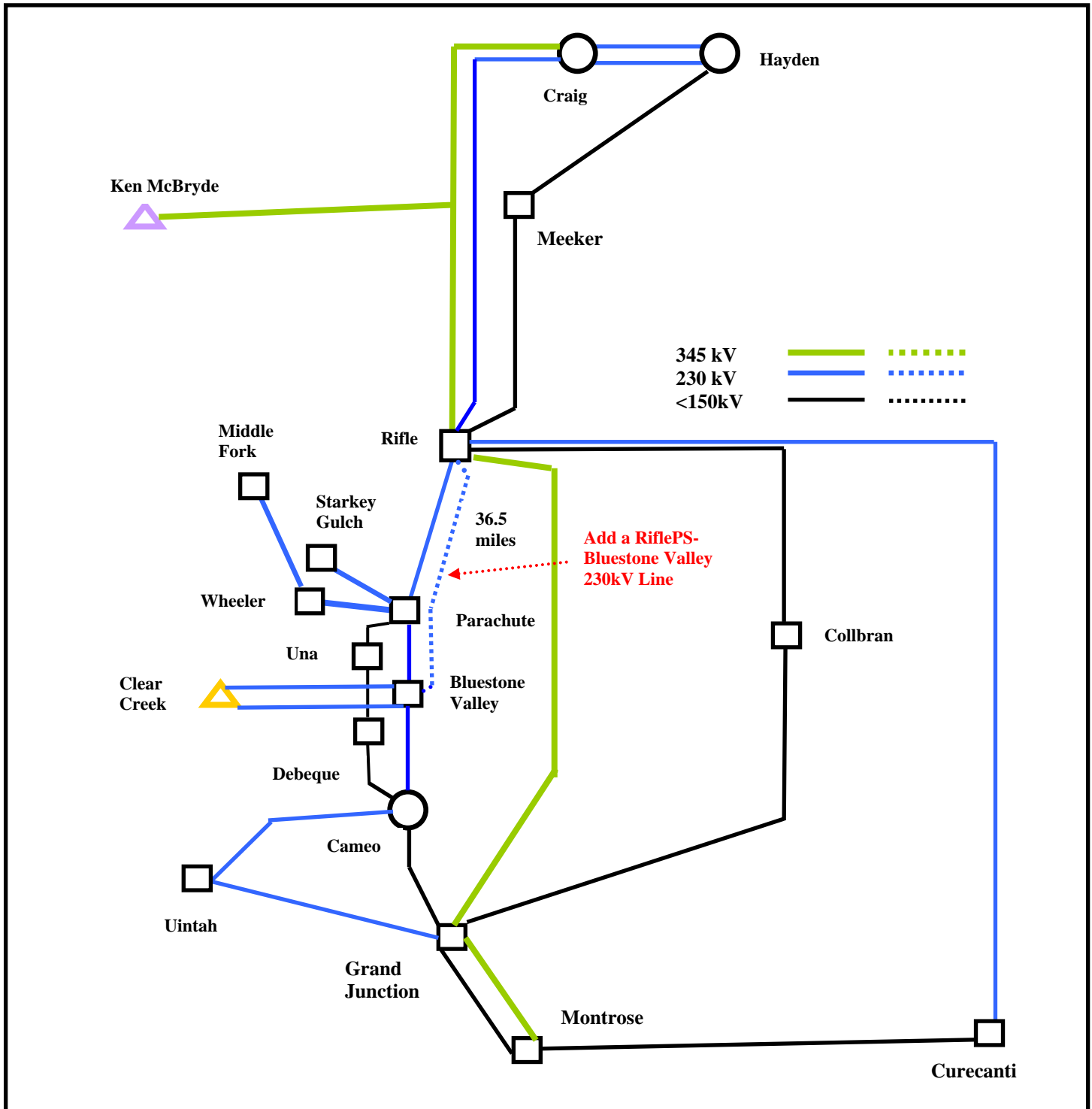


Alternative 3 consists of the construction of a RifleCu-Parachute 345kV transmission line. The new line would be approximately 17 miles (17.38 miles) long. A 560 MVA 345-230kV transformer would be installed at the Parachute Substation. The line would be terminated at the Ute Rifle (RifleCu) Substation instead of PSCo's Rifle Substation. Alternative 3 was modeled in the benchmark case and outages were simulated. The alternative mitigates the criteria violations in the benchmark case. The indicative planning cost estimate for this alternative is \$45.5 million.

**5. Alternative 4**

RiflePS-Bluestone Valley 230kV Line.

**Figure 6 – Alternative 4**

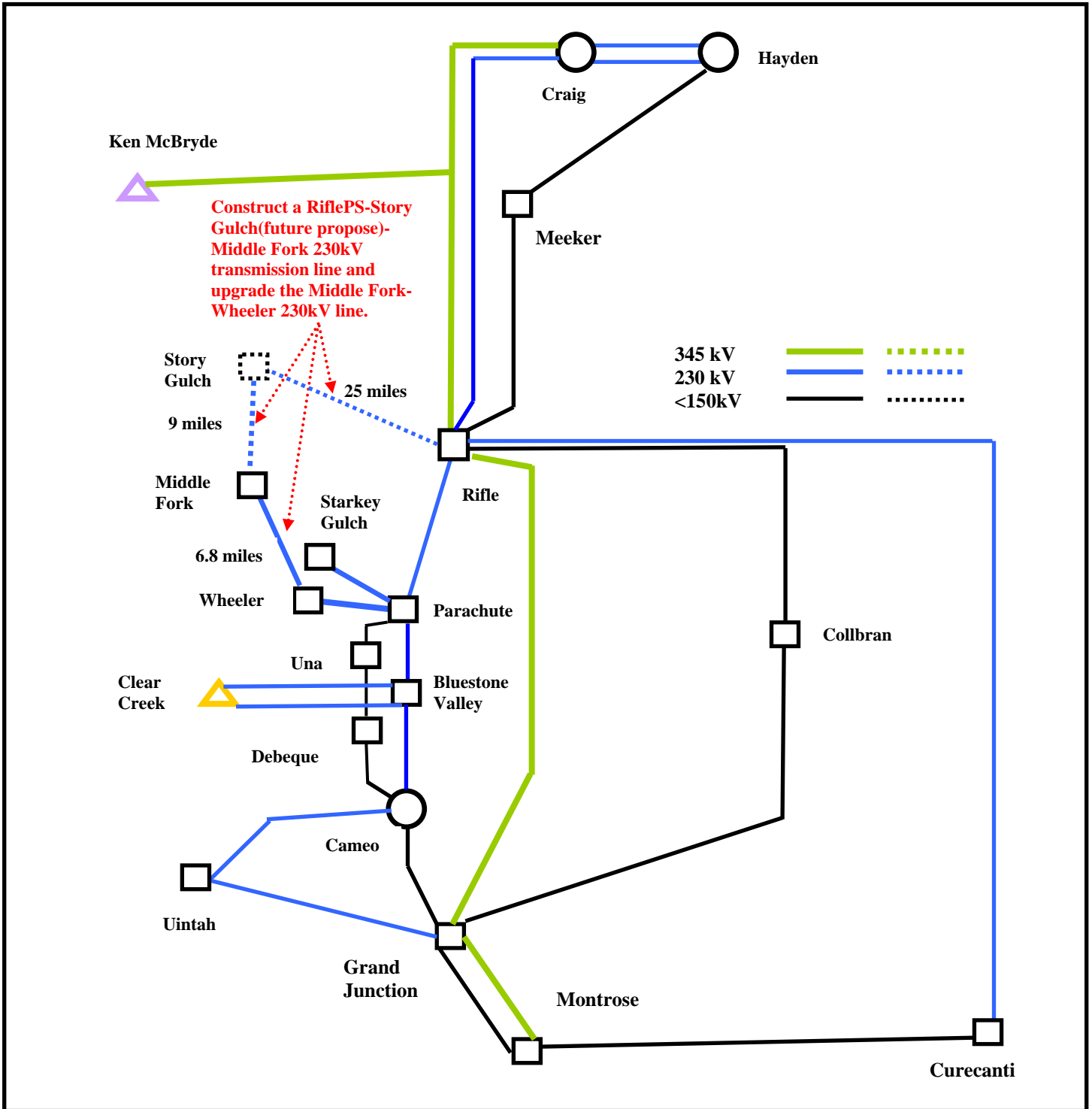


Alternative 4 consists of the construction of a RiflePS-Bluestone Valley 230kV Line. The new line would be approximately 36.5 miles long. Alternative 4 was modeled in the benchmark case and outages were simulated. Alternative 4 mitigates the criteria violations in the benchmark case. The indicative planning cost estimate for this alternative is \$42.1 million.

**6. Alternative 5**

RiflePS-Story Gulch-Middle Fork(Bench)-Wheeler 230kV Line.

**Figure 7 – Alternative 5**

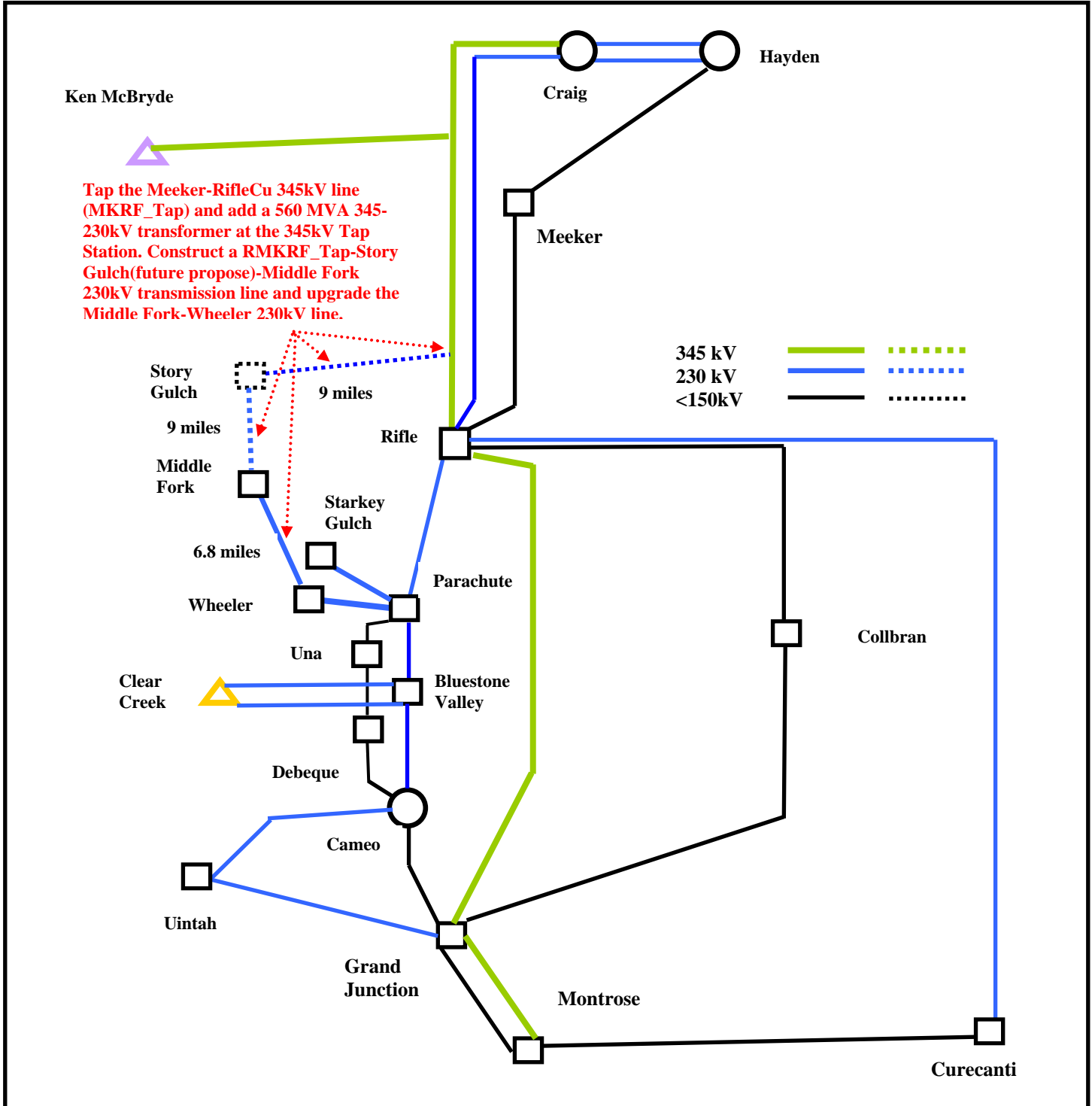


Alternative 5 consists of constructing a new RiflePS-Story Gulch-Middle Fork(Bench) 230kV Line and replacing the Middle Fork(Bench)-Wheeler 230kV Line. Story Gulch is a proposed substation to serve future load growth in the area north of the Middle Fork (Bench) Substation. The substation has not been designed or developed. The distance from the RiflePS Substation to the proposed Story Gulch substation is approximately twenty-five miles. The distance from the proposed Story Gulch Substation to the Middle Fork (Bench) Substation is approximately nine miles. The Middle Fork (Bench)-Wheeler 230kV Line is owned by a retail customer. The line would be rebuilt along a new route for a length of approximately 6.8 miles. The WheelerPS-Parachute 230kV has a base case limitation of 120 MVA due to metering unit CT's at Parachute. The 3.07-mile line (Ckt No. 5507) was constructed with 1033.5 kcmil (Ortolan) conductor on 6.403R towers (wood h-frame) with a thermal rating of 506 MVA. The study assumes the line rating will be increased sufficiently to prevent a contingency violation for an outage of the RiflePS-Parachute 230kV Line. Alternative 5 was modeled in the benchmark case and outages were simulated. The alternative mitigates the criteria violations in the benchmark case. The indicative planning cost estimate for this project is \$51.7 million.

**7. Alternative 6**

Meeker-RifleCu 34kV Line Tap (MKRF\_Tap) and MKRF\_Tap-Story Gulch-Middle Fork(Bench)-Wheeler 230kV Line.

**Figure 8 – Alternative 6**

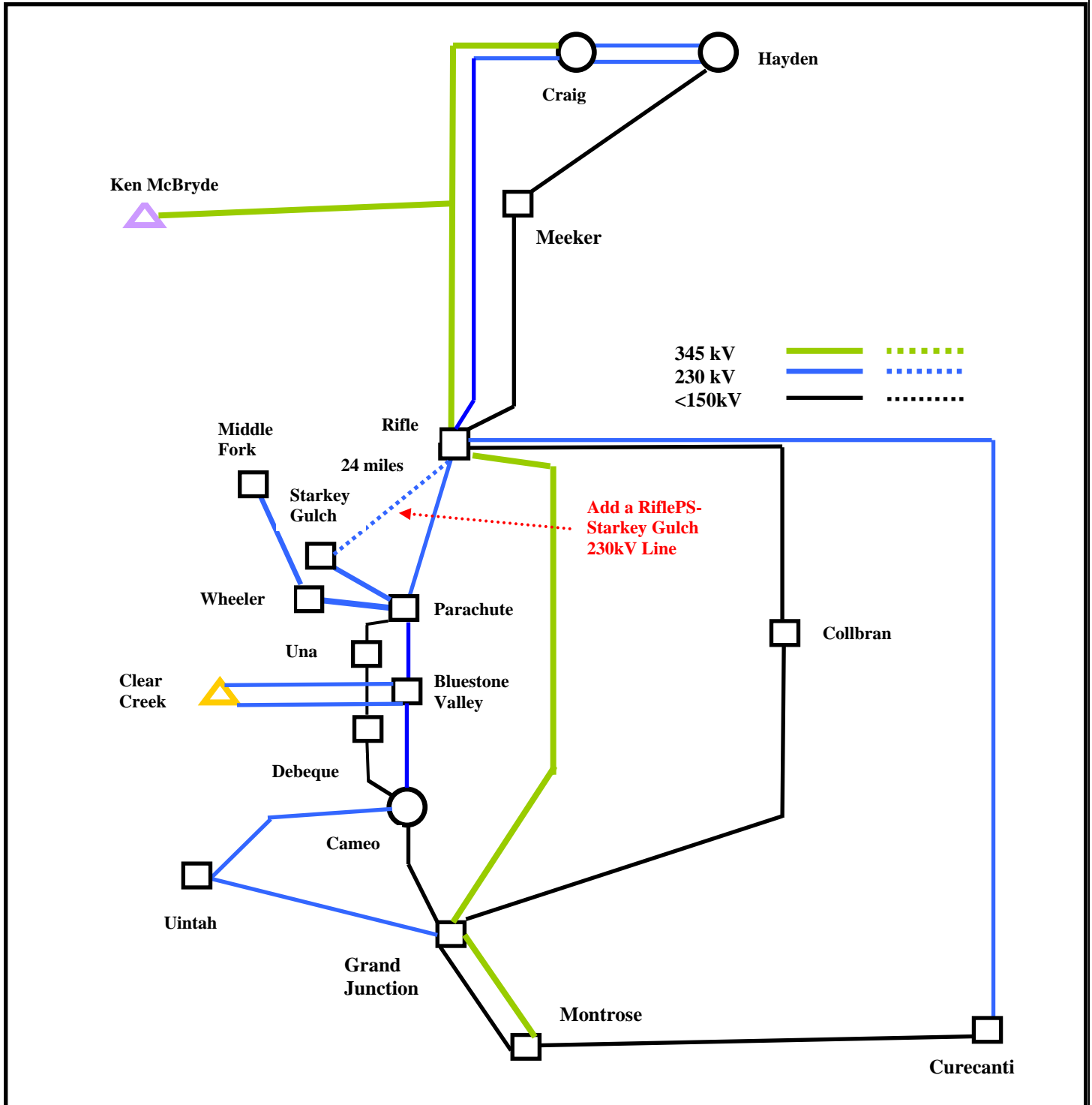


Alternative 6 consists of tapping the RifleCu-Meeker 345kV Line at a new tap station (MKRF\_Tap) approximately sixteen miles from the Rifle Substation along the fifty-five mile RifleCu-Meeker 345kV Line (29% of the distance). A MKRF\_Tap-Story Gulch-Middle Fork (Bench) 230kV Line would be constructed. Story Gulch is a proposed substation to serve future load growth in the area north of the Middle Fork (Bench) Substation. The substation has not been designed or developed. The distance from the MKRF\_Tap Substation to the proposed Story Gulch substation is approximately nine miles. The distance from the proposed Story Gulch Substation to the Middle Fork (Bench) Substation is approximately nine miles. The Middle Fork (Bench)-Wheeler 230kV Line is owned by a retail customer. The line would be rebuilt along a new route for a length of approximately 6.8 miles. This alternative mitigates the criteria violations of the benchmark case. The WheelerPS-Parachute 230kV has a base case limitation of 120 MVA due to metering unit CT's at Parachute. The 3.07-mile line (Ckt No. 5507) was constructed with 1033.5 kcmil (Ortolan) conductor on 6.403R towers (wood h-frame) with a thermal rating of 506 MVA. The study assumes the line rating will be increased sufficiently to prevent a contingency violation for an outage of the RiflePS-Parachute 230kV Line. Alternative 6 mitigates the criteria violations in the benchmark case. Alternative 6 has an advantage over Alternative 5 as it reduces the required transmission facilities to the proposed Starkey Gulch Substation reducing the overall cost of the project. The proposed alternative was modeled in the study case and outages were simulated. Alternative 6 mitigates the criteria violations in the benchmark case. The indicative planning cost estimate for this project is \$43.6 million.

8. Alternative 7

RiflePS-Starkey Gulch 230kV Line.

Figure 9 – Alternative 7



Alternative 7 consists of the RiflePS-Starkey Gulch 230kV Line. The RiflePS-Starkey Gulch 230kV Line would be approximately twenty-four miles in length. Alternative 7 was modeled in the benchmark case and outages were simulated. This alternative mitigates the criteria violations in the benchmark case. The indicative planning cost estimate for this project is \$32.1 million. Transmission Engineering has investigated this alternative and has determined that it would be extremely difficult to construct a transmission line into the Starkey Gulch location due to the difficult terrain and the actual cost of the project would far exceed the indicative planning cost estimate developed for this study; therefore, this alternative will not be considered.

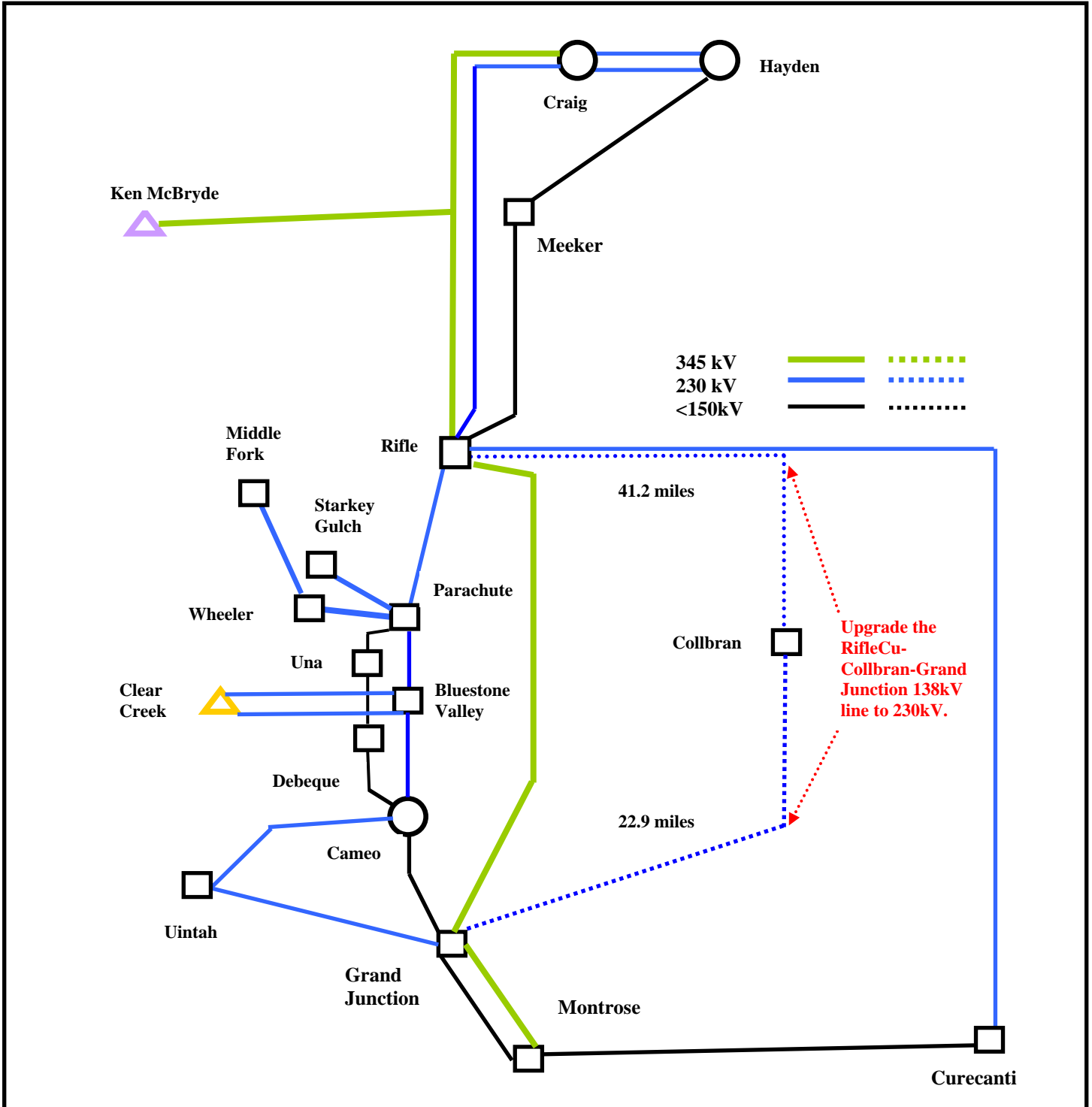


Alternative 8 consists of the construction of a Collbran-Parachute 138kV Line (on 230kV structures). The line would be approximately fourteen miles long. This alternative has an indicative planning cost estimate of \$21.3 million. Alternative 8 was modeled in the benchmark case and outages were simulated. An outage of the RifleCu-Grand Junction 345kV Line results in the flow on the RiflePS-Parachute 230kV Line to reach 100.7% of its 439 MVA thermal rating. This criteria violation makes the alternative unacceptable despite its relatively low cost.

**10. Alternative 9**

RifleCu-Collbran-Grand Junction 138kV to 230kV Upgrade.

**Figure 11 – Alternative 9**

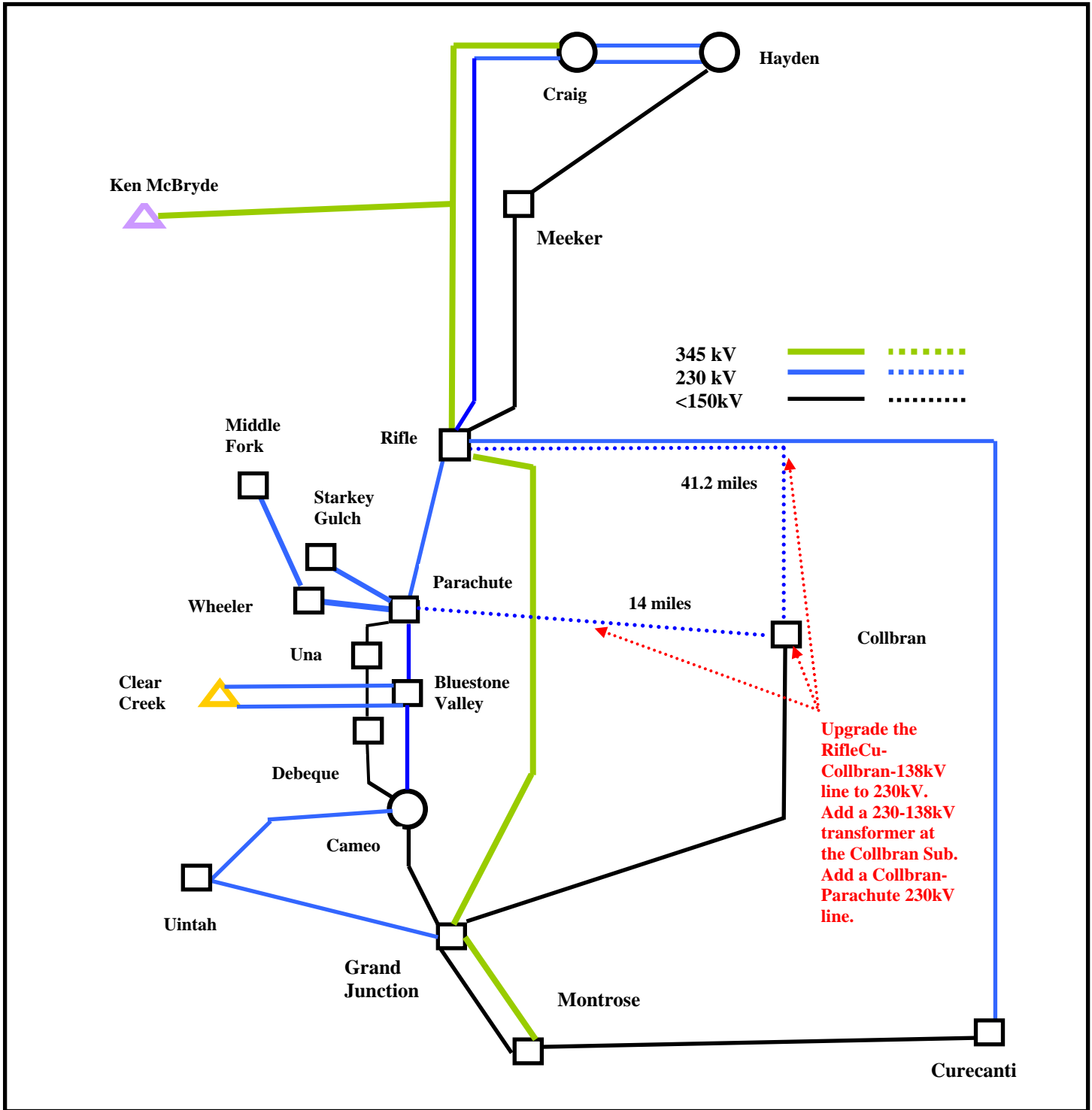


Alternative 9 consists of the upgrade of the RifleCu-Collbran-Grand Junction 138kV Line to 230kV. The RifleCu-Collbran 138kV Line is over forty-one miles in length while the Collbran-Grand Junction 138kV Line is nearly twenty-three miles in length. This alternative has an indicative planning cost estimate of \$76.7 million as it assumes the entire length of the line (approximately sixty-four miles) would be replaced with a 230kV line. PSCo Transmission Engineering would need to properly evaluate the transmission line for the upgrade and the actual cost would likely be less than \$76.7 million. The alternative was modeled in the benchmark case and outages were simulated. An outage of the Clifton-Grand Junction 230kV Line results in the flow on the RiflePS-Parachute 230kV Line to reach 101.0% of its 439 MVA rating. This criteria violation makes the alternative unacceptable.

**11. Alternative 10**

RifleCu-Collbran 138kV to 230kV Upgrade and Colbran-Parachute 230kV Line.

**Figure 12 – Alternative 10**

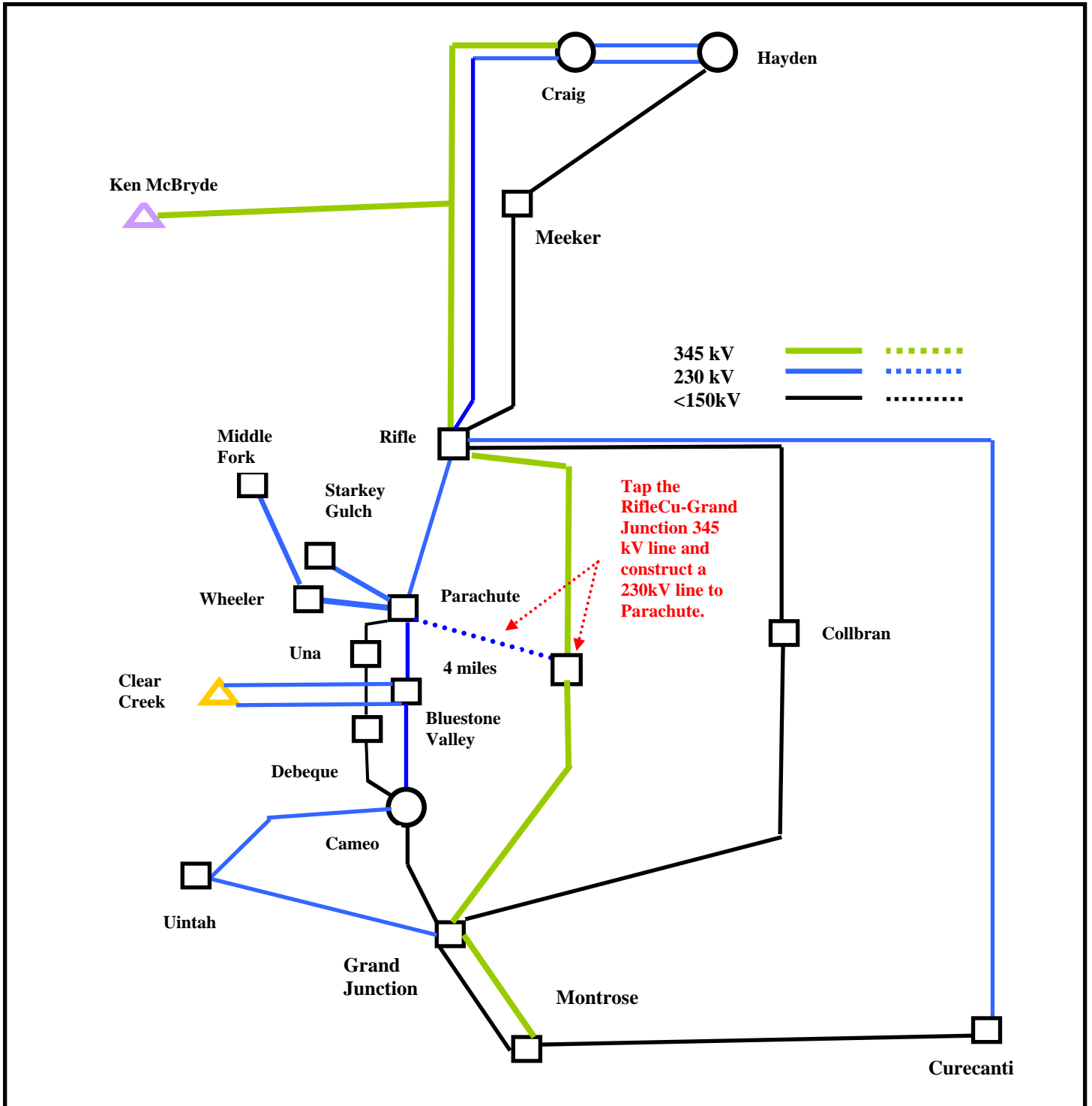


Alternative 10 consists of the upgrade of the RifleCu-Collbran-Grand Junction 138kV Line to 230kV and the construction of a Collbran-Parachute 230kV Line. The RifleCu-Collbran 138kV Line is over forty-one miles in length while the Collbran-Parachute 230kV Line would be approximately fourteen miles in length. The alternative was modeled in the benchmark case and outages were simulated. The project mitigates the criteria violations in the benchmark case. The project has an indicative planning cost estimate of \$67.9 million.

**12. Alternative 11**

RifleCu-Grand Junction 345kV Tap and construction of a 230kV line from the Line Tap to Parachute.

**Figure 13 – Alternative 11**

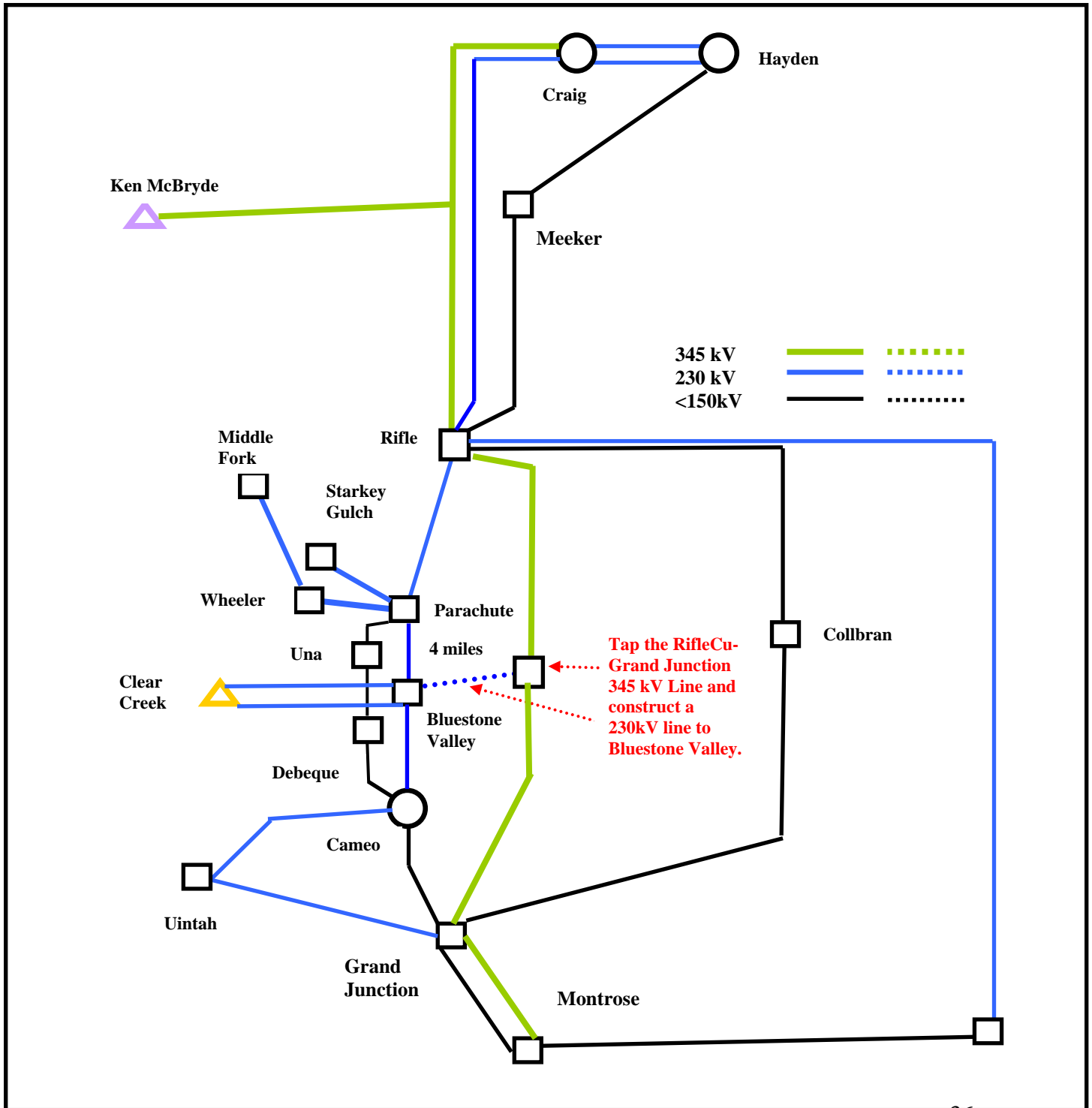


Alternative 11 consists of a 345kV Tap (RFGJ\_Tap 34kV) on the RifleCu-Grand Junction 345kV Line. A 230kV line would be constructed from the proposed tap station to the Parachute Substation. The RFGJ\_Tap-Parachute 230kV Line would be approximately four miles long. This alternative has an indicative planning cost estimate of \$18.3 million. Alternative 11 was modeled in the benchmark case and outages were simulated. An outage of the RifleCu-RFGJ\_Tap 345kV Line results in a 128.4% overload of the RiflePS-Parachute 230kV Line. Although this alternative (along with Alternative 12) has the lowest indicative planning cost estimate, Alternative 11 is not acceptable due to the criteria violation.

**13. Alternative 12**

RifleCu-Grand Junction 345kV Tap and construction of a 230kV line from the tap to Bluestone Valley.

**Figure 14 – Alternative 12**



Alternative 12 consists of a 345kV Tap (RFGJ\_Tap 34kV) on the RifleCu-Grand Junction 345kV Line. A 230kV line would be constructed from the proposed tap station to the Bluestone Valley Substation. The RFGJ\_Tap-Bluestone Valley 230kV Line would be approximately four miles long. This alternative has an indicative planning cost estimate of \$18.3 million. Alternative 12 was modeled in the benchmark case and outages were simulated. An outage of the RifleCu-RFGJ\_Tap 345kV Line results in a 118.9% overload of the RiflePS-Parachute 230kV Line. Although this alternative (along with Alternative 11) has the lowest indicative planning cost estimate, Alternative 12 is not acceptable due to the criteria violation.

## F. Conclusion

The benchmark and alternative cases were compared and the results listed in Table 4.

**Table 4. Summary Comparing the Benchmark Case and the Alternatives**

	Cost: Indicative Planning Estimate (\$million)	Losses Area 70 (MW)	Losses Area 73 (MW)	Rifle-Cameo (Zone 720) Load- Serving Capability (MW)	Conclusion
Benchmark		143.2	170.2	<229 MW	Unacceptable. The RiflePS-Parachute 230kV overloads for loss of the RifleCu-Grand Junction 345kV Line.
ALT1 (RiflePS- Parachute 230kV #2)	\$ 27.2 m	141.0	169.7	>229 MW	Acceptable
ALT1A (ALT1 with 345kV structures)	\$ 46.7 m	141.0	169.7	>229 MW	Acceptable
ALT2 (RifleCu- Parachute 230kV)	\$ 23.6 m	141.1	169.7	> 229 MW	Acceptable
ALT3 (RifleCu- Parachute 345kV)	\$ 45.5 m	141.5	169.4	>229 MW	Acceptable
ALT4 (RiflePS- Bluestone Valley 230kV)	\$ 42.1 m	140.9	169.4	>229 MW	Acceptable
ALT5 (RiflePS- Story Gulch- Middle Fork(Bench)- Wheeler- 230kV)	\$ 51.7 m	141.4	169.9	>229 MW	Acceptable
ALT6 (Meeker- RifleCu 34kV Line tap (MKRF_Tap)- Story Gulch- Middle Fork(Bench)- Wheeler 230kV Line)	\$ 43.6 m	141.4	169.2	>229 MW	Acceptable
ALT7 (RiflePS- Starkey Gulch 230kV)	\$32.1 m	141.2	169.8	>229 MW	Unacceptable. Although the alternative is acceptable from a reliability consideration, the Starkey Gulch Substation is too difficult to access.

<b>ALT8 (Collbran-Parachute 138kV)</b>	\$21.3 m	143.2	170.3	<229 MW	Unacceptable. The RiflePS-Parachute 230kV overloads for loss of the RifleCu-Grand Junction 345kV
<b>ALT9 (RifleCu-Collbran-Grand Junction 138 to 230kV Upgrade)</b>	\$76.7 m	143.2	169.2	<229 MW	Unacceptable. The RiflePS-Parachute 230kV overloads for outage of the Clifton-Grand Junction 230kV Line.
<b>ALT10 (RifleCu-Collbran 138kV to 230kV upgrade and Colbran-Parachute 230kV Line)</b>	\$67.9 m	142.2	169.7	>229 MW	Acceptable
<b>ALT11 (RifleCu-Grand Junction 345kV Tap and construction of a 230kV line from the tap to Parachute)</b>	\$18.3 m	143.5	168.7	<229 MW	Unacceptable. The RiflePS-Parachute 230kV Line overloads for loss of the RifleGJ_Tap-RifleCu 345kV Line
<b>ALT12 (RifleCu-Grand Junction 345kV Tap and construction of a 230kV Line from the tap to Bluestone Valley)</b>	\$18.3 m	142.6	168.5	<229MW	Unacceptable. The RiflePS-Parachute 230kV overloads for loss of the RifleGJ_Tap-RifleCu 345kV Line

Table 4 shows that Alternative 1 and Alternative 2 are the preferred projects as they are reliable projects with the least cost. A sensitivity study was conducted to compare the load-serving capability of Alternative 1 with the load-serving capability of Alternative 2. The future load growth in the study area is unknown at this time. To estimate the load-serving capability of both alternatives, a power flow zone called “Zone 720” was created by including the loads at the Parachute 230kV, Starkey Gulch 230kV, Wheeler 230kV, Middle Fork(Bench) 230kV, Clear Creek 230kV and Cameo 230kV busses in the new zone. The demand in the benchmark case for this zone was 229 MW. The demand in Zone 720 was scaled up until a limit was reached for Alternative 1. That occurred when the Zone 720 demand reached approximately 360 MW. An outage of the RifleCu-Grand Junction 345kV Line caused an overload of the RiflePS-RifleWA 230kV bus tie (rated at 500 MVA). Increasing the Zone 720 demand to approximately

391 MW resulted in the next limitation. At that demand level, an outage of the RiflePS-Parachute 230kV #2 Line caused the RiflePS-Parachute 230kV #2 Line to overload. Alternative 2 was also considered. A Zone 720 was created in the study as was done with Alternative 1. Demand was increased until a limitation was encountered. That occurred with a Zone 720 demand of approximately 391 MW. At that demand level, an outage of the RifleCu-Parachute 230kV Line resulted in an overload of the RiflePS-Parachute 230kV Line. The load-serving capability of Alternative 2 is approximately 31 MW greater than Alternative 1.

The choice of terminating the Rifle-Parachute 230kV Line at the PSCo Rifle Substation (RiflePS 230kV) or the Ute Rifle Substation (RifleCu 230kV) will be investigated in detail during the engineering and siting process and the selection of the termination point will be made at that time.

# **APPENDIX**

## **Power Flow Results**

## 0. Benchmark Case

**	From bus	** **	To bus	** CKT	ContMV A	Rating	Loadin g%	Contingency					
70214	GRANDUCT	69.0	79034	GRANDUCT	65.1	42.0	155.0	70309	PARACHUT	230	70358	RIFLE_PS	2
70205	GRANDUCT	230	79036	GRANDUCT	404.6	280.0	144.5	70309	PARACHUT	230	70358	RIFLE_PS	2
70327	FOCHA	115	70394	SMELTER	111.7	80.0	139.6	70330	FORTLAND	115	70456	W.STATION	1
70253	LAMAR_CO	115	70254	LAMAR_CO	133.1	100.0	133.1	70061	BOONE	230	70254	LAMAR_CO	2
70329	FORTLAND	69.0	70330	FORTLAND	33.2	25.0	132.7	70329	FORTLAND	69.0	70330	FORTLAND	1
70045	BANCROFT	115	70208	GRAY ST.	158.8	120.0	132.3	70023	ALLISON	115	70400	SODALAKE	1
70045	BANCROFT	115	70208	GRAY ST.	148.1	120.0	123.4	70037	ARAP_B	115	70398	SOUTHITP	1
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353	READER	69
70352	READER	115	70353	READER	50.7	42.0	120.7	70352	READER	115	70353	READER	69
70245	LAFAYETTE	69.0	70325	BLAZA	30.5	26.1	116.9	70230	HOOPERIP	69.0	70376	SANLSMLY	69
70065	BROOMFIELD	115	70382	SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382	SEMPER	1
70045	BANCROFT	115	70242	KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400	SODALAKE	1
70244	LAFAYETTE	115	70444	VALMONT	149.4	135.0	110.6	70191	FILUPTON	115	70192	FILUPTON	2
70005	BRUSH_SS	115	70397	B.CRK_PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
70005	BRUSH_SS	115	70397	B.CRK_PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
73211	WELD_IM	115	73212	WELD_IM	162.9	150.0	108.6	70470	WELD_PS	115	70471	WELD_PS	2
70108	CHEROKEE	115	70276	MAPLETOI	149.2	138.0	108.1	70039	ARGO	115	70108	CHEROKEE	1
79038	HAYDEN	138	79039	HAYDEN	107.1	100.0	107.1	79038	HAYDEN	138	79039	HAYDEN	2
79034	GRANDUCT	115	79035	GRANDUCT	53.3	50.0	106.7	79036	GRANDUCT	345	79058	RIFLE_CU	3
70108	CHEROKEE	115	70276	MAPLETOI	146.3	138.0	106.0	70073	CALIFOR	115	70108	CHEROKEE	1
70037	ARAP_B	115	70398	SOUTHITP	126.9	120.0	105.8	70045	BANCROFT	115	70208	GRAY ST.	1
79047	COLBRAN	138	79173	COLBRAN	14.8	14.0	105.6	70309	PARACHUT	230	70358	RIFLE_PS	2
70109	UNA_CRCH	69.0	70207	GRANDVLY	58.7	55.9	105.0	70309	PARACHUT	230	70358	RIFLE_PS	2
70207	GRANDVLY	69.0	70302	OILSHALE	58.7	55.9	105.0	70309	PARACHUT	230	70358	RIFLE_PS	2
70302	OILSHALE	69.0	70359	RIFLE_CU	58.7	55.9	105.0	70309	PARACHUT	230	70358	RIFLE_PS	2
70059	BO_TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO_TERM	115	70444	VALMONT	1
70045	BANCROFT	115	70208	GRAY ST.	125.0	120.0	104.1	70018	SODALAKE	230	70400	SODALAKE	1
70309	PARACHUT	230	70358	RIFLE_PS	452.6	439.0	103.1	79036	GRANDUCT	345	79058	RIFLE_CU	3
70108	CHEROKEE	115	70276	MAPLETOI	141.4	138.0	102.5	70039	ARGO	115	70148	DENVIM	1
79014	CRAIG	345	79266	MEEKER	612.7	598.0	102.5	79013	CRAIG	230	79059	RIFLE_WA	2
70108	CHEROKEE	115	70277	MAPLETOI	141.2	138.0	102.3	70108	CHEROKEE	115	70126	CONOCO	1
79047	COLBRAN	138	79173	COLBRAN	14.2	14.0	101.6	79036	GRANDUCT	345	79058	RIFLE_CU	3
79047	COLBRAN	138	79173	COLBRAN	14.2	14.0	101.1	79058	RIFLE_CU	345	79266	MEEKER	3
70218	HENDERBS	115	70328	FORTAL	80.7	80.0	100.9	70053	BLUERIVR	230	70057	PIARMGN	2
70218	HENDERBS	115	70328	FORTAL	80.7	80.0	100.8	70057	PIARMGN	230	70156	DILLON	2
70086	CANONCIY	115	70390	SKALA	120.8	120.0	100.7	70330	FORTLAND	115	70456	W.STATION	1
70025	ALMSA_TM	115	70026	ALMSA_TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380	SARGENT	69
79047	COLBRAN	138	79173	COLBRAN	14.0	14.0	100.1	70113	CLIFTON	230	70205	GRANDUCT	2
79047	COLBRAN	138	79173	COLBRAN	14.0	14.0	100.1	70205	GRANDUCT	230	79036	GRANDUCT	3

# 1. Alternative 1

**	From bus	** **	To bus	** CKT	A	Rating	g%	Contingency			
70327	PONCHA	115	70394 SMELTER		112.2	80.0	140.3	70330 PORTLAND	115	70456 W.STATION	1
70253	LAMAR_CO	115	70254 LAMAR_CO		133.1	100.0	133.1	70061 BOONE	230	70254 LAMAR_CO	2
70329	PORTLAND	69.0	70330 PORTLAND		33.2	25.0	132.7	70329 PORTLAND	69.0	70330 PORTLAND	1
70045	BANCROFT	115	70208 GRAY_ST.		158.7	120.0	132.3	70023 ALLISON	115	70400 SODALAKE	1
70045	BANCROFT	115	70208 GRAY_ST.		148.0	120.0	123.4	70037 ARAP_B	115	70398 SOUTH1TP	1
70352	READER	115	70353 READER	6	51.1	42.0	121.7	70352 READER	115	70353 READER	69
70352	READER	115	70353 READER	6	50.7	42.0	120.6	70352 READER	115	70353 READER	69
70245	LAGARITA	69.0	70325 PLAZA	6	30.5	26.1	116.8	70230 HOOPERIP	69.0	70376 SANLSVLY	69
70065	BROOMFLD	115	70382 SEMPER		89.7	80.0	112.1	70108 CHEROKEE	115	70382 SEMPER	1
70045	BANCROFT	115	70242 KENDRICK		152.8	138.0	110.7	70023 ALLISON	115	70400 SODALAKE	1
70244	LAFAYETT	115	70444 VALMONT		149.4	135.0	110.6	70191 FTLUPTON	115	70192 FTLUPTON	2
70005	BRUSH_SS	115	70397 B.CRK_PS		201.7	184.0	109.6	70005 BRUSH_SS	115	70397 B.CRK_PS	1
70005	BRUSH_SS	115	70397 B.CRK_PS		201.7	184.0	109.6	70005 BRUSH_SS	115	70397 B.CRK_PS	1
73211	WELD IM	115	73212 WELD IM		162.9	150.0	108.6	70470 WELD_PS	115	70471 WELD_PS	2
70108	CHEROKEE	115	70276 MAPLETOL		149.0	138.0	107.9	70039 ARGO	115	70108 CHEROKEE	1
79038	HAYDEN	138	79039 HAYDEN		106.9	100.0	106.9	79038 HAYDEN	138	79039 HAYDEN	2
70108	CHEROKEE	115	70276 MAPLETOL		146.1	138.0	105.9	70073 CALIFOR	115	70108 CHEROKEE	1
70037	ARAP_B	115	70398 SOUTH1TP		126.9	120.0	105.7	70045 BANCROFT	115	70208 GRAY_ST.	1
70059	BO_TERM	115	70444 VALMONT		125.1	120.0	104.3	70059 BO_TERM	115	70444 VALMONT	1
70045	BANCROFT	115	70208 GRAY_ST.		124.9	120.0	104.1	70018 SODALAKE	230	70400 SODALAKE	1
70108	CHEROKEE	115	70276 MAPLETOL		141.2	138.0	102.3	70039 ARGO	115	70148 DENVIM	1
70108	CHEROKEE	115	70277 MAPLETO2		141.1	138.0	102.2	70108 CHEROKEE	115	70126 CONOCO	1
79014	CRAIG	345	79266 MEEKER		611.2	598.0	102.2	79013 CRAIG	230	79059 RIFLE WA	2
70218	HENDERPS	115	70328 FORTAL		80.7	80.0	100.9	70053 BLUERIVR	230	70057 PTARMGN	2
70218	HENDERPS	115	70328 FORTAL		80.7	80.0	100.9	70057 PTARMGN	230	70156 DILLON	2
70086	CANONCTY	115	70390 SKALA		120.9	120.0	100.7	70330 PORTLAND	115	70456 W.STATION	1
70025	ALMSA_TM	115	70026 ALMSA_TM	6	25.2	25.0	100.6	70361 RIOGRDIP	69.0	70380 SARGENT	69
79034	GRANDJCT	115	79035 GRANDJCT		50.0	50.0	99.9	79036 GRANDJCT	345	79058 RIFLE_CU	3
79047	COLBRAN	138	79173 COLBRAN		14.0	14.0	99.7	79058 RIFLE_CU	345	79266 MEEKER	3

## 2. Alternative 1A

**	From bus	** **	To bus	** CKT	ContMV A	Rating	Loadin g%	Contingency			
70327	PONCHA	115	70394	SMELTER	112.2	80.0	140.3	70330	PORTLAND	115	70456 W.STATION
70253	LAMAR CO	115	70254	LAMAR CO	133.1	100.0	133.1	70061	BOONE	230	70254 LAMAR CO
70329	PORTLAND	69.0	70330	PORTLAND	33.2	25.0	132.7	70329	PORTLAND	69.0	70330 PORTLAND
70045	BANCROFT	115	70208	GRAY ST.	158.7	120.0	132.3	70023	ALLISON	115	70400 SODALAKE
70045	BANCROFT	115	70208	GRAY ST.	148.0	120.0	123.4	70037	ARAP_B	115	70398 SOUTHHTP
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353 READER
70352	READER	115	70353	READER	50.7	42.0	120.6	70352	READER	115	70353 READER
70245	LAGARTIA	69.0	70325	PLAZA	30.5	26.1	116.8	70230	HOOPERIP	69.0	70376 SANLSMLY
70065	BROOMFLD	115	70382	SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382 SEMPER
70045	BANCROFT	115	70242	KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400 SODALAKE
70244	LAFAYETT	115	70444	VALMONT	149.4	135.0	110.6	70191	FILUPTON	115	70192 FILUPTON
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH SS	115	70397 B.CRK PS
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH SS	115	70397 B.CRK PS
73211	WELD IM	115	73212	WELD IM	162.9	150.0	108.6	70470	WELD PS	115	70471 WELD PS
70108	CHEROKEE	115	70276	MAPLETOL	149.0	138.0	107.9	70039	ARGO	115	70108 CHEROKEE
79038	HAYDEN	138	79039	HAYDEN	106.9	100.0	106.9	79038	HAYDEN	138	79039 HAYDEN
70108	CHEROKEE	115	70276	MAPLETOL	146.1	138.0	105.9	70073	CALIFOR	115	70108 CHEROKEE
70037	ARAP B	115	70398	SOUTHHTP	126.9	120.0	105.7	70045	BANCROFT	115	70208 GRAY ST.
70059	BO TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO TERM	115	70444 VALMONT
70045	BANCROFT	115	70208	GRAY ST.	124.9	120.0	104.1	70018	SODALAKE	230	70400 SODALAKE
70108	CHEROKEE	115	70276	MAPLETOL	141.2	138.0	102.3	70039	ARGO	115	70148 DENVIM
70108	CHEROKEE	115	70277	MAPLETOL	141.1	138.0	102.2	70108	CHEROKEE	115	70126 CONOCO
79014	CRAIG	345	79266	MEEKER	611.2	598.0	102.2	79013	CRAIG	230	79059 RIFLE WA
70218	HENDERPS	115	70328	PORTAL	80.7	80.0	100.9	70053	BLUERIVR	230	70057 PTARMGN
70218	HENDERPS	115	70328	PORTAL	80.7	80.0	100.9	70057	PTARMGN	230	70156 DILLON
70086	CANONCIV	115	70390	SKALA	120.9	120.0	100.7	70330	PORTLAND	115	70456 W.STATION
70025	ALMSA TM	115	70026	ALMSA TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380 SARGENT
79034	GRANDUCT	115	79035	GRANDUCT	50.0	50.0	100.1	79036	GRANDUCT	345	79058 RIFLE CU
79047	COLBRAN	138	79173	COLBRAN	14.0	14.0	99.7	79058	RIFLE CU	345	79266 MEEKER
79047	COLBRAN	138	79173	COLBRAN	13.9	14.0	99.6	70079	BLUESTON	230	70309 PARACHUT
79047	COLBRAN	138	79173	COLBRAN	13.9	14.0	99.5	79036	GRANDUCT	345	79058 RIFLE CU

### 3. Alternative 2

				ContMV		Loadin					
				A	Rating	g%	Contingency				
70327	PONCHA	115	70394 SMELTER	112.2	80.0	140.3	70330	PORTLAND	115	70456 W.STATION	1
70253	LAMAR_CO	115	70254 LAMAR_CO	133.1	100.0	133.1	70061	BOONE	230	70254 LAMAR_CO	2
70329	PORTLAND	69.0	70330 PORTLAND	33.2	25.0	132.7	70329	PORTLAND	69.0	70330 PORTLAND	1
70045	BANCROFT	115	70208 GRAY_ST.	158.7	120.0	132.3	70023	ALLISON	115	70400 SODALAKE	1
70045	BANCROFT	115	70208 GRAY_ST.	148.0	120.0	123.3	70037	ARAP_B	115	70398 SOUTH1TP	1
70352	READER	115	70353 READER	51.1	42.0	121.7	70352	READER	115	70353 READER	69
70352	READER	115	70353 READER	50.7	42.0	120.6	70352	READER	115	70353 READER	69
70245	LAGARITA	69.0	70325 PLAZA	30.5	26.1	116.8	70230	HOOPERIP	69.0	70376 SANLSVLY	69
70065	BROOMFLD	115	70382 SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382 SEMPER	1
70045	BANCROFT	115	70242 KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400 SODALAKE	1
70244	LAFAYETT	115	70444 VALMONT	149.4	135.0	110.6	70191	FTLUPTON	115	70192 FTLUPTON	2
70005	BRUSH_SS	115	70397 B.CRK_PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397 B.CRK_PS	1
70005	BRUSH_SS	115	70397 B.CRK_PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397 B.CRK_PS	1
73211	WELD IM	115	73212 WELD IM	162.9	150.0	108.6	70470	WELD_PS	115	70471 WELD_PS	2
70108	CHEROKEE	115	70276 MAPLETOL	148.9	138.0	107.9	70039	ARGO	115	70108 CHEROKEE	1
79038	HAYDEN	138	79039 HAYDEN	107.3	100.0	107.3	79038	HAYDEN	138	79039 HAYDEN	2
70108	CHEROKEE	115	70276 MAPLETOL	146.1	138.0	105.8	70073	CALIFOR	115	70108 CHEROKEE	1
70037	ARAP_B	115	70398 SOUTH1TP	126.8	120.0	105.7	70045	BANCROFT	115	70208 GRAY_ST.	1
70059	BO_TERM	115	70444 VALMONT	125.1	120.0	104.3	70059	BO_TERM	115	70444 VALMONT	1
70045	BANCROFT	115	70208 GRAY_ST.	124.9	120.0	104.0	70018	SODALAKE	230	70400 SODALAKE	1
79014	CRAIG	345	79266 MEEKER	614.5	598.0	102.8	79013	CRAIG	230	79059 RIFLE WA	2
70108	CHEROKEE	115	70276 MAPLETOL	141.2	138.0	102.3	70039	ARGO	115	70148 DENVIM	1
70108	CHEROKEE	115	70277 MAPLETO2	141.1	138.0	102.2	70108	CHEROKEE	115	70126 CONOCO	1
70218	HENDERPS	115	70328 FORTAL	80.6	80.0	100.7	70053	BLUERIVR	230	70057 PIARMGN	2
70086	CANONCTY	115	70390 SKALA	120.9	120.0	100.7	70330	PORTLAND	115	70456 W.STATION	1
70218	HENDERPS	115	70328 FORTAL	80.5	80.0	100.6	70057	PIARMGN	230	70156 DILLON	2
70025	ALMSA_TM	115	70026 ALMSA_TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380 SARGENT	69
79047	COLBRAN	138	79173 COLBRAN	13.9	14.0	99.6	70079	BLUESTON	230	70309 PARACHUT	2
79047	COLBRAN	138	79173 COLBRAN	13.9	14.0	99.5	79058	RIFLE_CU	345	79266 MEEKER	3

### 4. Alternative 3

**	From bus	** **	To bus	** CRT	ContM	Rating	Loadin	Contingency		
70327	RONCHA	115	70394 SMELIER		112.2	80.0	140.3	70330 FORILAND	115	70456 W.STATION
70253	LAMAR CO	115	70254 LAMAR CO		133.1	100.0	133.1	70061 BOONE	230	70254 LAMAR CO
70329	FORILAND	69.0	70330 FORILAND		33.2	25.0	132.7	70329 FORILAND	69.0	70330 FORILAND
70045	BANCROFT	115	70208 GRAY ST.		158.7	120.0	132.3	70023 ALLISON	115	70400 SODLAKE
70045	BANCROFT	115	70208 GRAY ST.		148.0	120.0	123.3	70037 ARAP_B	115	70398 SOUTH TIP
70352	READER	115	70353 READER	6	51.1	42.0	121.7	70352 READER	115	70353 READER
70352	READER	115	70353 READER	6	50.7	42.0	120.6	70352 READER	115	70353 READER
70245	LAGARTIA	69.0	70325 BLAZA	6	30.5	26.1	116.8	70230 HOOPERIP	69.0	70376 SANLSMLY
70065	BROOMFIELD	115	70382 SEMPER		89.7	80.0	112.1	70108 CHERCKEE	115	70382 SEMPER
70045	BANCROFT	115	70242 KENDRICK		152.8	138.0	110.7	70023 ALLISON	115	70400 SODLAKE
70244	LAFAYETT	115	70444 VALMONT		149.4	135.0	110.6	70191 FILIPTION	115	70192 FILIPTION
70005	BRUSH SS	115	70397 B.CRK PS		201.7	184.0	109.6	70005 BRUSH_SS	115	70397 B.CRK_PS
70005	BRUSH SS	115	70397 B.CRK PS		201.7	184.0	109.6	70005 BRUSH_SS	115	70397 B.CRK_PS
73211	WELD IM	115	73212 WELD IM	6	162.9	150.0	108.6	70470 WELD_PS	115	70471 WELD_PS
70108	CHEROKEE	115	70276 MAPLEIOL		148.9	138.0	107.9	70039 ARGO	115	70108 CHERCKEE
79038	HAYDEN	138	79039 HAYDEN		106.5	100.0	106.5	79038 HAYDEN	138	79039 HAYDEN
70108	CHEROKEE	115	70276 MAPLEIOL		146.1	138.0	105.9	70073 CALIFOR	115	70108 CHERCKEE
70037	ARAP B	115	70398 SOUTH TIP		126.8	120.0	105.7	70045 BANCROFT	115	70208 GRAY ST.
79014	CRAIG	345	79266 MEEKER		626.0	598.0	104.7	79013 CRAIG	230	79059 RIFLE WA
70059	BO TERM	115	70444 VALMONT		125.1	120.0	104.3	70059 BO_TERM	115	70444 VALMONT
70045	BANCROFT	115	70208 GRAY ST.		124.8	120.0	104.0	70018 SODLAKE	230	70400 SODLAKE
70108	CHEROKEE	115	70276 MAPLEIOL		141.2	138.0	102.3	70039 ARGO	115	70148 DENVIM
70108	CHEROKEE	115	70277 MAPLEIOL		141.1	138.0	102.2	70108 CHERCKEE	115	70126 CONOCO
70086	CANONCIV	115	70390 SKALA		120.9	120.0	100.7	70330 FORILAND	115	70456 W.STATION
70025	ALMSA TM	115	70026 ALMSA TM	6	25.2	25.0	100.6	70361 RIGORDIP	69.0	70380 SARGENT
70218	HENDERES	115	70328 FORIAL		80.3	80.0	100.4	70053 ELIERIVR	230	70057 PIARMGN
70218	HENDERES	115	70328 FORIAL		80.3	80.0	100.3	70057 PIARMGN	230	70156 DILLON
79047	COLBRAN	138	79173 COLBRAN		13.9	14.0	99.6	79058 RIFLE_CU	345	79266 MEEKER
79047	COLBRAN	138	79173 COLBRAN		13.9	14.0	99.5	70079 ELLESTON	230	70309 PARACHUT

### 5. Alternative 4

**	From bus	** **	To bus	** CRT	ContMW	Rating	Loadin	Contingency					
70327	RONCHA	115	70394	SVELTER	112.4	80.0	140.5	70330	RORILAND	115	70456	W.STATION	1
70253	LAMAR CO	115	70254	LAMAR CO	133.1	100.0	133.1	70061	BOONE	230	70254	LAMAR CO	2
70329	RORILAND	69.0	70330	RORILAND	33.2	25.0	132.7	70329	RORILAND	69.0	70330	RORILAND	1
70045	BANCROFT	115	70208	GRAY ST.	158.7	120.0	132.3	70023	ALLISON	115	70400	SODALAKE	1
70045	BANCROFT	115	70208	GRAY ST.	148.0	120.0	123.3	70037	ARAP_B	115	70398	SOUTHHP	1
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353	READER	69
70352	READER	115	70353	READER	50.7	42.0	120.6	70352	READER	115	70353	READER	69
70245	LACARTIA	69.0	70325	ELAZA	30.5	26.1	116.8	70230	HOOPERIP	69.0	70376	SANLSMLY	69
70065	BROOMFIELD	115	70382	SEMPER	89.7	80.0	112.1	70108	CHECCKEE	115	70382	SEMPER	1
70045	BANCROFT	115	70242	KENRICK	152.8	138.0	110.7	70023	ALLISON	115	70400	SODALAKE	1
70244	LAFAYETT	115	70444	VALMONT	149.4	135.0	110.6	70191	FILLUPTON	115	70192	FILLUPTON	2
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
73211	WELD IM	115	73212	WELD IM	162.9	150.0	108.6	70470	WELD_PS	115	70471	WELD_PS	2
70108	CHECCKEE	115	70276	MAPLETOI	149.0	138.0	107.9	70039	ARGO	115	70108	CHECCKEE	1
79038	HAYDEN	138	79039	HAYDEN	106.7	100.0	106.7	79038	HAYDEN	138	79039	HAYDEN	2
70108	CHECCKEE	115	70276	MAPLETOI	146.1	138.0	105.9	70073	CALIFCR	115	70108	CHECCKEE	1
70037	ARAP_B	115	70398	SOUTHHP	126.8	120.0	105.7	70045	BANCROFT	115	70208	GRAY_ST.	1
70059	BO TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO_TERM	115	70444	VALMONT	1
70045	BANCROFT	115	70208	GRAY ST.	124.9	120.0	104.1	70018	SODALAKE	230	70400	SODALAKE	1
70108	CHECCKEE	115	70276	MAPLETOI	141.2	138.0	102.3	70039	ARGO	115	70148	DENVIM	1
70108	CHECCKEE	115	70277	MAPLETO2	141.1	138.0	102.2	70108	CHECCKEE	115	70126	CONOCO	1
79014	CRAIG	345	79266	MEKER	610.2	598.0	102.0	79013	CRAIG	230	79059	RIFLE WA	2
70218	HENDERES	115	70328	RORIAL	80.7	80.0	100.9	70053	BLUERIVR	230	70057	PIARMGN	2
70218	HENDERES	115	70328	RORIAL	80.7	80.0	100.8	70057	PIARMGN	230	70156	DILLON	2
70086	CANONCY	115	70390	SKALA	120.9	120.0	100.7	70330	RORILAND	115	70456	W.STATION	1
70025	ALMSA TM	115	70026	ALMSA TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380	SARGENT	69

## 6. Alternative 5

**	From bus	** **	To bus	** CKT	ContMV A	Rating	Loadin g%	Contingency					
70309	PARACHUT	230	70356	WHEELERS	186.8	120.0	155.7	70309	PARACHUT	230	70358	RIFLE PS	2
70327	PONCHA	115	70394	SMELTER	112.2	80.0	140.3	70330	FORILAND	115	70456	W.STATION	1
70253	LAMAR CO	115	70254	LAMAR CO	133.1	100.0	133.1	70061	BOONE	230	70254	LAMAR_CO	2
70329	FORILAND	69.0	70330	FORILAND	33.2	25.0	132.7	70329	FORILAND	69.0	70330	FORILAND	1
70045	HANCROFT	115	70208	GRAY ST.	158.7	120.0	132.3	70023	ALLISON	115	70400	SODALAKE	1
70045	HANCROFT	115	70208	GRAY ST.	148.0	120.0	123.4	70037	ARAP_B	115	70398	SOUTHITP	1
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353	READER	69
70352	READER	115	70353	READER	50.7	42.0	120.7	70352	READER	115	70353	READER	69
70245	LACARTIA	69.0	70325	BLAZA	30.5	26.1	116.8	70230	HOOPERIP	69.0	70376	SANLSVLY	69
70065	BROOMFD	115	70382	SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382	SEMPER	1
70045	HANCROFT	115	70242	KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400	SODALAKE	1
70244	LAFAYETT	115	70444	VALMONT	149.4	135.0	110.6	70191	FILUPTON	115	70192	FILUPTON	2
70005	BRUSH_SS	115	70397	B.CRK ES	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
70005	BRUSH_SS	115	70397	B.CRK ES	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
73211	WELD IM	115	73212	WELD IM	162.9	150.0	108.6	70470	WELD_PS	115	70471	WELD_PS	2
70108	CHEROKEE	115	70276	MAPLETOI	149.0	138.0	108.0	70039	ARGO	115	70108	CHEROKEE	1
79038	HAYDEN	138	79039	HAYDEN	106.9	100.0	106.9	79038	HAYDEN	138	79039	HAYDEN	2
70108	CHEROKEE	115	70276	MAPLETOI	146.1	138.0	105.9	70073	CALIFCR	115	70108	CHEROKEE	1
70037	ARAP B	115	70398	SOUTHITP	126.9	120.0	105.7	70045	HANCROFT	115	70208	GRAY_ST.	1
70059	BO TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO_TERM	115	70444	VALMONT	1
70045	HANCROFT	115	70208	GRAY ST.	124.9	120.0	104.1	70018	SODALAKE	230	70400	SODALAKE	1
70108	CHEROKEE	115	70276	MAPLETOI	141.2	138.0	102.3	70039	ARGO	115	70148	DENVIM	1
79014	CRAIG	345	79266	MEEKER	611.7	598.0	102.3	79013	CRAIG	230	79059	RIFLE WA	2
70108	CHEROKEE	115	70277	MAPLETOI	141.1	138.0	102.2	70108	CHEROKEE	115	70126	CONOCO	1
79034	GRANDJCT	115	79035	GRANDJCT	51.1	50.0	102.1	79036	GRANDJCT	345	79058	RIFLE CU	3
70218	HENDERES	115	70328	PORTAL	80.7	80.0	100.9	70053	ELUERTVR	230	70057	PIARMGN	2
70218	HENDERES	115	70328	PORTAL	80.7	80.0	100.8	70057	PIARMGN	230	70156	DILLON	2
70086	CANONCIY	115	70390	SKALA	120.9	120.0	100.7	70330	FORILAND	115	70456	W.STATION	1
70025	ALMSA TM	115	70026	ALMSA TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380	SARGENT	69
79047	COLERAN	138	79173	COLERAN	14.0	14.0	99.7	79058	RIFLE CU	345	79266	MEEKER	3

The WheelerPS-Parachute 230kV has a base case limitation of 120 MVA due to metering unit CT's at Parachute. The 3.07-mile line (Ckt No. 5507) was constructed with 1033.5 kcmil (Ortolan) conductor on 6.403R towers (wood h-frame) with a thermal rating of 506 MVA.

## 7. Alternative 6

**	From bus	** **	To bus	** CKT	ContMW A	Rating	Loadin g%	Contingency			
70309	PARACHUT	230	70356 WHEELERS		176.7	120.0	147.2	79058 RIFLE_CU	345	79268 MKRF_TAP	3
70309	PARACHUT	230	70356 WHEELERS		175.8	120.0	146.5	70309 PARACHUT	230	70358 RIFLE_PS	2
70327	PONCHA	115	70394 SMELTER		112.4	80.0	140.4	70330 FORILAND	115	70456 W.STATION	1
70253	LAMAR CO	115	70254 LAMAR CO		133.1	100.0	133.1	70061 BOONE	230	70254 LAMAR_CO	2
70329	FORILAND	69.0	70330 FORILAND		33.2	25.0	132.7	70329 FORILAND	69.0	70330 FORILAND	1
70045	BANCROFT	115	70208 GRAY ST.		158.7	120.0	132.2	70023 ALLISON	115	70400 SODALAKE	1
70045	BANCROFT	115	70208 GRAY ST.		147.9	120.0	123.3	70037 ARAP_B	115	70398 SOUTHPT	1
70352	READER	115	70353 READER	6	51.1	42.0	121.7	70352 READER	115	70353 READER	69
70352	READER	115	70353 READER	6	50.7	42.0	120.6	70352 READER	115	70353 READER	69
70245	LAGARITA	69.0	70325 BLAZA	6	30.5	26.1	116.8	70230 HOOPERIP	69.0	70376 SANLSMLY	69
70065	BROOMFIELD	115	70382 SEMPER		89.7	80.0	112.1	70108 CHEROKEE	115	70382 SEMPER	1
70045	BANCROFT	115	70242 KENDRICK		152.8	138.0	110.7	70023 ALLISON	115	70400 SODALAKE	1
70244	LAFAYETT	115	70444 VALMONT		149.4	135.0	110.6	70191 FILUPTION	115	70192 FILUPTION	2
70005	BRUSH SS	115	70397 B.CRK PS		201.7	184.0	109.6	70005 BRUSH_SS	115	70397 B.CRK_PS	1
70005	BRUSH SS	115	70397 B.CRK PS		201.7	184.0	109.6	70005 BRUSH_SS	115	70397 B.CRK_PS	1
73211	WELD IM	115	73212 WELD IM		162.9	150.0	108.6	70470 WELD_PS	115	70471 WELD_PS	2
70108	CHEROKEE	115	70276 MAPLETOI		148.9	138.0	107.9	70039 ARGO	115	70108 CHEROKEE	1
79014	CRAIG	345	79266 MEEKER		635.6	598.0	106.3	79013 CRAIG	230	79059 RIFLE WA	2
79038	HAYDEN	138	79039 HAYDEN		106.0	100.0	106.0	79038 HAYDEN	138	79039 HAYDEN	2
70108	CHEROKEE	115	70276 MAPLETOI		146.0	138.0	105.8	70073 CALIFOR	115	70108 CHEROKEE	1
70037	ARAP B	115	70398 SOUTHPT		126.8	120.0	105.7	70045 BANCROFT	115	70208 GRAY_ST.	1
70059	BO TERM	115	70444 VALMONT		125.1	120.0	104.3	70059 BO TERM	115	70444 VALMONT	1
70045	BANCROFT	115	70208 GRAY ST.		124.8	120.0	104.0	70018 SODALAKE	230	70400 SODALAKE	1
70108	CHEROKEE	115	70276 MAPLETOI		141.1	138.0	102.3	70039 ARGO	115	70148 DENVIM	1
70108	CHEROKEE	115	70277 MAPLETO2		141.0	138.0	102.2	70108 CHEROKEE	115	70126 CONOCO	1
79034	GRANDJCT	115	79035 GRANDJCT		50.4	50.0	100.9	79036 GRANDJCT	345	79058 RIFLE_CU	3
70086	CANONCTY	115	70390 SKALA		120.9	120.0	100.7	70330 FORILAND	115	70456 W.STATION	1
70025	ALMSA TM	115	70026 ALMSA TM	6	25.2	25.0	100.6	70361 RIOGRDIP	69.0	70380 SARGENT	69
70218	HENDERES	115	70328 PORTAL		80.1	80.0	100.1	70053 BLUERIVR	230	70057 PIARMGN	2
70218	HENDERES	115	70328 PORTAL		80.0	80.0	100.0	70057 PIARMGN	230	70156 DILLON	2
79047	COLBRAN	138	79173 COLBRAN		13.9	14.0	99.4	70079 BLUESTON	230	70309 PARACHUT	2

The WheelerPS-Parachute 230kV has a base case limitation of 120 MVA due to metering unit CT's at Parachute. The 3.07-mile line (Ckt No. 5507) was constructed with 1033.5 kcmil (Ortolan) conductor on 6.403R towers (wood h-frame) with a thermal rating of 506 MVA.

## 8. Alternative 7

**	From bus	** **	To bus	** CRT	ContMV A	Rating	Loadin g%	Contingency					
70327	PONCHA	115	70394	SMELTER	112.2	80.0	140.3	70330	PORTLAND	115	70456	W. STATION	1
70253	LAMAR CO	115	70254	LAMAR CO	133.1	100.0	133.1	70061	BOONE	230	70254	LAMAR_CO	2
70329	PORTLAND	69.0	70330	PORTLAND	33.2	25.0	132.7	70329	PORTLAND	69.0	70330	PORTLAND	1
70045	BANCROFT	115	70208	GRAY ST.	158.7	120.0	132.3	70023	ALLISON	115	70400	SODALAKE	1
70045	BANCROFT	115	70208	GRAY ST.	148.0	120.0	123.4	70037	ARAP_B	115	70398	SOUTHHTP	1
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353	READER	69
70352	READER	115	70353	READER	50.7	42.0	120.7	70352	READER	115	70353	READER	69
70245	IAGARITA	69.0	70325	FLAZA	30.5	26.1	116.8	70230	HOPERIP	69.0	70376	SANLSVLY	69
70065	BROOMFID	115	70382	SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382	SEMPER	1
70045	BANCROFT	115	70242	KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400	SODALAKE	1
70244	LAFAYETT	115	70444	VALMONT	149.4	135.0	110.6	70191	FILUPTON	115	70192	FILUPTON	2
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
73211	WELD IM	115	73212	WELD IM	162.9	150.0	108.6	70470	WELD_PS	115	70471	WELD_PS	2
70108	CHEROKEE	115	70276	MAPLETOL	149.0	138.0	107.9	70039	ARGO	115	70108	CHEROKEE	1
79038	HAYDEN	138	79039	HAYDEN	106.9	100.0	106.9	79038	HAYDEN	138	79039	HAYDEN	2
70108	CHEROKEE	115	70276	MAPLETOL	146.1	138.0	105.9	70073	CALIFOR	115	70108	CHEROKEE	1
70037	ARAP_B	115	70398	SOUTHHTP	126.9	120.0	105.7	70045	BANCROFT	115	70208	GRAY_ST.	1
70059	BO_TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO_TERM	115	70444	VALMONT	1
70045	BANCROFT	115	70208	GRAY ST.	124.9	120.0	104.1	70018	SODALAKE	230	70400	SODALAKE	1
70108	CHEROKEE	115	70276	MAPLETOL	141.2	138.0	102.3	70039	ARGO	115	70148	DENVIM	1
70108	CHEROKEE	115	70277	MAPLETOL	141.1	138.0	102.2	70108	CHEROKEE	115	70126	CONOCO	1
79014	CRAIG	345	79266	MEEKER	611.4	598.0	102.2	79013	CRAIG	230	79059	RIFLE_WA	2
70218	HENDERES	115	70328	PORTAL	80.7	80.0	100.9	70053	BLUERIVR	230	70057	PIARMGN	2
79034	GRANDJCT	115	79035	GRANDJCT	50.4	50.0	100.9	79036	GRANDJCT	345	79058	RIFLE_CU	3
70218	HENDERES	115	70328	PORTAL	80.7	80.0	100.8	70057	PIARMGN	230	70156	DILLON	2
70086	CANONCIY	115	70390	SKALA	120.9	120.0	100.7	70330	PORTLAND	115	70456	W. STATION	1
70025	ALMSA_TM	115	70026	ALMSA_TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380	SARGENT	69
79047	COLBRAN	138	79173	COLBRAN	14.0	14.0	99.7	79058	RIFLE_CU	345	79266	MEEKER	3
79047	COLBRAN	138	79173	COLBRAN	13.9	14.0	99.5	70079	BLUESTON	230	70309	PARACHUT	2

## 9. Alternative 8

**	From bus	** **	Tb bus	** CKT	ContMV A	Rating	Loadin g%	Contingency					
70327	FONCHA	115	70394	SMEALTER	111.8	80.0	139.7	70330	PORTLAND	115	70456	W.STATION	1
70253	LAMAR CO	115	70254	LAMAR CO	133.1	100.0	133.1	70061	BOONE	230	70254	LAMAR_CO	2
70329	PORTLAND	69.0	70330	PORTLAND	33.2	25.0	132.7	70329	PORTLAND	69.0	70330	PORTLAND	1
70045	BANCROFT	115	70208	GRAY ST.	158.8	120.0	132.3	70023	ALLISON	115	70400	SODALAKE	1
70045	BANCROFT	115	70208	GRAY ST.	148.1	120.0	123.4	70037	ARAP_B	115	70398	SOUTHITP	1
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353	READER	69
70352	READER	115	70353	READER	50.7	42.0	120.7	70352	READER	115	70353	READER	69
70245	LAGARITA	69.0	70325	LAZA	30.5	26.1	116.9	70230	HOOPERIP	69.0	70376	SANLSVLY	69
70065	BROOMFLD	115	70382	SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382	SEMPER	1
70045	BANCROFT	115	70242	KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400	SODALAKE	1
70244	LAFAVETT	115	70444	VALMONT	149.4	135.0	110.6	70191	FILUPTON	115	70192	FILUPTON	2
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
73211	WELD IM	115	73212	WELD IM	162.9	150.0	108.6	70470	WELD_PS	115	70471	WELD_PS	2
70108	CHEROKEE	115	70276	MAPLETOI	149.2	138.0	108.1	70039	ARGO	115	70108	CHEROKEE	1
79038	HAYDEN	138	79039	HAYDEN	107.6	100.0	107.6	79038	HAYDEN	138	79039	HAYDEN	2
79047	COLBRAN	138	79173	COLBRAN	15.0	14.0	107.1	70309	PARACHUT	230	70358	RIFLE_PS	2
70205	GRANDJCT	230	79036	GRANDJCT	298.9	280.0	106.8	70309	PARACHUT	230	70358	RIFLE_PS	2
70108	CHEROKEE	115	70276	MAPLETOI	146.3	138.0	106.0	70073	CALIFOR	115	70108	CHEROKEE	1
70037	ARAP B	115	70398	SOUTHITP	126.9	120.0	105.8	70045	BANCROFT	115	70208	GRAY_ST.	1
70059	BO TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO TERM	115	70444	VALMONT	1
70045	BANCROFT	115	70208	GRAY ST.	124.9	120.0	104.1	70018	SODALAKE	230	70400	SODALAKE	1
70108	CHEROKEE	115	70276	MAPLETOI	141.4	138.0	102.5	70039	ARGO	115	70148	DENVIM	1
70108	CHEROKEE	115	70277	MAPLETO2	141.2	138.0	102.3	70108	CHEROKEE	115	70126	CONOCO	1
79014	CRAIG	345	79266	MEEKER	611.8	598.0	102.3	79013	CRAIG	230	79059	RIFLE_WA	2
79034	GRANDJCT	115	79035	GRANDJCT	51.0	50.0	102.0	79036	GRANDJCT	345	79049	MONIROSE	3
70218	HENDERPS	115	70328	PORTAL	80.7	80.0	100.9	70053	BLUERIVR	230	70057	PIARMGN	2
70214	GRANDJCT	69.0	79034	GRANDJCT	42.4	42.0	100.9	70079	BLUESTON	230	70309	PARACHUT	2
70218	HENDERPS	115	70328	PORTAL	80.6	80.0	100.8	70057	PIARMGN	230	70156	DILLON	2
79047	COLBRAN	138	79173	COLBRAN	14.1	14.0	100.8	79036	GRANDJCT	345	79058	RIFLE_CU	3
70086	CANONCIY	115	70390	SKALA	120.8	120.0	100.7	70330	PORTLAND	115	70456	W.STATION	1
70309	PARACHUT	230	70358	RIFLE_PS	442.1	439.0	100.7	79036	GRANDJCT	345	79058	RIFLE_CU	3
70025	ALMSA TM	115	70026	ALMSA TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380	SARGENT	69
79047	COLBRAN	138	79173	COLBRAN	14.0	14.0	100.0	70113	CLIFTON	230	70205	GRANDJCT	2

### 10. Alternative 9

**	From bus	** **	To bus	** CKT	ContMVA	Rating	Loadin g%	Contingency					
70327	BONCHA	115	70394	SMELTER	112.1	80.0	140.2	70330	PORTLAND	115	70456	W.STATION	1
70253	LAVAR CO	115	70254	LAVAR CO	133.1	100.0	133.1	70061	BODNE	230	70254	LAVAR_CO	2
70329	PORTLAND	69.0	70330	PORTLAND	33.2	25.0	132.7	70329	PORTLAND	69.0	70330	PORTLAND	1
70045	BANCROFT	115	70208	GRAY ST.	158.8	120.0	132.3	70023	ALLISON	115	70400	SODALAKE	1
70045	BANCROFT	115	70208	GRAY ST.	148.1	120.0	123.4	70037	ARAP_B	115	70398	SOUTHHP	1
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353	READER	69
70352	READER	115	70353	READER	50.7	42.0	120.7	70352	READER	115	70353	READER	69
70245	LAGARITA	69.0	70325	ELAZA	30.5	26.1	116.8	70230	HOOPERIP	69.0	70376	SANLSMLY	69
70065	BROOMFIELD	115	70382	SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382	SEMPER	1
70045	BANCROFT	115	70242	KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400	SODALAKE	1
70244	LAFAVETT	115	70444	VALMONT	149.3	135.0	110.6	70191	FILLUPTON	115	70192	FILLUPTON	2
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
73211	WELD IM	115	73212	WELD IM	162.9	150.0	108.6	70470	WELD_PS	115	70471	WELD_PS	2
70108	CHEROKEE	115	70276	MAPLETO1	149.2	138.0	108.1	70039	ARGO	115	70108	CHEROKEE	1
79038	HAYDEN	138	79039	HAYDEN	106.1	100.0	106.1	79038	HAYDEN	138	79039	HAYDEN	2
70108	CHEROKEE	115	70276	MAPLETO1	146.3	138.0	106.0	70073	CALIFOR	115	70108	CHEROKEE	1
70037	ARAP B	115	70398	SOUTHHP	126.9	120.0	105.7	70045	BANCROFT	115	70208	GRAY_ST.	1
70059	BO TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO_TERM	115	70444	VALMONT	1
70045	BANCROFT	115	70208	GRAY ST.	124.9	120.0	104.1	70018	SODALAKE	230	70400	SODALAKE	1
79047	COLBRAN	138	79173	COLBRAN	14.5	14.0	103.7	70309	PARACHUT	230	70358	RIFLE_PS	2
70108	CHEROKEE	115	70276	MAPLETO1	141.4	138.0	102.5	70039	ARGO	115	70148	DENVIM	1
70108	CHEROKEE	115	70277	MAPLETO2	141.2	138.0	102.3	70108	CHEROKEE	115	70126	CONOCO	1
79014	CRAIG	345	79266	MEEKER	611.0	598.0	102.2	79013	CRAIG	230	79059	RIFLE WA	2
70218	HENDERES	115	70328	PORTAL	80.8	80.0	101.0	70053	BLUERIVR	230	70057	PIARMGN	2
70309	PARACHUT	230	70358	RIFLE PS	443.6	439.0	101.0	70113	CLIFTON	230	70205	GRANDUCT	2
70218	HENDERES	115	70328	PORTAL	80.7	80.0	100.9	70057	PIARMGN	230	70156	DILLON	2
70086	CANONCTY	115	70390	SKALA	120.9	120.0	100.7	70330	PORTLAND	115	70456	W.STATION	1
70025	ALMSA TM	115	70026	ALMSA TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380	SARGENT	69

### 11. Alternative 10

**	From bus	** **	To bus	** CRT	ContMV A	Rating	Loadin g%	Contingency					
70327	PONCHA	115	70394	SMELTER	112.1	80.0	140.1	70330	PORTLAND	115	70456	W.STATION	1
70253	LAMAR CO	115	70254	LAMAR CO	133.1	100.0	133.1	70061	BOONE	230	70254	LAMAR_CO	2
70329	PORTLAND	69.0	70330	PORTLAND	33.2	25.0	132.7	70329	PORTLAND	69.0	70330	PORTLAND	1
70045	BANCROFT	115	70208	GRAY ST.	158.8	120.0	132.3	70023	ALLISON	115	70400	SODALAKE	1
70045	BANCROFT	115	70208	GRAY ST.	148.1	120.0	123.4	70037	ARAP_B	115	70398	SOUTHTP	1
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353	READER	69
70352	READER	115	70353	READER	50.7	42.0	120.7	70352	READER	115	70353	READER	69
70245	LAGARITA	69.0	70325	PLAZA	30.5	26.1	116.8	70230	HOOPERIP	69.0	70376	SANLSVLY	69
70065	BROOMFIELD	115	70382	SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382	SEMPER	1
70045	BANCROFT	115	70242	KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400	SODALAKE	1
70244	LAFAVETT	115	70444	VALMONT	149.3	135.0	110.6	70191	FITLUPTON	115	70192	FITLUPTON	2
79034	GRANDJCT	115	79035	GRANDJCT	55.0	50.0	109.9	79036	GRANDJCT	345	79049	MONIROSE	3
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH_SS	115	70397	B.CRK_PS	1
73211	WELD IM	115	73212	WELD IM	162.9	150.0	108.6	70470	WELD_PS	115	70471	WELD_PS	2
70108	CHEROKEE	115	70276	MAPLETOI	149.2	138.0	108.1	70039	ARGO	115	70108	CHEROKEE	1
70108	CHEROKEE	115	70276	MAPLETOI	146.3	138.0	106.0	70073	CALIFOR	115	70108	CHEROKEE	1
79034	GRANDJCT	115	79035	GRANDJCT	53.0	50.0	105.9	79036	GRANDJCT	345	79058	RIFLE_CU	3
79038	HAYDEN	138	79039	HAYDEN	105.9	100.0	105.9	79038	HAYDEN	138	79039	HAYDEN	2
70037	ARAP B	115	70398	SOUTHTP	126.9	120.0	105.7	70045	BANCROFT	115	70208	GRAY_ST.	1
70059	BO TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO_TERM	115	70444	VALMONT	1
70045	BANCROFT	115	70208	GRAY ST.	124.9	120.0	104.1	70018	SODALAKE	230	70400	SODALAKE	1
70214	GRANDJCT	69.0	79034	GRANDJCT	43.3	42.0	103.1	70079	BLUESTON	230	70309	PARACHUT	2
79014	CRAIG	345	79266	MEEKER	615.0	598.0	102.8	79013	CRAIG	230	79059	RIFLE_WA	2
70108	CHEROKEE	115	70276	MAPLETOI	141.4	138.0	102.5	70039	ARGO	115	70148	DENVIM	1
70108	CHEROKEE	115	70277	MAPLETO2	141.2	138.0	102.3	70108	CHEROKEE	115	70126	CONOCO	1
79034	GRANDJCT	115	79035	GRANDJCT	51.0	50.0	102.0	70079	BLUESTON	230	70309	PARACHUT	2
70218	HENDERES	115	70328	PORTAL	80.7	80.0	100.8	70053	BLUERIVR	230	70057	PIARMGN	2
70218	HENDERES	115	70328	PORTAL	80.6	80.0	100.8	70057	PIARMGN	230	70156	DILLON	2
70086	CANONCTY	115	70390	SKALA	120.9	120.0	100.7	70330	PORTLAND	115	70456	W.STATION	1
70025	ALMSA TM	115	70026	ALMSA TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380	SARGENT	69

## 12. Alternative 11

**	From bus	** **	To bus	** CKT	ContMW A	Rating	Loadin g%	Contingency			
	70327 BONCHA	115	70394 SMELTER		111.8	80.0	139.8	70330 PORTLAND	115	70456 W.STATION	1
	70253 LAMAR CO	115	70254 LAMAR CO		133.1	100.0	133.1	70061 BOONE	230	70254 LAMAR_CO	2
	70329 PORTLAND	69.0	70330 PORTLAND		33.2	25.0	132.7	70329 PORTLAND	69.0	70330 PORTLAND	1
	70045 BANCROFT	115	70208 GRAY ST.		158.8	120.0	132.3	70023 ALLISON	115	70400 SODALAKE	1
	70309 PARACHUTE	230	70358 RIFLE PS		563.9	439.0	128.4	79058 RIFLE_CU	345	79097 RFGJ_TAP	3
	70045 BANCROFT	115	70208 GRAY ST.		148.1	120.0	123.4	70037 ARAP_B	115	70398 SOUTHTP	1
	70352 READER	115	70353 READER	6	51.1	42.0	121.7	70352 READER	115	70353 READER	69
	70352 READER	115	70353 READER	6	50.7	42.0	120.7	70352 READER	115	70353 READER	69
	70245 LACARTIA	69.0	70325 PLAZA	6	30.5	26.1	116.9	70230 HOOPERIP	69.0	70376 SANLSMLY	69
	70065 BROOMFIELD	115	70382 SEMPER		89.7	80.0	112.1	70108 CHEROKEE	115	70382 SEMPER	1
	70045 BANCROFT	115	70242 KENDRICK		152.8	138.0	110.7	70023 ALLISON	115	70400 SODALAKE	1
	70244 LAFAYETT	115	70444 VALMONT		149.3	135.0	110.6	70191 FILLIPTON	115	70192 FILLIPTON	2
	70005 BRUSH SS	115	70397 B.CRK PS		201.7	184.0	109.6	70005 BRUSH_SS	115	70397 B.CRK_PS	1
	70005 BRUSH SS	115	70397 B.CRK PS		201.7	184.0	109.6	70005 BRUSH_SS	115	70397 B.CRK_PS	1
	73211 WELD IM	115	73212 WELD IM		162.9	150.0	108.6	70470 WELD_PS	115	70471 WELD_PS	2
	70108 CHEROKEE	115	70276 MAPLETOL		149.3	138.0	108.2	70039 ARGO	115	70108 CHEROKEE	1
	79038 HAYDEN	138	79039 HAYDEN		106.9	100.0	106.9	79038 HAYDEN	138	79039 HAYDEN	2
	70108 CHEROKEE	115	70276 MAPLETOL		146.4	138.0	106.1	70073 CALIFOR	115	70108 CHEROKEE	1
	70037 ARAP B	115	70398 SOUTHTP		126.9	120.0	105.7	70045 BANCROFT	115	70208 GRAY_ST.	1
	70059 BO TERM	115	70444 VALMONT		125.1	120.0	104.3	70059 BO_TERM	115	70444 VALMONT	1
	70045 BANCROFT	115	70208 GRAY ST.		125.0	120.0	104.1	70018 SODALAKE	230	70400 SODALAKE	1
	79014 CRAIG	345	79266 MEEKER		620.0	598.0	103.7	79013 CRAIG	230	79059 RIFLE WA	2
	70108 CHEROKEE	115	70276 MAPLETOL		141.5	138.0	102.6	70039 ARGO	115	70148 DENVIM	1
	70108 CHEROKEE	115	70277 MAPLETOL		141.3	138.0	102.4	70108 CHEROKEE	115	70126 CONOCO	1
	70086 CANONCIV	115	70390 SKALA		120.8	120.0	100.7	70330 PORTLAND	115	70456 W.STATION	1
	70218 HENDERES	115	70328 PORTAL		80.5	80.0	100.6	70053 BLUERIVR	230	70057 PIARMN	2
	70025 ALMSA TM	115	70026 ALMSA TM	6	25.2	25.0	100.6	70361 RIOGRDIP	69.0	70380 SARGENT	69
	70218 HENDERES	115	70328 PORTAL		80.4	80.0	100.5	70057 PIARMN	230	70156 DILLON	2
	79047 COLBRAN	138	79173 COLBRAN		14.0	14.0	100.3	79058 RIFLE_CU	345	79266 MEEKER	3

### 13. Alternative 12

**	From bus	** **	To bus	** CKT	ContMW A	Rating	Loadin g%	Contingency				
70327	PONCHA	115	70394	SMELTER	111.9	80.0	139.9	70330	PORTLAND	115	70456 W.STATION	1
70253	LAMAR CO	115	70254	LAMAR CO	133.1	100.0	133.1	70061	BOONE	230	70254 LAMAR CO	2
70329	PORTLAND	69.0	70330	PORTLAND	33.2	25.0	132.7	70329	PORTLAND	69.0	70330 PORTLAND	1
70045	BANCROFT	115	70208	GRAY ST.	158.7	120.0	132.3	70023	ALLISON	115	70400 SODALAKE	1
70045	BANCROFT	115	70208	GRAY ST.	148.0	120.0	123.4	70037	ARAP B	115	70398 SOUTHWIP	1
70352	READER	115	70353	READER	51.1	42.0	121.7	70352	READER	115	70353 READER	69
70352	READER	115	70353	READER	50.7	42.0	120.7	70352	READER	115	70353 READER	69
70309	PARACHUT	230	70358	RIFLE PS	521.8	439.0	118.9	79058	RIFLE CU	345	79097 RFGJ TAP	3
70245	LACARTIA	69.0	70325	PLAZA	30.5	26.1	116.9	70230	HOOPERIP	69.0	70376 SANISLVY	69
70065	BROOMFLD	115	70382	SEMPER	89.7	80.0	112.1	70108	CHEROKEE	115	70382 SEMPER	1
70045	BANCROFT	115	70242	KENDRICK	152.8	138.0	110.7	70023	ALLISON	115	70400 SODALAKE	1
70244	LAFAVETT	115	70444	VALMONT	149.4	135.0	110.6	70191	FILLUPTON	115	70192 FILLUPTON	2
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH SS	115	70397 B.CRK PS	1
70005	BRUSH SS	115	70397	B.CRK PS	201.7	184.0	109.6	70005	BRUSH SS	115	70397 B.CRK PS	1
73211	WELD IM	115	73212	WELD IM	162.9	150.0	108.6	70470	WELD PS	115	70471 WELD PS	2
70108	CHEROKEE	115	70276	MAPLETOI	149.1	138.0	108.0	70039	ARGO	115	70108 CHEROKEE	1
79038	HAYDEN	138	79039	HAYDEN	106.7	100.0	106.7	79038	HAYDEN	138	79039 HAYDEN	2
70108	CHEROKEE	115	70276	MAPLETOI	146.2	138.0	105.9	70073	CALIFOR	115	70108 CHEROKEE	1
70037	ARAP B	115	70398	SOUTHWIP	126.9	120.0	105.7	70045	BANCROFT	115	70208 GRAY ST.	1
70059	BO TERM	115	70444	VALMONT	125.1	120.0	104.3	70059	BO TERM	115	70444 VALMONT	1
70045	BANCROFT	115	70208	GRAY ST.	124.9	120.0	104.1	70018	SODALAKE	230	70400 SODALAKE	1
79014	CRAIG	345	79266	MEEKER	621.0	598.0	103.8	79013	CRAIG	230	79059 RIFLE WA	2
70108	CHEROKEE	115	70276	MAPLETOI	141.3	138.0	102.4	70039	ARGO	115	70148 DENVIM	1
70108	CHEROKEE	115	70277	MAPLETO2	141.2	138.0	102.3	70108	CHEROKEE	115	70126 CONOCO	1
70086	CANONCTY	115	70390	SKALA	120.8	120.0	100.7	70330	PORTLAND	115	70456 W.STATION	1
70218	HENDERES	115	70328	PORTAL	80.5	80.0	100.6	70053	BLUERIVR	230	70057 PIARMGN	2
70218	HENDERES	115	70328	PORTAL	80.4	80.0	100.6	70057	PIARMGN	230	70156 DILLON	2
70025	ALMSA TM	115	70026	ALMSA TM	25.2	25.0	100.6	70361	RIOGRDIP	69.0	70380 SARGENT	69
79047	COLERAN	138	79173	COLERAN	14.0	14.0	100.1	79058	RIFLE CU	345	79266 MEEKER	3