Annual Report
2021 Vegetation Management Report
and 2022 Vegetation Management Plan
20 CSR 4240-23.030
April 1, 2022

Sam McGarrah
Director of System Performance

2021Vegetation Management Report

6(C).

Summary of the information required in subsection 6(B). Liberty Utilities contracted with six contractors to assist in maintaining the vegetation on the system.

They include:

- 10 CN Utility Consultant foresters, who plan and audit the work performed.
- 34 Wright Tree Service employees which includes 2 General Foreman under the supervision of a Project Manager. 12 two-men bucket/manual crews, 1 Jarraff crew and 3 two-man spray crews.
- 27 Shade Tree employees which includes 2 General Foreman under the supervision of a Regional Project Manager. 12 two-men bucket/manual crews.
- 14 EDKO TGR and Herbicide applicators under the guidance of 1 Supervisor.
- Kenny Singer Construction utilized for a variety of heavy equipment situations and planning and application of TGR and herbicide.
- Mid Central Contractors operate special mechanical clearing equipment on an as needed basis for select right-of-way situations.

There were no incidents of safety hazards or accidents that resulted in death or serious injury in 2021.

6(C)1.

Expenditures for vegetation management in the preceding year of 2021: $10,083,087.

6(C)2.

Vegetation Management's budget for the current year of 2022: $9,621,194.

6(C)3. Distribution Circuits completion dates and miles trimmed

ER-2019-0374 MPSC DR - 0247 (2) Distribution

Circuit ID	Area	Sub	State	Maint. Schedule	2021 Scheduled Miles	2021 Completed Miles	Conventional Completion Date	Mechanical	Herbicide	TGR
1861	212	186	OK	3	36.3	36.3	12/15/2021	x	x	x
3811	212	381	OK	3	12.2	12.2	12/18/2021		x	x
3812	212	381	OK	3	13.6	13.6	12/18/2021		x	x
4281	212	428	OK	3	1.6	1.6	11/20/2021	x		
4282	212	428	OK	3	9.0	9.0	11/27/2021		x	x
2781	212	278	KS	3	0.7	0.7	5/29/2021	x		
2782	212	278	KS	3	27.7	27.7	10/23/2021	x	x	x
2783	212	278	KS	6	2.9	2.9	8/28/2021	x	x	x
2784	212	278	KS	6	24.8	24.8	10/23/2021	x	x	x
1451	214	145	MO	3	10.7	10.7	10/16/2021	x	x	
1453	214	145	MO	3	20.3	20.3	12/18/2021	x	x	x
1454	214	145	MO	3	13.8	13.8	10/16/2021	x	x	x
1455	214	145	MO	3	7.7	7.7	9/18/2021	x	x	x
454	214	284	MO	3	0.8	0.8	6/26/2021	x	x	x
455	214	284	MO	3	2.1	2.1	9/18/2021	x	x	x
457	214	284	MO	3	1.3	1.3	9/18/2021	x	x	x
3911	214	391	MO	3	0.4	0.4	8/14/2021	x	x	x
3912	214	391	MO	3	15.4	15.4	8/7/2021		x	x
3913	214	391	MO	3	19.5	19.5	11/13/2021		x	x
3914	214	391	MO	3	10.3	10.3	8/7/2021		x	x
4691	214	469	MO	3	2.3	2.3	11/13/2021	x	x	x
4692	214	469	MO	3	29.1	29.1	8/7/2021		x	x
4693	214	469	MO	3	0.9	0.9	8/14/2021		x	x
1452	214	145	MO	6	21.3	21.3	12/18/2021	x	x	x
1101	215	110	MO	3	1.7	1.7	10/2/2021		x	
1102	215	110	MO	3	13.3	13.3	1/9/2021		x	
1103	215	110	MO	3	20.2	20.2	6/19/2021			x
3661	215	366	MO	3	15.1	15.1	6/12/2021		x	x
4171	215	417	MO	3	26.6	26.6	9/4/2021		x	x
4173	215	417	MO	3	6.0	6.0	6/9/2021		x	x
1081	215	108	MO	6	4.3	4.3	3/27/2021		x	x
1082	215	108	MO	6	119.8	119.8	9/18/2021			x
1083	215	108	MO	6	1.3	1.3	1/9/2021		x	
1084	215	108	MO	6	1.2	1.2	4/17/2021		x	x
3662	215	366	MO	6	25.3	25.3	4/17/2021			x
3663	215	366	MO	6	29.8	29.8	5/13/2021			
3664	215	366	MO	6	41.9	41.9	7/17/2021		x	
4172	215	417	MO	6	54.8	54.8	9/11/2021			x
1104	215	110	MO	3	4.0	4.0	7/17/2021		x	x
3221	216	322	MO	3	34.1	34.1	11/6/2021		x	x
1311	216	131	MO	6	24.2	24.2	10/16/2021		x	x
1312	216	131	MO	6	49.8	49.8	9/18/2021		x	x

Circuit ID	Area	Sub	State	Maint. Schedule	2021 Scheduled Miles	2021 Completed Miles	Conventional Completion Date	Mechanical	Herbicide	TGR					
3222	216	322	MO	6	27.7	27.7	11/13/2021		x	x					
4431	216	443	MO	6	45.6	45.6	11/20/2021		x	x					
4432	216	443	MO	6	17.4	17.4	11/13/2021		x	x					
7001	216	700	AR	6	29.1	29.1	12/25/2021		x	x					
7002	216	700	AR	6	12.9	12.9	11/27/2021		x	x					
7003	216	700	AR	6	38.2	38.2	12/18/2021		x	x					
7004	216	700	AR	6	3.9	3.9	11/20/2021		x	x					
3311	209	331	MO	3	8.2	8.2	3/20/2021	x							
3312	209	331	MO	3	4.7	4.7	1/4/2021	x							
3313	209	331	MO	3	6.1	6.1	2/8/2021	x	x						
3314	209	331	MO	3	6.0	6.0	1/18/2021	x	x						
3315	209	331	MO	3	26.1	26.1	4/19/2021	x							
4101	209	410	MO	3	18.1	18.1	5/26/2021	x							
4102	209	410	MO	3	10.5	10.5	11/17/2021	x	x	x					
3591	211	359	MO	3	15.9	15.9	12/29/2021	x	x	x					
3593	211	359	MO	3	5.3	5.3	8/14/2021	x	x	x					
3594	211	359	MO	3	9.3	9.3	9/4/2021	x	x	x					
1521	211	152	MO	6	31.6	31.6	1/6/2022	x							
1522	211	152	MO	6	15.8	15.8	12/14/2021	x							
1523	211	152	MO	6	54.8	54.8	1/6/2022	x							
3592	211	359	MO	6	51.3	51.3	12/29/2021	x	x	x					
3621	211	362	MO	6	74.2	74.2	1/7/2021	x		x					
4371	211	437	MO	6	42.4	42.4	11/20/2021	x	x						
4372	211	437	MO	6	41.5	41.5	10/23/2021	x							
4373	211	437	MO	6	72.0	72.0	12/22/2021	x							
4311	213	431	MO	3	9.4	9.4	8/14/2021		x	x					
4312	213	431	MO	3	6.0	6.0	9/18/2021		x	x					
4313	213	431	MO	3	27.6	27.6	9/18/2021	x	x						
2091	213	209	MO	6	57.3	57.3	9/18/2021	x	x	x					
2092	213	209	MO	6	33.9	33.9	12/21/2021	x	x	x					
2491	213	249	MO	6	14.6	14.6	1/22/2022		x	x					
2492	213	249	MO	6	6.4	6.4	1/12/2022		x	x					
3421	213	342	MO	6	6.2	6.2	4/26/2021		x						
3422	213	342	MO	6	34.5	34.5	9/18/2021	x	x						
3423	213	342	MO	6	22.2	22.2	7/20/2021		x						
3301	217	330	MO	3	16.4	16.4	3/2/2022	x							
3302	217	330	MO	3	11.0	11.0	2/19/2022	x							
3303	217	330	MO	3	19.3	19.3	3/2/2022	x	x						
3304	217	330	MO	3	19.8	19.8	2/19/2022	x							
3305	217	330	MO	3	0.7	0.7	3/8/2021		x						
3694	217	369	MO	3	8.2	8.2	12/22/2021	x							
3702	217	370	MO	3	11.8	11.8	3/25/2022		x						
3691	217	369	MO	6	5.6	5.6	12/14/2021	x		x					
3692	217	369	MO	6	10.8	10.8	11/17/2021	x							

Circuit ID	Area	Sub	State	Maint. Schedule	2021 Scheduled Miles	2021 Completed Miles	Conventional Completion Date	Mechanical	Herbicide	TGR					
3693	217	369	MO	6	4.2	4.2	12/14/2021	x							
3701	217	370	MO	6	22.2	22.2	3/11/2021	x							
3971	217	397	MO	6	18.8	18.8	3/11/2021	x							
					1,793	**1,793**									

ER-2019-0374 MPSC DR - 0247 (2) Transmission

Line#	NERC	KV	State	From--Expanded	To-- Epanded	2021 Sceduled Miles	2020 Completed Miles	Conventional Completion Date	Mechanical	Herbicide
94-0	Y	345	M	SUB 383 - MONETT	BROOKLINE 345	22.15	22.15	8/14/2021		x
21-0		69	A	SUB 326 - DECATUR NORTH	SUB 392 - DECATUR SOUTH	1.6	1.6	2/19/2022		x
21-0		69	A	SUB 326 - DECATUR NORTH	SUB 700 - GRAVETTE	4.4	4.4	2/19/2022		x
21-0		69	M	SUB 56 - NEOSHO WEST	SUB 314 - NEOSHO LINDE	2.8	2.8	2/19/2022		x
21-0		69	M	SUB 184 - NEOSHO SOUTH JCT.	SUB 314 - NEOSHO LINDE	1.2	1.2	2/19/2022		x
21-0		69	M	SUB 184 - NEOSHO SOUTH JCT.	SUB 322 - ANDERSON SOUTHWEST	15.2	15.2	2/19/2022		x
21-0		69	MA	SUB 435 - NOEL SOUTHWEST	SUB 700 - GRAVETTE	10.4	10.4	2/19/2022		x
21-0		69	M	SUB 443 - NOEL CITY	SUB 322 - ANDERSON SOUTHWEST	7.2	7.2	2/19/2022	x	x
21-0		69	M	SUB 443 - NOEL CITY	SUB 435 - NOEL SOUTHWEST	2.4	2.4	2/19/2022		x
21-1		69	M	SUB 314 - NEOSHO LINDE	SUB 314 - NEOSHO LINDE	0.18	0.18	2/12/2022		x
21-2		69	M	SUB 184 - NEOSHO SOUTH JCT.	SUB 296 - NEOSHO SOUTHEAST (ROCKETDYNE)	2.4	2.4	12/25/2021		x
21-3		69	M	SUB 414 - SOUTHWEST CITY	SUB 435 - NOEL SOUTHWEST	2.4	2.4	2/12/2022		x
35-2		69	M	SUB EXPLORER SPRING CITY TAP	SUB EXPLORER SPRING CITY	1	1	8/28/2021		x
35-0		69	M	SUB EXPLORER SPRING CITY TAP	SUB 389 - JOPLIN SOUTHWEST	2.95	2.95	12/11/2021	x	x
35-0		69	M	SUB 59 - JOPLIN 26TH ST.	SUB 430 - JOPLIN 32ND & OLIVER	1.6	1.6	12/11/2021	x	x
35-0		69	M	SUB 389 - JOPLIN SOUTHWEST	SUB 430 - JOPLIN 32ND & OLIVER	3.2	3.2	12/11/2021	x	x
35-0		69	M	SUB 56 - NEOSHO WEST	SUB EXPLORER SPRING CITY TAP	10.78	10.78	12/11/2021	x	x
35-1		69	M	SUB EXPLORER SPRING CITY TAP	SUB 375 - SENECA	5	5	12/11/2021	x	x
40-0		69	M	SUB 332 - NEOSHO CHEROKEE	SUB 398 - NEOSHO NORTHEAST	6.4	6.4	12/11/2021		x
40-0		69	M	SUB 296 - NEOSHO SOUTHEAST (ROCKETDYNE)	SUB 398 - NEOSHO NORTHEAST	6.4	6.4	12/11/2021		x
40-0		69	M	SUB 292 - TIPTON FORD	SUB 332 - NEOSHO CHEROKEE	4.4	4.4	12/11/2021		x
40-0		69	M	SUB 292 - TIPTON FORD	SUB 393 - REINMILLER	4	4	12/11/2021		x
91-0		161	MA	SUB 392 - DECATUR SOUTH	SUB 435 - NOEL SOUTHWEST	17.4	17.4	2/12/2022		x
91-0		161	M	SUB 184 - NEOSHO SOUTH JCT.	SUB 435 - NOEL SOUTHWEST	23.1	23.1	2/12/2022		x
91-0		161	A	SUB 392 - DECATUR SOUTH	FLINT CREEK 161KV	5	5	2/12/2022		x
91-1		161	M	GROVE	SUB 435 - NOEL SOUTHWEST	14.41	14.41	5/21/2021		x
92-0		161	M	SUB 389 - JOPLIN SOUTHWEST	SUB 422 - JOPLIN 24TH & CONNECTICUT	7.16	7.16	12/15/2021	x	x
92-0		161	M	SUB 391 - JOPLIN SOUTHEAST	SUB 422 - JOPLIN 24TH & CONNECTICUT	2.8	2.8	12/15/2021	x	x
92-0		161	M	NEOSHO	SUB 184 - NEOSHO SOUTH JCT.	1.7	1.7	12/15/2021	x	x
92-0		161	M	NEOSHO	SUB 292 - TIPTON FORD	10.6	10.6	12/15/2021	x	x
92-0		161	M	SUB 393 - REINMILLER	SUB 391 - JOPLIN SOUTHEAST	2.05	2.05	12/15/2021	x	x
92-0		161	M	SUB 292 - TIPTON FORD	SUB 393 - REINMILLER	4.00	4	12/15/2021	x	x
95-0		161	M	SUB 145 - JOPLIN WEST 7TH	SUB 439 - STATELINE	5.50	5.5	11/13/2021		x
95-0		161	M	SUB 110 - ORONOGO JCT.	SUB 145 - JOPLIN WEST 7TH	5.80	5.8	11/13/2021		x
96-0		161	M	SUB 389 - JOPLIN SOUTHWEST	SUB 439 - STATELINE	7.00	7	11/13/2021		x
						224.58	224.58			

6(C)4. Distribution Circuits scheduled for the current year

ER-2019-0374 MPSC DR - 0247 (3) Distribution

Circuit ID	Area	Sub	State	Cycle	2022 Planned Miles
3631	212	363	OK	3	33
3632	212	363	OK	3	24
6601	212	66	KS	6	51
6602	212	66	KS	6	20
2711	212	271	KS	6	0
2821	212	282	KS	6	10
2822	212	282	KS	6	6
2823	212	282	KS	6	25
2824	212	282	KS	6	17
3391	212	339	KS	6	73
4061	212	406	KS	6	41
4062	212	406	KS	6	31
401	214	64	MO	3	1
402	214	64	MO	3	2
403	214	64	MO	3	3
404	214	64	MO	3	1
405	214	64	MO	3	1
406	214	64	MO	3	1
407	214	64	MO	3	1
432	214	100	MO	3	1
434	214	100	MO	3	0
1261	214	258	MO	3	4
1263	214	258	MO	3	14
1264	214	258	MO	3	1
1265	214	258	MO	3	9
1267	214	258	MO	3	3
1273	214	341	MO	3	9
1274	214	341	MO	3	2

Circuit ID	Area	Sub	State	Cycle	2022 Planned Miles
1281	214	360	MO	3	2
1282	214	360	MO	3	8
1283	214	360	MO	3	2
1284	214	360	MO	3	10
1285	214	360	MO	3	6
1287	214	360	MO	3	0
1230	214	372	MO	3	12
1231	214	372	MO	3	0
1232	214	372	MO	3	14
1233	214	372	MO	3	5
1262	214	258	MO	6	5
1271	214	341	MO	6	43
1272	214	341	MO	6	1
4361	215	436	MO	3	32
4362	215	436	MO	3	7
4363	215	436	MO	3	39
4364	215	436	mo	3	27
3752	216	375	OK	3	21
3982	216	398	MO	3	21
1841	216	184	MO	6	19
1843	216	184	MO	6	43
3471	216	347	MO	6	27
3472	216	347	MO	6	42
3751	216	375	MO	6	27
3921	216	392	AR	6	3
3922	216	392	AR	6	56
3923	216	392	AR	6	4
3981	216	398	MO	6	75
3121	209	312	MO	3	16.65
2951	209	295	MO	6	37.52
2952	209	295	MO	6	10.44

Circuit ID	Area	Sub	State	Cycle	2022 Planned Miles
3123	209	312	MO	6	20.89
3122	209	312	MO	6	30.04
4782	209	438	MO	3	9.56
4783	209	438	MO	3	2.55
4784	209	438	MO	3	1.01
1242	211	124	MO	3	11.2
1243	211	124	MO	3	26.84
4511	211	451	MO	3	15.16
4512	211	451	MO	3	3.36
4513	211	451	MO	3	3.79
2622	211	262	MO	6	11.43
1241	211	372	MO	6	29.24
4601	211	460	MO	6	46.64
4602	211	460	MO	6	33.22
3671	213	367	MO	3	6.89
3672	213	367	MO	3	1.74
3673	213	367	MO	3	19.92
3674	213	367	MO	3	0
3675	213	367	MO	3	4.68
6143	213	614	MO	3	8.72
6144	213	614	MO	3	6.6
2501	213	250	MO	6	4.26
2511	213	251	MO	6	23.76
2621	213	262	MO	6	90.24
3081	213	308	MO	6	26.13
3082	213	308	MO	6	12.82
3181	213	318	MO	6	49.27
6141	213	614	MO	6	39.15
6142	213	614	MO	6	28.68
4151	217	415	MO	3	2.76
4152	217	415	MO	3	13.62

Circuit ID	Area	Sub	State	Cycle	2022 Planned Miles
4153	217	415	MO	3	15.38
4154	217	415	MO	3	6.79
4155	217	415	MO	3	11.5
4342	217	434	MO	3	12.99
4341	217	434	MO	6	44.74
4343	217	434	MO	6	40.66
4791	217	479	MO	3	25.9
4792	217	479	MO	3	3.43
4793	217	479	MO	3	10.88
4794	217	479	MO	3	7
Total Miles For 2022					**1763.5**

6(C)4. Transmission Lines scheduled for the current year						
ER-2019-0374 MPSC DR-0247 Transmission						
Line#	Nerc	KV	State	From	To	2022 Scheduled Miles
345	Nerc	345	M	SUB 250 - ARCOLA NORTH	SUB 614 - GREENFIELD	22.15
08-0		69	M	SUB 250 - ARCOLA NORTH	SUB 324 - STOCKTON NORTHWEST	13.2
08-1		34.5	M	SUB 308 - HUMANSVILLE WEST	SUB 217 - FAIRPLAY EAST	11.6
08-2		34.5	M	SUB 308 - HUMANSVILLE WEST	SUB 304 - CAPLINGER	13.7
08-2		34.5	M	SUB 324 - STOCKTON NORTHWEST	SUB 304 - CAPLINGER	13.73
08-2		34.5	M	SUB 308 - HUMANSVILLE WEST	SUB 318 - COLLINS SOUTH	5.7
08-3		69	M	SUB 418 - AEC STOCKTON	SUB 324 - STOCKTON NORTHWEST	7.46
08-4		69	M	SUB EXPLORER PLEASANT HOPE TAI	SUB 73 - BOLIVAR BURNS	2.526
20-0		69	M	SUB EXPLORER PLEASANT HOPE TAI	SUB 323 - BRIGHTON EAST	6.9
20-0		69	M	SUB 209 - HERMITAGE	SUB 73 - BOLIVAR BURNS	3.2
20-0		69		SUB 209 - HERMITAGE	MO PUBLIC SERVICE	24.79
20-0		69	M	SUB 80 - MARSHFIELD JCT.	SUB 170 - NICHOLS ST.	8.57
20-0		69	M	SUB 80 - MARSHFIELD JCT.	SUB 323 - BRIGHTON EAST	8.8
20-0		69	M	SUB EXPLORER PLEASANT HOPE TAI	SUB EXPLORER PLEASANT HOPE	8
20-1		69	M	SUB 80 - MARSHFIELD JCT.	SUB 445 - WILLARD	1.5
26-0		69	M	SUB 80 - MARSHFIELD JCT.	SUB 397 - FAIRGROVE SOUTH	6.35
26-0		69	M	SUB 445 - WILLARD	SUB 369 - WILLARD	8.8
26-5		69	M	SUB 170 - NICHOLS ST.	SUB 345 - REPUBLIC NORTHEAST	2.1
30-0		69	M	SUB 73 - BOLIVAR BURNS	SUB 367 - BOLIVAR SOUTHEAST	10.8
33-0		69	M	SUB 367 - BOLIVAR SOUTHEAST	SUB 602 - BOLIVAR PLANT	5.6
33-0		69	M	SUB CU PUMP STATION TAP	SUB 368 - DADEVILLE EAST	1.6
33-0		69	M	SUB CU PUMP STATION TAP	SUB 614 - GREENFIELD	5
33-0		69	M	SUB 217 - FAIRPLAY EAST	SUB 368 - DADEVILLE EAST	19.5
33-0		69	M	SUB 217 - FAIRPLAY EAST	SUB 602 - BOLIVAR PLANT	13.6
33-0		69	M	SUB 114 - NIXA NORTH	SUB 170 - NICHOLS ST.	8
39-0		69	M	NIX114 2 69.0	NIC170 2 69.0	13.6
						246.8

6(C)5.

Total Distribution miles for the system; and corresponding classification between rural and urban.

The total overhead distribution miles on Liberty Utilities Central system are 5,612; classified as 1,802 Urban miles and 3,810 Rural Miles.

8(A,B,C).

Highlights of Liberty Utilities public education and outreach program for 2021 consisted of:

- Door cards with Right Tree, Right Place information.
- Handout on Emerald Ash Borer to customers that have Ash trees in their yards.
- Annual Tree Line USA training for all of the contracted vegetation management crews.
    - Additionally, Liberty supplied many of the crews the opportunity for an online educational tree and plant identification course.
    - Made available to our herbicide planners and applicators field training on recognizing the difference between beneficial plants and invasive plants.
- Partnered again with National Arbor Day Foundation to offer 500 Energy Saving Trees to our customers who would get online and enter their address; then select a tree and move it around their yard for the Energy Saving benefits. We hosted the tree give away in conjunction with the City of Joplin and Missouri Dept of Conservation. There were games for the kids and a scavenger hunt for the pubic to learn about the different trees at Wildcat Glades.
- Chet Ellis, one of the CNUC foresters on our system has been recognized for the research he has been doing on our rights-of-way identifying and recording natives (thought to have vanished species); and those that are invasive which we will be working toward eradicating
- Power to the Pollinator initiative
    - We received a grant from Bee and Butterfly Habitat to sow 25 acres on our Right of Ways in pollinator seed.
    - Still being vigilant of Covid19 distancing, the George Washington Carver School in Neosho asked us to do a Zoom presentation with their second graders about pollinators and how to sow seeds for the pollinators. A lot of seeds sown that day with hopes of a lot of flowers for their Plant Sale later this Spring.
    - A collaboration of a variety of employees to restore the site of a retired substation that had been recently removed and create Liberty Park for the residence of Baxter Springs to enjoy. It is a display of creativity and teamwork: Nearly 500 pollinator plants planted, and a pergola donated by Playground USA. One of Liberty metal butterflies decorated with the 5th grade class from Baxter Springs artwork depicting what they think “Community” means. Vegetation Management was glad to be a part of creating additional habitat for the pollinators and add to Liberty’s sustainability numbers.
    - Over-seeding the Power to the Pollinator Prairie in Carl Junction in early January.
    - Quails Forever contacted us interested in our Power to the Pollinator initiative. We will be collaborating with the local chapter, who have received grant funding to seed the easement adjacent to Sub 110 on Zora. Anyone interested in information about Quails Forever can contact Carl Hutchison in Liberty Central’s Fiber Division, who is the current local chapter president). Prepping the ROW will start in June.

4(F)2. Copies of our current Vegetation Management Guidelines for Enhanced Electrical Reliability and NERC Transmission Program are attached.

VEGETATION MANAGEMENT GUIDELINES FOR ENHANCED ELECTRICAL RELIABILITY

Liberty Utilities Central actively manages vegetation on over 7200 miles of Transmission and Distribution in 4 states. Utilizing the Integrated Vegetation Management philosophy, Liberty Utilities performs Conventional, Mechanical and Chemical practices that promote Biological Control on and along its Right of Ways.

Title: Vegetation Management Guidelines for Enhanced Electrical Reliability		Author: J. Grossman	
Distribution Vegetation Management Policy		**Revision: E**	**11/1/2018**
Revision	**Date**	**Changes**	**Approved By**
A	8/9/2008	Formalized existing documentation	McGarrah, Palmer
B	3/1/2009	Review in conjunction with our new tree trimming contracts. See letter dated Jan 30, 2009.	McGarrah, Palmer
C	3/15/2012	Annual Review – no changes.	Wallace, Penning
D	3/22/2013	Annual Review – The addition of TGR specifications. See 2.2.4 and Appendix 8.	Wallace, Penning
E	11/1/2020	Changes in standards that reflect our systems current status. Update Utility Name	Haralson, Wilson

Approval Signatures and date:

Garry Haralson 11-24-20

Garry Haralson, Interim Director of Operations - Transmission and Distribution

12/03/20

Tim Wilson, Vice President Operations - Electric

Applicable Standards: 20 CSR 4240-23.010

CONTENTS

INTRODUCTION

The Objective of the Vegetation Management Guidelines for Enhanced Reliability is to establish the policies and procedures for Liberty Utilities (LU) to manage vegetation along its Right of Way (ROW). The main goal of the guideline will demonstrate how vegetation is managed to improve reliability, minimize risk for the public and reduce encroaching vegetation. This shall apply to all LU electric lines rated at 200kV and below

1 SAFETY

1.1 SAFETY REQUIREMENTS

All contractors performing work on or near LU facilities or rights-of-way shall:

- Follow approved safety guidelines and procedures.
- Comply with all applicable governmental safety and health regulations and the safety and health provisions of their contract.
- Comply with all municipal, County, State and Federal Laws, Rules and Regulations

All contractors must also, at all times, be aware of the nature and characteristics of LU electric facilities before work begins. Contractors shall understand that electric facilities must remain energized during the performance of work unless special arrangements are made with an authorized LU representative.

The following procedures pertain to contractors performing vegetation management work for LU:

The contractor shall obtain from LU full information as to the voltage of its circuits before starting the work.

The contractor shall at all times conduct work in a manner to safeguard the public from injury and property from damage.

The contractor must use all necessary protection for its employees and the public and guard against interference with normal operation of the circuits. If, in the judgment of the contractor's general foreman/supervisor, it is a risk to perform their work with the circuits energized, the contractor must contact an authorized LU representative(s). If appropriate, LU will provide the necessary protective materials or de-energize circuits to ensure the safe pruning or removal of the tree(s).

Should the contractor knock down or come into contact with LU conductors (power lines), the contractor must notify LU immediately and take the necessary protective measures. All contractor-caused electric service interruptions are subject to repair at the contractor's expense. This would include any damage to customers' property, including any electrical damage.

In the event a contractor becomes aware of any dangerous, broken, loose or faulty LU line/facilities in the normal course of its line clearance performance, the contractor shall promptly advise LU as to the exact pole location(s) and nature of the condition found.

2 GENERAL GUIDELINES

2.1 INTEGRATED VEGETATION MANAGEMENT

LU utilizes conventional crews, herbicide, mechanical clearing equipment, Tree Growth Regulators (TGR) and work planners to maintain its ROW. The ultimate goal will be biological control through species competition (floor) and directional pruning (side). Species competition along the floor will reduce the likely hood of tall growing woody vegetation from becoming established on the ROW while directional pruning will reduce encroachments into the wires by training the tree to grow away from the power lines. LU desires to provide ROWs that provide high quality habitat for wildlife as well as an aesthetic value where possible. This approach will use management practices that promote a 60/40 (grasses, forbs/low growing woody shrubs) split on the ROW.

2.2 MAINTENANCE CYCLE

LU shall maintain a cycle for vegetation management based on the number of customers per mile. Circuits' with customer density >35 customers per mile shall be considered Residential and be placed on a 3-year cycle. Circuits with <35 customers per mile shall be considered Rural and be placed on a 6-year cycle. Exceptions may be made for circuits with commercial load or critical facilities such as hospital, police, fire departments, etc. A Mid-Cycle Inspection will be performed on the rural circuits to ensure the circuit will remain reliable until the next maintenance cycle. TGR and Herbicide work will be performed pre-maintenance so that they may be audited during the maintenance cycle.

To improve efficiency, all circuits from a substation will be placed on the same schedule. This allows Substations with Rural and Residential circuits to be worked on the same cycle.

Circuit Type	Maintenance cycle (yrs.)	Mid-Cycle Inspection (yrs.)
Residential	3	N/A
Rural	6	3

Table 1. Maintenance and Inspection Cycle based on circuit type.

2.3 SCHEDULING AND CIRCUIT PRIORITIZATION

General scheduling of the Circuits/Substations for Vegetation management will be based on tree units. The variability of tree density per mile across the system leads to variability in staffing and a stable work force is essential to providing reliable, quality work.

Circuits may be adjusted during the year based on the following factors:

- Reliability – The circuits due to be pruned for any given year are weighted based on customer minutes interrupted by tree-related causes. Circuits that have the highest number of customer minutes interrupted by tree outages may rank higher. SAIFI and SAIDI
- Last Trim Date – Circuits are scheduled based on the last pruned date. The oldest are weighted over the earliest.

- Customers Affected – Circuits are ranked by customer count. Circuits with high numbers of customers or circuits with critical customers are ranked higher.

- Current Vegetation Conditions – The current vegetation conditions on a circuit will be used to prioritize it. Customer requests for tree pruning are also taken into consideration when determining the current vegetation conditions of a circuit.
- Other – Other factors that are considered when scheduling are circuit load, customer complaints, workload, efficiency and political issues.

3 WORK PLANNING

LU contracts a work planning service to assign resources based on the scope and type of work. Pre-Planned work makes the Contract Crews more efficient by locating access points, dealing with customer inquiries prior to the work commencement and by locating the actual work to be performed. LU or its agents will conduct a pre-work inspection to determine the amount and types of work needed to make the circuit reliable for the maintenance cycle. After the Work is completed, an audit will be performed to ensure the circuit is reliable for the next cycle and clearing specifications have been met. LU utilizes GPS based Electronic Workflow Management software that tracks Planning, Work Completion and Auditing.

3.1 NOTIFICATION

3.1.1 PRIVATE PROPERTY

LU or its agents will make a diligent attempt to notify property owners or occupants by personal contact, door hanger or mailer. Notification shall occur seven (7) days before any work is performed and no more than ninety (90) days after notification. A record of the date, content and address shall be maintained until the subsequent Maintenance Cycle has passed. If the work required is deemed an emergency due to an eminent outage, public safety issue etc., the 7-day window will be waived and the work shall be completed to ensure safe and reliable service. A Door Hanger with contact information will be left for the property owner or occupant, informing them of the situation.

3.1.2 COUNTY AND MUNICIPAL

LU shall provide each county and municipality at minimum two (2) months' notice of any scheduled Vegetation Management maintenance activities to a primary contact mutually agreed upon.

3.2 VEGETATION INQUIRIES

LU will respond to requests related to tree/right-of-way maintenance within 5 business days. After reviewing the situation, a priority level will be assigned and the request will be scheduled. The property owner will be informed of the results of the request. LU will decide if the work requested will benefit the overall safety and reliability of the electric system, its customers and the general public.

3.2.1 CUSTOMER REQUESTED PRUNING

When a customer requests LU to prune a tree away from pole-to-pole lines, LU will send out a representative to make a determination of any risk. If it is determined that pruning/removal is necessary for safety or reliability, LU will schedule a crew to prune/remove the tree(s) in question.

If the tree is not a significant risk, LU will inform the customer that the tree will be re-evaluated when that circuit is scheduled for maintenance.

Service drops are the customer's responsibility. Crews will not be re-directed unless there is an immediate threat to LU facilities. However, they will be picked up on regularly scheduled maintenance.

3.2.2 CUSTOMER REQUESTED ASSISTANCE

When a customer desires to prune/remove a tree close to LU lines for reasons other than line clearance, LU will send out a representative to make a determination of any potential risk that exists. LU will do one of the following after customer notification:

- Temporarily drop the conductor while the customer or customer's agent performs the work.
- Prune or remove the portion of the tree to meet the 10' minimum Overhead Powerline Safety Act. On Customer Requested Assistance work, limbs and branch cleanup will be the responsibility of the property owner.
- Inform the customer that the work is outside the scope of LU's responsibility and no work will be done by LU at this time.

In all cases, the decision on which course of action to take will be determined by an LU or an LU representative after consultation with the customer.

4 CONVENTIONAL CLEARING

Trees are pruned to provide adequate clearance from LU facilities at the time of trimming for the cycle length. ANSI-A300 and ANSI Z133.1 procedures and techniques will be followed.

The following guidelines (Table 2.) are minimum tree clearances that may apply at the time of pruning to protect the wires under normal operating conditions. Special clearances may be needed at times because of field conditions. Tree species are categorized into fast and slow growing (Table 3).

Clearance From Trees	Rate Of Growth	Secondary Cable (120-480V)	Open Wire Secondary (120-480V)	Primary Voltage Single Phase	Primary Voltage Three Phase
Side	Slow	3	6	10	10
	Fast			15	15
Over	Slow	3	6	15	Remove all Overhang
	Fast			15	
Under	Slow	3	8	10	10
	Fast			15	15

Table 2. Recommended Line Clearances (in feet).

Common Name	Scientific Name	Growth Rate
Aillanthus	*Ailianthus Altissima*	F
Ash, White	*Fraxinus americana L.*	F
Ash, Green	*Fraxinus pennsylvanica*	F
Basswood	*Tilia american L.*	F
Birch	*Betula nigra*	F
Black Walnut	*Juglans Nigra*	F
Boxelder	*Acer negundo*	F
Bradford Pear	*Pyrus calleryiana*	F
Buckeye	*Aesculus*	S
Catalpa	*Catalpa bignonioides*	F
Cherry	*Prunus scrotina*	F
Cottonwood	*Populus deltoides*	F
Dogwood	*Cornus florida*	S
Eastern Redcedar	*Juniperus virginiana*	S
Elm	*Ulmus sp.*	F
Ginkgo	*Ginkgo biloba*	F
Hackberry	*Celtis occidentalis*	F
Hickory	*Caryatexana sp.*	S
Honey locust	*Gleditsia triacanthos*	F
Hybrid Maples	*Acer sp.*	F
Kentucky Coffee Tree	*Gymnocladus dioica*	F
Locust	*Robinia sp.*	F
Mimosa	*Mimosa pudica*	F
Mulberry	*Morus sp.*	F
Osage Orange	*Maclura poynifera*	F
Pin Oak	*Quercus palustris*	F
Pine	*Pinus sp.*	S
Poplar	*Populus alba*	F
Post Oak	*Quercus stellata*	S
Red Bud	*Cercis canadensis*	S
Red Oak	*Quercus rubra*	S
Sassafrass	*Sassafrass albidum*	F
Silver Maple	*Acer saccharinum*	F
Sugar maple	*Acer saccharum*	S
Sweetgum	*Liquidambar styraciflua*	F
Sycamore	*Platanus occidentalis*	F
White Oaks	*Quercus alba*	S

Table 3. Major tree species and growth rates.

4.1 CONSIDERATIONS FOR PRUNING

Factors to consider before pruning include:

- The growth rate of the tree species and proximity to the line
- Tree/branch Failure potential
- TGR effectiveness
- The voltage of the conductor
- Sag and sway
- The Quality of the site (i.e. riparian zones, chert glades, etc.)

4.2 TREE REMOVAL

Trees less than 6 inches at Diameter at Breast Height (DBH) will be considered brush and removed from the ROW.

4.3 REMOVAL CONSIDERATIONS IN MANICURED AREAS

In areas that are being actively maintained, such as yards, LU or its agents shall acquire permission to remove trees from the property owner or occupant by signature. Verbal permission may be used in the event the property owner or occupant is unable to sign a removal card.

Candidates for removal:

- Trees growing in the ROW
- Fast growing trees adjacent to the ROW
- Trees growing around poles, guy wires and other equipment
- Regrowth from old stumps
- High risk trees – dead/ dying trees, root failure, canker, Insect infestation, internal decay, etc.
- Trees that cannot be pruned to ANSI A300 standards

4.4 REMOVAL CONSIDERATIONS IN NON-MANICURED AREAS

Volunteer trees in areas that lack any beneficial value shall be removed at the discretion of LU or its representatives. A diligent attempt will be made to inform the property owner or occupant of the removal prior to work commencement.

Candidates for removal:

- All considerations in section 4.3
- Unmarketable fencerow trees that currently lack ability to be beneficial shade for livestock.
- Edge trees of no market value that yield no additional benefit due to adjacent or otherwise available shade to livestock.
- Trees located in areas not manicured, accessible and inaccessible alleys, City and County Right of Ways, or not associated with a residence.

4.5 LIMB AND BRANCH DISPOSAL

4.5.1 MAINTENANCE

LU contract crews performing scheduled maintenance will dispose of limbs that are small enough to be fed through a chipper unless different arrangements have been made with the property owner or occupant. Wood too large to be chipped shall be cut and stacked at the site unless the homeowner requests the wood be removed before or at the time of the pruning (*See Section 3.2.2 for exception*).

4.5.2 OUTAGES

Outages caused by grow-ins will be cleaned up by LU contract crews. The property owner is responsible for outages caused by acts of God including but not limited to wind, rot, whole tree failure, ice, etc.

4.5.3 MAJOR EVENTS

LU's primary focus during Major Events is restoration. Due to the regional impact, brush and limbs cut during major events will be left onsite.

4.6 STUMPS

Stump will be cut as close to the ground as safely possible. All stumps shall be treated with an approved herbicide unless a property owner has requested that the stump not be treated or if the herbicide label warns against treatment of stumps in particular situations. LU and its contract crews will not grind out stumps, unless prior arrangements have been agreed upon.

5 HERBICIDES

Herbicides are an essential component of vegetation management and an integral tool for promoting biological control on the ROW.

All herbicides shall be applied in strict compliance with all federal, state and local laws and regulations. This includes, but is not limited to: application, transportation, handling and container disposal.

All herbicide and treatment methods used by the contractor shall have prior approval by LU.

It is the contractor's responsibility to provide all crew members applying herbicides with the appropriate protective gear, current label and Material Safety Data Sheet (MSDS) for the product being applied.

The contractor is responsible for the proper disposal or recycling of all herbicide containers.

Any spills shall be reported by the contractor's general foreman/supervisor as soon as the situation is controlled and it is safe to do so. The type of product and amount of spillage along with the contamination efforts that were made shall be documented in an email to the Manager of Vegetation Control. Then the general foreman shall notify the proper state or federal agencies if necessary. All damage from such leaks or spills are the responsibility of the contractor.

5.1 APPLICATION

- All herbicide treatment shall be performed in a responsible manner that will reflect the best interests of the property owner and LU. If a property owner should object to any of the herbicide treatments, the operation shall immediately be discontinued on that property until any differences are resolved. Legitimate refusals include but are not limited to: organic farming and chemical sensitivity of customer; in these instances, a recommendation for the customer to keep the area free of brush would eliminate the need for herbicide on their property.

- The Contractor shall guarantee one hundred percent (100%) coverage and a minimum ninety five percent (95%) control per span on stumps and vegetation applied, as determined during the growing season following the treatment. Spans not meeting these specifications shall be re-treated by the Contractor at the Contractor's expense to achieve the proper mortality.

- In herbicide application work, the Contractor shall have the right to skip any portion of a line when, in the opinion of the Contractor, damage to crops, orchards, or ornamental plantings may result. Any skips shall be reported to the appropriate LU representative.

5.2 APPLICATION METHODS

LU uses multiple methods for controlling vegetation on and along its ROW. These include but are not limited to:

- **Foliar**: Applied during the growing season to the foliage of undesirable vegetation
- **Basal**: Dormant season application applied to the base of undesirable vegetation

- **Dormant Stem**: Applied to the stems of undesirable vegetation during the dormant season
- **Granular**: Applied any time of year with soil residual activity to prevent regrowth
- **Mechanical Application**: Foliar application during the growing season
- **Bare ground**: Applied to Substations and areas surrounding substations regulators, distribution 3-phase re-closers, transmission and distribution switches before vegetation emerges.
- **Cut Stubble Application:** Brush hogging followed by broadcast selective herbicide.
- **Stump Treatment:** Stumps from removed Trees shall be treated to prevent regrowth.

6 TREE GROWTH REGULATOR

LU and its agents will apply TGR on a 3-year cycle to applicable trees. TGR is a cost effective alternative to pruning and will be the primary tool for preventing vegetative growth into energized conductors. Application methods are a Basal Drench or Probe. The main stem of the tree should be half the distance of maximum crown expansion from the conductor to be considered for application. Inches in Table 3 represent Diameter at Breast Height (DBH). Table 3 will serve as a guideline for TGR application. Field conditions may include or exclude trees from the guideline.

TGR / Trim type	Category 1	Category 2	Category 3	Category 4
Bucket ST	All	<24"	<24"	<12"
Bucket VT	All	<24"	<24"	<18"
Manual ST	All	All	<24"	<24"
Manual VT	All	All	<24"	<24"

Category 1	Sweetgum, Redbud, Bald Cypress
Category 2	Basswood, Hard Maple, Elm, Boxelder, Ailanthus
Category 3	Catalpa, Oaks, Mimosa, Hickory, Locust, Sassafras, Silver Maple,
Category 4	Birch, Gingko, Hackberry, Sycamore, Poplar, Osage Orange, Mulberry, Tulip Tree, Willow, Cottonwood

Table 4. TGR guidelines for application

7 MECHANICAL CLEARING

In areas that would be labor intensive for conventional crews to clear, mechanical clearing offers a cost effective alternative. LU utilizes serval types of machinery to clear vegetation along the ROW including, but not limited to boom trimmers, drum head mowers, dozers and flail head mowers. Mechanical clearing allows access to facilities and has shown a positive impact on SAIDI numbers

8 SUBSTATION VEGETATION MANAGEMENT

8.1 VEGETATION ENCROACHMENTS

During the maintenance cycle, the perimeter of the substation will be inspected for vegetation encroachments and the appropriate resource assigned to mitigate any vegetation issues.

8.2 SUBSTATION SPRAYING

Bare ground Herbicides will be applied between February 1st and April 30th to the graveled portions of the substation to prevent vegetation from establishing inside the Substation (see Section 5 for Application guidelines). Contractor shall guarantee one hundred percent (100%) coverage with a ninety five percent (95%) control based on square footage per Substation. Any work that does not meet these criteria shall be re-treated by the contractor at the contractor's expense. Audits will be performed during the growing season that the herbicide was applied.

9 PUBLIC EDUCATION

LU will host/participate yearly in multiple public outreach events including proper pruning, Right Tree Right Place, proper planting demonstrations and energy efficient tree planting. LU also has brochures on tree care, tree health and maintenance available through its website. By partnering with the Arbor Day Foundation's Energy Savings Tree Program LU has increased awareness of Right tree, Right Place and provides customers with information on where to plant trees for the most energy efficiency.

10 RESEARCH AND DEVELOPMENT

LU is committed to pursuing technology and improved methods of vegetation management that enhance reliability while reducing costs associated with vegetation management.

10.1 WIRES OVER WILDLIFE (WOW)

In this program, property owners are encouraged to maintain their portion of the ROW for vegetation that promotes wildlife while eliminating potential conflicts with the power lines. Forming a partnership with property owners will ultimately reduce LU's need for vegetation management.

10.2 SIDE TRIMMING WITH HERBICIDE

LU has pioneered an innovative delivery system that applies herbicide to the vertical wire zone to control side encroachment. Early evaluation shows a reduced cost per foot and potential increased cycle length.

10.3 AUGMENTED REALITY

Leveraging GIS to improve planning accuracy and information transfer reduces costs and improves efficiencies. Augmented Reality has multiple applications in the industry but specifically it allows the tree to become an asset that can be managed based on historical information.

10.4 TREE GROWTH REGULATOR

The benefit of tree growth regulator has already been proven, however their application and integration into a maintenance schedule is specific to each Utility. LU is developing a best management practice involving pruning and treating with TGR.

10.5 AUTO-MOWERS

LU is piloting test areas for Autonomous Electric Mowers. These mowers will reduce maintenance costs while providing a safer and better-quality product.

10.6 POWER TO THE POLLINATORS

LU also provides opportunities for individuals and communities to promote pollinator habitat on the ROW and for community improvement.

10.7 RE-GROWTH STUDY

LU tree crews are capturing the re-growth on trees previously trimmed to determine if the clearance distances are adequate. The data capture is timestamped and georeferenced for multiple species across the system. This study will also help assess the effectiveness of TGR usage in the Vegetation Management program and how it affects the clearance specifications.

AFFIDAVIT

State of Missouri)
) ss
County of Jasper)

I, Tim Wilson, state that I am the Vice President of Electric Operations – Liberty, under penalty of perjury, I declare that the above document is true and correct to the best of my knowledge and belief.

Tim Wilson

Liberty Utilities®
EMPIRE DISTRICT

Title: NERC TVMP 2020	Revision: G	Author: Rob McGovern 04-09-2020

Approval Signatures and date:

Robert McGovern
Robert McGovern (Apr 10, 2020)

Kayle Scott, Director, Transmission and Distribution Operations

Kayle Scott
Kayle Scott (Apr 22, 2020)

Tim Wilson, VP-Electric Operations

Tim Wilson (Apr 9, 2020)

Applicable NERC Standard(s): FAC003-4

Revision	Date	Changes	Approved By
A	6-23-14	Formalized existing documentation for FAC 003-3	John Donaldson Martin Penning
B	10-2-15	Revised MVCD calculations and table. Added Sway calculations table (Appendix III)	John Donaldson Brent Baker
C	9-16-16	Updated MVCD calculation table and changed labeling from version 03 to 04	John Donaldson Brent Baker
D	6-22-17	Annual Review of Document. Update Logo	Sam McGarrah Blake Mertens
E	5-22-18	Annual Review of Document. Update Logo, Author and company name throughout the document	Sam McGarrah Blake Mertens
F	8-2-19	Annual Review and update the Document. Update Title. Highlighted the Minimum Vegetation Clearance Distance Table.	Sam McGarrah Brent Baker
G	4-09-20	Annual Review and update the Document. Corrected Kayle Scott's title; Added Tim Wilson as interim approver for removal of Brent Baker; Added controls to the R3 narrative.	Kayle Scott Tim Wilson

Index

NERC Transmission Program

R1 and R2. Purpose (FAC-003-04 R1 & R2)

This Document provides strategies and goals to reduce the risk of vegetation related outages on NERC regulated lines. Strategies lined out in this document are designed to manage vegetation to distances beyond the Minimum Vegetation Clearance Distance (MVCD) to ensure no encroachment into the MVCD. The MVCD is defined by FAC-003-4, Table 2 (see Appendix I). Liberty Utilities (Liberty) will provide evidence that it managed vegetation to prevent encroachment into the MVCD (See M3).

Liberty does not currently have any lines that fall under FAC-003-4 R1.

R3. Vegetation Management Strategy (FAC-003-04 R3)

Liberty will manage all vegetation with potential growth into the MVCD (Appendix I) to the full width of the Right Of Way (ROW) on a six year cycle. Annual inspections will be used to monitor the conditions on and off the ROW. Any Vegetation observed that presents an elevated risk of encroachment into the MVCD prior to the subsequent cycle shall be addressed appropriately and documented for record keeping (See Annual Vegetation Work Plan for more details). Conditions to be considered for an elevated risk of encroachment will take into account sag of the lines (Appendix II), sway of the lines (Appendix III), vegetation growth rates, frequency of inspections and control methods. Liberty will use an Integrated Vegetation Management approach including but not limited to: mechanical trimming, mechanical mowing, conventional bucket crews, tree growth regulators, herbicide applications, and biological control in order to promote plant diversity. Resources will be allocated as determined by the Transmission Vegetation Control Coordinator. 100% of the Annual Work Plan shall be completed within the year it is generated to ensure no vegetation encroaches into the MVCD. Annual aerial patrol will help confirm completion of work. Any work that cannot be confirmed by aerial patrol will be verified by a ground inspection. Any modifications in response to changing conditions will be documented and a final Amended Vegetation Work Plan will be kept for documentation. All additional work added will be verified upon completion.

Violation Response Procedure

R4. Potential Fault Caused by Vegetation (FAC-003-04 R4)

If Liberty confirms a vegetation condition that is likely to cause a Fault at any moment, the individual on site shall contact Liberty dispatching who will notify the control centers of City Utilities of Springfield and/or AEP that holds the switching authority for the 345kV line, immediately and without delay to inform them of the situation and to determine necessary steps to avoid an unintended outage. A follow up email shall be sent to the Area Manager and the Transmission Vegetation Control Coordinator with all pertinent information. Documentation of the notification shall be retained for records. Appropriate

resources will be redirected to mitigate the condition once the situation is deemed safe. The Transmission Vegetation Control Coordinator will assess the site for other potential threats with the appropriate remediation actions taken.

R5 Known Potential Fault (FAC-003-04 R5)

In the event Liberty is constrained from performing vegetation management that could lead to an encroachment into the MVCD prior to the subsequent cycle, the Transmission Vegetation Control Coordinator shall be made aware of the condition by phone with a follow up email detailing the situation. If the condition cannot be remediated through conventional means with the property owner, documentation of the constraint shall be made for records and an alternative path of remediation shall be pursued up to and including de-rating of the line through engineering and System Operations Department. All ensuing constraints shall also be documented until the situation is resolved with the risk reduced to an acceptable level. If Liberty is unable to clear to the full width of the ROW, trees will be trimmed to clearances listed in Appendix III.

R6. Vegetation Inspection Frequency (FAC-003-04 R6)

Liberty will conduct an annual Aerial Patrol of the applicable transmission lines once per calendar year with less than 18 months in between patrols. A work plan will be generated as verification of patrol, even in the absence of any encroaching vegetation.

Ground Patrols will be conducted on all lines scheduled for maintenance and on an as needed basis determined by the Transmission Vegetation Control Coordinator. In the event that the Aerial Patrol is unable to complete 100% of the inspection, a ground survey will be scheduled to complete the remainder of the applicable lines.

R7. Annual Vegetation Work Plans (FAC-003-04 R7)

Annual Work plans for vegetation shall be generated based on the Aerial Patrol, any ground patrols and/or LiDar. A thorough ground inspection shall be conducted during the scheduled maintenance cycle. 100% of the Annual Work Plan shall be completed within the year it is generated to ensure no vegetation encroaches into the MVCD. Annual aerial patrol will help confirm completion of work. Any work that cannot be confirmed by aerial patrol will be verified by a ground inspection. Any modifications in response to changing conditions will be documented and a final Amended Vegetation Work Plan will be kept for documentation. All additional work added will be verified upon completion.

Appendix I

Minimum Vegetation Clearance Distance

Nominal AC System Voltage (kV)	MVCD at 1.0 Gap Factor (feet)														
	Sea Level up to 500 ft	Over 500 ft up to 1,000 ft	Over 1,000 ft up to 2,000 ft	Over 2,000 ft up to 3,000 ft	Over 3,000 ft up to 4,000 ft	Over 4,000 ft up to 5,000 ft	Over 5,000 ft up to 6,000 ft	Over 6,000 ft up to 7,000 ft	Over 7,000 ft up to 8,000 ft	Over 8,000 ft up to 9,000 ft	Over 9,000 ft up to 10,000 ft	Over 10,000 ft up to 11,000 ft	Over 11,000 ft up to 12,000 ft	Over 12,000 ft up to 13,000 ft	Over 13,000 ft up to 14,000 ft
765	11.6	11.7	11.9	12.1	12.2	12.4	12.6	12.8	13.0	13.1	13.3	13.5	13.7	13.9	14.0
500	7.0	7.1	7.2	7.4	7.5	7.6	7.8	7.9	8.1	8.2	8.3	8.5	8.6	8.8	8.9
345	4.3	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6
287	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.1	6.2	6.3	6.4	6.5	6.6	6.7
230	4.0	4.1	4.2	4.3	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3
161	2.7	2.7	2.8	2.9	2.9	3.0	3.0	3.1	3.2	3.3	3.3	3.4	3.5	3.6	3.6
138	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.0	3.1
115	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.6
88	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.1
69	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.5

Table 1 – Table of MVCD values at a 1.0 gap factor (in U.S. customary units)

For the 345kV line, EDE operates between 1000-2000ft above Sea Level. At this altitude the MVCD is **4.4 ft.**

Appendix II

Sag Calculations

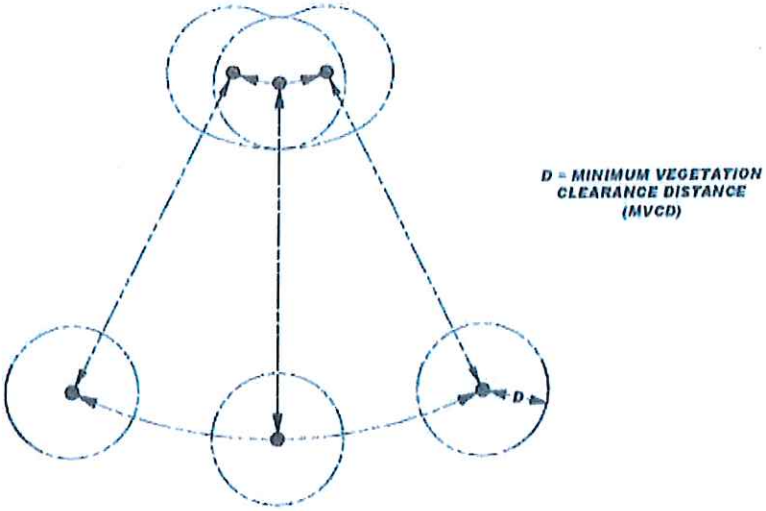

Figure 1

Sag*= ((Span Length ft^2)/(892 ft^2) x 25.21ft

** measured at 167°F, the sag for an 892ft conductor was 25.21ft*

Appendix III

Sway Calculations for maximum Sag on 345kV

Start Structure Number	End Structure Number	Span (ft)	Max Blowout Offset from Centerline (79.1 mph)	Minimum Vegetation Clearance Distance (ft)	TOTAL (ft)	Height of Conductor above Centerline Elevation at Lowest Point of Sag (ft)	Distance from start Structure where Conductor exits ROW (ft)	Distance from End Structure where Conductor exits ROW (ft)
EC322	EDE1	737	47.17	4.4	51.57			
EDE1	EDE2	1037	59.62	4.4	64.02			
EDE2	EDE3	877	49.31	4.4	53.71			
EDE3	EDE4	670	41.14	4.4	45.54			
EDE4	EDE5	801	49.29	4.4	53.69			
EDE5	EDE6	713	43.85	4.4	48.25			
EDE6	EDE7	720	44.31	4.4	48.71			
EDE7	EDE8	969	57.03	4.4	61.43			
EDE8	EDE9	679	46.41	4.4	50.81			
EDE9	EDE10	670	45.01	4.4	49.41			
EDE10	EDE11	635	43.81	4.4	48.21			
EDE11	EDE12	864	50.12	4.4	54.52			
EDE12	EDE13	766	46.08	4.4	50.48			
EDE13	EDE14	901	53.44	4.4	57.84			
EDE14	EDE15	885	52.95	4.4	57.35			
EDE15	EDE16	930	54.8	4.4	59.2			
EDE16	EDE17	732	47.36	4.4	51.76			
EDE17	EDE18	936	55.46	4.4	59.86			
EDE18	EDE19	904	54.4	4.4	58.8			
EDE19	EDE20	647	42.69	4.4	47.09			
EDE20	EDE21	753	45.95	4.4	50.35			
EDE21	EDE22	875	52.78	4.4	57.18			
EDE22	EDE23	790	49.08	4.4	53.48			
EDE23	EDE24	788	49.58	4.4	53.98			
EDE24	EDE25	949	56.31	4.4	60.71			
EDE25	EDE26	759	47.84	4.4	52.24			
EDE26	EDE27	908	53.74	4.4	58.14			
EDE27	EDE28	882	53.39	4.4	57.79			
EDE28	EDE29	853	51.98	4.4	56.38			
EDE29	EDE30	915	54.45	4.4	58.85			

Start Structure Number	End Structure Number	Span (ft)	Max Blowout Offset from Centerline (79.1 mph)	Minimum Vegetation Clearance Distance (ft)	TOTAL (ft)	Height of Conductor above Centerline Elevation at Lowest Point of Sag (ft)	Distance from start Structure where Conductor exits ROW (ft)	Distance from End Structure where Conductor exits ROW (ft)
EDE30	EDE31	739	47.72	4.4	52.12			
EDE31	EDE32	876	52.45	4.4	56.85			
EDE32	EDE33	745	47.46	4.4	51.86			
EDE33	EDE34	923	54.44	4.4	58.84			
EDE34	EDE35	813	50.48	4.4	54.88			
EDE35	EDE36	763	48.84	4.4	53.24			
EDE36	EDE37	852	51.48	4.4	55.88			
EDE37	EDE38	1022	58.92	4.4	63.32			
EDE38	EDE39	914	54.7	4.4	59.1			
EDE39	EDE40	934	55.78	4.4	60.18			
EDE40	EDE41	720	45.79	4.4	50.19			
EDE41	EDE42	505	37.65	4.4	42.05			
EDE42	EDE43	631	41.96	4.4	46.36			
EDE43	EDE44	915	54.44	4.4	58.84			
EDE44	EDE45	820	51.1	4.4	55.5			
EDE45	EDE46	766	49.23	4.4	53.63			
EDE46	EDE47	1054	61.18	4.4	65.58			
EDE47	EDE48	544	41.26	4.4	45.66			
EDE48	EDE49	1054	59.76	4.4	64.16			
EDE49	EDE50	738	47.53	4.4	51.93			
EDE50	EDE51	828	50.84	4.4	55.24			
EDE51	EDE52	834	51.08	4.4	55.48			
EDE52	EDE53	900	54.03	4.4	58.43			
EDE53	EDE54	900	53.84	4.4	58.24			
EDE54	EDE55	800	49.93	4.4	54.33			
EDE55	EDE56	752	48.2	4.4	52.6			
EDE56	EDE57	813	50.72	4.4	55.12			
EDE57	EDE58	954	56	4.4	60.4			
EDE58	EDE59	381	38.13	4.4	42.53			
EDE59	EDE60	925	50.8	4.4	55.2			
EDE60	EDE61	680	41.7	4.4	46.1			
EDE61	EDE62	989	57.6	4.4	62			

Start Structure Number	End Structure Number	Span (ft)	Max Blowout Offset from Centerline (79.1 mph)	Minimum Vegetation Clearance Distance (ft)	TOTAL (ft)	Height of Conductor above Centerline Elevation at Lowest Point of Sag (ft)	Distance from start Structure where Conductor exits ROW (ft)	Distance from End Structure where Conductor exits ROW (ft)
EDE62	EDE63	730	47.14	4.4	51.54			
EDE63	EDE64	1170	66.84	4.4	71.24			
EDE64	EDE65	800	50.05	4.4	54.45			
EDE65	EDE66	526	41.47	4.4	45.87			
EDE66	EDE67	1000	58	4.4	62.4			
EDE67	EDE68	900	53.38	4.4	57.78			
EDE68	EDE69	956	56.22	4.4	60.62			
EDE69	EDE70	960	56.51	4.4	60.91			
EDE70	EDE71	718	46.89	4.4	51.29			
EDE71	EDE72	942	55.39	4.4	59.79			
EDE72	EDE73	900	53.69	4.4	58.09			
EDE73	EDE74	851	51.53	4.4	55.93			
EDE74	EDE75	885	53.1	4.4	57.5			
EDE75	EDE76	1094	62.42	4.4	66.82			
EDE76	EDE77	833	47.4	4.4	51.8			
EDE77	EDE78	769	45.13	4.4	49.53			
EDE78	EDE79	945	55.35	4.4	59.75			
EDE79	EDE80	944	55.69	4.4	60.09			
EDE80	EDE81	756	48.19	4.4	52.59			
EDE81	EDE82	804	50.1	4.4	54.5			
EDE82	EDE83	1206	68.72	4.4	73.12			
EDE83	EDE84	948	55.56	4.4	59.96			
EDE84	EDE85	816	50.4	4.4	54.8			
EDE85	EDE86	848	51.72	4.4	56.12			
EDE86	EDE87	830	50.97	4.4	55.37			
EDE87	EDE88	821	50.67	4.4	55.07			
EDE88	EDE89	814	50.49	4.4	54.89			
EDE89	EDE90	900	53.72	4.4	58.12			
EDE90	EDE91	821	50.8	4.4	55.2			
EDE91	EDE92	744	47.48	4.4	51.88			
EDE92	EDE93	840	51.06	4.4	55.46			
EDE93	EDE94	866	52.09	4.4	56.49			

Start Structure Number	End Structure Number	Span (ft)	Max Blowout Offset from Centerline (79.1 mph)	Minimum Vegetation Clearance Distance (ft)	TOTAL (ft)	Height of Conductor above Centerline Elevation at Lowest Point of Sag (ft)	Distance from start Structure where Conductor exits ROW (ft)	Distance from End Structure where Conductor exits ROW (ft)
EDE94	EDE95	912	50.64	4.4	55.04			
EDE95	EDE96	721	43.37	4.4	47.77			
EDE96	EDE96A	422	39.1	4.4	43.5			
EDE96A	EDE97	508	41.57	4.4	45.97			
EDE97	EDE98	830	50.93	4.4	55.33			
EDE98	EDE99	651	44.32	4.4	48.72			
EDE99	EDE100	933	55.4	4.4	59.8			
EDE100	EDE101	867	53.01	4.4	57.41			
EDE101	EDE102	798	50.02	4.4	54.42			
EDE102	EDE103	1066	60.44	4.4	64.84			
EDE103	EDE104	554	41.16	4.4	45.56			
EDE104	EDE105	598	43.9	4.4	48.3			
EDE105	EDE106	1360	78.33	4.4	82.73	78	484	495
EDE106	EDE107	641	44.25	4.4	48.65			
EDE107	EDE108	1398	76.49	4.4	80.89	85	541	594
EDE108	EDE109	671	42.52	4.4	46.92			
EDE109	EDE110	600	43.66	4.4	48.06			
EDE110	EDE111	707	46.67	4.4	51.07			
EDE111	EDE112	1069	61.57	4.4	65.97			
EDE112	EDE113	880	52.72	4.4	57.12			
EDE113	EDE114	584	42.71	4.4	47.11			
EDE114	EDE115	906	54.42	4.4	58.82			
EDE115	EDE116	904	53.81	4.4	58.21			
EDE116	EDE117	704	45.43	4.4	49.83			
EDE117	EDE118	922	54.72	4.4	59.12			
EDE118	EDE119	1398	81.3	4.4	85.7	83	443	438
EDE119	EDE120	650	44.53	4.4	48.93			
EDE120	EDE121	300	35.11	4.4	39.51			
EDE121	EDE122	948	55.27	4.4	59.67			
EDE122	EDE123	1403	81.6	4.4	86	72	434	434
EDE123	EDE124	764	48.64	4.4	53.04			
EDE124	EDE125	908	53.1	4.4	57.5			

Start Structure Number	End Structure Number	Span (ft)	Max Blowout Offset from Centerline (79.1 mph)	Minimum Vegetation Clearance Distance (ft)	TOTAL (ft)	Height of Conductor above Centerline Elevation at Lowest Point of Sag (ft)	Distance from start Structure where Conductor exits ROW (ft)	Distance from End Structure where Conductor exits ROW (ft)
EDE125	EDE126	675	45.43	4.4	49.83			
EDE126	EDE127	736	47.75	4.4	52.15			
EDE127	EDE128	1015	58.95	4.4	63.35			
EDE128	EDE129	348	37.71	4.4	42.11			
EDE129	EDE130	1142	64.77	4.4	69.17			
EDE130	EDE131	926	54.98	4.4	59.38			
EDE131	EDE132	831	50.96	4.4	55.36			
EDE132	EDE133	452	39.81	4.4	44.21			
EDE133	EDE134	1084	62.33	4.4	66.73			
EDE134	EDE135	496	39.51	4.4	43.91			
EDE135	EDE136	472	39.09	4.4	43.49			
EDE136	EDE137	975	51.19	4.4	55.59			
EDE137	EDE138	1042	53.86	4.4	58.26			
EDE138	CU Line	682	41.76	4.4	46.16			

AFFIDAVIT OF TIMOTHY N. WILSON.

STATE OF MISSOURI)
) ss
COUNTY OF JASPER)

On the 22 day of March, 2022, before me appeared Timothy N. Wilson, to me personally known, who, being by me first duly sworn, states that he is the Vice President, Liberty Central Region and acknowledges that he has read the above and foregoing document and believes that the statements therein are true and correct to the best of his information, knowledge and belief.

Timothy N. Wilson

Subscribed and sworn to before me this 22 day of March, 2022.

Sherri J. Blalock
Notary Public

My commission expires: November 16, 2022.

SHERRI J. BLALOCK
Notary Public - Notary Seal
Newton County - State of Missouri
Commission Number 14969626
My Commission Expires Nov 16, 2022