Exhibit No.: 123NP
Issue: Vegetation Management
Witness: James "Jamie" S. Kiely
Type of Exhibit: Surrebuttal Testimony
Sponsoring Party: Kansas City Power & Light Company
Case No.: ER-2014-0370
Date Testimony Prepared: June 5, 2015

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO.: ER-2014-0370

SURREBUTTAL TESTIMONY

OF

JAMES "JAMIE" S. KIELY

ON BEHALF OF

KANSAS CITY POWER & LIGHT COMPANY

Kansas City, Missouri
June 2015

"[redacted]**" Designates "Highly Confidential" Information Has Been Removed. Certain Schedules Attached To This Testimony Designated "(Highly Confidential)" Have Been Removed Pursuant To 4 CSR 240-2.135.**

SURREBUTTAL TESTIMONY

OF

JAMES "JAMIE" S. KIELY

Case No. ER-2014-0370

Q: Please state your name and business address.

A: My name is James "Jamie" S. Kiely. My business address is 1200 Main Street, Kansas City, Missouri 64105.

Q: Are you the same James "Jamie" S. Kiely who pre-filed Direct Testimony in this matter?

A: Yes, I am.

Q: What is the purpose of your Surrebuttal Testimony?

A: I will respond to portions of the Rebuttal Testimony of Daniel Beck and Karen Lyons for the Missouri Public Service Commission ("Commission") Staff ("Staff") and William Addo for the Office of the Public Counsel ("OPC") regarding vegetation management programs and costs.

Q: What is your understanding of the positons taken by Staff and OPC regarding the enhancements to Kansas City Power & Light Company's ("KCP&L" or the "Company") vegetation management program you discussed in your Direct Testimony?

A: Staff appears to oppose implementation of all three enhancements to KCP&L's vegetation management program that I discussed in my Direct Testimony. Staff's opposition to the Company's triplex circuit trimming and urban/rural trim cycle alignment proposals is based on the concerns that the proposals lack sufficient data and analysis. (Beck Rebuttal, p. 5-11) The basis of Staff's opposition to the Company's emerald ash borer ("EAB") mitigation efforts is less clear, but may be due at least in part to the fact that 1) EAB infestation affects all of the State's electric utilities and 2) because EAB mitigation is not required by the Commission's vegetation management rule, the Company's EAB mitigation initiative is "discretionary". (Beck Rebuttal, p. 5, ll. 13-20; Lyons Rebuttal, p. 23, ll. 11-17)

OPC's opposition to implementation of the vegetation management program enhancements proposed by KCP&L appears to be based, at least in part, on the fact that these three initiatives are not required by the Commission's vegetation management rule. (Addo Rebuttal, p. 9, l. 14 through p. 10, l. 7)

Q: How do you respond?

A: One of the reasons KCP&L made proposals regarding triplex circuit trimming and alignment of urban and rural trim cycles was to obtain feedback on these proposals from stakeholders. In light of the feedback we've received from Staff and OPC, the Company has decided not to implement those program enhancements at this time. If we decide in the future that those proposals warrant further consideration, we'll raise them at that time.

Regarding EAB mitigation, I strongly disagree with the implication that EAB infestation is a problem that does not require attention now. In fact, it is imperative to implement this program enhancement now, and KCP&L has already begun doing so. As such, it is reasonable to include the estimated annual cost of $103,610 for the Missouri portion of this work in the Company's rates to be set in this case.

Q: Why is it imperative to implement EAB mitigation efforts now?

A: As discussed in greater detail in my Direct Testimony, implementing EAB mitigation efforts now will enable KCP&L to manage the process at a reasonable cost and avoid significant negative consequences from compromised or falling ash trees. It needs to be remembered that the Company's EAB mitigation effort is a 12-year project. Waiting to perform EAB mitigation efforts will most likely lead to significantly increased mitigation costs. As indicated on page 1 of Schedule JSK-1, the proactive EAB mitigation effort being undertaken by KCP&L is estimated to cost $4.27 million which compares quite favorably to the $101.6 million estimated restoration costs expected if mitigation efforts are not undertaken. Of course, this estimate of restoration costs does not include customer frustration and dissatisfaction resulting from increased service outages. Further, as indicated in paragraph 5 on page 4 of Schedule JSK-1, taking action now to mitigate EAB infestation will allow KCP&L to mitigate these future issues prior to tree death, which would increase removal cost and thus taking action now is in the best interest of both the Company and its customers.

I would also point out that in taking action to implement EAB mitigation efforts now, KCP&L's conduct is prudent and justifiable. This infestation and its progress has been recognized by the U.S. Forest Service, Missouri Department of Conservation, Kansas Forest Service, other investor-owned utilities and municipalities located in both Missouri and Kansas. All agree on EAB's existence and its ultimate effect on the Ash Tree, and either has or is currently developing some form of EAB mitigation effort based on their associated risk. As reported in the third paragraph on page 4 of Schedule JSK-1, a Michigan utility has experienced significant negative consequences – in the form of both cost and service disruption – as a result of EAB infestation. Our intention is to avoid such costs and disruptions by undertaking EAB mitigation efforts sooner rather than later.

Therefore, because KCP&L's EAB mitigation efforts, begun in 2015, are reasonable, necessary, beneficial to customers and not reflected in past vegetation management costs incurred by the Company, it is appropriate to include the estimated amount for EAB mitigation costs in the rates to be set in this case.

Q: What evidence do you have that KCP&L has already begun EAB mitigation efforts?

A: KCP&L, through Environmental Consultants, Inc., has performed the initial assessment and impact study. We have developed a mitigation plan and schedule and have initiated implementation within our normal cyclical planning process.

Q: Will EAB mitigation efforts result in cost reductions on a going forward basis?

A: While EAB mitigation will certainly result in avoided costs on a going forward basis, I do not believe EAB mitigation will result in any material reduction in the Company's vegetation management activities or costs compared to historical levels. The EAB infestation is a newly confirmed reliability risk which is now within the KCP&L service territory and mitigation efforts will be an additional cost to the Company's vegetation management program.

Q: Does that conclude your Surrebuttal Testimony?

A: Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Kansas City Power & Light Company's Request for Authority to Implement A General Rate Increase for Electric Service	)))	Case No. ER-2014-0370

AFFIDAVIT OF JAMES "JAMIE" S. KIELY

STATE OF MISSOURI)
) ss
COUNTY OF JACKSON)

James "Jamie" S. Kiely, being first duly sworn on his oath, states:

1. My name is James "Jamie" S. Kiely. I work in Kansas City, Missouri, and I am employed by Kansas City Power & Light Company as Director, Resource Management.

2. Attached hereto and made a part hereof for all purposes is my Surrebuttal Testimony on behalf of Kansas City Power & Light Company consisting of four (4) pages, having been prepared in written form for introduction into evidence in the above-captioned docket.

3. I have knowledge of the matters set forth therein. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded, including any attachments thereto, are true and accurate to the best of my knowledge, information and belief.

James "Jamie" S. Kiely

Subscribed and sworn before me this 5th day of June, 2015.

Nicol A. Wehry
Notary Public

My commission expires: Feb. 4, 2019

NICOLE A. WEHRY
Notary Public - Notary Seal
State of Missouri
Commissioned for Jackson County
My Commission Expires: February 04, 2019
Commission Number: 14391200

ENVIRONMENTAL CONSULTANTS, INC.

Kansas City Power & Light Company

Impact Analysis of Emerald Ash Borer on the KCP&L Distribution System

Prepared for:
KCP&L
Kansas City, MO
Under Attorney-Client
Privileged Communication

June 25, 2014

Prepared by:
Environmental Consultants, Inc.
520 Business Park Circle
Stoughton, WI 53589

KCP&L

Impact Analysis of Emerald Ash Borer on the KCP&L Distribution System

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KCP&L

1.0 Executive Summary

Emerald Ash Borer (EAB) may be present in every county within the Kansas City Power & Light (KCP&L) service territory as soon as the year 2026. Trees infested with EAB often die within one to three years. Significant ash tree mortality can occur within five years of initial EAB detection within a given community. Currently, five of the 47 counties that comprise the KCP&L system within northwest Missouri and eastern Kansas have known EAB infestations. In total, two counties in Kansas and the entire state of Missouri have been quarantined to minimize the spread of this pest by limiting the transportation of ash wood and byproducts.

KCP&L is estimated to have nearly 29,500 ash trees along its distribution corridors that are currently of sufficient height to impact the facilities should they succumb to EAB. The customer impact is estimated to be an additional 11,170 tree-caused outages over the next 12 years, impacting nearly three-quarters of a million customers (see Table 1). Preventing over 930 ash tree-caused outages annually will have an average annual impact on SAIFI of approximately 0.08.

Table 1. Cummulative Estimated Reliability Impact Due to Ash Tree Failure.

	TOTAL
# Outages	11,170
Customers Interrupted	750,790
Customer Minutes Interrupted	85,951,569
12-Year Average Annual Index Impact[1]:	
SAIFI	0.08
SAIDI	8.60
CAIDI	114.48

Failure to proactively remove these ash trees before they fall is estimated to cost in excess of $101.65 million in service restoration cost including: equipment repair, lost revenue, and customer dissatisfaction. The cost to proactively remove the ash trees identified as potential threats to service reliability is estimated to be $4.27 million over the next 12 years (Table 2). Therefore, adopting a proactive removal program is estimated to save KCP&L approximately $97.38 million. It should be noted, however, that annual net savings will vary and is highly dependent upon estimated per tree removal costs, average tree diameters, and ash population densities in the selected operational area. Estimated restoration repair cost is understood to be potentially understated due to the primary assumption that one ash tree will only cause one service interruption. In reality, a dying ash tree may decay and fall in pieces at varying times, causing multiple interruptions.

Removing the 29,500 ash trees proactively over the next 12 years will result in a overall net savings and avoid service interruptions. Table 2 summarizes a level budget strategy to address the proactive removal of this potential threat to service reliability.

[1] Assumes all ash-caused interruptions occur within 12 years.

Table 2. KCP&L Budget Option to Address Ash Tree Removals Over Next 12 Years.

Plan Year	Miles to Complete	ECI Survey Estimated # of Ash Trees	# Outages (N) Avoided	Estimated Customers Interrupted (CI) Avoided	Estimated Customer Minutes Interrupted (CMI) Avoided	Estimated Restoration Repair Cost	Estimated Removal Cost	Estimated Patrol Cost	Estimated Removal + Patrol Cost
2015	902.00	2,807	1,066	71,626	8,200,153	$9,697,568	$277,147	$78,375	$355,522
2016	1,019.98	2,716	1,031	69,324	7,936,396	$9,385,644	$277,694	$77,828	$355,522
2017	988.48	2,742	1,042	70,029	8,017,052	$9,481,028	$277,547	$77,975	$355,522
2018	1,119.66	2,639	1,004	67,516	7,729,216	$9,140,631	$278,156	$77,366	$355,522
2019	1,035.41	2,703	1,031	69,290	7,932,383	$9,380,898	$277,765	$77,757	$355,522
2020	1,582.38	2,289	874	58,759	6,726,849	$7,955,225	$280,302	$75,220	$355,522
2021	1,945.97	2,014	765	51,392	5,883,482	$6,957,852	$282,012	$73,540	$355,552
2022	1,473.18	2,372	902	60,617	6,939,496	$8,206,702	$279,796	$75,726	$355,522
2023	1,343.36	2,470	938	63,034	7,216,252	$8,533,996	$279,194	$76,328	$355,522
2024	1,748.96	2,162	822	55,262	6,326,542	$7,481,818	$281,075	$74,447	$355,522
2025	1,571.90	2,297	876	58,880	6,740,635	$7,971,528	$280,254	$75,268	$355,522
2026	1,781.72	2,139	819	55,059	6,303,113	$7,454,111	$281,204	$74,288	$355,492
Total:	**16,513.00**	**29,350**	**11,170**	**750,790**	**85,951,569**	**$101,647,000**	**$3,352,145**	**$914,119**	**$4,266,264**

INFORMATION THAT IS PROPRIETARY TO ECI HAS BEEN REDACTED FROM THIS DOCUMENT BY ECI.

2.0 Introduction

Emerald Ash Borer (*Agrilus planipennis* Fairmaire) or EAB is expected to impact approximately 37.9 million ash trees (genus *Fraxinus*) across the US by 2019 with an estimated economic cost to remove and replace infected trees of between $10.7 and $25 billion[2]. In the state of Missouri, it is estimated that approximately three percent of all tree species on forested land are ash; however ash trees may comprise nearly 14 percent of urban street trees and as much as 30 to 40 percent in some neighborhoods and parks[3]. Since the discovery of EAB in Wayne County in July of 2008, 11 Missouri counties have confirmed the presence of EAB. Additionally, the Animal and Plant Health Protection Service (APHIS) has issued a federal quarantine for the entire State of Missouri. The state of Kansas on the other hand, has quarantined only two counties to date, Johnson and Wyandotte counties after the discovery of EAB in July of 2012. Figure 1 presents the known EAB infected counties within the KCP&L service territory.

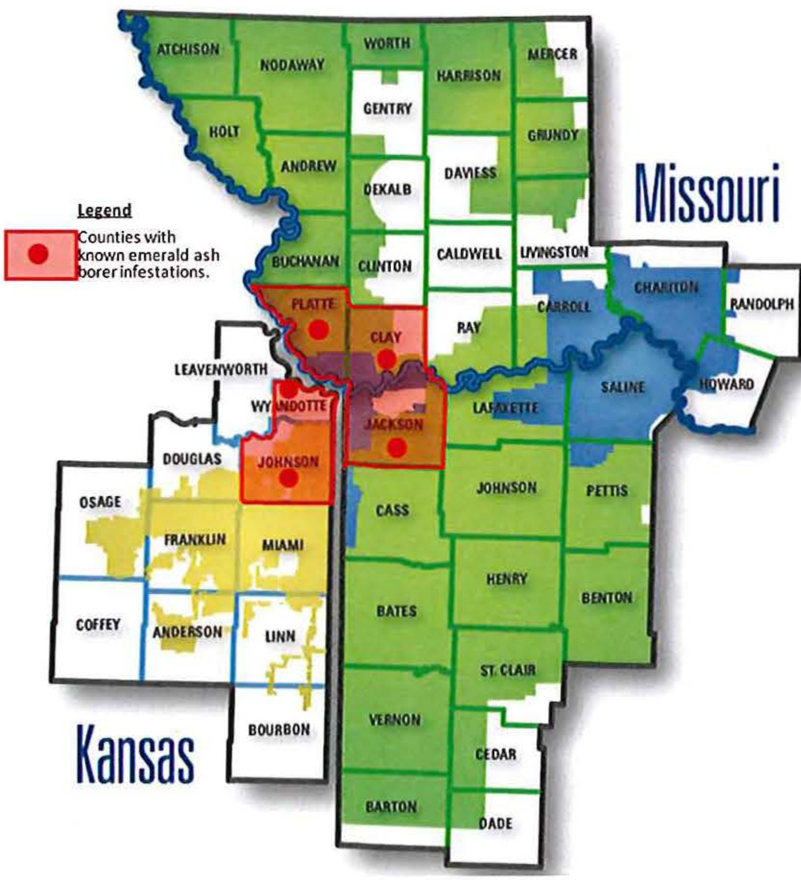

Figure 1. KCP&L Service Territory Showing Counties with Known Emerald Ash Borer (EAB) Infestations.

[2] *Cost of potential emerald ash borer damage in U.S. communities, 2009–2019.*
Kent F. Kovacs, Robert G. Haight, Deborah G. McCullough, Rodrigo J. Mercader , Nathan W. Siegert, Andrew M. Liebhold

[3] University of Missouri Extension, (n.d.) Emerald Ash Borer. Retrieved from http://extension.missouri.edu/treepests/emeraldashborer.aspx.

Estimating the rate of EAB spread across Kansas and Missouri or more specifically the KCP&L service territory is difficult. The rate of spread is dependent upon many factors; however, it is known that the largest contributor to the rate of spread is the transportation of infested trees (mainly in the form of firewood and millage) to non-infested areas. As such, EAB models designed to estimate the rate of spread utilize factors such as the number of major highways in and out of infested areas, the number of campgrounds and locations within a state, log mill locations within the state, ash population densities, and several other factors. While quarantines may help to slow the rate of spread, it is certain that these quarantines will not stop the spread.

Since EAB was first detected in Michigan in 2002 (some estimates place the actual date of infestation as early as 1998), EAB has been discovered in all 68 counties in the Lower Peninsula of Michigan and has killed over 35 million ash trees. Based on Michigan's experience where the spread of EAB occurred within a 14-year timeframe, and assuming that the infestations found in Missouri in 2008 and Kansas in 2012 likely occurred several years earlier, it is not unreasonable to estimate that EAB will infest every county within Missouri and Kansas by the year 2026. Collin Wamsley, State Entomologist with the Missouri Department of Agriculture as well as Robbie Doerhoff, Forest Health Specialist with the Missouri Department of Conservation, revealed in a recent phone interview with ECI, that the estimated rate of EAB spread across the state of Missouri has not been modeled. However, a similar rate of spread to Michigan is not unreasonable. Both felt that EAB is present in many more counties than are currently recognized and the proliferation of firewood transport within the state will further increase the rate of spread, despite the relatively lower density of ash as compared to Michigan.

Consumers Energy in the state of Michigan has seen substantial increases in outages related to EAB damaged trees. In addition, outage minutes are also increasing due to the catastrophic nature of these outages. Consumers Energy estimates a 150 percent increase in total tree-caused outages due to EAB related tree outages over the next five to seven years. The customer outage impact is estimated to be approximately $18 million per year for the next 10-years in the form of outage restoration costs and lost revenues and effect approximately one million additional customers per year. Consumers Energy estimates that the cost to remove the ash tree threat to be approximately $6 million per year over the same timeframe.

Trees become infested when adult beetles lay eggs on the bark, which hatch into larvae that bore into the tree. The larvae tunnel in the phloem layer (between bark and wood) and disrupt the movement of water and nutrients, eventually killing the tree. Tree mortality can be swift, commonly occurring within one to three years. From an electric utility standpoint, this poses obvious risks to service reliability. Ash trees that succumb to EAB are often subject to mechanical failure at the root plate, resulting in the whole tree hinging over at the base. Mechanical failure of this magnitude can cause severe damage to the utility infrastructure, causing conductors to fail, broken poles, and other hardware damage.

Dead ash trees are extremely hazardous to remove since they cannot be safely climbed. Therefore, quick and decisive action must be taken to remove these trees prior to tree death. Dead ash trees can also be much more expensive to remove since safety issues generally require higher levels of expertise and alternative removal techniques to effect their removal.

Kansas City Power & Light (KCP&L) recently engaged Environmental Consultants, Inc. (ECI) to perform an economic analysis of the potential impact of ash tree mortality along its 16,500 mile distribution system. The study focused on identifying the number of ash trees under and adjacent to the KCP&L primary overhead distribution system that are of sufficient height (currently or within the next 12 to 18 months) to contact the overhead facilities. It should be understood that the potential to contact the overhead facilities refers specifically to the ability of the tree to reach the facilities due to overall tree height and location relative to the lines and is not reflective of current tree health or condition. The assumption is that every ash tree is subject to Emerald Ash Borer and subject to structural failure. It should also be noted that the number of ash trees identified in this study is not representative of the total ash tree population, but rather only those trees currently identified as having sufficient height to contact the facilities.

The primary goal of this study is to quantify the number of ash trees, project associated budget requirements to remove these trees prior to mechanical failure, and estimate potential impacts to service reliability.

3.0 Study Methodology

The ash tree workload on the KCP&L distribution system was estimated statistically on the basis of a random sample survey conducted across KCP&L's combined service territory of approximately 16,500 miles of primary overhead distribution line. Data was collected by trained ECI survey personnel from April to May of 2014. [redacted] resulting in an overall sampling error of ±10.3 percent at the 90-percent level of confidence.

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3.2.1 Estimating System Ash Tree Workload

The total number of ash trees per mile recorded in the field survey were tallied and extrapolated over the total system miles. Ash trees that were noted as a "non-danger" tree due to lean, obstructions between the tree and the line, or other factors that would prevent the tree from making line contact were excluded from the estimate. Additionally, small ash trees, or those that were determined to be of insufficient height and that would not come within five feet of the energized conductor if they fell due to their height, were not tallied in this survey.

The study focused only on identifying the number of ash trees under and adjacent to the KCP&L primary overhead distribution system that are of sufficient height (currently or would be within the next 12 to 18 months) to contact the overhead facilities. It should be understood that the potential to contact the overhead facilities refers specifically to the ability of the tree to reach the facilities due to overall tree height and location relative to the lines and is not reflective of current tree health or condition.

Estimates were calculated at the KCP&L system level. Data was further stratified by diameter class and zone location to provide better removal cost estimates for budgetary purposes.

4.0 Results

The results provided in this section serve to quantify the number of ash trees on the KCP&L distribution system in order to establish estimated budgets for their removal and to provide estimates of the potential impact to service reliability and restoration costs that can be expected if no action is taken.

4.1 Workload Estimates

ECI projects that there are approximately 29,350 (± about 3,011) total ash trees on the 16,513 miles of line that comprise the KCP&L primary overhead distribution system. These are ash trees under and along the KCP&L overhead distribution system that have the potential to cause service interruptions due to structural failure resulting from EAB decline. Table 4 summarizes the estimated ash tree workload on the KCP&L distribution system by urban/rural and accessibility.

Table 4. Estimated Number of Ash Trees on the KCP&L Distribution System Capable of Making Line Contact, By Urban/Rural, Accessibility, Diameter Class, and Zone Distance from Conductor.

			Diameter Class						
Urban/Rural	**Accessibility**	**Zone**	**4" to 8"**	**8" to 12"**	**12" to 16"**	**18" to 20"**	**20" to 24"**	**>24"**	**Total**
Rural	**Accessible**	Zone1: <=10'	420	160	120	40	160	100	1,000
		Zone2: >10' and <=20'	850	750	570	200	220	180	2,770
		Zone3: >20' and <=30'	340	550	470	300	260	260	2,180
		Zone4: >30' and <=40'	40	340	160	300	220	40	1,100
		Zone5: >40' and <=50'	0	20	0	0	40	20	80
	A Total		**1,640**	**1,820**	**1,320**	**830**	**890**	**590**	**7,090**
	Inaccessible	Zone1: <=10'	180	60	40	0	0	0	280
		Zone2: >10' and <=20'	240	200	160	60	40	40	740
		Zone3: >20' and <=30'	60	120	40	20	20	0	260
		Zone4: >30' and <=40'	0	0	20	0	0	20	40
	I Total		**470**	**380**	**260**	**80**	**60**	**60**	**1,310**
R Total			**2,110**	**2,190**	**1,580**	**910**	**950**	**650**	**8,390**
Urban	**Accessible**	Zone1: <=10'	770	590	1,190	970	830	1,110	5,460
		Zone2: >10' and <=20'	530	710	950	810	1,050	1,260	5,310
		Zone3: >20' and <=30'	200	280	420	470	530	650	2,550
		Zone4: >30' and <=40'	40	40	60	200	450	710	1,500
		Zone5: >40' and <=50'	0	40	20	60	20	300	440
		Zone6: >50' and <=60'	0	0	0	0	20	60	80
		Zone7: >60' and <=70'	0	0	0	0	0	20	20
	A Total		**1,540**	**1,660**	**2,630**	**2,510**	**2,910**	**4,110**	**15,360**
	Inaccessible	Zone1: <=10'	100	120	60	200	200	160	840
		Zone2: >10' and <=20'	240	430	280	550	360	420	2,280
		Zone3: >20' and <=30'	40	120	160	420	400	280	1,420
		Zone4: >30' and <=40'	0	0	60	120	200	320	700
		Zone5: >40' and <=50'	0	0	0	100	100	120	320
		Zone6: >50' and <=60'	0	0	0	20	20	40	80
	I Total		**380**	**670**	**550**	**1,400**	**1,260**	**1,320**	**5,580**
U Total			**1,920**	**2,330**	**3,180**	**3,910**	**4,170**	**5,430**	**20,940**
Grand Total			**4,030**	**4,530**	**4,760**	**4,820**	**5,120**	**6,090**	**29,350**

Eighty-five percent of ash trees that could fall on the distribution system are within 30 feet of the line. The density of the ash tree population that could impact KCP&L facilities is estimated to be approximately 1.78 trees per line mile.

4.2 Workload Characteristics

The general characteristics of the ash tree population are described in this section. These characteristics include: 1) urban, suburban, and rural designation, 2) average accessibility of the ash tree population, 3) average state of health of the ash tree population, and 4) average probability of line contact.

4.2.1 Urban and Rural Characteristics

Figure 4 provides the KCP&L percentage of ash tree workload by urban-rural delineation of geographic areas. Urban indicates that the area is primarily commercial with mixed residential use, or otherwise developed for human use, and that the landscape under the conductors is actively maintained by the city, commercial businesses or homeowners. Rural indicates scattered houses among agricultural or forest lands, with little or no landscape maintenance. Surveyors familiar with the KCP&L classifications used local knowledge in determining the appropriate classifications.

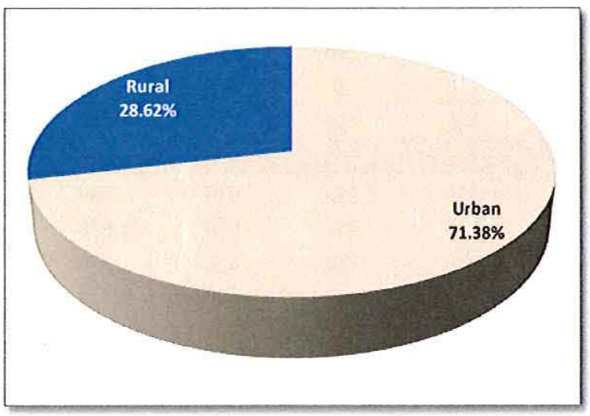

Figure 4. KCP&L Estimated Urban and Rural Breakout of Ash Tree Population.

In general, these demographic characteristics play a major role in the cost component of removing these trees. Urban trees may require more debris removal, traffic control, increased complexity in removal due to residential structures, etc. as compared to their rural counterparts.

4.2.2 Accessibility

Accessibility is defined as the ability to work a tree with a standard two-wheel drive bucket truck. Accessibility can play a major role in the cost of removal. Normally, trees that must be climbed (not accessible to a bucket) will have a higher cost to a factor of 1.6 or greater.

Figure 5 presents the average accessibility of the ash tree population on the KCP&L distribution system. The accessibility noted here represents the accessibility of the ash trees across the entire system for both urban and rural areas combined. The accessibility of the ash tree population in the Metro is still relatively high (64 percent) and is thought to be reflective of the fact that ash trees are most commonly found as part of the street tree landscape.

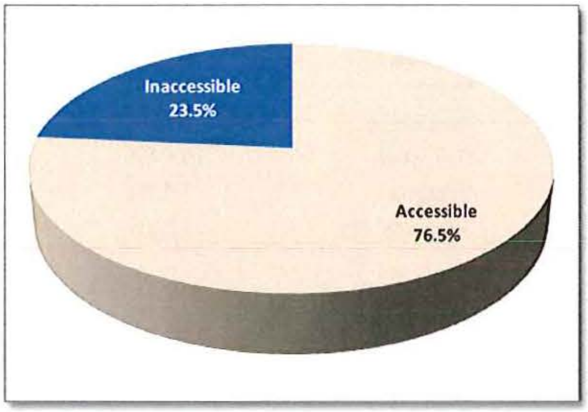

Figure 5. KCP&L Ash Tree Population Accessible to a Bucket.

4.2.3 Average Ash Tree Health

Figure 6 presents the percentage of ash trees that show obvious signs of decline or that are currently dead due to EAB or other causes. Note that the amount of decline demonstrated in the chart indicates that KCP&L ash tree population is beginning to see signs of tree mortality. Dodson and F&M are currently the areas noted with the highest ash declines. Approximately 25 percent of the ash trees tallied in both these operations centers were noted as declining (see Table 5).

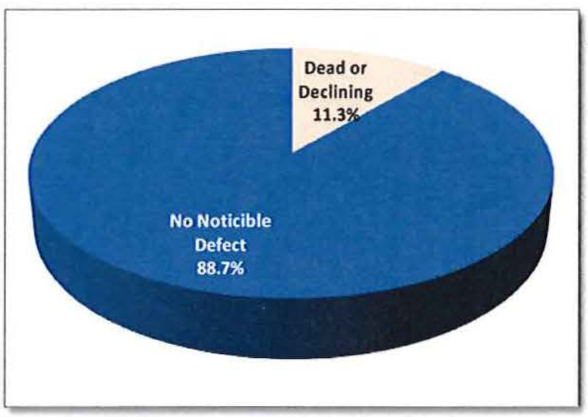

Figure 6. KCP&L Average Distribution System Ash Tree Population State of Health.

Table 5. Percentage of Ash Trees in Decline as Compared to the Total Ash Trees Inventoried by Operations Center.

Op Center	% Declining	Op Center	% Declining
Blue Springs	3.54%	Maryville	17.74%
Belton	7.95%	Northland	18.69%
Clinton	6.56%	Nevada	5.88%
Dodson	26.50%	Platte City	0.00%
East	2.70%	Sedalia	5.13%
F&M	25.49%	South	11.62%
Henrietta	4.35%	Southland	0.00%
Johnson County	15.11%	St Joseph	10.94%
Liberty	16.28%	Trenton	3.57%
Lees Summit	5.97%	Warrensburg	5.56%

4.2.4 Strike Probability

Table 6 presents the average strike probability by diameter class and zone distance from conductor. Strike probability is a measure of how likely the tree is to fall into the conductor versus fall in another direction. This probability is used in the estimate of the total number of potential ash tree outages.

Table 6. Ash Tree Strike Probability by Company, Diameter Class, and Zone Distance from Conductor.

Distance to Conductor	Diameter Class						
Zone	4" to 8"	8" to 12"	12" to 16"	18" to 20"	20" to 24"	>24"	Total
Zone1: <=10'	55.2%	60.2%	68.3%	60.4%	62.8%	63.8%	61.8%
Zone2: >10' and <=20'	19.8%	29.8%	32.5%	35.9%	38.7%	41.1%	32.8%
Zone3: >20' and <=30'	10.2%	22.4%	26.3%	29.7%	30.9%	35.6%	27.3%
Zone4: >30' and <=40'	10.9%	18.1%	23.0%	25.4%	25.6%	30.0%	25.6%
Zone5: >40' and <=50'	0.0%	10.5%	0.0%	21.1%	22.4%	27.0%	23.2%
Zone6: >50' and <=60'	0.0%	0.0%	0.0%	0.0%	12.4%	16.0%	13.1%
Zone7: >60' and <=70'	0.0%	0.0%	0.0%	0.0%	0.0%	21.9%	21.9%
Total:	**31.0%**	**33.1%**	**40.9%**	**38.5%**	**39.5%**	**41.7%**	**37.9%**

4.3 Estimated Cumulative Reliability Impacts

Table 7 presents the total estimated ash tree outages, customers interrupted, and customer minutes interrupted that can be expected on the KCP&L system if no action is taken to remove the ash trees, assuming that all ash trees will ultimately fail. It should be noted that these numbers represent only the ash tree impacts and are incremental to current tree outages. However, it can be assumed that not all of the ash trees will fail in any given calendar year and will most likely be spread over the next 12 years. The general poor health condition of the existing ash tree population in several operating areas as described in Table 5, Section 4.2.3, will serve as a guide to scheduling the proactive removal of ash trees. The visible decline in ash tree health should limit customer pushback in securing removals.

Note that the estimated outages presented in Table 7, assumes that each tree will fail only once (total tree failure), however, it should be understood that some trees may cause several outages due to limb breakage over a period of time, particularly those in the first three zones. The estimated outages presented here does not account for these potential additional outages.

Table 7. Cummulative Estimated Reliability Impact Due to Ash Tree Failure.

	TOTAL
# Outages	11,170
Customers Interrupted	750,790
Customer Minutes Interrupted	85,951,569
12-Year Average Annual Index Impact[4]:	
SAIFI	0.08
SAIDI	8.60
CAIDI	114.48

4.4 Estimated Cumulative Budget Requirements

Utilizing KCP&L average 2003 and YTD 2014 removal unit cost rates by diameter classification, urban/rural delineation, and accessibility, ECI was able to project the budget requirements for the removal of all of the ash trees identified as being of sufficient height (currently or within the next 12 to 18 months) to contact the facilities if they were to fail. Table 8 presents the estimated budget requirements including removal costs and cost to patrol by company. It should be noted that the historical removal costs used in these budget projections may not accurately reflect the amount of disposal fees, dump time, or other extraneous costs (tree replacement, etc.) that may be associated with the actual removal of these ash trees. Budget requirements should be recalculated annually based on the new unit cost data collected from the execution of the project and actual tree counts collected from the ash tree patrols for the circuits being maintained.

Table 8. Cummulative Estimated Budget Requirements to Patrol and Remove Ash Tree Population in close proximity to KCP&L Distribution Facilities.

	TOTAL
Removal Cost ($millions)	$3.51
Patrol Costs ($millions)	$0.91
Total Cost ($millions)	$4.43

Table 9 presents the average unit removal costs by diameter class used in the budget estimates.

[4] Assumes all ash-caused interruptions occur within 12 years.

Table 9. Estimated Cost per Removal by Diameter Class, Demographics, and Accessibility.

Diameter Class	Rural Accessible	Rural Inaccessible	Urban Accessible	Urban Inaccessible
4" to 8"	$16.09	$24.82	$32.72	$43.54
8" to 12"	$42.81	$25.93	$58.81	$73.63
12" to 16"	$98.20	$60.19	$95.91	$154.78
18" to 20"	$98.20	$60.19	$95.91	$154.78
20" to 24"	$98.20	$60.19	$95.91	$154.78
>24"	$98.63	$78.04	$202.72	$384.56

The cost to patrol and permission for ash tree removals on the KCP&L facilities was estimated based on a system average per mile cost of approximately $55 per mile ($87 urban, $31 rural).

4.5 Estimated Cumulative Restoration Cost

The cost to patrol and remove the ash tree population capable of causing service interruptions will be more than offset by the cost savings incurred by avoided restoration labor and repair costs. Tree structural failures can cause extensive damage to overhead conductors and equipment and generally result in longer restoration times at a higher overall cost. Table 10 presents the estimated repair cost assuming an average cost of $9,100 per ash tree outage. KCP&L therefore, is estimated to save approximately $97.38 million by proactively removing the ash trees. A persuasive argument can still be made in favor of proactive ash removal even if the restoration cost estimates and removal costs are off by a magnitude of five. Some argument may be made in regard to the potential capitalization of some or all of the restoration costs, but the same may be said in regard to the proactive removal costs. It is beyond the scope of this study to make those determinations.

Outages are assumed to be limited to one outage per ash tree and does not account for potential limb breakage which could result in multiple outages per tree over a period of time, particularly in zones 1 thru 3. Therefore, the restoration cost estimates as presented in Table 10 may be understated.

Table 10. Estimated Restoration Cost if KCP&L Defers Ash Removal, Estimated Using an Average Total Cost per Restoration Outage of $9,100 as Compared to Proactive Removal Cost.

	TOTAL
Estimated Restoration Cost ($millions)	$101.65
Estimated Proactive Removal Cost ($millions)	$4.43
Estimated KCP&L Savings by Proactive Removal	**$97.38**

4.6 Strategic Planning

The key to minimizing the outage impacts from EAB damaged trees is to develop a proactive strategy that addresses the removal of ash trees in infested and quarantined areas as quickly as possible; focusing on those Operations Centers within and in close proximity to these areas first. Secondly, those operations centers with a higher percentage of declining ash trees receive top priority. One advantage to this scenario is that public awareness and understanding of the EAB issues should be highest in these areas. Additionally, the visibility of the declining ash tree canopy is more apparent, thus allowing for fewer issues in obtaining removal consent. The scenario presented in Table 11 utilizes a level annual budget option of $355,522 to effectively address the removal of the 29,350 ash trees by 2026.

INFORMATION THAT IS PROPRIETARY TO ECI HAS BEEN REDACTED FROM THIS DOCUMENT BY ECI.

Table 11. KCP&L Ash Tree Removal Option Utilizing a Level Budget Strategy to Address Removals by 2026.

Plan Year	Op Center	Miles to Complete	Rank	ECI Survey Estimated # of Ash Trees	Estimated # Outages (N) Avoided	Estimated Customers Interrupted (CI) Avoided	Estimated Customer Minutes Interrupted (CMI) Avoided	Estimated Restoration Repair Cost	Estimated Removal Cost	Estimated Patrol Cost	Estimated Total Removal Cost	Removal + Patrol Cost/ Tree
2015	Dodson	902.00	1	2,807	1,066	71,626	8,200,153	$9,697,568	$277,147	$78,375	$355,522	$126.67
2016	Dodson	40.91	1	127	48	3,249	371,917	$439,832	$12,570	$3,555	$16,125	$126.67
2016	Johnson County	979.07	2	2,589	983	66,076	7,564,479	$8,945,812	$265,124	$74,274	$339,397	$131.11
2017	Johnson County	22.85	2	60	23	1,542	176,549	$208,788	$6,188	$1,733	$7,921	$131.11
2017	Northland	737.06	3	2,120	805	54,108	6,194,361	$7,325,500	$212,808	$59,913	$272,721	$128.64
2017	F&M	228.57	4	562	214	14,379	1,646,142	$1,946,740	$58,551	$16,328	$74,879	$133.26
2018	F&M	277.88	4	683	260	17,481	2,001,221	$2,366,660	$71,180	$19,851	$91,031	$133.26
2018	Lees Summit	681.89	5	1,584	603	40,531	4,640,000	$5,487,300	$167,662	$46,591	$214,253	$135.26
2018	Blue Springs	159.89	6	371	141	9,504	1,087,995	$1,286,671	$39,314	$10,925	$50,238	$135.26
2019	Blue Springs	522.00	6	1,213	462	31,027	3,552,005	$4,200,629	$128,348	$35,666	$164,014	$135.26
2019	Liberty	279.25	7	760	291	19,560	2,239,204	$2,648,100	$77,281	$21,687	$98,968	$130.22
2019	Platte City	234.16	8	730	278	18,703	2,141,173	$2,532,168	$72,136	$20,403	$92,539	$126.69
2020	Platte City	102.45	8	320	122	8,183	936,770	$1,107,832	$31,560	$8,927	$40,486	$126.69
2020	Southland	366.80	9	869	332	22,315	2,554,693	$3,021,200	$91,506	$25,461	$116,967	$134.60
2020	Henrietta	452.79	10	417	161	10,822	1,238,872	$1,465,100	$61,538	$15,877	$77,415	$185.65
2020	South	660.35	11	683	259	17,440	1,996,514	$2,361,093	$95,699	$24,955	$120,654	$176.55
2021	South	1,945.97	11	2,014	765	51,392	5,883,482	$6,957,852	$282,012	$73,540	$355,552	$176.55
2022	South	709.92	11	735	279	18,749	2,146,405	$2,538,355	$102,883	$26,829	$129,712	$176.55
2022	Belton	536.46	12	1,211	461	30,986	3,547,330	$4,195,100	$129,034	$35,786	$164,820	$136.10
2022	St Joseph	226.79	13	426	162	10,882	1,245,762	$1,473,247	$47,879	$13,111	$60,990	$143.00
2023	St Joseph	1,133.45	13	2,132	809	54,384	6,225,946	$7,362,853	$239,286	$65,526	$304,812	$143.00
2023	Warrensburg	209.92	14	338	129	8,650	990,306	$1,171,144	$39,908	$10,802	$50,711	$149.83
2024	Warrensburg	688.81	14	1,111	422	28,385	3,249,561	$3,842,956	$130,953	$35,447	$166,400	$149.83
2024	East	1,060.15	15	1,052	400	26,877	3,076,981	$3,638,862	$150,122	$39,000	$189,122	$179.79
2025	East	705.55	15	700	266	17,888	2,047,795	$2,421,738	$99,909	$25,956	$125,865	$179.79
2025	Clinton	565.98	16	871	333	22,383	2,562,388	$3,030,300	$104,356	$28,144	$132,500	$152.12
2025	Sedalia	300.37	17	726	277	18,609	2,130,452	$2,519,489	$75,989	$21,169	$97,158	$133.90
2026	Sedalia	54.39	17	131	50	3,370	385,767	$456,211	$13,760	$3,833	$17,593	$133.90
2026	Nevada	457.91	18	554	213	14,317	1,639,005	$1,938,300	$72,635	$19,203	$91,838	$165.77
2026	Maryville	893.87	19	1,021	389	26,147	2,993,300	$3,539,900	$136,972	$36,028	$173,000	$169.44
2026	Trenton	375.55	20	433	167	11,225	1,285,041	$1,519,700	$57,837	$15,224	$73,061	$168.73
Total:		**16,513.00**		**29,350**	**11,170**	**750,790**	**85,951,569**	**$101,647,000**	**$3,352,145**	**$914,119**	**$4,266,264**	**$145.36**