EB-2020-0007

BURLINGTON HYDRO RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

1.0-VECC-1

Reference: Exhibit 1, page 55

Please provide the bill impacts for a typical residential customer using 600 kWh per month.

Response:

BHI provides the bill impacts for a typical residential customer using 600 kWh per month in Table 1 below.

Table 1

Class	kWh	kW	Distribution (Fixed and Volumetric) Sub-Total A			
			Current Rates	Proposed Rates	$ Change	% Impact
Residential (as filed October 30, 2020)	600		$27.17	$30.03	$2.86	10.5%
Residential (updated for IRs)	600		$27.17	$29.67	$2.50	9.2%

Class	kWh	kW	Total Bill (after HST and OER)			
			Current Rates	Proposed Rates	$ Change	% Impact
Residential (as filed October 30, 2020)	600		$96.11	$98.63	$2.52	2.6%
Residential (updated for IRs)	600		$96.11	$98.33	$2.23	2.3%

1.0-VECC-2

Reference: Exhibit 1, page 65

BHI Increased the size of its Board of Directors from three directors to seven.

Please provide the rationale, increase in costs and the year the year the change was implemented

Response:

As part of its initiative to develop guidance on corporate governance for OEB rate-regulated utilities, the OEB issued its "*Report of the Ontario Energy Board: Best Practices regarding Governance of OEB Rate Regulated Utilities*"[1] ("the Report") on December 20, 2018, providing guidance on best practices for utility governance.

BHI determined that it was in the interests of the utility to incorporate the Report's guidance on governance architecture as best practice.

On October 15, 2019, BHI changed its governance structure including board size to incorporate recommendations of the Report.

BHI Board costs increased by $105k between 2018, when the Board consisted of 3 directors, and the 2020 Bridge Year, when the Board consisted of 7 directors. Please refer to Table 21 (row "Director Remuneration") on page 54 of Exhibit 4 for the increase in costs

[1] EB-2014-0255

2.0-VECC-3

Reference: Exhibit 2, pages 46-47
Chapter 2 Appendices, Appendix 2Z

a) Please confirm that BHI does not have any wholesale market participant customers.

i. If not confirmed what were the associated 2019 kWh sales?

Response:

a) BHI confirms that it does not have any wholesale market participant customers, as referenced in section 9.3.0.4 of Exhibit 9.

2.0-VECC-4

Reference: DSP, page 14

BHI indicates a large percentage (26%) of BHI's asset base is in Very Poor, Poor or Fair condition.

a) Please provide the percentage of BHI's asset base that is in very poor and poor condition and show the calculation.

b) Please provide the percentage of BHI's asset base that were in very poor and poor condition in EB-2013-0115.

c) Please provide the percentage of BHI's asset base that were in fair condition in EB-2013-0115.

Response:

a) The percentage of BHI's asset base that is in Very Poor and Poor condition is 3%, as shown in Table 1 below. The calculation is the sum of assets in Poor (643) and Very poor (378) condition divided by total assets (30,022).

Table 1

Asset Class	Population	Health Index Distribution				
		Very Good	Good	Fair	Poor	Very Poor
Wood Pole	14,471	846	10,236	2,739	412	238
Concrete Pole	165	130	35	-	-	-
Overhead Primary Conductor (km)	827	242	374	196	1	14
Underground Primary Cable (km)	662	251	174	104	54	79
Pole-Mount Transformer	3,189	1,360	1,462	344	23	-
Pad-Mount Transformer	4,007	2,663	1,204	139	1	-
Submersible Transformer	772	394	309	68	1	-
Vault Transformer	72	22	34	12	4	-
Switchgear	201	130	66	5	-	-
Overhead Switch	5,174	1,338	861	2,907	63	5
Recloser	14	14	-	-	-	-
Power Transformer	44	19	20	5	-	-
Circuit Breaker	132	4	30	76	20	2
Station Primary Switchgear	44	3	-	7	8	26
Feeder Egress Cable (km)	23	3	7	10	2	0
Battery Bank	33	10	6	14	1	2
Charger	33	11	3	11	-	8
Protective Relay	127	-	10	63	50	4
Building	32	-	17	12	3	-
Total Assets	**30,022**	**7,440**	**14,848**	**6,713**	**643**	**378**
% of Total	***100%***	***25%***	***49%***	***22%***	***2%***	***1%***
% of Total in Poor or Very Poor condition					***3%***	

b) BHI had not completed a formal ACA prior to 2019, and therefore cannot provide the percentage of its asset base that was in Very Poor and Poor condition in EB-2013-0115.

c) BHI had not completed a formal ACA prior to 2019, and therefore cannot provide the percentage of its asset base that was in Fair condition in EB-2013-0115.

2.0-VECC-5

Reference: DSP

BHI regularly updates its design and construction standards.

Please identify any new equipment design and construction standards since 2014 that are cost drivers of capital increases over the test period.

Response:

BHI provides the following equipment design and construction standards since 2014 that are cost drivers of capital increases over the test period.

1. BHI Standard 41-100A-r0 Condu-disc grounding for overhead installations

   Condu-disc grounding plates were introduced for new pole installations (with transformers or other equipment attached to it) to provide better protection in case of overvoltage on the line caused either by lightning or switching. Condu-disc grounding plates are more costly than traditional ground rods.

2. GridSmartCity standard DT-1PAD (Issue #4) Low-profile single-phase pad-mounted transformers

3. GridSmartCity standard DT-3PAD (Issue #4) Three-phase pad-mounted loop feed transformers

4. GridSmartCity standard DT-3-R-PAD (Issue #2) Three-phase pad-mounted radial feed transformers

   Standards 2, 3, and 4 specify the use of stainless steel tanks, which are more expensive but have been shown to extend the life of the transformer as most deficiencies are due to tank corrosion leading to oil leaks. These standards also specify improved transformer efficiency ratings leading to lower losses.

2.0-VECC-6

Reference: DSP, page 39 Table 5.2-6: Historical Performance – SAIDI

Please add a row to Table 5.2-6 that's shows SAIDI excluding Loss of Supply, MEDs and Scheduled Outages.

Response:

BHI provides Table 5.2-6 with an additional row that shows SAIDI excluding Loss of Supply, MEDs and Scheduled Outages in Table 1 below.

Table 1

Measure	Metric	Target [1]	2015	2016	2017	2018	2019	5-year Average
System Reliability	SAIDI	n/a	3.40	1.41	1.52	3.69	2.09	2.42
	SAIDI – Excl. LOS/MEDs	≤1.09	1.18	1.25	1.04	1.44	1.05	1.19
	SAIDI – Excl. LOS/MEDs/ Scheduled Outages	n/a	0.93	1.19	0.95	1.27	0.92	1.05

1. Target for 2015 – 2019 is based on the 2010-2014 SAIDI Historical Average

2.0-VECC-7

Reference: DSP, page 40 Table 5.2-8: Historical Performance – SAIFI

Please add a row to Table 5.2-8 that's shows SAIFI excluding Loss of Supply, MEDs and Scheduled Outages.

Response:

BHI provides Table 5.2-8 with an additional row that shows SAIFI excluding Loss of Supply, MEDs and Scheduled Outages in Table 1 below.

Table 1

Measure	Metric	Target [1]	2015	2016	2017	2018	2019	5-year Average
System Reliability	SAIFI	n/a	1.14	0.94	0.96	1.63	1.42	1.22
	SAIFI – Excl. LOS/MEDs	1.07	0.71	0.79	0.64	0.85	0.75	0.75
	SAIFI – Excl. LOS/MEDs/ Scheduled Outages	n/a	0.63	0.76	0.62	0.81	0.71	0.71

1. Target for 2015 – 2019 is based on the 2010-2014 SAIFI Historical Average

2.0-VECC-8

Reference: DSP P42
BHI provides a summary of outages by cause code in Figure 5.2-4 to Figure 5.2-6 and Table and Table 5.2-11 to identify the factors contributing to its reliability metrics.

Please provide the total number of outages by year for the years 2014 to 2020.

Response:

Please see BHI's response to 2.0-VECC-9 a).

2.0-VECC-9

Reference: DSP, page 44 Table 5.2-11: Reliability Performance by Cause Code (2015-2019)

a) Please add 2014 and 2020 to Table 5.2-11.

b) Please confirm the data for Defective Equipment excludes MEDs.

c) Please provide a breakdown of Defective Equipment data by Cause Code for the years 2014 to 2020.

Response:

a) BHI provides a recast Table 5.2-11 with 2014 and 2020 added in Table 1 below and in Excel format, attached as IR_Attachment_2-VECC-9a_BHI.

Table 1

Cause Code		2014	2015	2016	2017	2018	2019	2020	Total
Adverse Environment	# of interruptions	-	-	-	-	-	-	-	-
	Cust. Interruptions	-	-	-	-	-	-	-	-
	Cust. Hours	-	-	-	-	-	-	-	-
Adverse Weather	# of interruptions	72	28	19	17	74	27	34	271
	Cust. Interruptions	19,268	6,421	4,789	7,447	8,030	6,781	4,326	57,062
	Cust. Hours	40,446	16,716	8,677	18,844	29,871	8,873	10,115	133,542
Defective Equipment	# of interruptions	290	256	131	143	152	149	169	1,290
	Cust. Interruptions	31,401	17,779	19,624	16,013	15,226	24,128	22,741	146,912
	Cust. Hours	35,727	24,573	29,537	23,971	21,506	42,409	25,733	203,456
Foreign Interference	# of interruptions	31	45	58	61	50	56	59	360
	Cust. Interruptions	836	1,962	12,999	9,503	1,442	5,360	2,260	34,362
	Cust. Hours	541	2,995	9,932	9,035	4,649	6,257	1,785	35,194
Human Element	# of interruptions	3	2	1	2	5	1	-	14
	Cust. Interruptions	623	1,092	402	17	2,001	2	-	4,137
	Cust. Hours	73	74	27	10	848	8	-	1,040
Lightning	# of interruptions	1	6	2	1	2	2	5	19
	Cust. Interruptions	1	450	3,988	13	279	306	254	5,291
	Cust. Hours	7	980	4,052	49	286	524	39	5,938
Loss of Supply	# of interruptions	3	6	4	4	3	1	6	27
	Cust. Interruptions	4,805	4,754	10,609	3,574	15,048	134	36,387	75,311
	Cust. Hours	401	2,254	10,879	1,110	3,294	451	3,775	22,164
Scheduled Outage	# of interruptions	119	204	108	109	129	157	75	901
	Cust. Interruptions	1,838	4,781	1,634	1,695	2,901	2,758	729	16,336
	Cust. Hours	5,316	16,821	4,075	6,058	11,382	8,956	2,529	55,137
Tree Contacts	# of interruptions	51	28	33	54	66	36	53	321
	Cust. Interruptions	4,573	5,616	5,012	7,342	24,077	4,853	10,664	62,137
	Cust. Hours	7,896	5,891	19,713	10,641	26,803	3,418	22,388	96,750
Unknown/ Other	# of interruptions	88	27	29	33	29	37	35	278
	Cust. Interruptions	11,821	8,879	3,980	1,089	3,465	7,059	7,011	43,304
	Cust. Hours	6,812	10,307	7,469	1,089	1,673	1,250	5,558	34,158
Total	**# of interruptions**	**658**	**602**	**385**	**424**	**510**	**466**	**436**	**3,481**
	Cust. Interruptions	**75,166**	**51,734**	**63,037**	**46,693**	**72,469**	**51,381**	**84,372**	**444,852**
	Cust. Hours	**97,219**	**80,611**	**94,362**	**70,807**	**100,311**	**72,145**	**71,923**	**587,378**

b) BHI confirms the data for Defective Equipment excludes MEDs.

c) BHI cannot provide a breakdown of Defective Equipment data by Cause Code because this data is already broken down by Cause Code (Defective Equipment is the Cause Code). Please refer to BHI's response to 2-Staff-16 c) for a further breakdown of Defective Equipment data by year and equipment type.

2.0-VECC-10

Reference: DSP, page 54 Table 5.2-19: Health Index Results

Please provide historical data on the Health Index results for Wood Poles, MS Feeder Cables and Station Switchgear.

Response:

BHI does not have historical data on the Health Index results for Wood Poles, MS Feeder Cables and Station Switchgear because it had not completed a formal ACA prior to 2019.

2.0-VECC-11

Reference: Appendix 2-AA

a) Please add a column to the table to include 2020 actuals.

b) Please explain why BHI has not budgeted an amount for Storm Damage in 2020 and 2021.

c) Please provide the percentage of capital work undertaken by third party contractors for the years 2014 to 2020 and forecast for 2021.

d) Please provide Reactive Capital spending for the years 2014 to 2020.

e) Please provide the forecast budget for Reactive Capital for 2021 and explain how it was derived.

Response:

a) 2020 actual data is not available because BHI's year end processing is not complete. Please refer to BHI's response to 2-Staff-9 a) for an updated 2020 forecast in Appendix 2-AA format.

b) BHI has not budgeted an amount for Storm Damage in 2020 and 2021 because it is unable to forecast the frequency, timing, impact and cost of severe weather events.

c) BHI provides the percentage of capital work undertaken by third party contractors for the years 2014 to 2020 and forecast for 2021 in Table 1 below.

Table 1

% of BHI's Gross Capital Expenditures	2014	2015	2016	2017	2018	2019	2020	2021
Third Party Contractors	29%	25%	33%	33%	34%	32%	37%	48%

d) BHI does not track or budget expenditures related to reactive replacements separately from expenditures related to proactive replacements.

e) Refer to part e) above.

2.0-VECC-12

Reference: DSP, page 82 Table 5.3-6: Age Percentage Breakdown by Asset Class

a) Please add columns to the table that reflect asset age distribution by quantities in addition to percentages and provide an excel version of the table.

Response:

a) BHI provides a recast Table 5.3-6 including asset age distribution by quantities in addition to percentages in Table 1 below and in Excel, filed as IR_Attachment_2-VECC-12_BHI.

Table 1 (recast Table 5.3-6 to reflect asset age distribution by quantities)

Asset Category	Population	Age Distribution (#)							Age Distribution (%)						
		0-10	11-20	21-30	31-40	41-50	51-60	60+	0-10	11-20	21-30	31-40	41-50	51-60	60+
Wood Pole	14471	1707	1425	1875	2332	2928	1563	2641	11.79%	9.85%	12.96%	16.12%	20.23%	10.80%	18.25%
Concrete Pole	165	6	110	9	6	24	0	10	3.92%	66.67%	5.23%	3.92%	14.38%	0.00%	5.88%
Overhead Primary Conductors (km)	827.0	128.1	1.9	113.3	59.8	325.2	176.9	21.9	15.48%	0.23%	13.70%	7.23%	39.32%	21.39%	2.65%
Underground Primary Cable (km)	661.8	96.4	159.4	151.6	121.1	111.7	17.2	4.3	14.57%	24.08%	22.90%	18.31%	16.87%	2.60%	0.66%
Pole-Mount Transformer	3189	576	605	547	645	460	248	108	18.06%	18.97%	17.15%	20.23%	14.42%	7.78%	3.39%
Pad-Mount Transformer	4007	668	1362	1058	751	151	14	3	16.67%	33.99%	26.40%	18.74%	3.77%	0.35%	0.07%
Submersible Transformer	772	137	196	170	31	238	0	0	17.75%	25.39%	22.02%	4.02%	30.83%	0.00%	0.00%
Vault Transformer	72	17	8	12	6	20	9	0	23.61%	11.11%	16.67%	8.33%	27.78%	12.50%	0.00%
Switchgear	201	43	43	54	49	8	3	1	21.39%	21.39%	26.87%	24.38%	3.98%	1.49%	0.50%
Overhead Switch	5174	1318	61	561	357	1836	913	128	25.47%	1.19%	10.84%	6.91%	35.49%	17.65%	2.47%
Reclosers	14	14	0	0	0	0	0	0	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Station Power Transformer	44	10	0	5	5	13	11	0	22.73%	0.00%	11.36%	11.36%	29.55%	25.00%	0.00%
Circuit Breaker	132	0	10	10	50	37	25	0	0.00%	7.58%	7.58%	37.88%	28.03%	18.94%	0.00%
Station Switchgear	44	3	0	7	14	15	5	0	6.82%	0.00%	15.91%	31.82%	34.09%	11.36%	0.00%
Feeder Egress Cable (km)	22.8	2.1	1.5	0.3	2.2	12.0	2.2	0.1	9.14%	6.48%	1.38%	9.56%	52.68%	9.57%	0.53%
Battery Bank	33	30	3	0	0	0	0	0	90.91%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%
Charger	33	11	14	8	0	0	0	0	33.33%	42.42%	24.24%	0.00%	0.00%	0.00%	0.00%
Protective Relay	127	11	23	33	50	6	4	0	8.66%	18.11%	25.98%	39.37%	4.72%	3.15%	0.00%
Building	32	0	0	1	9	12	9	1	0.00%	0.00%	3.13%	28.13%	37.50%	28.13%	3.13%

2.0-VECC-13

Reference: DSP, page 84 Table 5.3-7: Health Index Percentage Breakdown by Asset Class

a) Please add a column to show the percentage of data available for each asset class.

b) Please add columns to the table that reflect the Health Index by asset quantities and provide an excel version of the table.

Response:

a) Table 0-2 on Page 9 of the Asset Condition Assessment, filed as Appendix 10 of the DSP, includes the percentage of data available (the Data Availability Index or "DAI") for each asset class.

b) BHI provides a recast Table 5.3-7 including the Health Index by asset quantities in Table 1 below and in Excel, filed as IR_Attachment_2-VECC-13_BHI.

Table 1 (recast Table 5.3-7 including the Health Index by asset quantities)

Asset Class	Population	Health Index Distribution (%)					Average Health Index	Health Index Distribution (#)				
		Very Good	Good	Fair	Poor	Very Poor		Very Good	Good	Fair	Poor	Very Poor
Wood Pole	14,471	5.84%	70.73%	18.93%	2.84%	1.65%	74.13%	846	10,236	2,740	412	238
Concrete Pole	165	78.62%	21.38%	0.00%	0.00%	0.00%	88.70%	130	35	-	-	-
Overhead Primary Conductor (km)	827	29.25%	45.19%	23.73%	0.15%	1.68%	74.94%	242	374	196	1	14
Underground Primary Cable (km)	662	37.96%	26.30%	15.74%	8.08%	11.92%	72.09%	251	174	104	54	79
Pole-Mount Transformer	3,189	42.64%	45.85%	10.78%	0.73%	0.00%	83.52%	1,360	1,462	344	23	-
Pad-Mount Transformer	4,007	66.46%	30.05%	3.46%	0.03%	0.00%	88.50%	2,663	1,204	139	1	-
Submersible Transformer	772	51.01%	40.00%	8.86%	0.13%	0.00%	84.42%	394	309	68	1	-
Vault Transformer	72	30.56%	47.76%	16.42%	5.97%	0.00%	77.93%	22	34	12	4	-
Switchgear	201	64.52%	32.80%	2.69%	0.00%	0.00%	88.68%	130	66	5	-	-
Overhead Switch	5,174	25.86%	16.63%	56.19%	1.23%	0.10%	75.59%	1,338	861	2,907	63	5
Recloser	14	100.00%	0.00%	0.00%	0.00%	0.00%	97.99%	14	-	-	-	-
Power Transformer	44	43.18%	45.45%	11.36%	0.00%	0.00%	83.03%	19	20	5	-	-
Circuit Breaker	132	2.73%	22.73%	57.27%	15.45%	1.82%	61.44%	4	30	76	20	2
Station Primary Switchgear	44	6.82%	0.00%	15.91%	18.18%	59.09%	34.90%	3	-	7	8	26
Feeder Egress Cable (km)	23	13.73%	30.22%	45.39%	9.05%	1.62%	69.54%	3	7	10	2	0
Battery Bank	33	30.30%	18.18%	42.42%	3.03%	6.06%	70.45%	10	6	14	1	2
Charger	33	33.33%	9.09%	33.33%	0.00%	24.24%	63.28%	11	3	11	-	8
Protective Relay	127	0.00%	7.72%	49.80%	39.58%	2.90%	50.12%	-	10	63	50	4
Building	32	0.00%	53.13%	37.50%	9.38%	0.00%	66.33%	-	17	12	3	-

2.0-VECC-14

Ref: DSP, page 94 Table 5.3-12: Summary of BHI's Asset Replacement Practices

BHI implements reactive replacement strategies for overhead conductors, distribution transformers, overhead and underground switches, and line reclosers.

a) Please discuss if BHI has made any changes to its reactive replacement strategies since its 2014 COS application.

b) Please provide the budget for this work and explain where the budget is located in Appendix 2-AA.

Response:

a) BHI historically replaced underground primary cables on a reactive basis when failures occurred. BHI is proposing a more proactive replacement approach to mitigate failure risk.

   BHI has not made changes to its other reactive replacement strategies since its 2014 COS application.

b) Please refer to BHI's response to 2.0-VECC-11 d).

2.0-VECC-15

Reference: DSP

Please complete the attached excel spreadsheet of Planned Asset Replacements.

Response:

BHI does not track assets replaced proactively separate from assets replaced reactively.

2.0-VECC-16

Reference: DSP

Please complete the attached excel spreadsheet of Reactive Asset Replacements.

Response:

BHI does not track assets replaced proactively separate from assets replaced reactively.

2.0-VECC-17

Reference: DSP, page 126

BHI engaged a third-party consultant to develop a framework and associated Prioritization Tool to optimally allocate available capital funds and prioritize projects in a given year. The framework ensures that all projects are evaluated against a standard set of criteria, project prioritization is objective and key outcomes are delivered as determined by BHI's asset management objectives.

a) Please identify the third-party consultant that developed the framework and associated Prioritization Tool.

b) Please provide the standard criteria for project prioritization.

c) Please confirm when the tool was implemented.

Response:

a) METSCO Energy Solutions developed the framework and associated Prioritization Tool.

b) The standard set of criteria are the impact on each asset management objective, as identified in Table 5.3-1 of the DSP (page 61 of 186), and the probability of that impact occurring.

c) BHI implemented the prioritization tool as part of the 2021 capital expenditure planning process.

2.0-VECC-18

Reference: DSP, Appendix 10: 2019 Asset Condition Assessment Report

Please provide BHI's Asset Condition Assessment from EB-2013-0115.

Response:

BHI did not conduct an Asset Condition Assessment as part of its EB-2013-0115 application.

2.0-VECC-19

Reference: DSP, Appendix 10: 2019 Asset Condition Assessment Report

Please identify the asset categories where the Health Index is based solely on age.

Response:

Station Battery Chargers is the only asset category where the Health Index is based solely on age.

2.0-VECC-20

Reference: DSP, page 142 Table 5.4-18 Net Capital Expenditures by Project 2014-2021 (OEB Appendix 2-AA)

Please recast Table 5.4-18 to include forecast amounts for each year 2014-2020 and provide an excel version of the Table.

Response:

Please refer to 1-SEC-8 for Table 5.4-18 recast to include the budgeted cost in the EB-2013-0115 application for the years 2014-2018, including an Excel version.

BHI did not produce its 2019 forecast amounts at the Appendix 2-AA level for this application; however, material variances against BHI's internal budget are provided in section 5.4.2.1 of the DSP (pages 135-140).

The 2020 Bridge Year in Table 5.4-18 reflects the forecasted amount for 2020. Please see 2-Staff-9 a) for an updated 2020 forecast of net capital expenditures.

2.0-VECC-21

Ref: DSP Appendix 1: Pole Replacement Program

a) Please provide the number of poles that can be replaced annually using internal resources.

b) Does BHI pay a premium to use third-party contractors to replace poles under the Pole Replacement Program or are there cost savings? Please discuss.

c) Has BHI used third-party contractors to undertake part of its pole replacement program in prior years? If yes, please provide details including annual quantities replaced and cost.

d) BHI indicates its average annual expenditures for this program were $760,000 from 2014 to 2020. Please explain the reason for the higher cost of $1,241,160 in 2019 (Appendix 2-AA) and compare to the budget amount.

e) Please provide the number of poles replaced in each of the years 2014 to 2020.

f) Please provide the forecast number of poles to be replaced in each of the years 2021 to 2025.

g) BHI states "Replacing poles that are at end of life and in Very Poor condition may reduce the frequency and duration of unplanned outages due to equipment failure. (5.4.3.2.B.1.d.iii). Does BHI track data on the age and condition of wood poles replaced? Please discuss.

h) Please provide the number of wood pole failures for the year 2014 to 2020.

i) Please indicate other capital programs where wood poles are replaced on a planned basis and provide the annual quantities for the period 2021 to 2025 compared to 2014 to 2020.

Response:

a) The number of poles that can be replaced annually using internal resources varies from year to year depending on the number and magnitude of other capital projects and programs.

b) No, BHI does not pay a premium to use third-party contractors to replace poles under the Pole Replacement Program. BHI uses a mix of internal and external resources to execute its pole replacement program and work is assigned based on factors such as the number of poles to be replaced, size of the pole(s), equipment on the pole(s), resource availability,

urgency, and other ongoing capital program work. This approach allows BHI to replace a higher number of poles within the allocated annual budget compared to using strictly internal or strictly third-party contractor resources.

c) Yes, BHI has used third-party contractors to undertake part of its pole replacement program in prior years. BHI does not track the quantities or cost of third-party contractor pole replacements separately from poles that are replaced using internal resources.

d) Please refer to page 146 in Section 5.4.2.2 of the DSP for an explanation of the reason for the higher cost of the Pole Replacement program in 2019.

e) Please refer to BHI's response to 2-SEC-19 for the number of poles replaced in each of the years 2014 to 2020.

f) Please refer to BHI's response to 2-SEC-19 for the forecast number of poles to be replaced in each of the years 2021 to 2025.

g) Yes, BHI tracks data on the age and condition of wood poles replaced under the Pole Replacement program. BHI leverages data from its 2019 Asset Condition Assessment to determine the condition of wood poles replaced under the Pole Replacement program. Please refer to BHI's response to 2-Staff-27 e) for the condition of poles replaced in 2020, per BHI's latest capital expenditure forecast.

h) BHI does not track the number of wood pole failures separately from poles that are replaced on a proactive basis. BHI does not track or budget expenditures related to reactive replacements separately from expenditures related to proactive replacements.

i) Other capital programs and projects where wood poles are replaced on a planned basis include the General Service Overhead and Underground programs, Region projects, City projects, the Metrolinx Corridor Electrification project, the Dundas St. Road Widening project and the Waterdown Rd. Road Widening project.

BHI provides the annual quantities for other capital programs where wood poles are replaced on a planned basis for the period 2021 to 2025 compared to 2014 to 2020 in Table 1 below. The increase in 2020 and 2021 is driven by the Metrolinx Corridor Electrification project, the Dundas St Road Widening project, and the Waterdown Rd Road Widening project. Annual quantities in 2021 and beyond are not confirmed as they are driven by an undefined number of discrete customer projects in the General Service programs or other third-party projects where the design has not been finalized.

Table 1

Project	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Planned pole replacements (excl. Pole replacement program)	69	48	30	76	43	21	104	191	-	-	-	-

2.0-VECC-22

Reference 1: DSP, pages 146-147
Reference 2: DSP, page 175 Appendix 1 Pole Replacement Program (5.4.3.2.C.SR.v)

At reference #1, BHI indicates it currently replaces approximately 80 poles per year or 0.6% of the population and is proposing to increase the pacing of its Pole Replacement program to replace an additional 20 poles per year currently in Very Poor and Poor condition over the five-year DSP horizon (100 poles/year).

At reference #2, BHI indicates it is proposing the recommended pace of 650 poles over the DSP horizon to appropriately pace the high cost of the program; manage customer bill impacts; and accommodate other capital investment priorities, while still effecting a decrease in the percentage of units in Very Poor condition (130 poles/year).

Please reconcile the two statements and confirm the number of planned pole replacements per year over the DSP horizon.

Response:

The number of poles in reference #2 (i.e., 650 poles or 130 poles/year) is incorrect and should read “BHI is proposing the recommended pace of 500 poles over the DSP horizon to appropriately pace the high cost of the program; manage customer bill impacts; and accommodate other capital investment priorities, while still effecting a decrease in the percentage of units in Very Poor condition”.

BHI confirms reference #1 is accurate and that it plans to replace 100 poles per year over the DSP horizon.

2.0-VECC-23

Reference: DSP, page 175 Appendix 1 Underground Rebuilds (Primary Cable)

BHI indicates it is proposing the recommended pace of ~12 km of cable over the DSP horizon, taking a more proactive approach compared to historical replacements.

a) Please provide the km of cable replaced by year for the years 2014 to 2020.

b) Please provide the number of cable failures for the years 2014 to 2020.

Response:

a) Please refer to BHI's response to 2-SEC-19 for the kilometers of cable replaced by year for the years 2014 to 2020.

b) BHI provides the number of underground cable failures each year from 2014-2020 in Table 1 below.

Table 1

Year	Number of underground cables failures
2014	42
2015	34
2016	24
2017	19
2018	23
2019	20
2020	18

2.0-VECC-24

Reference: DSP, page 175 Appendix 1 Station Primary Switchgear Replacement

BHI is proposing to replace two units per year starting in 2021 in order to decrease the percentage of switchgear in Very Poor and Poor condition.

Please provide the number of Station Primary Switchgear failures for the years 2014 to 2020.

Response:

BHI provides the number of Station Primary Switchgear failures each year from 2014-2020 in Table 1 below.

Table 1

Year	Number of Station Primary Switchgear Failures
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	1

2.0-VECC-25

Ref: DSP, page 175 Appendix 1 MS Feeder Cable Replacement

BHI is proposing the recommended pace of replacing 20 MS feeder egress cables over the DSP horizon.

a) Please provide the number of MS feeder egress cable replaced in the years 2019 and 2020.

b) Please provide the number of failures by year for the years 2014 to 2020.

Response:

a) Please refer to BHI's response to 2-SEC-19 for the number of MS feeder egress cable replaced in the years 2019 and 2020.

b) BHI provides the number of MS feeder egress cable failures each year from 2014-2020 in Table 1 below.

Table 1

Year	Number of MS feeder egress cables Failures
2014	0
2015	0
2016	0
2017	0
2018	0
2019	2
2020	1

2.0-VECC-26

Ref: DSP, page 175 Appendix 1 Station Transformer Replacement

BHI is proposing to replace six transformers over the DSP horizon.

a) Please provide the number of Station Transformers replaced in each of the years 2014 to 2020 and the condition and age of each Station Transformer replaced.

b) Please provide the number of Station transformer failures by year for the years 2014 to 2020.

Response:

a) BHI provides the number of Station Transformers replaced in each of the years 2014 to 2020 and the condition and age of each Station Transformer replaced in Table 1 below.

Table 1

Year	Number of Station Transformers replaced	Condition	Age
2014	0	N/A	N/A
2015	1	N/A	34
2016	1	N/A	34
2017	2	N/A	45
		N/A	43
2018	2	N/A	32
		N/A	32
2019	1	N/A	60
2020	1	Fair	59

b) BHI provides the number of Station transformer failures by year for the years 2014 to 2020 in Table 2 below.

Table 2

Year	Number of Station Transformers failures
2014	1
2015	1
2016	2
2017	1
2018	2
2019	0
2020	2

2.0-VECC-27

Reference: Appendix 2-AA

Please explain the increase in Other Substation Renewal in 2019.

Response:

There is no increase in Other Substation Renewal in 2019. Other Substation Renewal increases in the 2021 Test Year, primarily driven by a more proactive substation circuit breaker replacement program to begin addressing Very Poor, Poor, and/or obsolete breakers. BHI owns 132 substation circuit breakers, of which 22 (17.3%) are currently in Poor or Very Poor condition based on the condition parameters outlined in BHI's ACA. An additional 76 breakers (57.3%) are in Fair condition and expected to deteriorate into Poor or Very Poor condition over the DSP horizon.

Please refer to pages 149-150 in Section 5.4.2.2 of the DSP for more details.

3.0-VECC-28

Reference: Exhibit 3, page 10

Preamble: The Application states: "The load and customer forecast methodologies are unchanged from those approved by the OEB in BHI's 2014 Cost of Service application (EB-2013-0115)".

a) For each of the Residential, GS<50 and GS>50 classes are the independent variables used in the multivariate regression methodology the same as those used in BHI's 2014 Cost of Service application? If not, why were different variables used?

Response:

a) BHI's 2014 load forecast used HDD and CDD data from Pearson Airport relative to 18°, Toronto FTEs, Month Days, and Shoulder variables for each class. Additional variables "GS Structure" were used in the GS<50 kW and GS>50 kW regressions, which were not required in the time frame used in this load forecast. The 2014 forecast did not consider alternate HDD and CDD variables or alternate economic variables. The 2021 load forecast considered a wider range of degree day and economic variables than was considered at that time. Alternate degree day and economic variables were used when they were found to have a higher degree of statistical significance.

3.0-VECC-29

Reference: Exhibit 3, page 9

Preamble: The Application states: "The sales and energy forecast utilized actual data from January 2010 to June 2020."

a) Was the historical sales (kWh) data used for the Residential, GS<50 and GS>50 classes based on actual calendar month sales?
    i. If yes, how were the calendar month sales determined, particularly prior to the installation of smart meters?
    ii. If no, what adjustments were made to the actual historical sales data in order for it to represent sales during the calendar months?
b) Was actual data for January-June 2020 used to estimate the regression equations for any of the Residential, GS<50 or GS>50 classes?
c) Was actual data for January-June 2020 used to forecast the 2021 sales for either the Street Light or USL classes?
d) For what months were historical values for the independent economic variables (FTE and GDP) used in the regression analyses available? If values were "missing", how were the missing values determined for purposes of the analyses?

Response:

a) No, historical sales (kWh) data was not based on actual calendar month sales for the Residential and GS<50 rate classes and for some customers in the GS>50 classes.
    i. N/A
    ii. Calendar month sales were estimated by prorating the billed energy of the billing period for the number of billing days in each calendar month.

b) No, actual data for January-June 2020 was not used to estimate the regression equations for any of the Residential, GS<50 or GS>50 classes.

c) No, actual data for January-June 2020 was not used to forecast the 2021 sales for either the Street Light or USL classes.

d) GDP and FTE figures were available for all months.

3.0-VECC-30

Reference: Exhibit 3, page 11

Preamble: The Application states: "A range of degree day bases beyond 18°C were considered in each rate class regression model. HDD and CDD measures at temperatures lower than 18°C were found to be more predictive than the default 18°C".

a) Please explain what is meant by "more predictive".

Response:

a) The predicted figures that were obtained with those variables more closely aligned with actual values (i.e., lower MAPE and higher Adjusted R^2 statistics).

3.0-VECC-31

Reference: Exhibit 3, pages 12-13

Preamble: The Application states: "Forecasted GDP and employment in 2021 are based on forecast growth rates from four major Canadian banks: BMO, TD, Scotiabank, and RBC, as of August 20, 2020 and provided in Table 4 below".

a) Are the FTE and GDP forecasts set out in Table 4 for Ontario?
b) If the required data is available from the four banks' forecasts, please extend Table 4 beyond 2021.
c) Please provide a table similar to Table 4 but based on the forecasts from the four major Canadian banks issued just prior to the start of the COVID-19 pandemic and, if practical, extend the table beyond 2021 (per part (b)).

Response:

a) Yes, the FTE and GDP forecasts set out in Table 4 are for Ontario.

b) Table 1 below includes the latest 2020 and 2021 bank forecasts, extended to 2022.

Table 1

Ontario					
	BMO	TD	Scotia	RBC	Average
Report Date	23-Dec-20	15-Dec-20	12-Jan-21	15-Dec-20	
FTE (Employment growth % YoY)					
2020	(5.10%)	(5.00%)	(5.00%)	(4.90%)	(5.00%)
2021	5.10%	5.70%	3.90%	5.80%	5.13%
2022	3.70%	2.90%	3.20%	1.90%	2.93%
GDP (Real % YoY)					
2020	(5.60%)	(6.20%)	(5.60%)	(5.60%)	(5.75%)
2021	5.10%	5.60%	4.70%	5.50%	5.23%
2022	4.80%	4.10%	4.40%	5.00%	4.58%

c) Table 2 below sets out the last forecasts prior to the start of the COVID-19 pandemic. Bank forecasts did not extend to 2022 at that time.

Table 2

Ontario					
	BMO	TD	Scotia	RBC	Average
Report Date	12-Feb-20	17-Dec-19	13-Jan-20	Dec-19	
FTE (Employment growth % YoY)					
2020	1.90%	1.40%	1.20%	1.40%	1.48%
2021	1.20%	1.00%	1.00%	0.80%	1.00%
GDP (Real % YoY)					
2020	1.80%	1.70%	1.50%	1.60%	1.65%
2021	1.80%	1.70%	1.80%	1.60%	1.75%

3.0-VECC-32

Reference: Exhibit 3, pages 16-21
BHI Load Forecast Model

Preamble: At page 16 the Application states that the Residential volumes for 2020 are adjusted so as to be forecast assuming normal economic conditions. It also states that similar adjustments were not made for 2021.

The 2020 and 2021 predicted Residential monthly values (prior to the removal of CDM) are set out in the "Residential Normalized Monthly Avg" Tab of the Load Forecast Model.

a) In developing the Residential model did BHI test whether the number of weekdays vs. non-weekdays in the month was statistically significant in terms of explaining monthly Residential use?
b) Please confirm that the forecast 2020 monthly Residential values were determined using the regression model and forecast values for Ont_FTEAdj based on the corresponding 2019 months' values increased by 1.9% which is the pre-COVID 2020 forecast increase for FTE (per the "Economic (2020 Adj)" Tab – cell Q31).
    i. If not, please demonstrate with references to the Load Forecast Model what 2020 forecast FTE values were used and how they were derived.
c) The 2021 monthly values for "Ont_FTEAdj" used to determine the 2021 Residential forecast (as set out in the "Residential Normalized Monthly Avg" Tab of the Load Forecast Model) appear to be based on the corresponding 2020 month's values increased by 1.9% which is the pre-COVID 2020 forecast increase for FTE (per the "Economic (2020 Adj)" Tab – cell Q31).
    i. Please confirm if this is the case.
    ii. If not, please demonstrate with references to the Load Forecast Model what 2021 forecast FTE values were used and how they were derived.
    iii. If yes, please explain why the "Ont_FTEAdj" forecast increase for 2020 as opposed to 2021 was used and whether or not the Residential forecast needs to be revised.
d) Please provide an alternative Residential load forecast where the 2021 monthly values are projected using a forecast for "Ont_FTEAdj" that escalates the corresponding 2020 months' "Ont_FTEAdj" values by 1.2% (i.e., the pre-COVID forecast increase in FTE for 2021 per the "Economic (2020 Adj)" Tab – cell Q32).
e) Please provide a schedule that sets out the actual HDD and CDD values for 2020 for all months for which the data is available.
f) Please provide a schedule that sets out:
    i. The actual 2020 Residential sales for each month for which the data is available.
    ii. The monthly 2020 Residential forecast (for the same months) based on BHI's Residential model (per the Application) and forecasts for the independent

variables except use the actual 2020 HDD and CDD values and adjust the monthly results to remove 1/12th of the 2020 cumulative Residential CDM savings.

Response:

a) The difference between the number of weekdays and non-weekdays in the month was tested indirectly. The variable "Peak Days", the number of non-holiday workdays in the month, was tested. Month Days and Peak Days were separately found to be statistically significant. When Month Days and Peak Days were included in the same regression, the Peak Days variable was not statistically significant so only Month Days was used (to adjust the dependant variable, not as an independent variable).

b) BHI confirms that the forecast 2020 monthly Residential values were determined using the regression model and forecast values for Ont_FTEAdj based on the corresponding 2019 months' values increased by 1.9% which is the pre-COVID 2020 forecast increase for FTE (per the "Economic (2020 Adj)" Tab – cell Q31)

c)

i. BHI confirms that the 2021 monthly values for "Ont_FTEAdj" used to determine the 2021 Residential forecast (as set out in the "Residential Normalized Monthly Avg" Tab of the Load Forecast Model) were based on the corresponding 2020 month's values increased by 1.9% which is the pre-COVID 2020 forecast increase for FTE (per the "Economic (2020 Adj)" Tab – cell Q31)

ii. N/A.

iii. The 2020 growth rate was used in error. The updated load forecast has been corrected to increase the non-COVID 2020 FTE figures by the pre-COVID 2021 FTE forecast growth rate. The revised load forecast is filed as Attachment_Load_Forecast_Model_BHI_Revised.

d) The Residential load in the described scenario is 524,243,173 kWh, and derived in tab 'Part d)' of IR_Attachment_3-VECC-32_BHI.

e) The schedule is attached in tab 'Part e)' of IR_Attachment_3-VECC-32_BHI.

f) The schedule is attached in tab 'Part f)' of IR_Attachment_3-VECC-32_BHI. Data is available to November 2020.

3.0-VECC-33

Reference: Exhibit 3, page 22
BHI Load Forecast Model, Customer Count Tab

a) The January 2021 Residential customer count forecast in the Customer Count Tab (Cell C49) is not a calculated but rather a hard coded value. What is the basis for this value?
b) What are the actual 2020 Residential customer counts for those months after July 2020 for which data is now available?

Response:

a) The January 2021 residential customer count was manually adjusted so that the average customer count in 2021 reflected an increase over the average 2020 customer count equal to the geometric mean growth rate from 2010 to 2019. Each month subsequent to July 2020 was set to increase by the monthly equivalent of the geometric mean growth rate from 2010 to 2019, however, this created a minor mismatch depending on the actual customer counts in January 2020 to July 2020. The January 2021 customer count was derived with the Goal Seek function to maintain the monthly increase in each other month while maintaining the annual growth rate.

b) Actual 2020 Residential customer counts are provided in Table 1 below.

Table 1

Month	Residential Customer Count
Jan	61,510
Feb	61,517
Mar	61,554
Apr	61,567
May	61,593
Jun	61,616
Jul	61,659
Aug	61,687
Sep	61,707
Oct	61,698
Nov	61,769
Dec	61,803

3.0-VECC-34

Reference: Exhibit 3, page 16 and pages 22-27
BHI Load Forecast Model

a) In developing the GS<50 model did BHI test whether the number of weekdays vs. non-weekdays in the month was statistically significant in terms of explaining monthly GS<50 use?
b) Please confirm that the January-June 2020 "Tor_FTEAdj" values used in the Load Forecast Model for the GS<50 class are actual values.
c) At page 16 the Application states that the GS<50 usage for the second quarter of 2020 did not decrease to the extent predicted by the Q2 economic growth rates. Please provide a schedule that demonstrates this.
d) Please explain more fully the derivation of the July-December 2020 "Tor_FTEAdj" values used in the Load Forecast Model for the GS<50 class and how it reflects the observed smaller impact of the changes in quarterly GDP on consumption in Q2.
e) After the adjustments, what is the 2020 annual growth rate for the "Tor_FTEAdj" variable used in the model to forecast GS<50 sales for 2020?
f) The 2021 monthly values for "Tor_FTEAdj" used to determine the 2021 GS<50 forecast (as set out in the "GS<50 Normalized Monthly Avg" Tab of the Load Forecast Model) appear to be based on the corresponding 2019 months' "Tor_FTEAdj" values increased by 2.9% (the post-COVID FTE growth for 2019) and then increased by -5.1% (the which is the post-COVID 2020 forecast FTE increase for 2020) - see the "Economic (2020 Adj)" Tab – cells F146 to F157).
    i. Please confirm if this is the case.
    ii. If not, please demonstrate with references to the Load Forecast Model what 2021 forecast FTE values were used and how they were derived.
    iii. If yes, please explain why 2019 and 2020 growth rates were used for "Tor_FTEAdj" and whether or not the GS<50 forecast needs to be revised.
    iv. Please explain why it is appropriate to use a different 2020 growth rate for "Tor_FTEAdj" when forecasting 2021 GS<50 sales than was used to forecast 2020 GS<50 sales.
g) Please provide an alternative GS<50 load forecast where the 2021 monthly values are projected using a forecast for "Tor_FTEAdj" that escalates the corresponding 1999 month's value by 1.9% (i.e., the pre-COVID forecast increase in FTE for 2020 per the "Economic (2020 Adj" Tab) and then by 1.2% (i.e., the pre-COVID forecast increase in FTE for 2021 per the "Economic (2020 Adj" Tab).
h) Please provide a schedule that sets out:
    i. The actual 2020 GS<50 sales for each month for which the data is available.
    ii. The monthly 2020 GS<50 forecast (for the same months) based on BHI's GS<50 model and independent variable values except use the actual 2020 HDD and

CDD values and remove from the monthly results 1/12th of the 2020 cumulative GS<50 CDM savings.

iii. The monthly 2020 GS<50 forecast (for the same months) based on BHI's GS<50 model and independent variable values except use the actual 2020 HDD and CDD values, the pre-COVID forecast for "Tor_FTEAdj" and remove from the monthly results 1/12th of the 2020 cumulative GS<50 CDM savings.

Response:

a) The variable "Peak Days" was tested. Month Days and Peak Days were separately found to be statistically significant, though Month Days demonstrated greater statistical significance. In regressions with average GS<50 kW consumption per day, the Peak Days variable was not statistically significant.

b) BHI confirms that the January-June 2020 "Tor_FTEAdj" values used in the Load Forecast Model for the GS<50 class are actual values.

c) Please see tab "Part c)" of IR_Attachment_3-VECC-34_BHI. Note that quarterly economic forecasts were only available for GDP. When those quarterly forecasts are applied, predicted consumption fell below actual consumption. This peaked in June 2020 when predicted consumption with those figures was 10.3% below actual consumption.

d) The 2020 Adjusted FTE values were derived with a series of manual adjustments to utilize available economic forecast information to provide a rough estimate of consumption in the remaining months of 2020 as of August 2020. The figures are not used to forecast 2021 consumption and BHI is not seeking approval of the resulting figures or methodology.

Economic forecast data from the major Canadian banks was only available in the form of Canada-wide GDP growth figures. The quarterly Ontario FTE growth rates are a function of GDP growth rates in the quarter and an Adjustment factor that was applied to ensure the geometric mean of quarterly growth rates was equal to the forecast 2020 Ontario FTE growth rate. The weightings of the bank forecast quarterly Canada GDP rates and the adjustment factor were done in an iterative process to align predicted consumption with actual consumption in the first 6 months of the year. The Adjusted FTE values were intended to adjust the magnitude of the anticipated economic recovery (as of August 2020) with the substantial economic downturn.

e) The annual FTE growth rate in 2020 was -5.1%, consistent with the average FTE growth rate forecast from the four major Canadian banks.

f)

i. BHI confirms that the 2021 monthly values for "Tor_FTEAdj" used to determine the 2021 GS<50 forecast (as set out in the "GS<50 Normalized Monthly Avg" Tab of the Load Forecast Model) are based on the corresponding 2019 months' "Tor_FTEAdj" values increased by 2.9% (the post-COVID FTE growth for 2019) and then increased by -5.1%.

ii. N/A

iii. The 2020 growth rate was used in error. The revised load forecast, filed as Attachment_Load_Forecast_Model_BHI_Revised, has been corrected to increase the non-COVID 2020 FTE figures by the pre-COVID 2021 FTE forecast growth rate. Note also that the Scotiabank 2021 FTE growth rate was incorrectly entered as -6% but should have been 6% - this has also been corrected in the updated load forecast.

iv. The adjusted figures were derived and applied to account for the significant within-year variation in economic activity in 2020 and specifically to account for this within the forecasts from July 2020 to December 2020. The adjustment factors align with the annual FTE forecast, so the same 2020 growth rate is applied to both years.

g) The GS<50 kW consumption forecast in the described scenario is 172,524,750 kWh. This is derived in tab 'Part g)' of IR_Attachment_3-VECC-34_BHI.

h) The schedule is attached in tab 'Part h)' of IR_Attachment_3-VECC-34_BHI.

3.0-VECC-35

Reference: Exhibit 3, pages 27-28
BHI Load Forecast Model, Customer Count Tab

a) The January 2021 GS<50 customer count forecast in the Customer Count Tab (Cell G49) is not a calculated but rather a hard coded value. What is the basis for this value?
b) What are the actual 2020 GS<50 customer counts for those months after July 2020 for which data is now available?
c) The Application states that "BHI intends to make an adjustment to the customer counts for the 2020 reclassification before the OEB renders a decision on this Application". When will the information required to make this adjustment be available?

Response:

a) The January 2021 GS<50 kW customer count was manually adjusted so that the average customer count in 2021 reflected an increase over the average 2020 customer count equal to the geometric mean growth rate from 2010 to 2019. Each month subsequent to July 2020 was set to increase by the monthly equivalent of the geometric mean growth rate from 2010 to 2019, however, this created a minor mismatch depending on the actual customer counts in January 2020 to July 2020. The January 2021 customer count was derived with the Goal Seek function to maintain the monthly increase in each other month while maintaining the annual growth rate.

b) Actual GS<50 kW class customer counts are provided in Table 1 below.

Table 1

Month	GS<50 kW Customer Count
Jan	5,491
Feb	5,489
Mar	5,500
Apr	5,502
May	5,501
Jun	5,504
Jul	5,501
Aug	5,502
Sep	5,550
Oct	5,531
Nov	5,535
Dec	5,560

c) Please refer to BHI's response to 3-Staff-38 a).

3.0-VECC-36

Reference: Exhibit 3, page 16 and pages 28-33
BHI Load Forecast Model

a) In developing the GS>50 model did BHI test whether the number of weekdays vs. non-weekdays in the month was statistically significant in terms of explaining monthly GS>50 use?
b) Please confirm that the January and February 2020 "GDP" values used in the Load Forecast Model for the GS>50 class are actual January and February values respectively for 2019 (see "Economic (2020 Adj" Tab, Cells K134 & K135).
    i. If not, please demonstrate with references to the Load Forecast Model what 2020 forecast "GDP" values were used and how they were derived.
    ii. If yes, please explain why this is appropriate and whether the GS>50 forecast for 2020 needs to be revised.
b) At page 16 the Application states that the GS>50 usage for the second quarter of 2020 did not decrease to the extent predicted by the Q2 economic growth rates. Please provide a schedule that demonstrates this.
c) Please explain more fully the derivation of the February-December 2020 "GDP" values used in the Load Forecast Model for the GS>50 class and how it reflects the observed smaller impact of the changes in quarterly GDP on consumption in Q2.
d) After the adjustments, what is the 2020 annual growth rate for the "GDP" variable used in the model to forecast GS>50 sales?
e) The 2021 monthly values for "GDP" used to determine the 2021 GS>50 forecast (as set out in the "GS>50 Normalized Monthly Avg" Tab of the Load Forecast Model) appear to be based on the corresponding 2019 months' "GDP" values increased by -5.8% (the post-COVID GDP growth for 2020) and then increased by 4.2% (the which is the post-COVID 2020 forecast GDP increase for 2021) - see the "Economic (2020 Adj)" Tab – cells C146 to C157).
    i. Please confirm if this is the case.
    ii. If not, please demonstrate with references to the Load Forecast Model what 2021 forecast GDP values were used and how they were derived.
    iii. If yes, please explain why it is appropriate to use the post-COVID GDP growth for 2020 when this value was not used to determine the 2020 GS>50 forecast.
f) Please provide an alternative GS>50 load forecast where the 2021 monthly values are projected using a forecast for "GDP" that escalates the corresponding 1999 month's value by 1.8% (i.e., the pre-COVID forecast increase in GDP for 2020 per the "Economic (2020 Adj" Tab) and then again by 1.8% (i.e., the pre-COVID forecast increase in GDP for 2021 per the "Economic (2020 Adj" Tab).
g) Please provide a schedule that sets out:
    i. The actual 2020 GS>50 sales for each month for which the data is available.

ii. The monthly 2020 GS>50 forecast (for the same months) based on BHI's GS>50 model and independent variable values except use the actual 2020 HDD and CDD values and remove from the monthly results 1/12th of the 2020 cumulative GS>50 CDM savings.
iii. The monthly 2020 GS>50 forecast (for the same months) based on BHI's GS<50 model and independent variable values except use the actual 2020 HDD and CDD values, the pre-COVID forecast for "GDP" and remove from the monthly results 1/12th of the 2020 cumulative GS>50 CDM savings.

Response:

a) The variable "Peak Days" was tested in addition to Month Days. Both measures were found to be statistically significant in regressions with total class consumption as the dependant variable, however, consumption per customer per month day was selected as the dependant variable because the predicted values with that regression model were loser to actual values on an annual basis. Additionally, this dependant variable better accounted for changing customer counts and reclassifications between the GS classes. In the selected regression with month days as the dependant variable Peak Days was not statistically significant. Consumption per peak day was also considered as the dependant variable but the predicted values had higher mean average predicted errors than consumption per month day.

b) BHI confirms that the January and February 2020 "GDP" values used in the Load Forecast Model for the GS>50 class are actual January and February values respectively for 2019 (see "Economic (2020 Adj" Tab, Cells K134 & K135).

i. N/A

ii. Please note that the 2020 GDP figures were derived to utilize available economic forecast information to provide an estimate of consumption in the remaining months of 2020 as of August 2020, despite considerable economic uncertainty and unknowable variable of lockdowns. The figures are not used to forecast 2021 consumption and BHI is not seeking approval of the resulting figures or methodology.

GDP figures for January and February 2020 were not available and forecast figures for Q1 were strongly influenced by the impacts of COVID beginning in March. In absence of better data, 2019 GDP was carried forward to January and February. As the figures are not relevant to the 2021 test year, a revision is not needed.

b) BHI notes that this is the second question labelled “b)”. The schedule is attached in tab ‘Part b)’ of IR_Attachment_3-VECC-36_BHI.

c) Economic forecast data from the major Canadian banks was available only in the form of Canada-wide GDP growth figures. The quarterly Ontario GDP growth rates are a function of Canadian GDP growth rates in the quarter and an Adjustment factor to ensure the geometric mean of quarterly growth rates was equal to the forecast 2020 Ontario GDP growth rate. The weightings of the bank forecast quarterly Canada GDP rates and the adjustment factor were done in an iterative process to align predicted consumption with actual consumption in the first 6 months of the year. GDP was forecast to decline by 42% in Q2, however, this would correspond to a larger decline in forecast consumption than the actual decline in that quarter. The Adjusted GDP values were intended to adjust the magnitude of the anticipated economic recovery (as of August 2020) with the substantial economic downturn. The figures are not used to forecast 2021 consumption and BHI is not seeking approval of the resulting figures or methodology.

d) The annual GDP growth rate in 2020 was -6.1%, consistent with the average Ontario GDP growth rate forecast from the four major Canadian banks.

e)

a. The description in part e) of the interrogatory is correct, however, the cited figures (-5.8% and 4.2%) are the RBC forecast growth rates.

b. The average GDP growth rates used are -6.1% and 5.15% for 2020 and 2021, respectively, from column Q. The cited figures are in column O.

c. The adjusted figures were derived and applied to account for the significant within-year variation in economic activity in 2020 and specifically to account for this within the forecasts from July 2020 to December 2020. The adjustment factors align with the annual GDP forecast, so the same 2020 growth rate is applied to both years.

f) Assuming the growth rate should be applied to 2019 GDP (and not 1999 GDP, as per the interrogatory text above), GS>50 kW consumption in the described scenario is 864,259,119 kWh. This is derived in tab ‘Part f)’ of IR_Attachment_3-VECC-36_BHI.

g) The schedule is attached in tab ‘Part g)’ of IR_Attachment_3-VECC-36_BHI.

3.0-VECC-37

Reference: Exhibit 3, pages 33-34
BHI Load Forecast Model, Customer Count Tab

a) The January 2021 GS>50 customer count forecast in the Customer Count Tab (Cell K49) is not a calculated but rather a hard coded value. What is the basis for this value?

b) What are the actual 2020 GS>50 customer counts for those months after July 2020 for which data is now available?

Response:

a) Please refer to BHI's response to 3.0-VECC-33. The same explanation applies to the GS>50 kW rate class.

b) 2020 Actual GS>50 kW customer counts are provided in Table 1 below.

Table 1

Month	GS>50 kW Customer Count
Jan	1,006
Feb	996
Mar	1,008
Apr	1,008
May	1,006
Jun	1,005
Jul	1,004
Aug	1,006
Sep	959
Oct	981
Nov	983
Dec	984

3.0-VECC-38

Reference: Exhibit 3, pages 36-340
Exhibit 8, Appendix C, Street Lighting Service Classification Tariff
BHI Load Forecast Model, Customer Count Tab

a) The Application reports "actual" use by Street Lights for the years 2010-2019 (Table 18) and states (page 37): "Since completion of the LED conversion program, (i.e. from December 2018 to July 2020), the Street Light class has had consistent demand per device". Please confirm that actual monthly usage by Street Lights as set out in the Application is determined in accordance with the provision of the Tariff, namely "The daily consumption for these customers will be based on the calculated connected load times the required night time or lighting times established in the approved Ontario Energy Board street lighting load shape template."
    i. If confirmed, please provide and explain the basis for the "the approved Ontario Energy Board street lighting load shape template". How often does BHI review/update this template?
    ii. If not, what is the basis for the actual usage values in Table 18?
b) The number of Lamps/Devices increases annually from 2010-2017 but does not increase in 2018 or 2019. Please explain why there is no increase in the number of devices in 2018 or 2019.
c) The January 2021 Street Lighting customer count forecast in the Customer Count Tab (Cell O49) is not a calculated but rather a hard coded value. What is the basis for this value?

Response:

a) BHI confirms that actual monthly usage by Street Lights as set out in the Application is determined in accordance with the provision of the Tariff.

    i. The basis for "the approved Ontario Energy Board street lighting load shape template" is the work that was coordinated by the OEB and completed by Hydro One Networks in 2006, as cited in the Board's June 12, 2015 *Review of Cost Allocation Policy for Unmetered Loads* (EB-2012-0383)[1]. BHI's street lighting load shape template was based on this work and is used to calculate daily consumption for these customers using the calculated connected load. The load profile in the template has not been updated within the last 5 years; the connection counts are updated monthly if necessary based on receipt of new connection requests from the City, Region or Ministry of Transportation. BHI

[1] EB-2012-0383, Distributor Load Profiles (page 4).

attaches an example of its street lighting load shape template as IR_Attachment_3-VECC-38a_BHI, as the entire file is very large.

b) The reason that there is no increase in the number of devices in 2018 or 2019 is that there were no new streetlights connected. The City of Burlington and the Region of Halton underwent an LED conversion in 2017 and 2018[2] during which time no new street lights were connected.

c) Please refer to BHI's response to 3.0-VECC-33. The same explanation applies to the Streetlight class.

[2] Exhibit 4, Section 4.6.2.8.1, page 224

3.0-VECC-39

Reference: Exhibit 3, pages 13-14 and 47-48
BHI Load Forecast Model, "CDM" Tab

Preamble: The Application states:
"CDM data from IESO persistence reports are used for the years 2010 to 2017. These are filed as attachments:

- Attachment12_Final_CDM_Evaluation_Results_for_2011_2014_BHI_10302020 (for 2011-2014)
- Attachment13_Final_CDM_Evaluation_Results_for_2015_2017_BHI_10302020 25 (for 2015-2017)

CDM in 2018 and 2019 is based on limited data in the IESO's Participation and Cost Report 1 ("P&C Report") filed as:

- Attachment14_April2019_Participation_and_Cost Report_BHI_10302020;

and additional 2019 programs not included in the IESO reports provided by BHI's third party CDM consultant. These are included in Tab "3-a. Rate Class Allocations" of the LRAMVA Workform."

a) The 2011 CDM program impacts set out in the CDM Tab (H5-H15) appear to match those reported in Attachment 25 for all years except 2011 and 2013. Please explain the discrepancies for those years.
b) The 2012 CDM program impacts set out in the CDM Tab (H17-H26) appear to match those reported in Attachment 25 for all years except 2013. Please explain the discrepancy.
c) The 2013 CDM program impacts set out in the CDM Tab (H28-H36) appear to match those reported in Attachment 25 for all years except 2014-2017. Please explain the discrepancies for those years.
d) Please confirm that the 2014 CDM program impacts as set out in the CDM Tab (H38-H45) are consistent with those reported in Attachment 25 (2011-2014 Persistence Report).
e) The 2015 CDM program impacts set out in the CDM Tab (H47-H53) do not appear to match those reported in any of the following: i) Attachment 15 (LRAMVA Workform, Tab 5); ii) Attachment 14 (April 2019 P&C Report) or iii) Attachment 26 (2017 Final Verified Results Report, LDC Savings Persistence Tab). Please explain and provide the basis/source for the 2015 CDM program impacts set out in the CDM Tab.
f) The 2016 CDM program impacts set out in the CDM Tab (H55-H60) match those in Attachment 14 (April 2019 P&C Report) for the years 2016 and 2020. What is the basis/source for the impacts shown for the other years in the period 2016-2021?
g) The 2017 CDM program impacts set out in the CDM Tab (H62-H66) do not appear to match those reported in any of the following: i) Attachment 15 (LRAMVA Workform, Tab 5); ii) Attachment 14 (April 2019 P&C Report) or iii) Attachment 26 (2017 Final Verified

Results Report, LDC Savings Persistence Tab). Please explain and provide the basis/source for the 2017 CDM program impacts set out in the CDM Tab.

h) The 2018 CDM program impacts set out in the CDM Tab (H68-H71) do not match those in: i) Attachment 14 (April 2019 P&C Report) for the years 2018 and 2020 or ii) Attachment 15 (LRAMVA Workform, Tab 5) for the year 2021. What is the basis/source for the impacts shown for the period 2016-2021 as set out both here and in the LRAMVA Workform and why don't the two reconcile for 2021?

i) The 2019 CDM program impacts set out in the CDM Tab (H73-H756) do not appear to match those reported in either: i) Attachment 15 (LRAMVA Workform, Tab 5) or ii) Attachment 14 (April 2019 P&C Report. Please explain and provide the basis/source for the 2019 CDM program impacts set out in the CDM Tab.

j) Please provide the source/basis for the 2020 CDM program impacts set out in the CDM Tab (H77-H78).

Response:

a) Please see the 'Summary' tab of IR_Attachment_3-VECC-39_BHI for a reconciliation of 2011-2014 persistence data with 2011 to 2014 CDM data within the load forecast. The only discrepancy between the summarized persistence data and load forecast is an additional 899 kWh in 2011. This value represents 2011 Residential Demand Response savings as per Attachment 12 ('LDC – Results (Net)', cell N13). Persistence of 2011 to 2013, including adjustments, is equal to the value provided in the CDM Tab of the load forecast.

b) Please see the 'Summary' tab of IR_Attachment_3-VECC-39_BHI, which demonstrates there is no discrepancy.

c) Please see the 'Summary' tab of IR_Attachment_3-VECC-39_BHI, which demonstrates there are no discrepancies.

d) BHI confirms that the 2014 CDM program impacts as set out in the CDM Tab (H38-H45) are consistent with those reported in Attachment 25 (2011-2014 Persistence Report).

e) The CDM data for 2015 to 2018 used data in a draft version of the LRAMVA workform that did not include all adjustments that are present in the final LRAMVA workform filed as Attachment 15 in the Application. The LRAMVA was subsequently revised but the data in the load forecast was not updated at that time.

f) See response to part e) above.

g) See response to part e) above.

h) See response to part e) above.

i) The CDM data for 2019 is based on the April 2019 P&C Report for the Residential class and project level data for the GS<50kW and GS>50kW classes. Project data, and conversion from gross to net savings, is provided in IR_Attachment_3-Staff-39_BHI.

j) CDM data for 2020 is based on project level data provided in IR_Attachment_3-Staff-39_BHI.

3.0-VECC-40

Reference: Exhibit 3, pages 21, 27 and 33
BHI Load Forecast Model, "CDM" Tab

a) Please explain why the Residential Cumulative Persisting CDM value for 2021 is 37,472,221 kWh (per page 21) as opposed to the sum of the persisting savings in 2021 from 2011-2020 programs (37,486,355 kWh – per the CDM Tab).
b) Please explain why the GS<50 Cumulative Persisting CDM value for 2021 is 12,700,386 kWh (per page 27) as opposed to the sum of the persisting savings in 2021 from 2011-2020 programs (13,300,166 kWh – per the CDM Tab).
c) Please explain why the GS>50 Cumulative Persisting CDM value for 2021 is 49,805,696 kWh (per page 33) as opposed to the sum of the persisting savings in 2021 from 2011-2020 programs (56,156,282 kWh – per the CDM Tab).

Response:

a) The 37,472,221 kWh value includes savings persisting to 2021 of programs from 2011 to 2018 and half of 2019 programs whereas the 37,486,355 kWh figure includes all 2011-2020 program savings persisting to 2021. The load forecast separately includes a CDM adjustment to account for half of 2019 CDM activities that are not present in 2019 data (there are no 2020 Residential savings). If 37,486,355 kWh is used as the Residential Cumulative Persisting CDM savings within the 'Normalized Annual Summary' tab, the CDM adjustment would be double counted.

b) The 12,700,386 kWh value includes 2011 to 2018 and half of 2019 savings and 13,300,166 kWh includes all 2011-2020 program savings persisting to 2021. The load forecast separately includes a CDM adjustment to account for half of 2019 CDM activities that are not present in 2019 data and full 2020 savings. If 13,300,166 kWh is used as the GS<50 kW Cumulative Persisting CDM savings, the CDM adjustment would be double counted.

c) The 56,156,282 kWh value includes 2011 to 2018 and half of 2019 savings and 49,805,696 kWh includes all 2011-2020 program savings persisting to 2021. The load forecast separately includes a CDM adjustment to account for half of 2019 CDM activities that are not present in 2019 data and full 2020 savings. If 56,156,282 kWh is used as the GS<50 kW Cumulative Persisting CDM savings, the CDM adjustment would be double counted.

3.0-VECC-41

Reference: Exhibit 3, pages 47-48
BHI Load Forecast Model, "CDM Adjustment" Tab

a) Please confirm that the LRAMVA calculation assumes that the full annualized savings are achieved in the first year of a CDM program's implementation.
    i. If confirmed and given 2019 actual data is used in the development of the forecast models, please explain why it is appropriate to include ½ of 2019 savings in the LRAMVA threshold.
b) Will BHI's persisting savings in 2021 from 2019 and 2020 programs be verified by an independent 3rd party?
    i. If yes, who?

Response:

a) The LRAMVA calculation is based on full annualized savings because the CDM data for which it will be evaluated against in future LRAMVA workforms is annualized data.

    i. The LRAMVA threshold includes full 2019 savings.

b)

    i. Persisting savings in 2021 from 2019 and 2020 programs are not anticipated to be verified but will be calculated according to a methodology prescribed by the Ontario Energy Board. These calculations will be performed by an independent third party: IndEco Strategic Consulting Inc.

3.0-VECC-42

Reference: Exhibit 3, pages 70 and 76-77
Chapter 2 Appendices, Appendix 2-H
Exhibit 8, pages 12 and 15

a) Please provide a schedule that breaks down BHI's revenues from specific service charges (Account 4235) for each specific charge for the years 2016-2021.
b) Do the proposed tariffs for 2021 and the forecast 2021 revenues for Retail Services Revenue and STR Revenue reflect the OEB's 2.2% adjustment in charges issued December 3, 2020 (EB-2020-0285)?
    i. If not, what would be the revised revenues?
c) Do the proposed tariffs for 2021 and the forecast 2021 revenues for Rent from Electric Property (i.e., Pole Attachment Chares) reflect the OEB's December 10, 2020 Order (EB-2020-0288)?
    i. If not, what would be the revised revenues?
d) Please provide a schedule setting out the 2019 rates and revenues for carrier and non-carriers, including the revenues recorded in Account 1508 – Sub Account – Pole Attachment Revenue Variance.
e) Please explain why the Rent from Electric Property is constant over the period 2014-2019. Was there no change in the number of pole attachments during this period?
f) What is the basis for the -$98,000 in 2021 for Accounts 4355/4360?
g) With respect to the proposed treatment of the 2021 revenues associated with the associated with the implementation of Metrolinx Regional Express Rail ("RER") project in BHI's service territory:
    i. What is amount that has been included as a revenue offset for 2021?
    ii. Does BHI expect there to be other projects similar to the RER in future years that will lead to revenues for BHI? If not, why not?

Response:

a) Please refer to BHI's response to 3-Staff-40 a) for a schedule that breaks down BHI's revenues from specific service charges (Account 4235) for each specific charge for the years 2016 to 2021.

b) Please refer to BHI's response to 3-SEC-24 b).

c) Please refer to BHI's response to 3-SEC-24 b).

d) Table 1 provides a schedule of 2019 rates and revenues for carrier and non-carriers, including the incremental revenue recorded in the 1508 sub-account for Pole Attachment Revenue.

Table 1

2019 Pole Attachment Revenue	Rates	Specific Service Charges Revenue	Account 1508 - Sub Account - Pole Attachment Revenue	Total Revenue Earned/ (Expense Incurred)
Carrier 1	$43.63	$100,284	$95,483	$195,768
Carrier 1	($53.47)	($58,615)	($55,811)	($114,426)
Total Carrier 1		**$41,670**	**$39,672**	**$81,342**
Carrier 2	$43.63	$78,493	$74,735	$153,229
Carrier 2 (Strands)	$5.59	$12,544		$12,544
Total Carrier 2		**$91,037**	**$74,735**	**$165,773**
Total Carrier 3	**$43.63**	**$1,788**	**$1,702**	**$3,490**
Carrier 4	$43.63	$60,032	$57,158	$117,190
Carrier 4 - km of Duct ($1,000/km)		$9,930		$9,930
Total Carrier 4		**$69,962**	**$57,158**	**$127,120**
Total Carrier 5	**$43.63**	**$9,700**	**$9,236**	**$18,935**
Total Carrier Revenue		$214,157	$182,504	$396,661
Non-Carrier 1	$43.63	$107,191	$102,059	$209,249
Non-Carrier 2	$43.63	$6,035	$5,746	$11,780
Non-Carrier 3	$40.00	$2,400		$2,400
Total Non-Carrier Revenue		$115,625	$107,804	$223,430
Total		**$329,782**	**$290,308**	**$620,090**

e) BHI's Rent from Electric Property is constant over the period 2014 to 2019 because there was no change in the number of pole attachments during this period.

f) Please refer to BHI's response to 9-Staff-72 c).

g)

i. BHI included $80,800 as a revenue offset for the 2021 Test Year in the Application based on collecting $404,000 associated with the Metrolinx Regional Express Rail ("RER") project in BHI's service territory. Since the Metrolinx project is scheduled to be completed in 2021, this amount was smoothed over the 5-year rate term.

ii. No, BHI does not expect there to be other projects similar to the Metrolinx RER in future years that will lead to revenues for BHI. The Metrolinx RER is a large multi-phased project which required BHI to manage materials separately (both physically and electronically) from its own inventory, and for which BHI generated supplemental revenue. This process was unique to Metrolinx.

4.0 -VECC-43

Reference: Exhibit 4, pages 218-222 142
BHI LRAMVA Workform, Tab 5

a) Have all of the actual savings in 2019 from programs implemented in 2013-2019 been verified by an independent 3rd party?
   i. If yes for some or all of the reported savings, who provided the verification?
   ii. If no for some or all of the reported savings, which savings have not been independently verified?
b) Have all of the actual savings in 2020 from programs implemented in 2013-2020 been verified by an independent 3rd party?
   i. If yes for some or all of the reported savings, who provided the verification?
   ii. If no for some or all of the reported savings, which savings have not been independently verified?

Response:

a) No, all of the actual savings in 2019 from programs implemented in 2013-2019 have not been verified by an independent 3rd party.

   i. Savings from programs implemented in 2013-2014 were verified by the IESO.

   ii. Most savings from programs implemented in 2015-2017 were verified by the IESO and were reported in the 2017 final verified results report.

   iii. Savings from 2018 and 2019 programs, and adjustments to programs in 2015-2017 identified by the IESO after the 2017 final verified results report was issued were provided by the IESO in the April 2019 P&C report. The IESO identifies these results as unverified.

   iv. Savings for projects which were reported to the IESO subsequent to the issue of the April 2019 P&C report have not been independently verified.

   However, savings in parts iii) and iv) above have been calculated in accordance with the Chapter 2 Filing Requirements. Net values in the April 2019 P&C report have been used for most programs through 2019. In the case of the Retrofit program and the High Performance New Construction program, there were projects implemented for which savings were not included in the April 2019 P&C report. For those programs, the reported gross savings were multiplied by the 2017 verified Net to Gross and Realization Rate values reported for the same program in 2017. For example, reported Retrofit program projects completed after the April

2019 P&C report are multiplied by the NTG and RR for the Retrofit program in the 2017 final results report to get the net savings for those projects.

b) Please refer to part a) iv. However, BHI is not making an LRAMVA claim for programs implemented in 2020 as part of this Application.

4.0-VECC- 44

Reference: Exhibit A, page 14 Table 3

Please provide Table 3 excluding inflationary increases.

Response:

BHI provides Table 1 below to recast Table 3 on page 14 of Exhibit 4 to exclude inflationary increases.

Table 1 (recast Table 3 of Exhibit 4 to exclude inflationary increases)

Description	2019 Actuals	2020 Bridge Year	2021 Test Year	2021 vs. 2019 Actuals Incr/(Decr)
Total Salaries and Benefits	$11,234,883	$10,746,788	$11,688,814	$453,931
Temporary Staff	$415,977	$370,972	$142,143	($273,834)
Consulting Fees	$669,749	$586,655	$472,254	($197,495)
Bad Debt Expense	$124,797	$335,804	$219,958	$95,161
Postage/Mail Service/Stationery	$380,562	$398,826	$644,989	$264,427
Rate Rebasing Costs	$0	$0	$169,769	$169,769
OEB Regulatory Costs	$215,193	$208,377	$299,606	$84,413
Computer Software	$629,190	$992,663	$808,850	$179,660
Locates	$220,701	$382,817	$378,084	$157,383
Vegetation Management	$527,241	$708,230	$747,201	$219,960
Other	$4,670,251	$4,641,230	$5,094,600	$424,349
Total OM&A before Inflation	**$19,088,545**	**$19,372,363**	**$20,666,268**	**$1,577,723**
Inflation		$390,141	$831,508	$831,508
Total OM&A	**$19,088,545**	**$19,762,504**	**$21,497,775**	**$2,409,231**

4.0-VECC-45

Reference: Exhibit A, page 14 Table 3

BHI has experienced a cumulative 49% turnover rate from 2014 to 2019, representing 45 employees, 31 of which were retirements. Direct replacement costs can be as high as 50% to 60% of an employee's annual salary, with total costs associated with turnover ranging from 90% to 200% of annual salary.

a) Please provide the cumulative turnover rate from 2014 to 2019 excluding retirements.

b) Please provide BHI's annual turnover target.

c) Please explain why direct replacement costs can be as high as 50% to 60% of an employee's salary with total costs associated with turnover ranging from 90% to 200% of annual salary.

d) Please provide the current number of vacancies.

e) Please provide the average length of a vacancy for the years 2014 to 2020.

f) Please provide the vacancy savings for each of the years 2014 to 2020.

g) Please provide the vacancy assumption in the 2021 budget.

Response:

a) BHI's cumulative turnover rate from 2014 to 2019 excluding retirements is 15%.

b) BHI does not set an annual turnover target.

c) The rationale for direct replacement costs being as high as 50% to 60% of an employee's salary with total costs associated with turnover ranging from 90% to 200% of annual salary is identified in the Society for Human Resource Management ((“SHRM”) Report – *Retaining Talent, A Guide to Analyzing & Managing Employee Turnover (“the Report”)*:

“Employee departures costs a company time, money and other resources”. The report provides a breakdown of these costs which impact the company when there is employee turnover. These are summarized in Table 1 below.

Table 1

Type of Costs	Description
Financial Costs	HR staff time (exit interview, payroll administration, benefit changes)
	Manager's time (retention attempts, exit interview)
	Accrued paid time off (vacation, sick pay)
	Temporary coverage (overtime, contingent/contract employees)
Replacement Costs	Hiring inducements
	Hiring manager and unit/department employee time
	Orientation program time and materials
	HR staff induction costs (payroll, benefits enrollment)
Training Costs	Formal training (trainee and instruction time, materials, equipment)
	On-the-job training (supervisor and employee time)
	Productivity loss until proficiency reached
	Mentoring (mentor's time, travel)

The Report states that "turnover is tougher on smaller organizations". The loss of key employees can have a particularly damaging impact on small organizations due to the following reasons: departing workers are more likely to be single incumbents and possess a particular skill or knowledge set which results in a smaller internal pool of workers to cover the lost employee's workload until replaced; and the organization has fewer resources available to cover replacement costs.

d) Please refer to BHI's response to 4-SEC-29.

e) BHI's HR and payroll system does not record vacancy length and as such BHI does not have this data readily available for the years 2014 to 2020.

f) Refer to part e) above.

g) BHI vacancy assumption in the 2021 budget is zero.

4.0-VECC-46

Reference: Exhibit 4, page 22

BHI incurred one-time costs in 2019 and 2020 related to the introduction of two new asset management tools – Program Evaluation Tool and a Project Prioritization Tool.

a) Please provide the cost of each tool.

b) Please provide a table that sets out all one-time costs for the years 2014 to 2020.

Response:

a) The Program Evaluation and Project Prioritization Tools cost [redacted] each.

b) BHI's accounting system does not have the ability to track one-time costs separately from on-going costs.

4.0-VECC-47

Reference: Exhibit 4, page 47 Table 16

For each of the categories in Table 16 please provide 2014 actuals.

Response:

BHI provides 2014 actuals by the categories identified in Table 16 of Exhibit 4 (OEB Appendix 2-JB) in Table 1 below.

Table 1

Description	2014 Actuals
Salaries and Benefits	$9,122,602
Incentive Pay	$403,303
Contracted Labour	$449,757
Temporary Staff	$95,669
Consulting Fees	$222,055
Postage/Mail Service/Stationery	$378,615
Bad Debt Expense	$253,395
Rate Rebasing Costs	$98,788
OEB Regulatory Costs	$206,685
Computer Software	$634,916
Locates	$564,636
Vegetation Management	$381,080
Materials - Distribution Mtce/Ops	$592,467
Materials - Station Mtce/Ops	$278,917
Other	$3,163,656
Total OM&A per 2-JB	**$16,846,540**

4.0-VECC-48

Reference: Exhibit 4, page 48 Table 17

The change in incentive pay since 2014 is due to changes to BHI's incentive compensation plan. Changes to the plan were based on the recommendations of an independent third party consultant's report. The report determined that BHI's incentive program for its non-union employees was not competitive and the design of the plan was not comparable to the LDC market overall. BHI made revisions to its plan to retain and attract talent.

Please provide the specific revisions to BHI's incentive compensation plan in response to the Incentive Program Review, Willis Towers Watson, October 2016.

Response:

Please refer to BHI's response to 4-Staff-53 e) for the specific revisions to BHI's incentive compensation plan in response to the 2016 Willis Towers Watson Incentive Program Review.

4.0-VECC-49

Reference: Exhibit 4, page 67 Table 25

The Control Room had vacancies from 2014 to 2019 as identified in Table 25 below; including the full time supervisor position which was vacant from 2014 to April 2018.

Has BHI undertaken a recent analysis to determine the optimal level of staffing required for the Control Room given that for several years the Control Room operated with less than 9 FTEs? If yes, please provide. If not, how has BHI determined that 10 FTEs is the right size for the Control Room for 2021?

Response:

BHI undertook an analysis in 2017 to determine the optimal level of staffing required for the Control Room, attached as Appendix A: 4-VECC-49. The report identified that a six person complement (of fully competent and qualified journey persons) optimized the balance between employee needs and operational efficiencies. The recommendation, at that time, was that BHI operate with a six person schedule plus one apprentice; or a seven person schedule when that apprentice became fully qualified.

This recommendation was premised on the assumption that only one apprentice was required to ensure a minimum six person complement i.e., that only one retirement was pending. Circumstances have changed since 2017 and BHI expects four retirements from 2021-2025; which requires the control room to be staffed with a minimum complement of six fully competent operators and four apprentices. This results in the complement of 10 FTEs as identified on page 67 of Exhibit 4 of the Application. Advance hiring of apprentices is required due to the lead time of three to five years required to hire and train apprentices ahead of future retirements (refer to BHI's response to 4-Staff 52 c)). This ensures that BHI has enough fully competent, qualified operators at all times. Apprentices can not participate in the control room rotation until they have completed all training and competency requirements.[1]

[1] Exhibit 4, page 67

4.0-VECC-50

Reference: Exhibit 4, page 68 Table 26

a) With respect to salaries and benefits, please show overtime costs as a separate line item in Table 26.

b) Please explain why system maintenance costs have been transferred to the Station Maintenance Program.

Response:

a) BHI provides Table 1 below to show overtime costs as a separate line item.

Table 1 (Recast Table 26 – Control Room Program Expenditures of Exhibit 4 to separate overtime costs)

Description	2014 Actuals (Revised CGAAP)	2014 Actuals (MIFRS)	2015 Actuals	2016 Actuals	2017 Actuals	2018 Actuals	2019 Actuals	2020 Bridge Year	2021 Test Year	2021 vs. 2014 Incr/(Decr)	2021 vs. 2014 CAGR
Salaries and Benefits excl Overtime	$1,145,594	$1,145,594	$1,001,258	$973,596	$1,131,217	$1,234,099	$1,256,651	$1,336,592	$1,432,135	$286,541	3.2%
Overtime	$131,010	$131,010	$197,775	$188,216	$160,518	$354,844	$268,578	$170,249	$197,135	$66,125	6.0%
Maintenance	$135,949	$135,949	$24,891	$25,221	$85,182	$91,902	$24,253	$25,527	$31,000	($104,949)	(19.0%)
Bell Canada Line Rental	$31,878	$31,878	$32,156	$32,831	$32,795	$33,714	$34,211	$34,967	$35,664	$3,786	1.6%
Tower Rental	$11,400	$11,400	$11,400	$11,400	$11,720	$12,360	$12,360	$12,150	$12,046	$646	0.8%
Fibre Connection - Milton Control Room	$10,080	$10,080	$5,790	$5,400	$5,400	$5,800	$4,950	$5,088	$5,190	($4,890)	(9.0%)
Control Room - All Other	$17,916	$17,916	$15,311	$17,147	$8,570	$10,809	$11,978	$16,241	$16,007	($1,909)	(1.6%)
Total	**$1,483,827**	**$1,483,827**	**$1,288,581**	**$1,253,811**	**$1,435,402**	**$1,743,528**	**$1,612,981**	**$1,600,813**	**$1,729,177**	**$245,350**	**2.2%**

b) The system maintenance costs include costs associated with Supervisory Control and Data Acquisition ("SCADA") costs associated with monitoring and controlling BHI's substations. These costs had incorrectly been reported in the Control Room Program in prior years and were transferred to the Station Maintenance Program for 2020 and 2021.

4.0-VECC-51

Ref: Exhibit 4, page 71

With respect to Bad Debt, the higher amount in the 2020 Bridge Year includes additional write-offs for small commercial customers as a result of the COVID-19 pandemic.

Please provide the amount of additional write-offs for small commercial customers.

Response:

BHI would like to clarify the evidence on page 71 of Exhibit 4. The higher amount in the 2020 Bridge Year includes a provision for additional write-offs for small commercial customers as a result of the COVID-19 pandemic. BHI does not have the amount of additional write-offs for small commercial customers for the 2020 Bridge Year and will not have this information for several months. Small commercial write-offs for the period up to Nov 18, 2020 are $43,078; however this represents bad debt incurred up to August 2020 at a maximum; and would not include all 2020 write-offs.

4.0-VECC-52

Ref: Exhibit 4

Please complete the following table:

	2014 Actuals MIFRS $	2021 Forecast MIFRS $
Salaries		
Benefits		
Overtime		
Incentives		
Contracted Labour		
Temporary Staff		
Consulting Fees		

Response:

BHI provides the requested table as Table 1 below.

Table 1

Description	2014 Actuals MIFRS	2021 Test Year MIFRS
Salaries	$5,251,990	$6,708,877
Benefits	$3,393,554	$3,882,668
Overtime	$477,057	$843,891
Salaries/Benefits/Overtime	**$9,122,602**	**$11,435,436**
Incentive Pay	$403,303	$765,444
Contracted Labour	$449,757	$392,036
Temporary Staff	$95,669	$161,102
Consulting Fees	$222,055	$499,312

4.0-VECC-53

Reference: Exhibit 4

Please provide the % of OM&A costs outsourced for each of the years 2014 to 2020 and the forecast for 2021.

Response:

BHI provides the % of OM&A costs outsourced for the 2014-2019 Actuals, the 2020 Bridge Year and the 2021 Test Year in Table 1 below.

Table 1

Description	2014 Actuals (Revised CGAAP)	2014 Actuals (MIFRS)	2015 Actuals	2016 Actuals	2017 Actuals	2018 Actuals	2019 Actuals	2020 Bridge Year	2021 Test Year
% OM&A Costs Outsourced	17%	17%	19%	16%	17%	16%	17%	19%	19%

4.0-VECC-54

Reference: Exhibit 4, page 78

Please provide a table of expenditures for Distribution Maintenance and Operations similar to Table 28 on page 75, beginning with 2014 Actuals (Revised CGAAP).

Response:

BHI provided a table of expenditures for Distribution Maintenance and Operations similar to Table 28 on page 75, beginning with 2014 Actuals (Revised CGAAP) as Table 31 on page 88 of Exhibit 4.

4.0-VECC-55

Reference: Exhibit 4, page 79 Table 29

Please discuss if BHI has made any significant changes to its inspection and maintenance activities and the frequency of activities since 2014.

Response:

BHI has not made any significant changes to its inspection and maintenance activities or the frequency of activities since 2014.

4.0-VECC-56

Reference: Exhibit 4, page 78

BHI provides emergency and trouble call response 24 hours per day, 7 days per week.

a) Please provide the number of emergency and trouble calls by year for each of the years 2014 to 2020.

b) Please explain how the budget for emergency and trouble calls was derived for 2021.

Response:

a) BHI provides the number of emergency and trouble calls by year for each of 2014 to 2020 in Table 1 below.

Table 1

Year	Emergency and Trouble Calls
2014	no stats
2015	no stats
2016	836
2017	1165
2018	1820
2019	1390
2020	1498

b) BHI did not derive a budget specially for emergency and trouble calls. The overtime labor to respond to emergency and trouble calls is included in the 2021 overtime budget which is based on historical actual costs.

4.0-VECC-57

Reference: Exhibit 4, page 95

In explaining the 2019 to 2020 variance, BHI references to an increase in vegetation management of $191,534 driven by new contract pricing for the 2020-2022 period.

a) Please explain further how new contract pricing results in an increase of $191,534 and compare it to how BHI executed its vegetation management prior to this new contract.

b) Please provide the number of vendors under the new contract.

c) Please provide the vegetation management contract.

d) Please provide the annual performance outcomes related to BHI's vegetation management program for the years 2014 to 2020, forecast compared to actuals.

e) Please provide BHI's vegetation management performance metrics and targets for 2021.

f) Please provide a copy of City of Burlington's Urban Forest Management Plan.

Response:

a) New contract pricing resulting in an increase in costs can be attributed to market pricing and demand for Line Clearing contractors. BHI's contract is tendered every three years. Through the tendering process, proponents are encouraged to drive/walk the areas to be cleared and familiarize themselves using the maps that BHI provided to them to accurately prepare bid prices for each zone. This process is similar to that of previous tenders with one difference. Previous contracts were awarded to one proponent who was responsible for 100% of BHI's vegetation management program for the three-year period. The 2020-2022 contract was awarded by zone which (i) afforded the opportunity for multiple contractors to be awarded a contract for one or more zones in BHI's service territory; and (ii) allowed BHI to minimize the total cost of the contract by selecting the lowest cost option by zone (assuming all other criteria were met as identified in BHI's response to 4-Staff-49 b)).

b) Please refer to BHI's response to EP-15 a) for the number of vendors under the new vegetation management contract.

c) BHI provides the vegetation management contract as Appendix B: 4.0-VECC-57 c).

d) Please see Table 1 below for the performance outcomes related to BHI's vegetation management program for the years 2014 to 2021.

Table 1

Year	Planned Areas/Zones	Actual Areas/Zones
2014	Area C - East Burlington	80% completed
2015	Area B - Central Burlington	Area B 100% completed plus remainder of Area C
2016	Area A - West Burlington and area North of Britannia Road	100% completed
2017	Area C (Zones 1-5)	Zones 1-4 completed; 30% of Zone 5
2018	Area B (Zones 6-12)	Zones 8, 9,10,12 completed; remainder of Zone 5; 50% of Zone 6 and Zone 12 completed; 0% of Zone 7 (so that Zone 5 could be completed)
2019	Area A	Zone 6, 7, 12 completed
2020	Zone 7, 13, 14, 16	100% completed
2021	Zone 1, 2, 3, 4, 5, 6	

e) Please refer to Table 1 above. for 2021. In addition to the outcomes listed in Table 1 above, contractors have committed to comply with the performance requirements identified in Appendices A through F of the vegetation management contract attached as Appendix B: 4.0-VECC-57 c).

f) BHI provides a copy of City of Burlington's Urban Forest Management Plan as Appendix C: 4.0-VECC-57 f). Names and titles have not been redacted as this document is publicly available on the City of Burlington's website.

4.0-VECC-58

Reference: Exhibit 4, page 98 Table 33

Please provide a breakdown of consultant costs for the years 2018 to 2021.

Response:

The breakdown of consultant costs for the 2018 and 2019 Actuals; and the 2020 Bridge Year and 2021 Test Year forecasts is provided in Table 1 below.

Table 1

Consultants	2018	2019	2020	2021
Asset Management & Engineering Process Design	$27,250	$44,066	$95,590	$21,064
Audit, Compliance & Other	$12,323	$957	$2,816	$2,872
Operational Technology Support	$73,221	$77,486	$65,000	$66,300
Project Coordination & Support[1]	$34,605	$174,577	$75,259	$76,764
Total	**$147,399**	**$297,087**	**$238,665**	**$167,000**

[1] Mainly comprised of customer-driven work requiring the isolation of equipment (e.g. high voltage lines, distribution transformers) for maintenance and repairs.

4.0-VECC-59

Reference: Exhibit 4, page 98

Pole/Cable testing is increasing by $112,105 in 2021 compared to 2014 due to the increased level of cable testing due to the increased incidence of cable failures in 2019 and 2020.

a) Please describe the new cable testing in terms of scope and length of cable tested.

b) Please provide the number of cable failures for the years 2019 to 2020.

Response:

a) Cables are tested using a non-destructive method to detect the effect that water trees have on XLPE cables. This method is called DC Polarization/Depolarization Measurement System. BHI intends to test one targeted area (neighborhood) of its service territory per year. The increase in the level of cable testing will allow BHI to test approximately 120 cable segments or 18km per year.

b) Please refer to BHI's response to 2.0-VECC-23 b).

4.0-VECC-60

Reference: Exhibit 4, page 102

Please provide BHI's vehicle utilization rate for the years 2014 to 2020 and the forecast for 2021.

Response:

BHI provides its vehicle utilization rate for the year 2014 to 2020 and the forecast for 2021 in Table 1 below.

Table 1

2014	2015	2016	2017	2018	2019	2020 Bridge Year	2021 Test Year
48%	49%	45%	46%	42%	40%	63%	54%

4.0-VECC-61

Reference: Appendix 2-BA

With respect to System O&M costs, BHI forecasts $10.267 million in 2021, compared to $9.468 million in 2020.

Please explain the 8.4% increase in System O&M costs from 2020 to 2021.

Response:

BHI identifies the system O&M costs by program in Table 1 below. The increase of $798,429 or 8.4% from the 2020 Bridge Year to the 2020 Test Year is due to an increase in costs in the Control Room, Distribution Maintenance & Operations, and Engineering Programs. BHI provides a reference to the evidence in Exhibit 4 which explains the year over year variance in detail.

Table 1

Department	System O&M Costs				Evidence Reference
	2020 Bridge Year	2021 Test Year	2021 vs. 2020 $ Incr/(Decr)	2022 vs. 2020 % Incr/(Decr)	
Control Room (2-JC)	$1,600,813	$1,729,177	$128,364	8.0%	Exhibit 4, Table 26 and pg 70
Distribution Maintenance and Operations (2-JC)	$3,567,372	$4,216,494	$649,122	18.2%	Exhibit 4, Table 31 and pg 95
Engineering (2-JC)	$1,616,539	$2,172,006	$555,467	34.4%	Exhibit 4, Table 33 and pg 100
Metering (O&M)	$711,586	$703,590	($7,996)	-1.1%	
Stations Maintenance and Operations (2-JC)	$1,432,635	$1,517,028	$84,393	5.9%	Exhibit 4, Table 45 and pg 135
Other	$539,237	$500,385	($38,852)	-7.2%	
Other - FTE Adjustment	$0	($572,068)	($572,068)	n/a	Exhibit 4, Section 4.3.0.17
Total	**$9,468,183**	**$10,266,612**	**$798,429**	**8.4%**	

4-VECC-62

Reference: Exhibit 4, page 120

With respect to the Metering Program expenditures, BHI explains an increase in overtime costs. Meter Technicians are on "stand by" as first responders to emergency trouble calls during the day and after-hours. These costs fluctuate with BHI customer needs and requirements.

a) Please explain "stand by" and how the costs are determined.

b) Please provide any other work activities that require staff to be on standby.

c) Are standby costs built into the budget? If yes please provide the assumption for 2021.

Response:

BHI would like to clarify the evidence on page 120 of Exhibit 4. The increase in overtime costs is not related to the requirement that meter technicians be on stand by. The increase in overtime is related to an increase in emergency trouble calls for which a meter technician is required to attend in order to resolve a power outage or meter issue. The reference to stand by was meant to explain that the metering program also incurs overtime which can fluctuate with emergency trouble calls, including those which are the result of extreme weather.

a) A competent and qualified Meter Technician is required to be 'on-call' or on 'stand-by' to respond to calls that are dispatched by BHI's control room operators. The 'on-call' pay or rate is 7% of the hourly rate for all hours the technician is required to be on-call. This payment is in recognition of the employee's obligation to remain ready and available to attend work.

b) Two other work activities require staff to be on standby as follows:

   i. Station Maintenance Electrician - A qualified and competent Station Maintenance Electrician is "on-call" to be available for substation alarms, SCADA issues, emergency locates, emergency underground cable fault locates, and other emergency type calls that require their subject matter expertise and specific set of skills.
   ii. Operations Lines Crew – two competent and qualified Powerline Technicians are required to be 'on-call' to be available to respond to any calls such as EMS 911 emergency assistance calls, wires down calls, broken poles, defective equipment, no power, and trees/branches on wires.

c) Standby costs or ‘on-call’ costs are typically built into the budget; however in preparing the response to this interrogatory BHI identified that standby costs of $114k were erroneously excluded from the 2021 budget. Standby charges are based on the number of hours employees are required to be on standby (i.e. all non-business hours) and are calculated as follows:

(Non-business day hours) X (# of employees on Standby) X (7% of employee rate)

This estimate does not incorporate the overtime cost incurred if the staff member is required to report into work.

4-VECC-63

Reference: Appendix 2-K

a) Please break out overtime and incentive pay from Total Salary and Wages in the table.

b) Please provide the % of labour capitalized by year.

c) Please provide an excel version of the table that incorporates (a) and (b).

d) Please provide the number of executives by year.

e) Please provide the number of overtime hours by year.

f) Please discuss the work activities that attract overtime.

g) Please provide the total number of hours worked by year excluding overtime for the years 2014 to 2020.

h) Please explain how the overtime budget was derived for 2021.

i) Please provide the overtime amounts related to adverse weather by year for the years 2014 to 2020.

j) Please provide the % of eligible incentive pay paid out each year for the years 2014 to 2020.

k) Please provide the assumption for payout of incentive pay for 2021.

Response:

a) Please refer to BHI's response to 4-Staff-55 a) for OEB Appendix 2-K with overtime and incentive pay broken out from Total Salary and Wages.

b) Please refer to BHI's response to 4-Staff-55 a) for OEB Appendix 2-K with the percentage of labour capitalized by year.

c) Please refer to BHI's response to 4-Staff-55 a) for an Excel version that incorporates part a) and b) above.

d) Please refer to BHI's response to 4-Staff-55 a) for OEB Appendix 2-K with the number of executives by year.

e) Table 1 below identifies the number of overtime hours per year in Appendix 2-K format for 2014 to 2019 Actuals, the 2020 Bridge Year and the 2021 Test Year.

Table 1

Description	Last Rebasing Year (2014 Actuals)	2015 Actuals	2016 Actuals	2017 Actuals	2018 Actuals	2019 Actuals	2020 Bridge Year	2021 Test Year
REGULAR HOURS								
Executive	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800
Management	44,200	40,170	40,170	41,990	42,120	40,040	50,050	50,050
Non-Management (Non-Union)	9,750	9,750	11,700	11,700	11,700	9,750	15,600	17,550
Union	139,880	126,750	121,550	120,445	121,550	125,450	120,991	135,980
Total	**201,630**	**184,470**	**181,220**	**181,935**	**183,170**	**183,040**	**194,441**	**211,380**
OVERTIME HOURS								
Executive	-	-	-	-	-	-	-	-
Management	833	409	244	285	272	347	174	-
Non-Management (Non-Union)	-	-	-	-	-	-	-	-
Union	12,691	12,767	10,833	10,467	15,767	12,832	9,069	10,890
Total	**13,524**	**13,176**	**11,077**	**10,752**	**16,039**	**13,179**	**9,243**	**10,890**
TOTAL HOURS WORKED								
Executive	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800
Management	45,033	40,579	40,414	42,275	42,392	40,387	50,224	50,050
Non-Management (Non-Union)	9,750	9,750	11,700	11,700	11,700	9,750	15,600	17,550
Union	152,571	139,517	132,383	130,912	137,317	138,282	130,060	146,870
Total	**215,154**	**197,646**	**192,297**	**192,687**	**199,209**	**196,219**	**203,684**	**222,270**

f) The following work activities attract overtime:
- Response to extreme weather events (wind storms, lightning/heavy rains, ice storms) that contribute to Major Event Days ("MEDs") or increased outages and prolonged outage durations;
- Emergency calls from Emergency Services such as wires down, pole down, pole fires, motor vehicle accidents or other calls that come in through EMS 911 service;
- No power, part power, fluctuating power calls or power quality calls from residential/commercial and industrial customers;
- Emergency alarms/codes from any of the 32 Municipal substations that BHI owns and maintains;
- Emergency locate requests from Ontario One Call that are received outside of normal operating hours;
- Trees/limbs on wires;
- Patrolling of distribution lines after feeder lock out or auto reclosure;
- After hour reconnects (either from collection activities or service upgrades);
- Emergency meter base repairs;
- Planned customer requested work for maintenance, upgrades; large vessel moves, isolation for tree removal; new service connections
- Planned BHI capital and maintenance work that requires outages during non-business hours;
- Reports of unsafe conditions with potential for danger to public safety i.e. padmount transformer shifted, wires exposed;
- Wires hanging low;
- Suspected theft of electricity;
- Oil spills/leaks from transformers;
- Foreign objects on wires, i.e. balloons, kites;
- Broken meter/meter base;
- Defective meter equipment inside customer electrical room;
- Distribution system switching operations requested by Hydro One or neighbouring LDCs;
- Control room shift coverage and;
- Large scale outages which require additional control room operator(s)

g) Please refer to the response to part e).

h) The overtime for 2021 was budgeted based on historical experience with the following exception:
- 2020 was not representative of overtime costs in a typical year as frequency and severity of extreme weather events was less than in prior years

i) BHI does not track overtime amounts by adverse weather or by cause code.

j) Please refer to BHI's response to 4-SEC-30 c) for the percentage of eligible incentive pay paid out each year for the years 2014 to 2020.

k) Please refer to BHI's response to 4-SEC-30 d) for the assumption for payout of incentive pay for 2021.

4.0-VECC-64

Reference: Exhibit 4, page 138

a) Please provide BHI's resource utilization rate for the years 2014 to 2020 and the forecast for 2021.

b) Please provide the calculation with assumptions.

Response:

a) BHI's systems do not have the ability to track (nor has BHI calculated) resource utilization rates (i.e., defined as the percentage of an employee's available time that is used for productive and/or billable work).

BHI referenced utilization in its Five-Year Strategic Workforce Plan attached as Appendix A in Exhibit 4; recognizing that determining the optimal utilization of its existing staff is the first step in assessing workforce planning.[1]

Used in this context, BHI considers individual employees' skills and talents; enhances their capabilities to meet the needs of the organization; and works with them to optimize their performance. By continually assessing the skills, experience, and capabilities of its current workforce, BHI can optimally utilize this information when identifying future skills gaps or lack of expertise in certain areas of the organization. Through identifying skills gaps in the existing workforce, BHI can achieve optimal utilization of its resources (training, people, facilities); identify obsolete functions; and redistribute staff accordingly to meet the needs of the business.

b) Please refer to part b) above.

[1] BHI's Five-Year Strategic Workforce Plan, p 2

7.0 – VECC –65

Reference: Exhibit 7, page 5

Preamble: The Application states:
"In its last Cost of Service application EB-2013-0115, BHI used the load profiles provided by Hydro One in its cost allocation model. The Hydro One profiles were based on 2004 data, and consumption patterns have changed since then due to factors such as technology, macroeconomic changes, conservation programs and time of use pricing.
BHI has updated the load profiles for all rate classes."

a) Please provide an alternative 2021 Cost Allocation model using the Hydro One profiles based on the 2004 data.

Response:

a) Please see IR_Attachment_7-VECC-65_BHI. Hourly 2004 Demand Data has been scaled to the 2021 Load Forecast.

7.0 – VECC –66

Reference: Exhibit 7, page 6

Preamble: The Application states: "The weather profile of a typical year in the City of Burlington is calculated using average daily temperatures from 2009 to 2018".

a) It is noted (Exhibit 3, page 11) that the 10 year period 2010-2019 was used to determine "weather normal" HDD and CDD values for purposes of the load forecast. Why wasn't the same period used for purposes of establishing weather normal load profiles?
b) Please provide a schedule that compares the average daily HDD and CDD values for each month based on: i) the period 2009-2018 and ii) the period 2010-2019. Note: Please provide separate schedules using the definitions of HDD and CDD as employed in the load forecast for each customer class.

Response:

a) Please refer to 7-Staff-66 a).

b) Please see IR_Attachment_7-VECC-66_BHI. The HDD and CDD definitions for each class are provided on different tabs within the attachment.

7.0 – VECC –67

Reference: Exhibit 7, page 7 (Figure 2)

a) With respect to Figure 2, please explain how the "Average Daily Temperature" value for each day was determined.

Response:

a) Average Daily Temperature HDD values are derived with the methodology described on page 6 of Exhibit 7. HDD values are ranked in each year for each month and the average HDD for same-ranked days are used as the Average Daily Temperature.

As an illustrative example, January Average Daily Temperatures are derived in the following three tables.

- Table 1 shows the Heating Degree Day (relative to 14°C, consistent with Figure 2) for each day in each January from 2009 to 2018.
- Table 2 shows the same HDDs sorted from highest to lowest in each year. The Average Daily Temperature is calculated as the 10-year average for each rank.
- Table 3 reorganizes the Average Daily Temperatures to match the 2018 dates in January with the corresponding average HDD. For example, January 1st 2018 (26.4 HDD) was the 3rd coldest day (Rank 3 in Table 2) so it is assigned the 3rd ranked Average Daily Temperature (*25* HDD).

Figure 2 on page 7 of Exhibit 7 in the Application compares the two HDD measures in Table 3: Actual 2018 January HDD and Average Daily Temperature HDD.

Table 1

Date	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	21.5	17.2	7.3	8.7	17.3	24.7	17.2	14.5	12.4	26.4
2	15.1	24.2	15.9	16.9	18.6	29.6	15.4	13.4	11.8	23.3
3	17.6	23.4	16.0	24.9	17.3	27.4	14.3	17.2	10.1	21.7
4	17.3	21.6	14.5	19.4	14.6	17.3	13.5	25.2	15.6	26.1
5	15.8	20.1	18.4	12.0	14.4	13.6	22.1	20.9	21.9	30.4
6	17.4	18.1	18.7	7.8	13.2	23.0	23.2	13.9	23.5	31.4
7	14.1	17.4	19.3	9.1	15.6	32.5	26.2	13.5	23.4	23.0
8	18.1	20.3	20.3	14.1	11.8	25.6	24.4	14.5	22.8	13.6
9	20.5	22.9	20.0	11.4	9.8	22.5	23.3	7.4	18.8	14.5
10	19.9	22.2	19.4	9.9	10.7	16.1	24.7	13.2	10.5	12.7
11	21.3	18.5	18.6	11.6	7.6	8.9	17.7	21.1	7.7	3.8
12	19.7	19.0	21.0	9.1	2.9	11.8	20.7	18.6	7.9	12.0
13	19.9	16.6	21.0	14.8	4.0	8.4	27.2	21.6	17.2	24.9
14	28.6	13.0	18.6	22.6	10.6	11.3	23.7	17.4	18.4	23.5
15	26.7	11.1	17.4	23.3	14.8	14.3	21.2	11.4	15.7	21.0
16	28.4	13.2	23.4	14.4	12.8	15.9	18.7	12.5	14.1	20.6
17	25.5	12.4	23.7	8.8	17.5	13.5	21.0	21.1	11.7	21.9
18	18.6	14.1	14.1	17.8	17.4	18.9	9.7	22.0	11.2	18.4
19	22.4	13.8	19.3	18.8	8.2	18.6	16.8	22.2	11.7	13.3
20	23.8	16.9	21.8	22.5	13.7	21.2	21.3	19.5	11.5	11.2
21	23.9	16.1	23.2	18.9	22.5	29.9	19.7	19.0	10.0	12.6
22	16.6	12.6	24.9	15.2	25.8	29.9	16.8	18.1	10.3	11.5
23	14.1	13.1	27.6	8.1	27.3	27.6	15.7	20.3	11.2	12.6
24	22.7	11.3	26.3	12.6	25.3	25.9	15.2	18.3	12.1	19.6
25	25.1	10.2	17.5	14.7	23.9	22.4	19.3	11.0	10.3	18.9
26	24.9	13.8	15.7	13.2	19.5	23.5	21.8	9.6	10.6	11.3
27	21.2	16.7	15.7	11.5	19.1	23.6	22.5	13.5	13.3	7.5
28	19.8	21.0	16.9	13.1	13.2	29.5	21.8	13.3	14.8	11.9
29	19.7	25.9	19.0	15.4	9.3	26.7	16.8	17.4	17.4	16.8
30	20.3	27.0	21.8	15.8	4.7	19.7	21.4	13.0	20.1	22.4
31	22.4	21.5	25.4	8.3	13.8	14.3	22.3	6.4	16.6	17.5

Table 2

HDD Rank	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average Daily Temperature HDD
1	28.6	27.0	27.6	24.9	27.3	32.5	27.2	25.2	23.5	31.4	**27.52**
2	28.4	25.9	26.3	23.3	25.8	29.9	26.2	22.2	23.4	30.4	**26.18**
3	26.7	24.2	25.4	22.6	25.3	29.9	24.7	22.0	22.8	26.4	***25.00***
4	25.5	23.4	24.9	22.5	23.9	29.6	24.4	21.6	21.9	26.1	**24.38**
5	25.1	22.9	23.7	19.4	22.5	29.5	23.7	21.1	20.1	24.9	**23.29**
6	24.9	22.2	23.4	18.9	19.5	27.6	23.3	21.1	18.8	23.5	**22.32**
7	23.9	21.6	23.2	18.8	19.1	27.4	23.2	20.9	18.4	23.3	**21.98**
8	23.8	21.5	21.8	17.8	18.6	26.7	22.5	20.3	17.4	23.0	**21.34**
9	22.7	21.0	21.8	16.9	17.5	25.9	22.3	19.5	17.2	22.4	**20.72**
10	22.4	20.3	21.0	15.8	17.4	25.6	22.1	19.0	16.6	21.9	**20.21**
11	22.4	20.1	21.0	15.4	17.3	24.7	21.8	18.6	15.7	21.7	**19.87**
12	21.5	19.0	20.3	15.2	17.3	23.6	21.8	18.3	15.6	21.0	**19.36**
13	21.3	18.5	20.0	14.8	15.6	23.5	21.4	18.1	14.8	20.6	**18.86**
14	21.2	18.1	19.4	14.7	14.8	23.0	21.3	17.4	14.1	19.6	**18.36**
15	20.5	17.4	19.3	14.4	14.6	22.5	21.2	17.4	13.3	18.9	**17.95**
16	20.3	17.2	19.3	14.1	14.4	22.4	21.0	17.2	12.4	18.4	**17.67**
17	19.9	16.9	19.0	13.2	13.8	21.2	20.7	14.5	12.1	17.5	**16.88**
18	19.9	16.7	18.7	13.1	13.7	19.7	19.7	14.5	11.8	16.8	**16.46**
19	19.8	16.6	18.6	12.6	13.2	18.9	19.3	13.9	11.7	14.5	**15.91**
20	19.7	16.1	18.6	12.0	13.2	18.6	18.7	13.5	11.7	13.6	**15.57**
21	19.7	14.1	18.4	11.6	12.8	17.3	17.7	13.5	11.5	13.3	**14.99**
22	18.6	13.8	17.5	11.5	11.8	16.1	17.2	13.4	11.2	12.7	**14.38**
23	18.1	13.8	17.4	11.4	10.7	15.9	16.8	13.3	11.2	12.6	**14.12**
24	17.6	13.2	16.9	9.9	10.6	14.3	16.8	13.2	10.6	12.6	**13.57**
25	17.4	13.1	16.0	9.1	9.8	14.3	16.8	13.0	10.5	12.0	**13.20**
26	17.3	13.0	15.9	9.1	9.3	13.6	15.7	12.5	10.3	11.9	**12.86**
27	16.6	12.6	15.7	8.8	8.2	13.5	15.4	11.4	10.3	11.5	**12.40**
28	15.8	12.4	15.7	8.7	7.6	11.8	15.2	11.0	10.1	11.3	**11.96**
29	15.1	11.3	14.5	8.3	4.7	11.3	14.3	9.6	10.0	11.2	**11.03**
30	14.1	11.1	14.1	8.1	4.0	8.9	13.5	7.4	7.9	7.5	**9.66**
31	14.1	10.2	7.3	7.8	2.9	8.4	9.7	6.4	7.7	3.8	**7.83**

Table 3

January Date	Actual 2018	HDD	Average Daily Temperature HDD
	HDD 14	Rank	
1	26.4	3	*25.00*
2	23.3	7	21.98
3	21.7	11	19.87
4	26.1	4	24.38
5	30.4	2	26.18
6	31.4	1	27.52
7	23.0	8	21.34
8	13.6	20	15.57
9	14.5	19	15.91
10	12.7	22	14.38
11	3.8	31	7.83
12	12.0	25	13.20
13	24.9	5	23.29
14	23.5	6	22.32
15	21.0	12	19.36
16	20.6	13	18.86
17	21.9	10	20.21
18	18.4	16	17.67
19	13.3	21	14.99
20	11.2	29	11.03
21	12.6	23	14.12
22	11.5	27	12.40
23	12.6	24	13.57
24	19.6	14	18.36
25	18.9	15	17.95
26	11.3	28	11.96
27	7.5	30	9.66
28	11.9	26	12.86
29	16.8	18	16.46
30	22.4	9	20.72
31	17.5	17	16.88

7.0 – VECC –68

Reference: Exhibit 7, page 8
Attachments 20, 27 and 28 ("Hourly Data" Tab)

Preamble: The Application states:
"The impact of HDDs and CDDs on hourly load is calculated with a regression of three years of actual hourly loads (2016 to 2018) on daily HDDs and CDDs. The regression results provide the estimated impact of a change in degree days on load".

a) In developing the regression model was any assessment made as to whether the type of day (i.e., Weekday vs. Saturday vs. Sunday/Statutory Holiday) would affect the impact temperature has on load?
    i. If yes, what were the results?
    ii. If not, why not?
    iii. If not, please develop an alternative model for the Residential class that includes three additional independent binary variables (where each captures whether the day concerned is a Weekday, Saturday or Sunday/Statutory Holiday) and provide the results in a format similar to Attachment 20, "Res OLS" Tab.
b) It is noted that Attachments 20, 27 and 28 only include hourly data for 2018. Please confirm that the regression analysis also used data for 2016 and 2017.
c) Please explain why the years 2016-2018 were selected.

Response:

a) Type of day was not considered in the regression model.

    i. N/A

    ii. Accounting for the type of day in assessing the impact of temperatures on load would require a range of weekday, Saturday, and Sunday/Holiday interaction variables with CDD and HDD. The results of the regression provided in part iii) provide a single coefficient for each of the weekday, Saturday, and Sunday/Holiday variables that is applied to each hour of those days, regardless of the weather. For example, the Weekday coefficient (approximately -5,000) would be applied to each hour of each weekday, irrespective of actual temperatures. The variable would not reflect any impacts of temperature on load based on the type of day. Given the large dataset and number of variables, additional variables were not considered.

    iii. Please see IR_Attachment_7-VECC-68_BHI.

b) BHI confirms that the regression analysis also used data for 2016 and 2017. The years 2016 and 2017 were removed to reduce the file size.

c) Please see BHI's response to 7-Staff-66 a).

7.0 – VECC –69

Reference: Exhibit 7, page 9
Attachments 20, 27 and 28 ("CP and NCP" Tab)
Attachment 19 (2021 Cost Allocation Model), Tab I8

Preamble: The Application states:
"After load profiles are derived for all classes, total system and class-specific peaks within each month are compiled to produce Coincident Peak ("CP") and Non-Coincident Peak ("NCP") figures used in Tab "I8 Demand Data" of the OEB's Cost Allocation Model. BHI provides a model illustrating how demand data was derived as Attachment20_Load_Profile_Derivation_BHI_10302020.".

a) In the "CP and NCP" Tabs factors are applied to the GS<50 and GS>50 Primary NCP values in order to determine the corresponding Line Transformer and Secondary NCP values. What is the basis/source of these factors?

Response:

a) BHI relied on the same factors used in its 2014 COS application.

7.0 – VECC –70

Reference: Exhibit 7, page 10
OEB Accounting Procedures Handbook for Electric Distribution Utilities, page 64

Preamble: The Application states:
"The weighting factors for all other rate classes were determined relative to the residential rate class. Table 2 below identifies the services weighting factors. There is no factor assigned to the GS>50 kW class as service is supplied via a padmount transformer, not wires or cables."

The Accounting Procedures Handbook defines Services (Account 1855) as:
"This account shall include the cost installed of overhead and underground conductors leading from a point where wires leave the last pole of the overhead system or the transformers or manhole, or the top of the pole of the distribution line, to the point of connection with the customer's electrical panel. Conduit used for underground service conductors shall be included herein."

a) For GS>50 customers how is the supply from the padmount transformer to the customer's electrical panel provided (e.g., overhead or underground conductor) and who owns the conductor?
b) If BHI owns any of the conductor, does this conductor meet the definition for Services as set out in the Accounting Procedures Handbook? If not, why not?

Response:

a) The supply is underground from the padmount transformer (secondary spades) to the main customer-owned electrical panel. The customer owns the complete secondary circuit (ducts and cables).

b) BHI does not own any of the conductor.

7.0 – VECC –71

Reference: Exhibit 7, pages 10-11

Preamble: The Application states:
"To calculate the billing and collecting weighting factors, BHI determined the billing and collecting costs directly attributable to each rate class. The remaining non-directly attributable costs were allocated to each rate class."

a) Please provide the analysis supporting the proposed billing and collecting weighting factors.

Response:

a) Please refer to BHI's response to 7-Staff-65 c).

7.0 – VECC –72

Reference: Exhibit 7, page 11
Attachment 19 (BHI's 2021 Cost Allocation Model), Tabs I6.2 & I7.1

a) For both the GS<50 and GS>50 classes, the number of customers in Tab I6.2 does not equal the number of meters for class per Tab I7.1. Please reconcile.

Response:

a) The number of customers for the GS<50 kW and GS>50 kW rate classes in Tab I6.2 of BHI's 2021 Cost Allocation Model was correct. The number of meters in Tab I7.1 of BHI's 2021 Cost Allocation Model was incorrect - it reflected out-of-date numbers. BHI has corrected this in the Cost Allocation Model filed in response to these interrogatories. Please refer to BHI's response to 1-Staff-1 for more information on the model update.

7.0 – VECC –73

Reference: Exhibit 7, page 12
Attachment 19 (BHI's 2021 Cost Allocation Model), Tab I7.2

Preamble: The Application states:
"Approximately 3% of BHI's residential customers have a smart suite meter which costs approximately 2.7 times as much to read as a non-suite meter."

a) Under what circumstances do BHI's residential customers have a "suite meter" and why does it cost approximately 2.7 times as much to read?
b) In those circumstances where a residential customer has a suite meter does BHI own the transformer, secondary facilities and services (Account 1855) servicing that customer?
    i. If no, have Residential customer counts and NCP demand allocators been adjusted to reflect that not all such facilities are owned by BHI?

Response:

a) BHI's residential customers have a 'suite meter' when owners/developers are required to comply with Ontario Regulation 389/10. This regulation deals with residential complexes and condominium buildings. The developer has the option to install suite metering with a third party submeter provider. There are instances where the developer signs an agreement with BHI to design/own and maintain the suite meter assets and bill the suite owner customers. In these instances, BHI uses the same suite meter technology as third-party submetering firms as the main purpose is to save space in electrical rooms and electrical closets in the building.

   The meter reading costs are higher for these customers as a separate Automated Meter Infrastructure reading technology and system is required to retrieve the meter data on a daily basis. The meter reading cost is greater than BHI's AMI mesh network system that is used for its other residential customers.

b) In most cases where a residential customer has a suite meter, BHI owns the transformer and facilities up to the demarcation point. In some cases where the transformer is located inside the building, the transformer and secondary facilities and services are customer owned.

    i. No adjustment has been made to Residential customer counts of NCP demand allocators.

7.0 – VECC –x

Reference: Exhibit 7, page 12

Attachment 19 (BHI's 2021 Cost Allocation Model), Tabs I6.1, I.6.2 and I8

In Tab I6.1 there is no GS<50 kW load that receives the Transformer Ownership Allowance. However, in both Tabs I6.2 and I8 the number of customers using and the demand attributed to Line Transformers is less than the total for the class. Please reconcile.

Response:

All GS<50 kW customers are served by line transformers and as such, the LTNCP and SNCP data has been revised in tab I8 Demand Data of the revised Cost Allocation Model filed in response to these interrogatories as:

Attachment_2021_Cost _Allocation_Model_BHI_Revised

7.0 – VECC –74

Reference: Exhibit 7, pages 5-10

Preamble: Pages 5 to 10 describe BHI's proposed methodology for deriving the weather normal load profiles for each customer class for use in the cost allocation model.

a) Did BHI (or its consultants) consult at all with other electricity distributors in Ontario to determine what approaches they were using/planning to use in order to update the load profiles used in their cost allocation models?
    i. If yes, please generally describe any other approaches identified and why they were not pursued by BHI.

b) Is BHI aware of any other electric utility in Ontario that has used the same methodology for deriving customer class load profiles for used in its cost allocation model? If yes, please provide the utility names and respective case numbers?

c) Is BHI aware of any electric utility outside of Ontario that has used the same methodology for deriving customer class load profiles for used in its cost allocation model? If yes, please provide the utility names and for each the relevant regulator and a reference (e.g. web site link or electronic copy) where a description of the methodology and the regulator's decision regarding the use of the methodology can be found.

Response:

a) BHI engaged Elenchus to prepare weather-normalized load profiles, who had previously used the methodology with other Ontario LDCs. A brief survey found many LDCs continue to rely on Hydro One's 2004 Cost Allocation Informational Filing ("CAIC") data.

b) The methodology was previously used by Erie Thames Powerlines (EB-2017-0038) and Essex Powerlines (EB-2017-0039).

c) BHI is not aware of utilities outside of Ontario that has used this methodology.

8.0 –VECC -75

Reference: Exhibit 8, page 11
Attachment 21, RTSR Workform (Tabs 3 and 5)

a) Please confirm that the retail sales data by class in Tab 3 and the UTR billing determinant data in Tab 5 are both based on the same historical year.

Response:

a) No, the retail sales data by class in Tab 3 erroneously reflects historic actual quantities from 2018. The UTR billing determinant data in Tab 5 correctly reflects historic actual quantities from 2019. BHI provides an updated RTSR model with 2019 retail quantities, attached as Attachment_RTSR_Workform_BHI_Revised.

8.0 –VECC -76

Reference: Exhibit 8, pages 15-16 and Appendix C

Preamble: The Application states (page 15):
"BHI is proposing modifications to its Tariff of Rates and Charges to distinguish between the specific service charge for pole attachments for carriers and non-carriers."

a) What is BHI definition of a "carrier" vs. a "non-carrier" and where is or will this definition be documented?
b) It is noted that in Appendix C the proposed tariff for non-carriers is $22.35 which is different from that for carriers ($44.50). Why is this the case?

Response:

a) BHI proposes to use the definition of a "carrier" as identified on page 4 in the *Report of the Ontario Energy Board – Wireline Pole Attachment Charges* dated March 22, 2018 (the "Report").[1] Carriers are defined as cable and telecommunications providers. A complete list of carriers as of March 22, 2018 can be found in Appendix A of the Report. BHI proposes to define a "non-carrier" as any party who is not a cable or telecommunications provider. BHI proposes to document these definitions on its Tariff of Rates and Charges should its request in this Application for two specific service charges for pole attachments be approved.

b) The proposed tariff for non-carriers of $22.35 per pole per year represents the most recent approved rate for non-carriers as determined by the OEB.[2] The proposed tariff for carriers of $44.50 per pole per year represents the effective rate for carriers, adjusted for inflation, as determined in the Report. The Report only applied to wireline attachments by carriers as identified on page 8 of the Report: "*The review is limited to wireline attachments by carriers and does not apply to wireless attachments or non-carrier attachments*."

[1] EB-2015-0304
[2] Ibid. page 3

APPENDIX A: 4.0-VECC-49

Burlington Hydro Inc.

Control Complement Analysis

January 2017

Note: This analysis should be considered in tandem with the attached spreadsheet of the same title.

Background

Burlington Hydro Inc. (BHI) operates a 24/7 Control Room and is seeking to optimize its staffing levels in terms of efficiency and work/life balance for staff.

This analysis is based on 2016 data and uses that data as a snapshot in time for the purposes of comparisons of various staff complement scenarios.

Given Data

- In 2016 there were five fully qualified Operators and two apprentices.
- One apprentice will be qualified to work in a fully qualified capacity by July 2017.
- The second apprentice is likely to become qualified to work in a fully qualified capacity in 2019.
- Two of the Operators will become eligible to retire in 5 years.
- 2016 Overtime costs were $191,000.
- The average amount of paid leave per fully qualified employee was 327 hours in 2016.
- The person hours of service per week to operate the Control Room is 208 or 10,816 hours annually.
- 5 employees are scheduled to work 200 hours per week or 10,400 annually.

Assumptions

- A wage rate of $41.92 was applied.
- Benefit and statutory obligation costs of 30% of wages was applied.
- 12 hours of ‘minor leaves’ such as court or bereavement per year was applied for each employee.
- $18,967 in unavoidable overtime costs were applied.
- It takes 3 years for an apprentice to operate as is fully qualified.
- It takes 4.5 years for an apprentice to become fully qualified.

Outcomes

5 Fully Qualified

- Wage, benefit and overtime costs = **$757,765**
- Hours required less hours available = 416
- Hours of paid leave = 1,636
- Total hours shortfall = 2,052
- Cost to replace shortfall with overtime = $172,040

6 Fully Qualified

- Wage, benefit and overtime costs = **$724,162 ($777,775) (see note below)**
- Hours required less hours available = (1,664)
- Hours of paid leave = 1,963
- Total hours shortfall = 299
- Cost to replace shortfall with overtime = $25,085

7 Fully Qualified

- Wage, benefit and overtime costs = **$812,429 ($819,247) (see note below)**
- Hours required less hours available = (3,744)
- Hours of paid leave = 2,290
- Total hours surplus = 1,454
- Cost to replace shortfall with overtime = $0

Considerations

- The $0 cost to replace the shortfall with overtime quoted above is a misnomer and is included only for the purposes of the illustration of the comparisons. Unless a redundant staff member is available on every shift, replacement overtime cannot be avoided.
- The proposed 7 person schedule offers redundancy on 86.5% of the shifts so an additional overtime cost of $25,785 can be assumed.
- The proposed 6 person schedule offers redundancy on 62% of the shifts so an additional overtime cost of $72,580 can be assumed.

Analysis

1. The current 5 person complement is the least expensive option.
2. The current 5 person complement requires each employee to work an average of 400 hours of overtime per year.
3. Giving consideration to the impact of one employee experiencing a long term absence, this schedule should not be viewed as sustainable.
4. The 6 person complement increases ‘assumed’ costs by $20,000 annually.

5. The 6 person complement requires each employee to work an average of 194 hours of overtime per year.
6. The 7 person complement increases ‘assumed’ costs by $61,500 annually over and above the current schedule.
7. The 7 person complement requires each employee to work an average of 51 hours of overtime per year.

Recommendations

1. The 6 person complement appears to optimize the balance between employee needs and operational efficiencies.
2. However, given the length of time required to train an apprentice, the lack of notice required of an employee to provide prior to retirement and the cost of prolonged periods of long term absences, succession planning is a key requirement as well.
3. Therefore, it is recommended that the 6 person complement be viewed as the minimum complement for any prolonged periods. In short, the recommendation of this review is that BHI operate with a 6 person schedule plus 1 apprentice.
4. When the current apprentice becomes qualified, adopt the 7 person schedule.
5. When the complement drops to 6, recruit an apprentice immediately and revert to the 6 person schedule as proposed.

Respectfully submitted,

[redacted]
Levack Management Consulting Inc.

APPENDIX B: 4.0-VECC-57 c)

Burlington hydro inc.

BURLINGTON HYDRO INC.

2020 TREE TRIMMING CONTRACT

REQUEST FOR PROPOSAL (RFP)

CLOSING DATE: TUESDAY NOVEMBER 12, 2019 AT 3:00 P.M.

BURLINGTON HYDRO INC.

1340 BRANT STREET

BURLINGTON

ONTARIO

L7R 3Z7

Contents

* Tree Trimming Maps and the Line Clearing Weekly Contractor Time Sheet will be handed out separately with the RFP document. An electronic copy of the time sheet will be made available to the successful proponent(s).

General Conditions

Sealed RFP 2020 Tree Trimming Contract, as described herein, addressed to the Chair, c/o Scott Davidson, Purchasing Manager, will be received until **Tuesday November 12, 2019 at 3:00 P.M. local time.** **Late** or **unsealed** RFP submissions will be returned unopened, with **no** exemptions.

All index and reference numbers, either in the RFP Form, Plans, Drawings, Specifications, General Conditions or Index are given for the convenience of the Contractor, and such must be taken only as a general guide to the items referred to. It must not be assumed that such numbering is the only reference to each item, but the plans and specifications as a whole must be fully read in detail for each item.

LENGTH OF TERM

The length of the contract will take the form of a three (3) year term. If both parties agree in writing this contract may be extended for three (3), additional one year terms. We agree that this agreement may be terminated by Burlington Hydro Inc. ("BHI") for any reason without financial penalty within 60 days upon receiving written notice. The evaluation of bids is not solely based on price, but will take into consideration past performance, experience, equipment, flexibility, ability to meet work schedule, references. Prior to commencement of work, the successful contractor will attend a pre-contract meeting to discuss items such as scheduling and safety.

RFP RESPONSE REQUIREMENTS

All proponents must include the following information in their RFP response as identified below:

1. Completed Pricing Schedule (Schedule "D")
2. Completed BHI Contract Form
3. Additional Requirements (outlined in Schedule "E")

PRICING (SCHEDULE "D")

All pricing and crew availability information must be completed as set out in Schedule "D" contained herein and be signed by the proponent, with its business address fully outlined therein. The submission must be verified by the Statutory Declaration of the party or parties making the submission that all matters stated herein are in all respects true.

FORMAL CONTRACT

The successful proponent(s) shall be required to execute in duplicate a Formal Contract in the manner and on the BHI "CONTRACT FORM", a blank copy of which is herewith included.

ADDITIONAL REQUIREMENTS

The proponent(s) shall be required to provide the information set out in Schedule "E" contained here-in. These requirements will be factored into the evaluation process in addition to the pricing provided in Schedule "D" and the evaluation criteria identified under PRICE AND EVALUATION CRITERIA below.

PUBLIC LIABILITY AND PROPERTY DAMAGE

The contractor shall at its own expense, take out and maintain, during the life of this contract, Public Liability Insurance, Property Damage Insurance and Motor Vehicle Insurance for an amount of at least $5,000,000.00 each.

When working near or around pipeline crossings the contractor must supply insurance coverage for the amount of $5,000,000.00 or as requested by the Carrier Company or National Energy Board.

The insurance policies must include BHI as a named insured and include a waiver of subrogation with respect to BHI and any parties for whom BHI is responsible in law.

Certified copies or proof of insurance coverage must be submitted and approved by the Engineer before any work is commenced. The successful contractor must provide their WSIB Certificate of Clearance and other information as per Due Diligence.

DUE DILIGENCE

Due Diligence documentation form parts of this agreement. The successful contractor must and agrees to provide BHI with updated Certificates of Qualification, Insurance and WSIB Certificates of Clearance throughout the year prior to expiration dates automatically and routinely.

CONTRACTOR RESPONSIBILITIES

The contractor will be responsible for providing its own transportation and operating costs, computers, cell phones and the associated operating costs, digital cameras, company uniforms and all the PPE required to perform the associated duties required. BHI will be responsible to setup the contractor's photo identification and provide "BHI Contractor" vehicle magnets if needed.

SUB CONTRACTORS

The names of all sub-contractors performing work must be submitted in writing and must be qualified by BHI. Any change of sub-contractor **must** be specifically approved by BHI.

ANTI-KICKBACK/ANTI-BRIBERY/ANTI-LOBBYING

The contractor and any director, officer, shareholder, employee, partner, principal or agent of the contractor shall not offer or attempt to offer to any officer, agent, or employee of BHI any benefits, financial or otherwise, in connection with this Project or the transactions contemplated by this Agreement, other than as specified in this Agreement. The contractor warrants that no bribe, gift or other inducement has been paid, given, promised or offered to any officer, agent, or BHI employee for, or with a view to, entering into this Agreement. The contractor further warrants that no broker, finder or other intermediary or adviser has been retained by or is authorized to act on behalf of the contractor who might be entitled to any fee, commission or reimbursement of expenses from the contractor or BHI upon consummation of the transactions contemplated by this Agreement.

DECLARATION OF CONFLICT OF INTEREST

All vendors retained by BHI. shall disclose to BHI prior to submitting a bid and/or accepting an assignment any actual or potential conflict of interest. If BHI staff determines that such a conflict of interest does exist, BHI may, at its discretion, withhold the assignment from the vendor until the matter is resolved. If a significant conflict of interest is deemed to exist, then the vendor shall be ineligible for the contract or shall take such steps that are deemed necessary to remove the conflict of interest without penalty to BHI.

The determination of whether a conflict of interest renders a vendor ineligible for a contract will be made by BHI in its sole discretion.

LITIGATION CLAUSE

Active or pending litigation against BHI by a vendor will prevent consideration of any bid submitted by that vendor.

PUBLICITY

The contractor or its employees shall not make, participate in, distribute or cause to permit to be distributed, any announcement, press release, interview, article, story, appearance, marketing material or advertisement, whether in print, radio, television or any other medium or media, regarding this Agreement or the terms and conditions thereof or regarding the Project or any aspect thereof without BHI's prior written consent.

INVOICE PROCEDURE

All invoices for work completed are to be broken down into areas and zones as identified in Schedule "D". Invoices in duplicate, are to be sent to the attention of the BHI Director of Operations, based on the previous month's activities.

EXPERIENCE

All contractors performing work on this contract must show adequate proof of past experience on jobs of a similar nature.

CONTRACTOR REPRESENTATIVE

The contractor must have a reliable representative to deal with BHI's Director of Operations or his appointed assistant. This representative must have the power to sign, and when requested, accept for completion any service work order, replace order or additional service installations issued by the Director of Operations.

PRICING & SOURCES

Prices & Sources will be treated as Confidential Information. Prices and Sources will not be shared with Competitors. At the conclusion of the award process only the name of the success respondent will be disclosed.

PRICE AND EVALUATION CRITERIA

The lowest priced or any Quotation will not necessarily be accepted.
Award of a contract will be based on the additional requirements set out in Schedule "E", health and safety metrics and industry experience ratings, references, experience, performance on previous contracts with BHI and/or other clients and crew availability.

CLARIFICATIONS

BHI expressly reserves the right to request clarification or explanation, at its sole discretion, of any Quotation or part of any Quotation by contacting the Proponent without the obligation to contact any other Proponents.

NEGOTIATIONS WITH PROPONENTS

BHI may identify one or more Proponents with whom it may enter into negotiations with a view to obtaining a contract or arrangement that is responsive to BHI needs. Selection as a Proponent with whom BHI will negotiate does not guarantee that BHI will conclude an arrangement with the Proponent. BHI expressly reserves the right to terminate the RFP process before a Proponent is selected, to terminate negotiations with the Selected Proponent(s) or to determine that BHI's needs can be met, or have been met, in a different manner.

QUOTATION EVALUATION AND AWARD OF CONTRACT

All Quotations shall be opened after the Closing Time in the presence of the BHI Purchasing Manager or designate. The opening will not be public. At the conclusion of the award process

only the name of the successful Proponent(s) will be disclosed. Quotations will be assessed on the basis of information provided by the Proponent(s).

Without limiting the generality of the foregoing clauses, BHI shall be entitled to reject any Quotation if:

a) A Quotation is not typed or completed in ink, or is not computer-generated;
b) A Quotation is not properly executed by an individual having the authority to bind the Proponent (s);
c) A Quotation is submitted after the due date and time;
d) A Quotation contains prices which appear to be so unbalanced that they may adversely affect the interests of BHI.
e) A Quotation is received on other than the supplied Quotation Documents
f) A Quotation is incomplete (all items are not Proposed on), except where the Quotation Documents clearly state that a Contract Award may be made for individual items;
g) Unauthorized alterations have been made to any part of the Quotation Documents;
h) A Quotation contains any error whatsoever;
i) A Quotation that contains any substitution or deviation from specifications provided by BHI.

BHI reserves the right to consider during the evaluation of the Quotations:

a) Information provided in the Quotation itself;
b) Information provided in response to enquiries of credit, experience and Industry references set out in the Quotation;
c) Information received in response to enquiries made by BHI of third parties apart from those disclosed in the Quotation in relation to the reputation, reliability, experience and capabilities of the Proponent(s);
d) The manner in which the Proponent(s) provides services to others;
e) The experience and qualification of the Proponent(s) senior management and project team;
f) The compliance of the Proponent(s) with BHI's requirements and specifications;
g) Innovative approach(es) proposed by the Proponent in the Quotation where requested in Quotation Documents;
h) The ability of a proposed system to meet or exceed the requirements or needs of BHI;
i) Warranties offered by Proponent(s); and
j) Any other criteria considered to be relevant by BHI in its sole discretion including, but not limited to, criteria set out elsewhere in this RFP.

ADDITIONAL TASKS OR PROCESS CHANGE

Should additional requirements based on a change of process/conditions or based on technology arise during the life of the agreement, the Proponent(s) and BHI shall mutually agree to the change of conditions without penalty to BHI. Should both parties fail to agree on the additional tasks or process change, may terminate the Contract on sixty (60) calendar day's written notice to the Contractor without financial penalty to BHI.

TERMINATION OF RFP PROCESS

BHI reserves the right to:

a) Terminate the process described in this RFP at any time, including before the closing date, for any reason whatsoever and will not be responsible for any costs incurred by vendors in the preparation and submission of their responses to this RFP.
b) Not to accept any Quotation and is expressly permitted to reject any or all Quotations.
c) To terminate negotiations with an RFP Proponent(s) at any time.

TERMINATION OF CONTRACT FOR PERFORMANCE PROBLEMS/SAFETY VIOLATIONS

BHI may terminate a Contract through a "three strike process" based on risk and severity of performance problems and health and safety violations, customer service incidents, outages, adverse environmental impacts or other performance violations (CVOR loss, BHI and other applicable Rule violations, at fault damage to customer property, damage to BHI's distribution system). Should three such events occur within any three month period that are, in the opinion of BHI's Contract Supervisor exercising a sole discretion, sufficiently serious to warrant termination of the Contract, BHI may immediately terminate the Contract upon written notice to the Contractor.

SPECIFICATIONS AND SAFETY

Contractor shall be required to comply with BHI Tree Trimming Specifications (**Schedule "A"**), City of Burlington Standards (**Schedule "B"**) and Ontario Regulation 22/04 (see **Schedule "C"**, ESA Distributor Safety Bulletin)

TERMS AND CONDITIONS

BHI Purchase Order General Terms and Conditions of Purchase **(Schedule "G")** is attached as an integral part of this RFP and the Proponent(s) agrees to abide by these terms and conditions should an award be given to Proponent(s) on the subject matter herein. In addition, should Proponent(s) submission be accepted BHI will issue a Purchase Order to implement the accepted RFP/contract.

TREE TRIMMING BY BHI AND AFFILIATES

It is understood and agreed that during the term of a Contract and any extensions or renewals thereof, BHI and/or its affiliates may also undertake tree trimming using their own employees as determined by BHI in BHI's sole discretion.

NOTE

The Contract prices shall be valid for the period from January 1, 2020 to December 31, 2022. BHI reserves the right to reject any or all submissions. Lowest or any submission is not necessarily accepted. BHI reserves the right to modify quantities, higher or lower. BHI also reserves the right to award partial contracts to multiple or single Contractors.

Contract Form
RFP – 2020 Tree Trimming Contract

THIS AGREEMENT made in duplicate the_____day of_____20___

BETWEEN:

_____
Hereinafter called the "Contractor"
of the First Part

- and –

BURLINGTON HYDRO INC.
Hereinafter called "BHI"
of the Second Part

WHEREAS BHI did award to the said Contractor the contract for the following works:

RFP - 2020 Tree Trimming Contract

According to the specifications prepared by BHI's Director of Operations and signed by the Contractor and according to the Instructions to Bidders and General Conditions hereto annexed, the said Contractor having put in a RFP therefore, a copy of which is hereto annexed and marked **RFP - 2020 Tree Trimming Contract.**

NOW THIS AGREEMENT WITNESSETH that the said Contractor for itself, its heirs, executors and administrators, covenants and agrees with BHI and its successors and assigns to perform and execute the whole of the works herein and in the said specifications and General Conditions mentioned with due expedition and in thoroughly workmanlike manner and to the satisfaction of the BHI's Director of Operations in strict accordance with the provisions of this Agreement and the said specifications, instructions to bidders, general conditions and the plans herein referred to, all of which are made part of this Contract as if embodied therein and thereafter maintain the same as therein provided; and further covenants and agrees to and with BHI to carry out, do, perform and observe and be bound by all covenants, agreements, stipulations, provisos and conditions to be carried out, done, performed and observed by them to the same extent and as fully as if each of them were set out specifically in this Agreement.

BHI covenants with the said Contractor there if the said work, including all extras in connection therewith, shall be duly and properly executed as aforesaid, and if the said Contractor shall observe and keep all the provisos, Terms and Conditions of the contract, BHI will pay the said Contractor the amounts or at the rates and in the manner subject to the drawbacks and penalties mentioned in the said contract.

IN WITNESS WHEREOF the Contractor of the First Part has hereunto set its hand and seal the day and year above written and BHI hereunto set its Corporate Seal.

THE CONTRACTOR

(_____) NAME

per: _____

I have authority to bind the Contractor

BURLINGTON HYDRO INC.

per: _____

per: _____

We have authority to bind the Corporation

Schedule "A"- BHI's Tree Trimming Specifications

SCOPE

The purpose of these specifications is to establish standard practices for line clearing operations on all BHI power lines. The specifications, as written, will govern all line clearing operations authorized by BHI unless specifically amended by the substitution of approved clauses or otherwise, to meet special conditions. Pruning shall be done to meet the Ontario Electrical Code ("OEC") requirement of 3 metres of clearance all round while still maintaining the structural integrity and safety of the trees.

PERIOD OF CONTRACT

This period of contract is to commence January 2, 2020. All work in the Three Year Areas has been divided into smaller zones and should be complete within the year stated. Please note that certain species of trees shall not be trimmed while the sap is running. If the Contractor comes across any such tree during this time, they must return before June 30th of said year to complete the trimming requirements.

PERMISSION

Before any work on trees is commenced, the permission of private property owners, Highways and Road Officials and Municipal Authorities must be obtained. BHI will obtain necessary permits from Highways and Road Officials and Municipal Authorities. The Contractor shall obtain permission of private property owners. BHI staff will render any assistance necessary in this respect.

PAYMENT AND PENALTIES

Payment for a zone will not be made until all work has been completed in the zone to the satisfaction of BHI's Contract Supervisor unless arrangements for partial payment have been agreed upon. Should any work be delayed by the inclemency of the weather or by reason of a general strike in any particular trade or calling, BHI shall have the power to extend the time for the completion of the works, making a just and reasonable extension for that purpose. If the Contractor fails to complete the work for which they are issued a purchase order, the Contractor will pay BHI the difference between their successful bid and the cost of the contractor who actually completes the work This will be calculated on a by zone basis.

EXPERIENCE

The Contractor shall be actively engaged in the line of work required by the document, and shall be able to refer to work of similar scope and nature performed by them. The Contractor must be prepared, when requested, to present evidence of experience, ability, capacity, services facilities, financial resources and managerial controls when necessary to satisfactorily meet the requirements set forth or implied in the document. The Contractor must have competent staff as prescribed by regulations; this includes competent Utility/Arborists, Arborists, Foresters or apprentices within the Arboriculture trade. All grounds persons, labourers, equipment operators or other staff shall be competent as prescribed in regulations and rules. The Contractor shall provide competent supervisors as defined in regulations.

PROVISION FOR TRAFFIC

The Contractor shall at all times carry on the work in a manner that will create the least interference with traffic, consistent with the faithful performance of the work. The Contractor shall not close the road or reduce the width or number of traffic lanes available for traffic except as specified in the contract documents or as approved. The Contractor shall, at his own expense and to the satisfaction of BHI provide all vehicular traffic control equipment, material, and labour required to perform the work in a safe manner in accordance with the "Occupational Health and Safety Act" and the "Ontario Traffic Manual"(Book 7 Workers shall be competent in the application of traffic and pedestrian control measures. This includes training, experience and knowledge to execute traffic and pedestrian control measures. The contractor shall follow all road authority measures (e.g. City of Burlington, Halton Region) as prescribed, including notification and times of work requirements.

PROTECTION OF WORK AND PROPERTY

The Contractor shall continuously maintain adequate protection of the work area from damage or injury and shall make good any property damage or injury. If damage or injury does occur, the Contractor shall restore such property to its original state.

The Contractor shall provide, erect and maintain all guard rails, barriers, night lights, sidewalk and curb protection as may be necessary or as by-laws of the City of Burlington may require.

COMMERICIAL VEHICLE OPERATORS REGISTRATION (CVOR)

When applicable, Contractors are required to have a valid CVOR with a minimum rating of satisfactory. While under contract with BHI, the Contractor is required to operate under its own CVOR operating authority. Prior to any work being performed for BHI, the Contractor must submit a copy of its current CVOR abstract with its RFP submission (as identified in Schedule "E") and thereafter each six month period following the course of the contract via email to the Director of Health and Safety. During the term of the contract, if there is any change to the Contractors CVOR rating, the Contractor must immediately notify BHI and submit a revised CVOR abstract. An unsatisfactory CVOR abstract or rating is cause for contract cancellation or disqualification.

SAFETY REGULATIONS

The Contractor shall be a member of the Infrastructure Health & Safety Association and abide by the most current edition of Electrical Utility Safety Rules and regulations regarding line clearing in proximity to energized conductors including the use of Hazard 2 or 8 Cal/cm2 Arc Rated Clothing that meets, ASTM F1506 for regular clothing and ASTM 1891 for arc and flame resistant rain wear. UWPC Training and shall ensure that the employees are conversant with the appropriate rules and regulations and anyone failing to abide by the rules may be required to leave the work site. Documentation of membership must be submitted to BHI in the pre-qualification process.

All work must be performed in accordance with the Occupational Health and Safety Act including the appropriate regulations that apply.

SUPERVISION

Contractor shall provide competent and adequate supervision of crews at all times throughout the

duration of this contract. BHI's Contract Supervisor is only responsible for the overall supervision of the contract, and has no responsibility for direct supervision of the Contractor's crews.

PERFORMANCE SPECIFICATIONS

The Contractor will be required to comply with the following:

a) Perform the work in accordance with specifications based on approved arboriculture practices. Following ISA or ANSI pruning standards. Comply with all statues, orders, regulations, rules and by-laws of every governmental authority relating to the work.

b) Must submit weekly, to BHI's Director of Operations and Contract Supervisor, the "Line Clearing Weekly Contractor Time Sheet" showing the streets worked on, the number of hours worked, along with the number of crews used on the job.

c) The Contractor shall, each day, before commencing work, communicate with BHI's Control Room (905-336-2004) advising of the following:

    1) Location and duration of area in which work is to be performed including secondary line clearing.

    2) "Hold-off" requirements.

d) And at the end of each working day, must inform the Control Room Operator that all employees are clear of the work area and surrender of all "Hold-offs".

e) Inform the Control Room Operator immediately should they cause a limb to fall across a line or other incident that may result in a feeder that might cause a power interruption.

CIRCUITS AND APPARATUS TO BE CLEARED

a) Branches and limbs will be pruned to provide a minimum clearance of three metres in all directions, from the 27,600 volt to the 13,800 volt and 4,160 high voltage lines including primary services.

    Clearance shall provide for at least three years growth, except where this would seriously mutilate the tree. This should be particularly borne in mind when dealing with fast growing trees. (See IHSA Safe Practice Guide Section 600 for reference). All limbs that are liable by falling, swaying or other means, to make contact the conductor, shall be removed wherever practical.

    In establishing clearances, the possibility of children climbing trees and making contact with live apparatus must always be borne in mind and particular caution shall be exercised regarding trees on or near school yards, residential neighbourhoods and playground areas.

Where adequate clearance cannot be obtained without mutilating the tree inform the BHI Contract Supervisor at once, in writing.

Sufficient clearance should also be provided so that guy wires and strain insulators are not in contact with heavy limbs.

b) Branches, limbs and vines will be pruned to provide a minimum clearance of 1.5 metres in all directions, from transformers, open drop leads, secondary wires and services. In addition, poles will be cleared such that a lineman can climb, without being obstructed by branches and limbs.

c) Remove all dead wood, regardless of location of the tree, which, under normal wind conditions, could strike the conductors or any part of the electrical equipment, in falling.

PROTECTING THE BARK OF TREES

Spurs will not be used for climbing trees, unless emergency rescue is required.

PRUNING

a) **Cuts**

Saw and pruner cuts shall be made using good arboriculture practices this includes follow good pruning practices that do not result in additional damage to the tree. (Stripping, cracking or damaging remaining tree structure)

b) **Cut Branches**

Ropes shall be used for lowering cut branches where necessary, to prevent damage to trees, conductors, fences and other property. No "hangers" shall be left in trees after pruning and no twigs or branches shall be left on the conductors.

c) **Saw Cuts to be Protected**

There is no need to paint, cover or treat pruning cuts to reduce decay or rot.

d) **Corrective Pruning**

Old stubs remaining from previous line clearing operations shall be removed as well as any stubs, broken or damaged limbs on the line side of the tree, resulting from storm damage.

e) **Shaping**

When a line passes through a tree, the opening should be cut back in a slope, away from the line towards the top, so that the notch is a Vee shape. The cutting of slots is not permitted. The cutting of Vee notches shall be kept to a minimum.

Where lines run alongside a tree, the tree should be trimmed to give correct clearance at

the lowest BHI line and slope away from the upper circuits.

If in obtaining the desired line clearance, trees are rendered unsightly due to lack of symmetry, further pruning to restore their appearance shall be carried out. The extent of such shaping shall be governed by the location of the trees to the nature of their surroundings etc. Full shaping shall consist of:

1. The removal or shortening by natural or "drop-branch attachment" method, of branches in crown of tree. Sufficient growth must be left on branches that are cut back, ensure the health of the tree. When possible, the branch being removed shall be cut in such a way as to preserve the natural appearance of the tree. "Hedge-pruning" or excessive clipping with pole pruners and brush saws shall be avoided.

2. Removal or shortening of long straggly branches at side of trees.

3. Removal or shortening of branches at backs of trees, to restore balance which has suffered as a result of limbs being removed to obtain clearance of the line side. Care must be exercised to avoid an effect similar to girdling, as a result of removing too many adjacent branches.

4. Removal or shortening of side branches on line side of tree to eliminate or reduce to a minimum a gouged effect.

f) **Limbs Under Conductors**
Limbs growing up into the conductors from the side of a tree shall be removed at the main trunk. If this appears impractical, or inadvisable, the limbs shall be shortened to avoid whipping up into the line.

g) **Limbs Parallel with Conductors**
Limbs that are growing out from the side of a tree, parallel with conductors, and could sway or be flown into the conductors, shall be removed wherever practical. Otherwise they shall be shortened.

h) **Trees Below a Line**
Young trees growing directly under a line are to be topped and rounded in a pleasing manner.

i) **Overhanging Limbs**
Limbs directly over the conductors shall be removed if possible; otherwise they shall be shortened sufficiently to prevent their dropping into the conductors under the additional weight of wind, snow or ice.

j) **Dead Limbs**
All dead wood, level with, or above the conductors, in trees immediately adjacent to the

line shall be removed together with dead limbs that might be blown into the line from trees located across the road or elsewhere in the near vicinity.

k) **Tops of Weak-Wooded Trees to be Lowered**
All tall weak-wooded trees towering above the line shall have their tops lowered as much as practical. To lower the tops, the "crown reduction" method shall be used so that the tree will not appear to have been chopped off at a definite height.

l) **Vines**
Vines growing on poles, down guys and span guys are to be cut at grade elevation and removed. Where the vines have encroached within the safe limits of approach for removal from overhead high voltage conductors and secondary service conductors, notify BHI in writing. BHI will dispatch a crew to create a safe condition in order to remove the vines.

DISPOSAL OF WOOD, BRUSH AND DEBRIS
The disposal of brush, wood and other debris resulting from Contractor`s activities shall be governed by the following:

a) If the Council or other road authority does not wish to retain timber cut from road allowances, adjacent property owners shall be afforded the privilege of using it. Such timber and branches over 4" in diameter shall be trimmed and cut into convenient lengths for handling unless otherwise designated by the property owner. Alternatively, dispose of all debris at an approved dumping site.

b) Timber and branches that are to be given to property owners shall be piled neatly on the land of the property owner, immediately adjacent to the road allowance, during the progress of the line clearing operation.

c) Wood or brush, which has been cut from private property during the progress of a line clearing operation, shall be cleared up to the satisfaction of the property owner, providing the request is reasonable.

d) Brush, wood and debris, shall not be left lying overnight along streets, highways, county roads or any main travelled road. Brush left overnight on lightly travelled roads shall be stacked neatly so as not to obstruct traffic, and shall be removed the following day. Lawns and grassed areas shall be raked to eliminate small twigs, branches, and debris.

TREES OF DOUBTFUL STRENGTH
Report in writing, all trees of doubtful strength that in falling could strike BHI lines. These shall include all trees especially Ash trees that are over-mature, diseased or showing signs of decay, as well as all Oak, Beech, and Basswood Trees, regardless of their outward appearance, since trees of these species are particularly prone to internal decay.

Schedule "B" – City of Burlington Standards

The following pages have been extracted from the City of Burlington Standards and should be read in conjunction with the preceding requirements. Where a discrepancy occurs, notify the Engineer in writing. However, special regard to the needs of Burlington Hydro Inc. shall be overriding factor.

ROADS & PARKS MAINTENANCE SPECIFICATIONS

GENERAL

a) All wood chips and other material shall be removed off the site.

b) Cost of disposal shall be included in the unit base price.

c) Repair of damage to City or private lands resulting from improper use of equipment shall be the responsibility of the Contractor.

d) The presence of any disease condition, fungus fruit bodies, decayed trunk or branches, cracks or other structural weakness should be reported in writing to the City Representative and work stopped on tree immediately.

SAFETY

a) All workers working near utility lines will be briefed by the Contractor on the current of the conduit in the vicinity of the work. The On-Site Supervisor in charge of any work group will be fully aware of, and comply with, safety procedures involving utility lines.

b) Safety ropes, tools, severed limbs, equipment and aerial lifts will be handled in such a way as to ensure they do not breach the safe limits of approach and to ensure they do not come into contact with any utility lines.

c) All safety ropes in use on the site will be inspected from end to end each day to ensure that there is no weakening; fraying or stressing that constitutes a danger to the climber or his co-workers. Similarly all other safety equipment will be checked regularly to ensure that it is in safe working condition and that any defect is rectified.

d) All safety equipment will be approved by the Canadian Standards Association for the purpose for which it is being used.

e) All aerial lifts will be insulated so as to ensure the safety of any employee in the bucket or at any controls, should the lift come into contact with any energized utility line on the site.

f) All work will be carried out in accordance with the applicable sections of the

Occupational Health and Safety Act including the applicable Industrial or Construction Regulations this includes all relevant rules and regulations made under such legislation.

g) Safe limits of approach from live electrical apparatus including lines must be maintained by all persons. This safe limit of approach will also apply for any conducting tools or material handled by any worker see the Electrical Utility Safety Rules for additional requirements. All work performed in proximity to Burlington Hydro Distribution System shall be performed in accordance with the Electrical Utility Safety Rules.

h) It is the responsibility of the Contractor to coordinate specific needs (isolations etc.) with Burlington Hydro prior to commencing work in close proximity to utility lines.

i) It is the responsibility of the Contractor to obtain policies and regulations pertaining to services and limitations directly from Burlington Hydro. It is advised that the Contractor investigate these policies prior to bidding. Any additional costs incurred by the Contractor due to Burlington Hydro polices will be borne by the Contractor.

PRUNING STANDARDS

a) Standard pruning shall consist of the removal of dead, dying, diseased, decaying, interfering, objectionable, obstructing, and weak branches, as well as selective thinning to lessen wind resistance. The removal of such described branches is to include those on the main trunks, as well as those inside the leaf area. An occasional undesirable branch up to one inch (2.5 cm) in diameter may remain within the main leaf area where it is not practical to remove it. The following General Statistics listed below, apply to Class II, Standard Pruning:

1) All cuts shall be made as close as possible to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stud. Bark at the edge of all pruning cuts should remain firmly attached.

2) All branches and limbs shall be removed in a manor to reduce the probability of additional damage or stress to the tree. Where necessary, ropes, other approved procedures or equipment should be used to lower branches or stubs to the ground.

3) Equipment that will damage the bark and cambium layer should not be used on or in the tree. For example, the use of climbing spurs (hooks, irons) is not an acceptable work practice for pruning operations on live trees. Sharp tools shall be used so that clean cuts will be made at all times.

4) All cut limbs shall be removed from the crown upon completion of the pruning.

5) Trees susceptible to serious infection should not be pruned at the time of year during which the pathogens causing the diseases or the insect vectors are most active. Similarly, if pruning wounds may attract harmful insects, pruning should be timed so as to avoid insect infestation.

6) All visible girdling roots are to be reported to a supervisor and/or the owner, and corrective measures recommended.

a) The City's minimum tree limb clearance is 2.5 metres above sidewalks and 4.2 metres over roadways. Attempts are to be made to maintain a balanced crown while still observing these standards.

b) Site lines and street sign clearance must be maintained as per section 162 (3) of the Highway Traffic Act.
Street lights are to be cleared in such a way as to permit maximum illumination of roadways and sidewalks while still maintaining the trees' structural integrity.

c) In locations where ordinary pruning operations might cause damage to property, trees shall be suitably dismembered using recognized forestry rigging practices ensuring that any severed limb is under control at all times.

d) Anchors for guide ropes shall be installed in such a position that a person handling the guide ropes are able to stand well outside the drop zone of the tree.

e) Guide ropes shall be used on all trees that are sufficiently large to cause damage should they fall in any direction other than that intended. The guide ropes shall be installed before any cutting at the base.

f) When removing limbs by use of a guide rope, a moving vehicle shall not be used as the stresses to the guide ropes in unknown. When it is necessary to anchor tackle for this purpose, it must be anchored to a fixed object such as a tree, a truck with its wheels locked, or a stake hold fast. Where a tree is used for an anchor, bark will be appropriately padded to ensure that no damage occurs.

g) Brush and other debris or equipment that would hamper free movement when using sharp tools or when getting clear in case of emergency, shall always be cleared away.

WORKERS

a) Each worker involved in tree pruning under contract will be competent including experienced and knowledgeable in standard tree removal and pruning practices.

b) All workers involved in pruning will be aware of the standards and specifications contained herein.

TOOLS AND EQUIPMENT

a) Each utility arborist will employ safety belt and strap, or safety belt and saddle in the tree at all times. When working in an aerial lift, he will remain inside the bucket with his safety lanyard securely and properly fastened at all times.

b) Aerial devices will be kept clean of all tree paint, grease and dirt that could reduce its specified dielectric capacity.

c) Under no circumstances will axes or hatchets be used off the ground.

d) All ropes employed in lowering major limbs will be used within the manufactures recommendations and instructions and shall not over-loaded or shock loaded.

e) All pruning equipment will be designed specifically for tree work and shall be clean, sharp and in proper, safe working order.

f) Rubber sole (or equivalent) shoes will be employed in climbing to ensure that the risk of slipping is minimized.

CLEANLINESS OF SITE

a) Once removed, all wood chips, brush, limbs, trunks and logs, unless otherwise specified in the contract documents, will be considered the property of the contractor who will dispose of them in a manner consistent with applicable Provincial Statutes and Municipal by-laws.

b) In some cases, if the adjoining resident so requests, the City Forester may approve logs from 3 inches (7.62cm) to 8 inches (20.32cm) in diameter and suitable for burning, cut into lengths not to exceed 18 inches (45.72cm), being left stacked along a road right-of-way, if the contractor agrees and no further cost is incurred.

c) Where a chipper is to be used, all wood chips will be removed from the site and disposed of by the Contractor. Spreading chips will not be permitted except as allowed for in the contract documents or in writing by the City Forester.

d) In natural, meadow, or rural areas all branches, limbs and twigs over 1/4 inch (.64cm) in diameter will be removed from the site. In all industrial, residential, commercial, park and similarly maintained areas, all grass, gravel and garden areas will be left “fan rake clean”. All driveways, walkways, roads, curbs, patios, and other asphalt, concrete, stone and similar surfaces will be “broom clean” when the site is vacated at the end of each shift and at the end of each day.

e) It is expected that clean up operations will progress with the job and that a minimum of one grounds person will be engaged in brush removal for each three climbers or pruners.

f) It is understood that all damage caused by workers engaged in the work under these specifications will be repaired by the Contractor and at the Contractor’s sole expense.

Damaged turf areas will be levelled and seeded or sodded, all horticultural planting damaged beyond repair will be replaced and any damage to structures, utilities, signs, light fixtures, landscape furniture, etc. will be repaired or replaced.

g) Repair work will be carried out by competent workers acceptable to the City Arborist.

h) All repairs and replacements will be approved by the City Forester prior to final payment.

DOCUMENTATION

Inspection forms shall be completed for each location and submitted to the City upon completion of the contract.

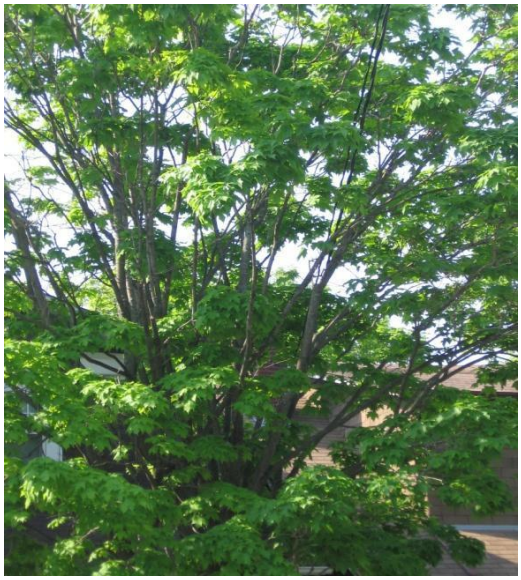
Schedule "C" – ESA Distributor Safety Bulletin

GENERAL STATEMENT: **Electrical Distribution Safety**

LDCs have a legal obligation set out in O. Reg. 22/04 to manage vegetation around all LDC owned overhead conductors including secondary. There have been a number of incidents and public safety concerns due to trees in direct contact with powerlines. One incident involved tree branches pushing the LDC owned secondary service against the eaves trough of a home, wearing away the service insulation and energizing the eaves trough. This resulted in the homeowner receiving an electric shock causing injury when a ladder was placed against the eaves trough. ESA is also concerned that the number of powerline contacts by DIY homeowners and arborist trimming trees near powerlines continues to increase.

O. Regulation 22/04 states:

- Section 4(4) "All overhead distribution lines, **including secondary distribution lines**, shall meet the following safety standards… (3) Energized conductors and live parts shall be barriered such that vegetation, equipment or unauthorized persons do not come in contact with them or draw arcs under reasonably foreseeable circumstances."



ESA RECOMMENDS:

- LDCs review and modify as necessary their Conditions of Service to ensure it aligns with O. Reg. 22/04
- Ensure LDC tree trimming practices and other measures be taken to meet the obligations set out in O. Reg. 22/04

ADDITIONAL INFORMATION: If you can provide additional information on this Bulletin or any other Utility issue, please contact ESA to share your experiences. Additional information requests, and follow-up information, may be directed to ESA. Please be prepared to quote Bulletin "DSB-02/09".

Provincial Office 155A Matheson Blvd. West, Suite 200, Mississauga, Ontario
L5R 3L5 Fax 905-507-4572
Website: www.esaeds.info E-Mail: Utility.Regulations@ElectricalSafety.on.ca

Schedule "D" - Pricing and Submission of Proposal

BHI requires trees to be trimmed clear of all primary and secondary circuits in a manner described in the Schedule "A". It should be noted that all zones will be inspected by BHI and payment will be withheld until the zone is completed to the satisfaction of BHI's Contract Supervisor. Payments for partial zone completion may be prearranged at the sole discretion of BHI upon awarding of the contract.

Proposal Requirements
Proponents to complete the below in full and indicate any additional charges that may apply with explanations e.g. overtime charges, minimum call-out or travel time. Only charges described in the RFP will be considered for payment during the contract period.

The proposed areas to be trimmed are identified on the maps provided with the RFP. Each large area is divided into smaller numbered zones. Exclude HST. BHI reserves the right to award the contract by zone (i.e. multiple proponent(s) could be awarded in each year). Work must be completed in all zones listed in the specified calendar year.

I/we certify that I/we have visited all zones as outlined on the maps provided, prior to determining cost by zone. _____ ← *Initial Here*

1. Fixed Pricing by Zone
Provide cost to complete each zone by year in the tables below. The proposed areas and zones to be trimmed are identified on the provided maps. Each large area is divided into smaller numbered zones. Exclude HST. BHI reserves the right to award the contract by zone (i.e. multiple proponent(s) could be awarded in each year). Work must be completed in all specified zones in each calendar year.

2020 – 4 Zones	
Zone	**Cost**
Zone 7	
Zone 13 (partial)	
Zone 14	
Zone 16	
Total Area	

Schedule "D" Pricing and Submission of Proposal (continued)

2021 – 6 Zones	
Zone	**Cost**
Zone 1	
Zone 2	
Zone 3	
Zone 4	
Zone 5	
Zone 6	
Total Area	

2022 – 8 Zones	
Zone	**Cost**
Zone 8	
Zone 9	
Zone 10	
Zone 11	
Zone 12	
Zone 13 (full)	
Zone 15	
Zone 17	
Total Area	

Schedule "D" Pricing and Submission of Proposal (continued)

2. Time and Material

In addition to work completed by zone under this contract, there may at times be a need for additional planned time and material work as required, including specific customer requests. There is also additional emergency work for which crews must be available 24 hours a day, 7 days a week, 365 (366) days a year. Crews must be equipped to work at night and additional crews may be required.

Tree Contractor Hourly Rates for Time and Material Work		
Description	**Normal Working Hours** [1]	**Overtime Rates (outside normal working hours)** [2]
Applicable Hours		
Applicable Days of Week		
2 person crew and bucket truck (rate per hour)		
Additional person including bucket truck (rate per hour)		
Additional person including pick-up truck (rate per hour)		
Minimum Call Out Charge	**n/a**	

1. These rates also apply for emergencies in normal working hours
2. These rates also apply for emergencies outside of normal working hours

3. Emergency Response Time

In the event of an emergency and a crew is not already on site:

a. I can provide _____ crew(s) within 1 hour response time.

_____ ← ***Initial Here***

b. I can provide _____ crew (s) within 4 hours response time.

_____ ← ***Initial Here***

Schedule "D" Pricing and Submission of Proposal (continued)

Completed by:

Name: _____

Title: _____

Date: _____

I, /WE, THE UNDERSIGNED, declare that, after having carefully read the General Conditions, BHI Tree Trimming Specifications (Schedule "A"), City of Burlington Standards (Schedule "B"), and the General Terms and Conditions of Purchase (Schedule "F") and after having examined the plans and profiles of the streets upon which the works are to be performed.

WE DO HEREBY OFFER to perform the work described for furnishing all labour and materials as specified that may be necessary to complete the said works in accordance with said specifications, plans, etc. and to conform to all conditions therein at and for the price or sum as shown on the attached Schedule. This Proposal is irrevocable and open for acceptance for ninety (90) calendar days from the closing date.

Signature of Authorized Officer: _____
I have the authority to bind the Company

Name and Title (print): _____

Title: _____

Company Name: _____

Address: _____

Phone Number: _____

E-Mail Address: _____

Schedule "E" - BHI Qualifying Contractor Requirements
for Line Clearing Operations in Proximity to Energized Apparatus

1. A copy of the following list of documents must be provided as part of the due diligence evaluation for this RFP:

- Currently dated and signed Corporate Health and Safety Policy ☐
  (*Must be signed and dated each year)*
- Currently dated and signed Corporate Environmental Policy (if not included in preceding policy) ☐
- Policy on Management of the Electrical Utility Safety Rules (EUSR) as appropriate ☐
  (*EUSR 101 requires the employer to establish a policy on the management of the Rules)*
- Current WSIB Clearance Certificate ☐
  (*Renewable every 90 days please include industry experience rating)*
- Proof of current valid driver's licenses for all pertinent drivers along with the most recent date of abstract searches – a signed letter to this effect will meet the intent of this requirement ☐
- Current GL and / or PL Insurance Policy naming BHI and / or COB (as pertinent) as an additional insured ☐
  ($5M aggregate, $2M per occurrence)
- Proof of current appropriate Health and Safety Association Membership ☐
- Occupational Health and Safety Program <u>including work site emergency plan, and Job Plan Procedures</u> ☐
  (Managed System such as COR, CSA Z1000, or equivalent)

2. Provide current and complete pertinent employee listing, including competencies and proof of qualifications, Provide competencies and / or copies of training certificates by an approved / accredited training agency or agent.

All Crew members must have:

- Standard First Aid and CPR (AED if equipped) ☐
- Safe Operating and Maintenance of Chain Saws ☐
- Safe Operation and Maintenance of Chippers ☐
- Work Area Protection (MTO Traffic control, Book 7) ☐
- Safety and Awareness for Line Clearing ☐
- Appropriate Working at Heights (Fall Protection) ☐
- Tree Trimming and Removal Techniques ☐

3. Provide proof of the following competencies if available:

- an MTCU Utility Arborist Certificate (will consider / accept an ISA Certified Arborist/Forester who holds competencies equivalent to Utility Arborist 444B) ☐
- Utility Line Clearing Technician Proficiency (IHSA or approved equivalent) ☐
- Pertinent Working at Heights and Rescue (IHSA] or approved equivalent) ☐
- Appropriate Supervision per the Occupational Health & Safety Act (as a minimum) ☐

- **Additional Proof of Training for Crew Member to Hold Work Protection as an Authorized Worker (as governed by Electrical Utility Safety Rules):**

  Utility Work Protection Code (must complete and pass the examination for this IHSA Administered Program in order to apply and hold UWPC Work Protection) ☐

- **Additional Proof of Training for Crew Member working from Bucket Truck and/or providing Rescue Support to a Member in Bucket Truck:**

  Pertinent Hydraulic Aerial Equipment (IHSA or approved equivalent manufacturer) ☐

  Pertinent Working at Heights including Rescue Techniques (IHSA or approved equivalent) ☐

- **Additional Proof of Training for Crew Member Performing General Ground Support Functions (NOT rescue support):**

  Electrical Safety and Awareness – Line Clearing Ground Support (IHSA or approved equivalent) ☐

  Rescue Techniques and Practice ☐

4. Provide the following Inspection Documents:

- Current CVOR records for pertinent vehicles ☐
- Lifting / hoisting Inspection Records for pertinent vehicles ☐
- Annual Small Vehicle Inspections (Preventative Maintenance Programs) ☐
- Pertinent current Certification of Dielectric Tools ☐
- Current Certification of Dielectrics for Aerial Devices ☐
- Current Certification of Voltage Rated Gloves ☐

PPE Minimum Requirements

Workers working in proximity are expected to wear Arc Rated clothing as required from EUSR, the min requirement is for the arc rated clothing to have HC 2 or 8 cal/cm2 as min, the clothing must meet ASTM F 1506 standards and rainwear must meet ASTM 1891 Standards. The Clothing shall be used in accordance to manufacture instructions and provincial regulations:

- Class E Head Protection
- CSA Approved Safety Glasses with UVA/B protection
- CSA Approved Work Boots
- Chain Saw Cut Protection (not required if in Aerial Device unless prescribe though contractor policy)

Sub Contactors

Any sub-contractors working for the prime contractor must be approved through the same process. No sub-contractors are to perform any work without the written consent of BHI Prequalification procedure.

5. <u>Provide the Following Performance Metrics Documents:</u>

- Health and Safety Metrics from previous year (summary only) of fatalities, critical injuries, lost time incidents, medical aid claims, first aid incidents, and near miss incidents. For contractors working under multiple rate groups please provide for activities under rate group 830 only. ☐
- WSIB NEER previous year experience rating against rate group 830 ☐
- CVOR previous years' experience summary ☐
- Inspections previous year summaries from supervisors, regulators, or subject matter experts on health and safety performance from previous year. ☐
- Environmental Metrics, previous year summary of spills, impacts or incidents related to environmental losses. ☐
- Three (3) industry references related to experience in performing line clearing operations. ☐
- Awards or recognition in business, health and safety, environmental or community recognition. ☐

RFP responses will be evaluated on the basis of all requirements identified in this RFP, of which price is only one component. Once the contract is awarded, the successful contractor (s) shall be responsible to maintain the competencies, insurance, inspections, testing and requirements as described throughout this RFP.

Additional Notes Forming Part of this Qualification Process

1. Following awarding of the contract the successful contractor (s) must attend a scheduled orientation session with BHI; this may take upwards of 60 to 90 minutes and must include those personnel qualified under the UWPC and who will be working on the contract. The orientation may include more than one contractor and time for this orientation will be at the contractor's expense.

2. Approval under this process is based on the personnel included in the RFP response submission. Should crew members change or a new crew member be added, their qualifications must be submitted for approval prior to the individual being assigned to any pertinent contract work.

3. The Electrical Utility Safety Rules (EUSR) will govern the qualifications and clearances required to work in proximity to BHI's distribution system.

4. Once the contractor has provided documented proof that one or more crew members are trained and certified in the Utility Work Protection Code, and these individuals have attended BHI's orientation program, they will be authorized to be a holder of work protection (within the requirements of the EUSR) and governed by BHI's pre- qualification process; and they will be considered as authorized to request a 'Hold Off' from the BHI's Control Room. Please note that the sole purpose of a "Hold -off" is for system equipment protection and is not in any way to be considered personal protection. This latter point will be a main orientation topic.

5. Only the contractor's pertinent authorized individuals may request hold offs from BHI's control room; the authorized individual must be on the affected work site to request the Hold Off and remain on the site while the Hold Off is in effect. The Hold Off must be surrendered at the completion of the work day and / or before leaving the site. Abuse of this requirement will jeopardize the Contractor's privilege of obtaining a Hold Off from BHI and be subject to the three strike procedures up to and including termination of the contact described in General Conditions.

6. Upon contract award (if applicable), the contractor will receive notice as to whether or not they will be an approved contractor for working in proximity to energized apparatus. The notification will serve as a letter of authorization to perform line clearing operations in proximity to BHI's distribution system. The intent of this letter is only for the scope of the work as defined within the contract. This authorization will not apply to work such as private work, weekend or outside of scope work of crew members of the contractor.

Schedule "F" - BHI General Terms and Conditions of Purchase

The following terms and conditions of purchase shall apply to any purchase of goods and/or services specified in this purchase order ("Deliverables") by BHI (the "Purchaser"), and acceptance of these terms and conditions is an express condition of such purchase. Supplier shall be deemed to have full knowledge of the terms and conditions herein and such terms and conditions shall be binding if the Deliverables referred to herein are delivered to Purchaser or if Supplier does not within five days from the date hereof deliver to Purchaser written objection to said terms and conditions or any part thereof.

1. GOVERNING TERMS/CONFLICT/MODIFICATION: No order will be recognized by Purchaser unless issued on the Purchaser's form of purchase order. The purchase order issued herein, together with this General Terms and Conditions of Purchase and all Purchasers' documentation referenced in the purchase order shall constitute the contract between Purchaser and Supplier (the "Contract"). In the event of any conflict or inconsistency between the terms and conditions herein and the terms and conditions contained in any acknowledgment order or in any other form issued by Supplier, whether or not any such form has been acknowledged or accepted by Purchaser, Purchaser's terms and conditions herein shall prevail. No waiver, alteration or modification of the terms and conditions herein shall be binding upon Purchaser unless made in writing and signed by a duly authorized representative of Purchaser. Supplier shall refer the Purchaser's purchase order and/or Contract number set out on the reverse hereof on all invoices, shipping documents and other writings pertaining to this order.

2. SHIPMENT/EXTRA CHARGES: Unless otherwise stated in the face of the purchase order, all Deliverables shall be delivered FCA (Incoterms 2000) Supplier's facility. For greater certainty, receipt of such Deliverables at Supplier's facility does not constitute acceptance of the Deliverables by Purchaser. No transportation or delivery charges of any kind including packing, boxing, storage, cartage or customs brokerage charges shall be paid by Purchaser unless specifically agreed to by Purchaser in writing. Supplier shall ensure use of carrier designated by Purchaser. If Supplier does not have such instructions from Purchaser, Supplier shall obtain the same. Supplier shall suitably pack, mark and ship Deliverables in accordance with any instructions from the Purchaser and the requirements of the carrier in order to secure the lowest possible transportation cost. Supplier shall be liable for any freight charges or damage to the Deliverables resulting directly or indirectly from any failure by Supplier to comply with this provision. If Deliverables are deemed to be dangerous and/or hazardous, Supplier shall ensure all legally required documentation is prepared and submitted to the carrier prior to shipment with copy to the Purchaser. For shipments originating outside of Canada, Supplier shall ensure that a commercial invoice certified in accordance with Canadian customs regulations ("Canada Customs Invoice") accompanies the Deliverables clearly indicating the purchase order and consignee together with any export documents/permits required by the foreign customs authorities. The Canada Customs Invoice should indicate the customs broker for clearance as advised by the Purchaser. All Bills of Lading prepared on behalf of the Purchaser shall also indicate the purchase order number.

3. DELIVERY SCHEDULE: Supplier shall not make material commitments or production arrangements in excess of the amount or in advance of the time necessary to meet Purchaser's delivery schedule. It is Supplier's responsibility to comply with the schedule, but not to anticipate Purchaser's requirements. Deliverables shipped to Purchaser in advance of schedule may be returned to Supplier or warehoused at Supplier's expense.

4. DELAY IN DELIVERY: Time is of essence. Supplier shall ensure that delivery is made in accordance with the purchase order. Supplier shall forthwith advise Purchaser of any anticipated delays. Purchaser reserves the right to reject any shipments or deliveries not then made or to cancel the Contract without any liability to Purchaser and without prejudice to any of Purchaser's rights and remedies at law or equity, should the Supplier fail to meet scheduled delivery or completion dates or if there is a reasonable likelihood of Supplier failing to meet such schedule.

5. INSPECTION/REJECTION/REPLACEMENT: All Deliverables shall be subject to inspection and test by the Purchaser at all times and places including the period of manufacture and in any event prior to final acceptance by the Purchaser in order to assess work quality, conformance with specifications, and conformance with Supplier's representations, warranties and covenants under this Contract. No such verification shall relieve the Supplier of its obligations and warranties hereunder. The Deliverables shall not be deemed accepted until after such final inspection. If any Deliverables or parts thereof are found at any time to be defective in material or workmanship or otherwise not in conformity with the requirements set out herein, in addition to any other rights which it may have under applicable warranties, or under law, Purchaser shall have the right to reject and return such Deliverables for either full credit or a refund (at Purchaser's discretion) at Supplier's expense including payment of shipping charges incurred by Purchaser. All returned Deliverables shall be at Supplier's risk of damage or loss. Without limiting the foregoing, Purchaser shall also have the right to require that Supplier promptly and at its own expense repair, replace or restore any defective or deficient portion of the Deliverables, to Purchaser's reasonable satisfaction. If the Supplier is unwilling to or unable to effect prompt replacement, Purchaser may use its own facilities or contract with a third party at the Supplier's expense. Neither the failure of Purchaser to inspect, nor acceptance of, nor payment for any Deliverables shall prejudice Purchaser's rights under this paragraph. Supplier's records relating to the manufacture or provision of Deliverables shall be maintained for a minimum of six (6) years following delivery unless otherwise agreed in writing by Purchaser.

6. COMPLIANCE WITH LAWS: The Supplier shall properly execute and comply with all statutes, rules, orders, ordinances, standards and regulations of all foreign and domestic governmental authorities in providing the Deliverables pursuant to this Contract.

7. WARRANTIES: The Supplier warrants that the Deliverables: (a) are free from defects in design, materials and workmanship for a period of twelve (12) months from the date of acceptance by Purchaser; (b) conform with all specifications attached or contained in the purchase order and all documentation and information provided by Purchaser for the Deliverables; (c) are fit for their intended purpose (d) are new, unused (unless otherwise specified in this order) and merchantable. To the extent services are to be provided hereunder, Supplier warrants that all work rendered shall be careful and proper and in full compliance with

specifications and shall be in accordance with the best current practices in the industry and with the highest engineering or other applicable professional standards. The foregoing warranties shall survive any testing, inspection or acceptance by the Purchaser of the Deliverables. The warranties set forth above shall not be subject to any disclaimer or exclusion of warranties or to any limitation of Supplier's liability under this Contract.

8. INDEMNITY: Supplier shall indemnify, defend and hold harmless Purchaser, its affiliates and their respective directors, officers, employees, agents, consultants and subcontractors from and against any and all expenses, costs, claims, losses, actions, lawyer's fees, damages or liability (including without limitation for any Intellectual Property infringement, special and consequential damages, and including the costs of replacing or recalling Purchaser's equipment which may be damaged or rendered defective by materials furnished or work done in breach of warranties), arising directly or indirectly out of any breach by Supplier of the terms and conditions set forth herein and from any claims or actions arising from bodily injury (including injuries resulting in death) or loss of or damage to property of others which may result, directly or indirectly, from the negligent or wrongful acts of Supplier or its directors, officers, employees, agents or subcontractors relating to the performance of this Contract or any Deliverables supplied hereunder.

9. INTELLECTUAL PROPERTY: The Supplier warrants that the Purchaser and its customers may freely use, resell or otherwise deal with the Deliverables without infringement of patents, copyrights, trademarks, trade secrets or other intellectual property rights held by the Supplier or any third party. If the Deliverables or any activity in connection therewith are held to be an infringement and their use is enjoined, the Supplier shall promptly, at the option of the Purchaser, secure for the Purchaser the right to continue using or reselling the Deliverables or take any action required to avoid such infringement.

10. CONFIDENTIAL INFORMATION: Unless otherwise expressly stated in writing, all information including general business information, financial data, technical data, reports, photographs, electronic files, specifications, software, drawings, tools, dies, patterns, plans methods or other intellectual property ("Information"), supplied, conceived or prepared by Supplier or by Purchaser or both in connection with this Contract, shall be the property of the Purchaser, shall be considered confidential, shall not, at any time, be disclosed to a third party by Supplier without written consent of Purchaser and shall be used solely for the purpose of supplying the Deliverables to Purchaser. Upon termination of this Contract, Purchaser may request Supplier to deliver all the Information to the Purchaser and such Information shall not be utilized, directly or indirectly, by Supplier for the use or benefit of Supplier or any other person.

11. PAYMENT/SET-OFF: Prices herein specified shall, unless otherwise expressly stated, be fixed and in Canadian dollars inclusive of all duties of any kind and all packaging and loading, but exclusive of any taxes (HST) which shall be shown as a separate line item on the Supplier's invoice. Invoices will be paid within 60 days from receipt of an accurate and complete invoice by Supplier, and approval of work by BHI's Contract Supervisor unless a discount is permitted for payments made within another specified period. Purchaser shall be entitled to set-off against any amounts owing to Supplier, any amounts owing by Supplier hereunder.

12. EXPORT CONTROL/CUSTOMS: Supplier will provide to Purchaser, prior to shipment of the Deliverables, information in writing necessary for a true, valid and complete customs declaration to be made by Purchaser to the Canada Border Services Agency ("CBSA"), including but not limited to information identifying the origin, tariff classification, quantity, value of the Deliverables and classification of the Deliverables under any export control programs administered by the governments of the country of export. If Supplier identifies the origin of the Deliverables as a country that is a beneficiary of a Preferential Tariff as set out in Canada's *Customs Tariff*, or any successor thereto, Supplier shall provide to Purchaser certificates and other proof of origin of the Deliverables, as required under Canadian law in order for the Deliverables to qualify for duty-free or preferential duty. If the Deliverables being purchased are subject to US re-export regulations or contains US parts manufactured under a US license, Supplier shall also state the ECCN (Export Control Classification Number) for each item. Supplier shall hold harmless, indemnify, and reimburse Purchaser for any duties, taxes, penalties, interest, costs, legal or other fees or any amounts incurred by or which may become payable by Purchaser as a result of Supplier's failure to provide to Purchaser, prior to shipment of the Deliverables, the information required in this paragraph, or as a result of the provision by Supplier of incorrect information/invalid certificates of origin. Purchaser shall be entitled to deduct any amounts that may become owing by Supplier under this section from the balance owing by Purchaser on any unpaid invoices of Supplier. Supplier shall advise Purchaser immediately of any change in its manufacturing and production processes, or in its sourcing practices, which could affect the validity of any information provided to Purchaser. Supplier agrees to immediately notify Purchaser of any investigation by CBSA and to fully participate and cooperate in any such review or audit by CBSA of the origin of the Deliverables, including any appeals. Purchaser shall have the right to cancel this Contract without liability to Supplier and without prejudice to Purchaser's rights to claim damages against Supplier, in the event that Supplier has not, to the satisfaction of Purchaser, complied with any of the requirements contained herein.

13. TITLE/RISK OF LOSS: Unless otherwise agreed by the parties, risk of loss and/or damage to all Deliverables shall remain with Supplier until delivery to, and off loading at, Purchaser's premises at which time the risk of loss and/or damage shall pass to the Purchaser. Title to Deliverables shall pass upon acceptance of delivery of Deliverables at Purchaser's premises, provided that vesting of title shall not constitute acceptance of the work by Purchaser.

14. INSURANCE: Supplier shall, before commencing any work hereunder, and at its own expense, procure and maintain with such public bodies or insurance companies as are acceptable to Purchaser (a) Workplace Safety and Insurance Board insurance (or the equivalent thereof outside of Ontario) when work is performed on the property of the Purchaser or its customer, and shall provide Purchaser with a current (dated within 60 days) certificate of clearance from the WSIB (or the equivalent thereof outside of Ontario); and (b) Comprehensive General Public Liability Insurance, including coverage for contractual liability, bodily injury, product and completed operations liability and property damage with a minimum limit of $5,000,000 per occurrence. Upon request, Supplier shall provide Purchaser with a certificate evidencing such insurance coverage, which shall include Purchaser as additional insured and shall state that 30 days notice of cancellation or modification of the insurance coverage shall be given to Purchaser.

15. FORCE MAJEURE: Neither party shall be liable for any delay or failure of performance due solely to causes beyond its control without its fault or negligence including without limitation acts of God, strikes, fires, war, riot, flood, provided that Supplier shall have given notice in writing to Purchaser of any such cause for delay or anticipated delay promptly after first obtaining notice thereof and shall have used its best efforts to make deliveries as expeditiously as possible taking such cause for delay into account. Should Supplier be unable, due to such a cause, to meet all of its delivery commitments for the Deliverables ordered herein as they become due, Supplier shall not discriminate against Purchaser in favour of any other customer in making deliveries of such Deliverables. If Purchaser believes that the delay or anticipated delay in Supplier's deliveries may impair its ability to meet its production schedules or may otherwise interfere with its operations, Purchaser may at its option, and without liability to Supplier, cancel outstanding deliveries hereunder wholly or in part.

16. ASSIGNMENT: The Supplier shall not assign this Contract, in whole or in part, without the express written consent of Purchaser. Purchaser may assign its rights hereunder to an affiliate or to third party purchasers.

17. GOVERNING LAW: This Agreement shall be governed by, construed and interpreted in accordance with the laws of the Province of Ontario and the federal laws of Canada applicable herein.

18. SEVERABILITY/NON-WAIVER: Failure or delay by either party in enforcing any right or provision hereof shall not be deemed a waiver of such provision or right. A determination that any provision of this contract may be unenforceable or invalid shall not affect the enforceability or validity of the remaining provisions hereof.

19. INDEPENDENT CONTRACTOR: The parties herein are two independent entities. Supplier is engaged as an independent contractor solely for the purpose of providing the Deliverables hereunder. Supplier is solely responsible for all losses and expenses prudent to performing its obligations hereunder.

20. NOTICES: All notices given hereunder shall be in writing and may be sent by registered mail, courier or facsimile transmission (provided that if sent by facsimile, it shall also be sent by regular or registered mail) and addressed to the party for whom it is intended at the address set out in the purchase order or as subsequently agreed between the parties. Notices shall be deemed to be given when received by the other party.

21. SURVIVAL: Paragraphs relating to Warranties, Confidential Information, Governing Law, Indemnification and Liability shall survive the termination and expiration of this Contract.

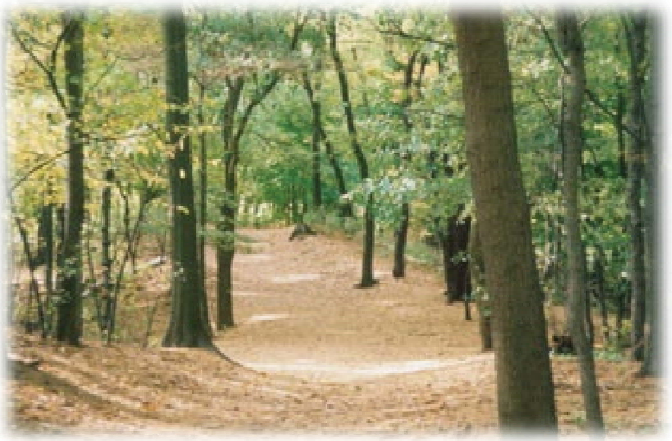
22. CANCELLATION AND CHANGES: The right is reserved to Purchaser to either cancel this order in whole or in part or to change it at any time, including addition or deletions to quantities, upon notice in writing to Supplier. If cancellation takes place, delivery shall be

accepted at the purchase price of all Deliverables completed prior to receipt of the notice of cancellation. Supplier shall immediately comply with such notice and take all steps necessary to minimize the cost of terminating or changing this Contract. If changes affect delivery or price, Supplier shall immediately notify Purchaser and negotiate an adjustment. A revised purchase order shall be issued therefrom. Purchaser shall not be liable for any other costs arising from such notice including but not limited to loss of anticipated profits or loss of opportunity.

23. TERMINATION: If Supplier ceases to conduct its operation in the normal course of business (including inability to meet its obligations as they mature) or if any proceeding under the bankruptcy or insolvency laws is brought by or against Supplier, or a receiver for Supplier is appointed or applied for, or an assignment for the benefit of creditors is made by Supplier, Purchaser may terminate this order without liability, except for deliveries previously delivered in accordance with the terms and conditions of this Contract.

24. LIMITATION OF LIABILITY: Notwithstanding any other provision of this contract or any applicable statutory provisions, Purchaser shall not be liable to the Supplier or Supplier's assistants or any third party for indirect, special, consequential, incidental or punitive damages arising directly or indirectly from any breach of this Contract or from any acts or omissions or its officers, employees or agents which may give rise to any liability (whether in tort, including for negligence, strict liability or under any other theory of legal liability). In no event shall the aggregate liability of Purchaser exceed the purchase price herein.

APPENDIX C: 4.0-VECC-57 f)



Management and Implementation ~ Community Engagement and Stewardship ~ Protection and Preservation

Replenishment and Enhancement ~ Tree Health and Risk Management

CITY OF BURLINGTON | **URBAN FOREST MANAGEMENT PLAN** | 2011-2030

JULY 2010

CITY OF Burlington

Table of Contents

OVERVIEW

Burlington residents enjoy a high quality of life in a vibrant, healthy and prosperous community. All of the city's trees, whether they are along streets or in parks, in yards or in woodlands, in the urban or in the rural areas, contribute significantly to the city's health and are considered part of the *urban forest*. The effective management of this diverse and valuable resource is the focus of this plan.

Burlington's urban forest includes trees of different species, ages and sizes. Some are large, old remnants of the area's natural forests; others are small, young saplings. Some have been planted; others have regenerated on their own. All of these trees form part of the city's *green infrastructure,* which sustains the community by filtering air pollution, providing shade, reducing energy use and bringing nature to the city.

Burlington's urban forest, as in many cities, is confronted with various challenges that threaten its health and sustainability. Primary pressures include changes in land use, urban intensification, conflicts with infrastructure, climate change, invasive pests, plants and diseases, and limited allocation of resources.

To maintain and enhance the urban forest under these conditions requires careful planning, effective management, adequate resource allocation and ongoing cooperation between the city, its residents and other local stakeholders.

In *Future Focus Seven*, the city's strategic plan, city Council committed to the development and implementation of an Urban Forest Management Plan (UFMP).

The purpose of this plan is to increase urban forest management effectiveness and efficiency, improve tree health and diversity, minimize risks to the public and maximize the benefits provided by a healthy and sustainable urban forest.

This plan identifies opportunities on both public and private lands, in urban and rural Burlington, and focuses on five key areas:

1. Management and Implementation
2. Community Engagement and Stewardship
3. Protection and Preservation
4. Replenishment and Enhancement
5. Tree Health and Risk Management

Recommendations for each of these areas have been developed based on a comprehensive review of Burlington's current practices, evaluation of leading examples from other jurisdictions and input from Council, city staff, various stakeholders and the community.

The recommendations have been assigned priorities within the plan's 20-year framework, considering actions likely to provide the most tangible benefits in the short and long-term. These priorities will need to be reviewed every five years and may be adjusted to reflect changes in existing conditions and/or resource availability.

URBAN FOREST BENEFITS

Urban forests provide a wide range of benefits to cities and the areas around them. These have been well documented in various studies and reports, and the latest research has begun ascribing economic value to some of these benefits.

Environmental Benefits

Trees in cities provide valuable environmental services, including these:

- filtering air pollution
- moderating the urban heat island effect
- providing energy savings by shading buildings in the summer and screening them from wind in the winter
- cleaning and reducing storm water runoff and
- removing atmospheric carbon.

Trees in built-up areas also provide habitat for urban-adapted wildlife and migratory birds, and they can provide temporary refuge for some types of wildlife moving between natural areas. Woodlands in both urban and rural areas provide habitat for a variety of species, including plant and animal *species at risk*.

Although there remains uncertainty about how different species and ecosystems are going to respond to the shifts predicted to be associated with climate change (i.e. shifts in temperature and precipitation and increased incidence of extreme weather events), it's generally agreed in the scientific community that the maintenance and restoration of treed areas is one of the easiest and least expensive means of reducing greenhouse-gas emissions and of cooling urban and rural environments.

VALUING THE URBAN FOREST

Each year, every street tree in Burlington provides over $67 in net benefits* by reducing building energy use, improving air quality, and storing carbon. This means that Burlington's 52,000 street trees combined provide an estimated $3.5 million annually for these environmental benefits alone. Since street trees account for only a small proportion of the canopy cover, the environmental value of Burlington's entire urban forest would be much greater.

*** Calculated using the United States Forest Service's *i-Tree Streets* computer model.**

Social/Economic Benefits

Trees and green spaces have been linked to improvements in these:

- physical and psychological well-being
- visual screening and noise reduction
- safety for pedestrians and other road users and
- property values.

Urban spaces with large, healthy trees feel more welcoming and safer than those without them. Stress levels have been found to be lower among people who enjoy even moderate exposure to trees and green areas, and research shows that trees facilitate positive social interaction.

PREAMBLE

The following vision, guiding principles and strategic objectives have been developed based on input from consultations with Council, city staff, representatives from a cross section of stakeholder groups and members of the community. These have also been developed with careful consideration for best practices and for Burlington's unique environmental and social context. The themes that run through these statements are intended to be realized through the implementation of the recommendations laid out in this plan.

VISION

The trees and woodlands of Burlington's urban forest will be maintained and enhanced for the long term, in recognition of the valued environmental, social and economic services they provide. The city will work with its partners and the community in the urban and rural areas to ensure that this essential resource is managed effectively to maximize tree cover and health, increase native biodiversity, minimize risks to public and property and contribute to the environmental sustainability and quality of life in Burlington.

GUIDING PRINCIPLES

The following seven principles are intended to guide the implementation of this plan over the long term.

i. The city's urban forest, a major component of its green infrastructure, is a valued and shared resource.

ii. The city, its residents and other local stakeholders must work together to improve and expand Burlington's urban forest.

iii. The right tree must be planted in the right place to reach its full potential.

iv. The city's urban forest must include a high diversity of *native* and non-*invasive species* to improve its resilience to various stressors, including climate change.

v. Tree protection and replenishment must be priority considerations during development and intensification.

vi. The city's trees must be maintained in a healthy and safe condition through ongoing risk management practices, a *Plant Health Care (PHC)* and *Integrated Pest Management (IPM)* approach.

vii. This plan must adopt an *adaptive management* approach that allows for changes in response to new information or new circumstances.

STRATEGIC GOALS

The following seven goals identify the key items that the City of Burlington is seeking to achieve through implementation of this plan.

1. **Increase awareness** among city staff, local landowners and residents alike about the benefits and services provided by the urban forest and how to care for it.

2. **Foster engagement and stewardship** in both the urban and the rural areas by providing resources, building partnerships and supporting educational and hands-on activities.

3. **Transition the city from a reactive to a proactive management paradigm** by implementing appropriate policies and management practices related to both the protection of existing trees and the planting of new trees, on public and private lands.

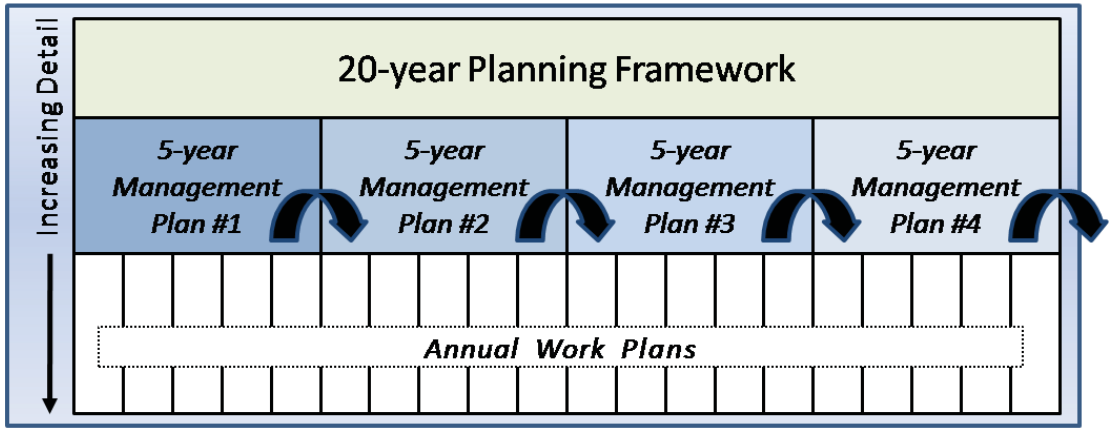
4. **Improve the resilience of trees and woodlands** to current and anticipated stressors by implementing policies and management practices that optimize *native species* diversity and tree growth potential.

5. **Minimize the risk presented by trees** in the urban forest to people and property on public lands by expanding and formalizing the city's current risk management practices.

6. **Monitor and review the status of the urban forest** using established criteria and indicators on a regular basis, and revise planning and practices as required to ensure ongoing progress towards realizing the vision.

7. **Ensure that the urban forest is recognized as a critical municipal asset** and infrastructure component through a long-term commitment to proactive management, adequate resource allocation and joint stewardship by city staff and the community.

PLAN FRAMEWORK



This plan spans 20 years because trees are a long-lived resource, and this span is considered a realistic timeline during which the guiding vision and strategic objectives can be realized. The recommendations in this plan will translate into immediate changes and inform day-to-day urban forest management policies and operations through four five-year management plans, as well as annual work plans developed by city staff.

This document lays out the long-term (i.e. 20 year) framework as well as the initial five-year management plan through the timing identified in the recommendations. Each subsequent five-year plan will confirm the priority actions and timing of outstanding recommendations, both from a policy and operational perspective, and identify resource requirements for that five-year period.

2011 – 2015: Five-Year Management Plan #1
2016 – 2020: Five-Year Management Plan #2
2020 – 2025: Five-Year Management Plan #3
2026 – 2030: Five-Year Management Plan #4

This framework allows for re-evaluation of practices and priorities at regular intervals, and it sets in motion policies and programs to transition Burlington from reactive to proactive management of its urban forest.

STATE OF BURLINGTON'S URBAN FOREST

Burlington's urban forest includes extensive wooded natural areas, as well as hundreds of thousands of trees along roads and in parks, yards and other open spaces. Current analysis estimates an average canopy cover of approximately 23%, comprising 17% in the urban area and 28% in the rural area.

The city's diverse topography includes the lower Queenston shale slopes, the Niagara Escarpment, the Peel Plain and the Iroquois Plain along the lakeshore. This landform diversity, as well as its location within Canada's relatively warm Carolinian Zone, is the basis for the city's ability to support a very high level of tree diversity.

The city's wooded natural areas cover more than 3,800 hectares, with most of those (approximately 3,150 hectares) being within the rural areas. Many of these wooded features are protected as designated Environmentally Sensitive Areas (ESAs), and some are also located within the provincial Greenbelt. In addition, Halton Region's by-law 121-05 regulates all woodlands of at least one hectare.

In addition to providing habitat for hundreds of species, including some *species at risk*, the ESAs also provide important ecological corridors and linkages.

Natural woodlands, or forested areas, account for approximately two thirds of the city's canopy cover, while more isolated trees along roads and in open spaces account for the remaining third. Upland deciduous forests are the dominant wooded natural area type in the city, with coniferous forests, treed swamps, plantations and thickets accounting for the remainder.

VALUING BURLINGTON'S STREET TREES

Number of street trees - 52,000
Street tree net benefits - $3.5 million*
Average net benefit - $67 per tree*
Street tree replacement value - $107 million*
Management costs - $2.1 million
Tree benefit/management cost ratio - 1.65:1

**** These are conservative estimates developed using the United States Forest Service i-Tree model, which accounts only for the annual cost savings of reducing building energy use, improving air quality and storing carbon associated with trees in urban settings.***

In 2010, the city completed an inventory of *street trees* in the urban area south of Dundas Street (Highway 5) and Highway 407. Analysis of this data reveals the following:

- The city has 52,000 street trees in its urban area, mostly in fair or good health.
- Most of the trees are young or middle-aged and are non-native (many were planted for desirable traits, such as showy flowers or tolerance for urban conditions).
- Nearly three-fifths of the city's street trees are non-native species.
- Nearly one-fifth of the city's street trees conflict with overhead utility wires or other infrastructure.
- The city's street trees are worth over $107 million in estimated *replacement value*.

This analysis does not include the thousands of trees on public lands in the city's parks and rural communities, including those along rural roads, which have not yet been inventoried.

URBAN FOREST SUSTAINABILITY: CHALLENGES AND SOLUTIONS

Burlington's downtown has been named an urban growth centre in the province's *Growth Plan for the Greater Golden Horseshoe (2006)*. The city's current population of 175,000 is expected to grow to approximately 200,000 by the year 2031.

New residents bring diversity, ideas and new opportunities. They also bring more demand for housing and more pressure on the city's urban municipal services, including roads, sewers, parks and natural areas. These pressures, combined with the already present and emerging threats of tree pests, and environmental stresses anticipated with climate change, will require careful planning, active management, ongoing monitoring and creative problem solving to maintain the urban forest as a healthy and growing entity.

Currently, the biggest threat to the urban forest is the Emerald Ash Borer, which has the potential to decimate the city's ash trees.

At the site-specific level, particularly in urban and urbanizing areas, the biggest pressure on trees is the competition for space both above and below ground.

Below-ground root habitat in built-up areas is typically characterized by inadequate soil volumes, quality and drainage. Roots must share space with underground utilities, and soils can become too compacted to support the fine roots that provide water, oxygen and nutrients. Above ground, trunks, branches and foliage compete for growing space with people, buildings, utility wires and cars. As a result, conditions are typically insufficient to promote tree longevity and health, and trees are unable to reach their *genetic potential*, meaning they ultimately provide fewer benefits and cost more to maintain and replace.

Other conflicts occasionally occur when branch failures, tree roots and uprooted trees damage property and infrastructure and sometimes pose risks to human safety.

Solutions, as recommended in this plan, include the following:

- Identifying adequate space for trees early in the planning and development approval process
- improving above-ground and below-ground site conditions for trees, especially in built-up areas
- protecting trees determined to be significant in the community
- planting a diversity of native and non-invasive tree species, and
- regular, proactive tree care.

Urban trees with adequate growing space and subject to regular maintenance will be more resilient to environmental extremes and to the rigours of urban life and will, therefore, be better able to adapt to future challenges. They will also pose less risk of failure, need to be replaced less frequently and provide exponentially more benefits as they mature.

PLAN DEVELOPMENT

Key Considerations

The following key considerations have shaped the development of this plan:

1. The City of Burlington contains a defined urban area that will become increasingly built-up over the next few decades, as well as a rural area whose significant natural spaces are already reasonably well protected by both the Niagara Escarpment and Greenbelt legislation and policies.

2. A number of innovative policies and practices are already in place or under development in the city.

3. Although the city is responsible for thousands of trees on its streets and in its parks and open spaces, most of Burlington's trees are on private land.

4. There will be many challenges involved in protecting and maintaining the city's current tree cover under the existing and anticipated conditions.

5. Resources for urban forest management will likely be a limiting factor for the immediate future.

Key Directions

This plan recognizes each of these key considerations these ways:

1. It recognizes the distinct land-use and policy contexts in Burlington's urban and rural areas and includes a number of specific recommendations targeted to address opportunities unique to each of those areas.

2. It builds on and integrates existing policies and practices that support the vision and strategic goals.

3. It includes strategies for tree protection and replenishment on public and private lands.

4. It includes a recommendation to utilize a suite of criteria and indicators for monitoring the state of Burlington's urban forest, rather than simply setting a target for canopy cover.

5. It provides specific recommendations intended to optimize the cost/benefit ratio of urban forest management.

Other city-wide plans (e.g., Parks and Recreation Master Plan) were also considered during development of this plan.

Consultations

Internal consultations with Council and city staff and external consultations with the community and a cross-section of local stakeholder groups have been a cornerstone in the development of this plan.

These are the top priorities that came out of these consultations:

- the need to draw on best practices from elsewhere in Ontario and beyond
- the importance of early and ongoing education and engagement with a wide range of stakeholders and
- the need to address management of treed resources in all of Burlington (i.e. urban and rural areas, public and private lands).

This plan's recommendations reflect these and other priorities.

THE URBAN FOREST MANAGEMENT PLAN (UFMP)

1 MANAGEMENT AND IMPLEMENTATION

1.1 KEY ISSUES

The management and administration of the urban forest is the shared responsibility of a number of various stakeholders. The majority of the urban forest is under the ownership of residents and other local landowners. However, the city is directly responsible for trees along roads (in both the urban and rural areas) and in parks and open spaces, while the Region owns some woodlands in the city's rural area. Halton Region and the Ministry of Transportation both maintain major road *rights-of-way* throughout Burlington, many of which are lined with trees or present opportunities for tree plantings. Burlington Hydro and Hydro One are responsible for clearing any vegetation that might interfere with transmission lines in the urban and rural areas respectively. Conservation Halton and the Royal Botanical Gardens also own and manage some large wooded areas.

Burlington's municipal departments, the agencies mentioned above, private contractors and citizens are all directly involved in decision-making, funding and management processes that affect the health, structure and function of the urban forest. Communication, coordination and common direction among these parties are critical to realizing urban forest sustainability and implementing good management programs and practices.

It is also important that the status and progress of this plan, and the state of the urban forest, be monitored to ensure that the city is able to realize its vision for a sustainable urban forest.

1.2 CURRENT PRACTICES IN BURLINGTON

Service Delivery

Burlington's urban forest is managed by four municipal departments: Roads and Parks Maintenance, Parks and Recreation, Engineering, and Planning and Building. The city's forestry staff is currently within Roads and Parks Maintenance. Halton Region and Conservation Halton also manage a number of woodlots under their respective ownerships.

Roads and Parks Maintenance conducts operations, such as street and park tree pruning, inspection and planting. This includes maintenance of trees along regional roads. The staff conducts approximately 40% of these maintenance activities directly, and contractors carry out the remaining 60%. City forestry staff also review Tree Saving Plans as part of the site plan application process. They are also responsible for maintaining the current level of service for trees on city lands and for implementing urban forestry operating policies.

The Parks and Recreation Department is responsible for planning Burlington's public facilities, parks and open spaces and undertakes a variety of environmental initiatives, including tree planting and naturalization. All new parks have designated naturalization areas as well as individual tree plantings although some older parks in the city cannot accommodate these initiatives.

The Engineering Department oversees and undertakes a range of capital projects, including road and drainage improvements and subdivision and site servicing. These projects typically include tree plantings, which the department contracts out through tenders.

1.2 Current Practices in Burlington (cont'd)

Service Delivery (cont'd)

The Planning and Building department makes decisions that affect street and park trees and that impact trees on private lands, by regulating land uses, developing and implementing policies and by-laws and carrying out building and site inspections.

Halton Region, through its tree by-law, currently regulates tree removal activities in private woodlands of at least one hectare and in *greenlands* in the city, while Conservation Halton regulates activities in floodplains, valleys and wetlands and along the shoreline irrespective of land ownership.

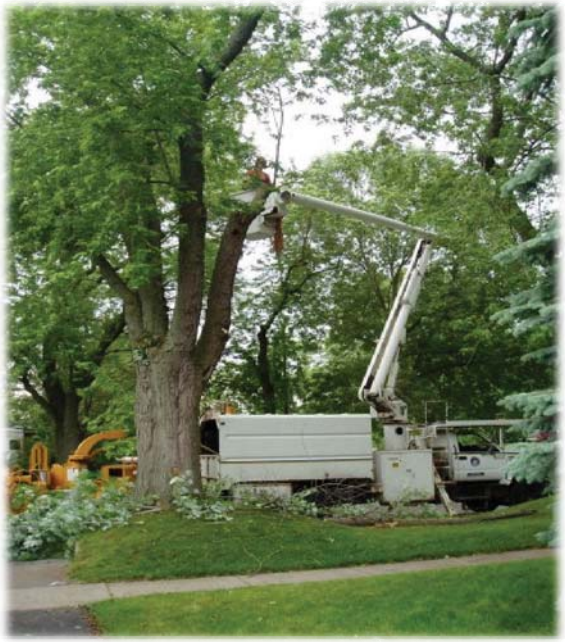
The activities of each city department, the Region and Conservation Halton have a profound effect upon individual trees and wooded areas within the city, as they often oversee, direct or comment on decisions about tree preservation, removal and replacement, as well as enhancement or restoration.

Utility and Road Right-of-Way Maintenance

Utility *right-of-way* and corridor maintenance is conducted with the primary objective of providing adequate clearance between trees and hydroelectric wires to prevent hazards and service disruptions, particularly during storms. Utility pruning is generally conducted on a more frequent basis than *grid pruning* and, often out of necessity, with lesser regard for tree health or proper structure. Burlington Hydro currently prunes trees along the urban utility rights-of-way on a three-year cycle, while Hydro One (which focuses on large transmission lines and the rural areas) uses a six-year cycle.

A key issue concerning utility pruning in Burlington is a lack of co-ordination between municipal and utility pruning activities. Clearer communication and delineation of responsibilities are needed to ensure that overlapping pruning cycles do not lead to inefficiencies. A review of tree planting standards is also needed to ensure that trees planted near utility lines are selected and located to minimize future conflicts as the trees mature and that good arboricultural practices, including proper pruning and hazard tree removal, are implemented.

Halton Region and the Ministry of Transportation maintain roadways and utilities in their rights-of-way. There is currently limited co-ordination between these agencies and the city regarding tree protection and replacement along these corridors.



1.2 Current Practices in Burlington (cont'd)

Tree Asset Management

Trees on city lands, like roads and sewers, are municipal assets, but unlike most other infrastructure they appreciate in value over time. A co-ordinated asset management system, including a baseline assessment, is necessary for successful maintenance of this resource. The Roads and Parks Maintenance department currently uses the Avantis Enterprise Asset Management System to manage many aspects of municipal infrastructure maintenance.

Burlington completed a basic inventory of its street trees in 2010, primarily in the urban areas south of Highway 5. This inventory is not currently linked with the results of the cyclical tree inspections or individual tree work requirements nor tracked in the city's Avantis system. Therefore, as trees are maintained or removed, there is no process to update inventory information. There is also no inventory of Burlington's park trees, street trees in the rural areas, nor records of trees removed or planted as part of the Site Plan Approval process on private lands.

Woodlot and Creek Block Management

Burlington's woodlot management practices are currently limited to annual inspections along *formal trails* in city-owned woodlands for hazard and diseased trees. The city recognizes that there should be more extensive management of city-owned woodlots, as well as in wooded creek blocks and storm water management areas. Key needs likely include invasive species management, ecologically sensitive trails and planting of native trees, as well as shrubs and groundcovers. However, current staffing and resource levels do not support an expanded level of service for these areas.

Budget and Reserve Funding

The 2009 net operating budget for direct urban forestry maintenance was $1.2 million. Additional funding for urban forestry activities such as tree planting and protection are within the Engineering and Parks and Recreation budgets. The city also maintains a "Future Services – Trees" reserve fund to support tree planting. This fund, valued at nearly $200,000 in 2010, is supported by development charges and is directed to the establishment of new trees. The city is currently formalizing the process to draw on these funds.

The city recently redefined its Winter Control Reserve Fund as a Severe Weather Reserve to expand the scope to include catastrophic weather events, such as ice storms, which impact the urban forest. The city has also proactively budgeted $11 million to manage the recently confirmed Emerald Ash Borer infestation on its lands.

1.3 Consultation Input

Consultations to discuss urban forest management and administration issues were held jointly with a number of municipal staff, including engineers, planners, risk managers and urban forestry staff. One of the key considerations identified by staff was a need for ongoing urban forest management and sustainability to be recognized and placed in the greater context of planning, infrastructure management, growth and other community needs. It was agreed that realizing the vision of a sustainable urban forest will depend on long-term financial and community support, as well as improved communication and co-ordination between various municipal departments. The need for improved communication and co-ordination with Burlington Hydro, Hydro One, Halton Region and the Ministry of Transportation on tree protection, pruning, removal and replacement along utility and transportation corridors was also identified.

In terms of implementing and monitoring the Urban Forest Management Plan itself, several stakeholders emphasized the need for measurable criteria and indicators and the importance of tracking both the status of the plan itself and the state of the urban forest. Formalizing a working group for municipal departments, agencies and organizations involved in tree care in the city to communicate and co-ordinate activities and programs was identified as a need. The importance of keeping contractors informed and educated about the city's standards on an ongoing basis was also raised.

1.4 Best Practices

Service Delivery

Many larger municipalities in southern Ontario apply a joint service delivery model to urban forest management. Under this system, urban forest management is carried out by a combination of municipal staff and private contractors. The key variables are the distribution of workload between contractors and staff and the type of work conducted by each. In most examples, municipal staff and contractors share the tasks of routine maintenance such as pruning, while utility line clearing, tree removal and stumping are often contracted out. Planting is often conducted by contractors as part of capital projects, with additional infill planting undertaken by the municipality or contractors by tender.

The main strength of the joint service delivery model is efficiency and cost effectiveness. However, this model can result in some lower quality work by contractors, especially if appropriate standards are not specified and if work is not adequately supervised. Maintaining co-ordination between municipal staff and contractors and clearly defining minimum quality standards as well as ensuring they are implemented are key to successful joint service delivery.

1.4 BEST PRACTICES (CONT'D)

Utility and Road Right-of-Way Maintenance

In some cities, utility providers have contracted municipal forestry departments to conduct pruning in utility corridors and along streets. These municipalities, in turn, then sub-contract part of this work, facilitating co-ordination of inspection and pruning cycles and ensuring that trees are pruned according to standards acceptable to the municipality. Other places bring municipal forestry staff together with utility companies to co-ordinate standards, practices and public awareness campaigns.

Another practice for effective utility right-of-way and corridor management is long-term vegetation community conversion. This means gradual replacement of mature, large growing tree species under utility lines with smaller stature trees and shrubs. Such programs naturally maintain line clearance and reduce potential risk from improperly pruned trees.

Tree Asset Management and Monitoring

There are two general types of urban forest inventories: sample plot-based and complete.

Several municipalities in southern Ontario have completed sample plot-based inventories that collect urban forest data from randomly located sample plots on both private and public property, known as Urban Forest Effect (or UFORE) studies. This data can be analyzed (using the *i-Tree* Eco model) in conjunction with hourly meteorological and air pollution information, to quantify urban forest structure, environmental benefits and value to the community.

Model outputs can be used to support effective resource management decisions, developing policy and setting management priorities. In Ontario, UFORE studies have been undertaken by London, Toronto, Brampton, Oakville and Ajax, among others.

Individual tree inventories are generally restricted to street or park trees, which are the main focus of municipal urban forest management. These inventories range from collection of basic species, size and location information, to complete asset-management systems with detailed condition assessments and prioritized work recommendations. A wide array of computer-based inventory management systems is available, from simple spreadsheet programs to sophisticated Geographic Information Systems.

Some cities have made their tree inventory databases and maps available online. A few cities also allow residents to add information about their own backyard trees, enabling a better understanding of urban forest composition and structure. Making inventory information readily accessible also promotes greater awareness of urban forestry issues and promotes stewardship.

Monitoring the status of the urban forest can be done, to some extent, through the UFORE approach. However, a more comprehensive set of criteria and indicators could allow for evaluation of a given municipality's treed resources, management approach and community engagement. This is considered most appropriate for Burlington.

1.4 Best Practices (cont'd)

Woodlot and Creek Block Management

Woodlands and other natural areas such as wooded creek blocks in urban settings require active management if they are to continue to provide some level of ecological function and maximize their potential value in terms of environmental services.

Municipal woodlot and creek block management plans in urban areas typically focus on maintaining a careful balance between access and protection of ecological sensitivities. This can be achieved through measures such as careful trail design, closure of informal trails through highly sensitive areas, educational signs, and clear markers of permitted uses.

Other typical elements include invasive species management, native plant restoration, engagement of local groups and residents and ongoing monitoring of management activities. In creek blocks, tree planting can help stabilize slopes, and Conservation Halton has policies that support reforestation creek blocks and a vision of having them all reforested.

Budget and Reserve Funding

Municipal forestry budgets vary widely among similarly sized municipalities in Ontario and largely depend on the local service delivery models, tax base and urban forest structure. Some municipalities maintain tree planting reserve funds for future tree planting and are able to draw on these resources to address emergency situations such as Emerald Ash Borer infestations. The creation of a tree planting reserve fund was recommended in Peterborough's urban forest strategy, and the City of Toronto has committed to investigating a funding strategy for its proposed Extreme Weather Reserve Fund, which may be used to fund tree replacement after severe weather events such as ice or wind storms.

While every municipal urban forestry program could likely benefit from more funding, the required funding ultimately depends on the nature and extent of the treed resources, the level of service that is required and expected and to what extent the municipality is committed to having a proactive and progressive urban forest management program.

1.5 Opportunities for Improvement

Service Delivery

The current service delivery model applied to urban forest management in Burlington is similar to that of many municipalities, and the service works well. There are, however, opportunities for improvement. The four municipal departments most involved in urban forest management (i.e. Roads and Parks Maintenance, Parks and Recreation, Engineering, and Planning and Building) must co-ordinate their activities on a more regular and formalized basis. Each department must recognize its unique role in shaping the urban forest and making decisions that affect existing and future trees. There is also a need for better and more regular co-ordination with the Region, Conservation Halton, the Ministry of Transportation, Hydro One, Burlington Hydro and other utilities on tree matters.

A multi-departmental Urban Forest Working Group that includes members from these departments and organizations should be established. This group will ensure that all parties work towards common standards and practices and understand the challenges and opportunities for sustainable urban forest management in Burlington.

This group should oversee and monitor the implementation of the Urban Forest Management Plan using standardized performance-based criteria and indicators. They should also ensure that implementation of existing plans and development of new plans for the city are consistent with the direction and objectives in this plan.

Utility and Road Right-of-Way Maintenance

Co-ordinating tree protection, pruning and planting standards between the city and utility companies (particularly Burlington Hydro and Hydro One) will promote good urban forestry practices for utility right-of-way maintenance. This will ensure that trees are planted in appropriate locations to prevent future conflicts with utilities and will reduce future maintenance costs and reduce risk.

There are also opportunities for the city to have more input to tree preservation and plantings along transportation corridors under the Region or Ministry of Transportation's (MTO) jurisdictions. One way to foster better communication would be to include representatives from the utility companies, the Region and possibly MTO in the Urban Forest Working Group and to share information about the planned maintenance locations, practices and concerns for a given time period.

The City of Burlington, Burlington Hydro and Hydro One should also co-ordinate promotional efforts to improve public awareness about the scope and role of their activities in relation to Burlington's urban forest.

Tree Asset Management and Monitoring

The city's Avantis asset management system is a powerful tool to improve the efficiency and effectiveness of a wide range of maintenance operations. This system can be readily harnessed to help the city transition from reactive tree maintenance to proactive urban forest management by integrating inventory data and inspection results into a computerized work order system.

Burlington now has a complete street tree inventory for areas south of Dundas Street. Trees north of Dundas, in rural settlements and in municipal parks, need to be added to the inventory. The inventory must be recognized as a "living" component of the city's asset management and should be continually updated as trees are inspected during the regular grid inspection and pruning cycle. Additional information including crown width, geographic co-ordinates, condition data and prioritized work requirements should also be collected and integrated into the existing inventory.

The city should also, in addition to monitoring the status of the recommendation in this plan, adopt a customized version of the criteria and indicators for strategic urban forest management to track the three key components to effective urban forest management: the status of the treed resources, the management approach and the level of community and stakeholder engagement. These criteria include measures such as canopy cover, species distribution, agency co-operation, tree inventory and tree risk management.

Woodlot Management

To better manage its woodlots, creek blocks and other natural areas, the city requires an assessment and plan of these areas that identifies key management issues, prioritizes work requirements and provides a template for ongoing management. Options and strategies for invasive species management should be investigated thoroughly as part of this work, and a balance between effectively managing storm water flow (in the case of creek blocks), maintaining ecological integrity and promoting urban forest sustainability must be achieved.

Opportunities for co-operation with the Royal Botanical Gardens and Conservation Halton should also be explored in developing woodlot management strategies, which will help promote the achievement of common objectives.

Procedures for improved coordination between departments should be implemented to ensure the best management of the urban forest. These are the key elements of such co-ordination:

- Ensuring all tree protection and replacement plans are reviewed by a certified and *qualified arborist* and that implementation is overseen by an arborist or comparably trained city staff.
- Building better relationships with Burlington Hydro, the Region, Conservation Halton and the Royal Botanical Gardens regarding tree protection and replacement.
- Ensuring that staff documents all proactive and reactive management appropriately.

MANAGEMENT AND IMPLEMENTATION 1.6 RECOMMENDATIONS	Priority	Resource Implications	Target Timing
Tree Asset Management			
1. Develop appropriate work order management processes to track work requests and work performed on individual inventoried trees within the city's asset management system.	High	Low (One-time)	2011
2. Expand the existing tree inventory on city lands by adding data about park trees and street trees north of Highway 5 and by increasing the list of parameters collected for each tree to allow for proactive management.	High	High (One-time)	2010 (Underway)
3. Start to document and track trees planted, protected and removed as part of the Site Plan Approval process.	Low	Low (Ongoing)	2015
4. Develop a city-wide Woodlot Management Plan, in partnership with the Royal Botanical Gardens and Conservation Halton, to provide direction for assessment and management of the city's woodlots, including wooded creek blocks, using an ecologically based approach.	High	High (One-time)	2012
5. Review opportunities with Burlington Hydro to co-ordinate pruning activities to minimize duplication and maximize efficiencies and ensure pruning and planting standards are appropriate.	Med	Low (One-time)	2013

Resource Implications: Low = existing staff work plan and/or existing resources, Med = moderate impact to staff work plan and/or resources (~ $10,000), High = significant impact to staff work plan and/or resources (~ $50,000).

MANAGEMENT AND IMPLEMENTATION 1.6 RECOMMENDATIONS (CONT'D)	Priority	Resource Implications	Target Timing
Urban Forest Management Plan Management and Implementation			
6. Undertake a State of the Urban Forest analysis every five years using the established suite of criteria and indicators.	Med	High (Periodic)	2015, 2020, 2025
7. Utilize a standard suite of criteria and indicators to evaluate the state of the city's urban forest and track the progress of this plan. Criteria will include measures of the forest itself, such as canopy cover, as well as measures of the city's management approach and success in building partnerships with the various stakeholders.	Med	Med (One-time)	2014
8. Establish an Urban Forestry Working Group including city departments and representatives from the Region, Conservation Halton, the Royal Botanical Gardens, Burlington Hydro, Hydro One, the Ministry of Transportation and other utilities to better co-ordinate tree protection and replenishment.	High	Low (Ongoing)	2011

Resource Implications: Low = existing staff work plan and/or existing resources, Med = moderate impact to staff work plan and/or resources (~ $10,000), High = significant impact to staff work plan and/or resources (~ $50,000).

WHY HAVE NO CANOPY COVER TARGETS BEEN SET?

Canopy cover is a relatively simple, one-dimensional indicator of the extent of the urban forest. However, it does not provide information about other aspects of the urban forest such as tree height, species diversity or age class. Setting overly ambitious canopy cover targets can unduly focus urban forest management on tree planting at the expense of other equally important strategic initiatives. Consequently, the recommendation of this plan is to track canopy cover as one of a comprehensive suite of criteria and indicators whereby "optimal" canopy cover is the maximum potential cover in the city.

2 COMMUNITY ENGAGEMENT AND STEWARDSHIP

2.1 KEY ISSUES

Similar to the situation in many other southern Ontario municipalities, Burlington's urban forest grows predominantly on private property. Consequently, residents and other stakeholders who own or manage land in the city have the greatest significant ability to influence the health and development of the urban forest. Making sure these people are educated about and engaged in tree care is key to ensuring that Burlington's urban forest is protected and replenished.

While most people appreciate trees, many do not understand the tangible benefits that a healthy urban forest brings to a community. In addition, many who are interested in caring for their trees lack the information or resources to do so. The city is in a position to provide some of this support and to develop partnerships with groups committed to providing stewardship.

2.2 CURRENT PRACTICES IN BURLINGTON

The city has for many years recognized the important role the community and local organizations have to play in caring for the urban forest. The city also recognizes the importance of providing information to the community on why they should care for their trees and how best to do so.

The city's website has a dedicated "urban forestry" page, as well as a page dedicated to providing information about this plan. The urban forestry page includes information about insect pests that occur or are anticipated to occur in the city, Burlington's Honour Roll of Trees and Arbor Day.

The city's Roads and Parks Maintenance Department helps organize and participates in an annual Arbor Day tree-planting event at a local school (a different ward is selected each year), as well as annual IKEA and Tree Canada Foundation supported tree plantings. Restoration events, including tree plantings, have also been undertaken with local organizations such as the local Field and Stream Rescue Team and the Bay Area Restoration Council.

The city has a Sustainable Development Committee that is a multi-sectoral citizens' committee that acts as an advisory body to City Council. Every few years this group completes a State of the Environment Report, which includes information about the city's wooded natural areas, and the group is committed to increasing awareness of local environmental issues.

2.2 Current Practices in Burlington (cont'd)

Some local groups and organizations in the city also undertake urban forestry related initiatives independently, such as these:

- Burlington Green, whose members undertake awareness raising, advocacy and action on a range of environmental issues, including preservation of trees and forested areas.
- Friends of Kerncliff Park, whose members undertake and monitor tree plantings in Kerncliff, as well as New City Park.
- The Bay Area Restoration Council.

Larger organizations involved in urban forestry planning and management within the city – the Royal Botanical Gardens, Conservation Halton and Halton Region (including the Halton-Peel Woodlands and Wildlife Stewardship Program) – engage in activities such as these:

- The Royal Botanical Gardens' multi-partner Cootes to Escarpment Park System Land Management Strategy.
- Conservation Halton's
  - Trees for Watershed Health
  - Managed Forest Tax Incentive Program planning service
  - support for tree planting on private lands.
- Halton-Peel Woodlands and Wildlife Stewardship Program's assistance to private (primarily rural) landowners with the management of their forest resources through funding for reforestation activities, forest management plan preparation, and advice and guidance on forest management, establishment and health issues.

2.3 Consultation Input

A common theme that came out of the consultations for this plan was the importance of early and ongoing engagement with residents, local community groups and other stakeholders who own or manage land in the city. Engagement with arboricultural contractors, who are currently responsible for about half of the city's urban forestry maintenance, was also identified as being of high importance.

In addition, a number of individuals and organizations came forward as potential volunteers and partners for urban forest stewardship activities.

Caring for Street Trees

During consultations, some residents asked if they are allowed to prune or water the trees on the city's boulevards. The city encourages residents to care for newly planted street trees and to continue to monitor the health of these trees. However, pruning and removal of any street trees should only be undertaken by a city staff trained arborist or a city-approved contractor.

2.4 Best Management Practices

A number of municipalities in southern Ontario, and elsewhere, offer a range of resources to foster engagement and support stewardship of their urban forests. Typically, larger cities with larger urban forestry departments offer the broadest range of information and services, but some mid-sized municipalities like Burlington are also finding creative ways to engage their communities. Some examples are cited below.

The Canadian Urban Forest Network's Compendium of Best Management Practices states: "Any urban forestry program has to integrate people as part of the program itself." It identifies maintaining an urban forestry section on the municipal website as a key component of municipal outreach, along with engagement through events such as field tours and open houses.

The City of Toronto maintains a comprehensive urban forestry website that includes information on the city's tree by-laws and policies, forest health care program (including fact sheets on common tree pests and sources of stress), operations in different wards and community volunteer event opportunities. Additional documents available for downloading include lists of native tree and shrub species, information on invasive plants and tree pests, and information on dealing with tree roots. The city also co-ordinates a number of community events annually, some with the Toronto Region Conservation Authority.

The Town of Richmond Hill also has a number of pages on various urban forestry topics on its website. In addition to information about the town's tree by-laws, the site provides pages on topics such as when the town's schedules pruning, how to deal with branches that touch hydro wires, when and how to water trees and how to prevent tree damage from powered grass trimmers and edgers.

The Town of Markham has a dedicated urban forestry page on its website that provides information on the town's Trees for Tomorrow Program, tree by-laws, boulevard tree care and invasive tree pests. The site also posts the town's Treescape Guidelines. Community stewardship initiatives co-ordinated by the town include workshops and a backyard tree planting program led by Local Enhancement and Appreciation of Forests (LEAF). The town also offers funding for local tree planting projects through its Trees for Tomorrow Fund.

The Town of Oakville's urban forest web page provides information about and links to a wide range of urban forestry initiatives. These include the town's tree by-laws and policies, tree protection guidelines and basic tree care information, major tree pest threats in the town, woodlot management approaches and the town's urban forest management plans and studies.

Halton Region also has a web page dedicated to its regional forests that includes information on current activities within the forests (e.g. trail improvements), maps, the Region's woodland by-law, the Region's forest management plan, and other topics such as invasive species and hunting regulations.

2.5 Opportunities for Improvement

The city should promote the value and sustainable management of the urban forest these ways:

- providing more information on the city's website
- providing pamphlets and posters about key topics in public spaces
- hosting or co-sponsoring public workshops, seminars, presentations, surveys, site walks and/or demonstrations
- developing and promoting urban forest stewardship awards and
- using the local media (e.g., newspapers, radio) and other local organizations to advertise stewardship events.

Urban forestry resources should include this information:

- the city's urban forest management practices (e.g. care of existing and planting of new street trees, links to city tree-related policies, standards, by-laws)
- key areas of interest or concern (e.g., invasive species identification and management, good tree care practices, lists of native species suitable for yards, tree risk management);
- opportunities for residents to support urban forest sustainability (e.g. watering new city trees in boulevards, planting and maintain trees on their property) and
- city-sponsored or endorsed events (past and upcoming) related to urban forestry.

The city should involve more residents and neighbourhood groups in the stewardship of trees on their lands by engaging in educational public workshops, seminars, presentations, visits to schools, site walks and demonstrations several times per year. Workshops could also be held for contractors working within the city (e.g. landscape architects, arborists, engineers) to inform them about city standards and practices related to tree protection and replacement. Opportunities for partnerships with various groups and organizations should also be explored.

In order to undertake expanded engagement effectively, dedicated resources are required to increase awareness, undertake outreach and coordinate stewardship activities. This would include organizing tree planting initiatives throughout the city, making presentations to various groups, including students, and providing technical support to residents and local groups on tree care issues.

Partnerships for both education and hands-on stewardship activities should be developed with a number of local area and national organizations. Key local organizations include Conservation Halton, the Ministry of Natural Resources, the Royal Botanical Gardens and the local school boards. The city also has a number of active community-based organizations such as Burlington Green, the Field and Stream Rescue Team, the Burlington Lions' Club and Friends of Kerncliff Park. Other broader organizations that could provide support include LEAF (Local Enhancement & Appreciation of Forests), Trees Ontario and the Nature Conservancy of Canada. This is not an exhaustive list, but a starting point.

COMMUNITY ENGAGEMENT AND STEWARDSHIP 2.6 RECOMMENDATIONS	Priority	Resource Implications	Target Timing
9. Develop and provide urban forestry related events, workshops and presentations designed to improve awareness and engagement among residents, community groups and other interested stakeholders such as contractors and consultants working within the city.	Med	Med (Ongoing)	2012
10. Expand and improve the urban forestry section on the city's website to offer more information and resources.	High	Low (One-time)	2011
11. Create an Urban Forest Community Coordinator function or role to support increased community engagement.	High	High (Ongoing)	2011
12. Develop and implement a program to acknowledge individuals, groups, builders, developers and corporations that undertake urban forest stewardship on their lands.	Low	Low (Ongoing)	2013
13. Expand opportunities for partnerships with local neighbourhood groups, school boards, agencies (e.g. Conservation Halton) and organizations to undertake urban forest stewardship activities.	Med	Med (Ongoing)	2012

Resource Implications: Low = existing staff work plan and/or existing resources, Med = moderate impact to staff work plan and/or resources (~ $10,000), High = significant impact to staff work plan and/or resources (~ $50,000).

3 PROTECTION AND PRESERVATION

3.1 KEY ISSUES

As Burlington grows, housing development and infrastructure renewal will place increasing pressures on the urban forest. Protecting existing trees, particularly larger specimens, prior to and during construction has been shown to be more effective in sustaining the provision of urban forest benefits than planting new trees. Works such as paving, sidewalk installation, excavation and road widening can adversely affect trees, and trees on private and public property are equally vulnerable. This type of work can lead to tree damage and mortality, which will result in losses in the overall canopy.

Early identification of wooded areas and trees to be protected is critical. This requires policies, guidelines and planning practices that recognize that trees, like other components of the urban infrastructure, need space and a suitable rooting environment. Early identification of trees and treed areas to be protected must then be followed by identification and implementation of effective protection measures.

3.2 CURRENT PRACTICES IN BURLINGTON

Trees on Public Property

By-law No. 19-1975 prohibits the removal or injury of trees located on public property, including parks, road rights-of-way and natural areas. The city has the authority to issue a fine for unauthorized public tree removal or injury. This by-law is currently being reviewed to ensure consistency with contemporary legislation and to reflect updated standards and practices.

The city also has tree protection and preservation specifications that apply to “trees not designated for removal for all works within the City of Burlington’s road right-of-way.” These specifications include minimum *tree protection zones* (TPZs) based on trunk diameter, requirements for protective hoarding and required procedures within TPZs, such as *root pruning* and *sensitive excavation*. The specification also enables the city to hold financial securities against tree damage for up to two years from the date of final inspection of the construction works. This is one of the few municipal specifications to recognize the importance of a tree’s *critical root zone* (CRZ) and is a progressive and comprehensive specification.

The Region and the Ministry of Transportation each have responsibility for planting and protecting the trees within regional and provincial rights-of-way. Protection of trees, where possible, during improvements to existing or creation of new transport corridors is typically considered through the Environmental Assessment process.

3.2 Current Practices in Burlington (cont'd)

Trees on Private Property

Halton Region's By-law 121-05 regulates woodlands of at least one hectare within the City of Burlington. It can also protect woodlands between half and one hectare if the local municipality delegates this authority to the Region. Burlington is currently in the process of delegating this responsibility to the Region. In addition, significant woodlands and other treed *key natural heritage features* in the rural areas are protected under the provincial Greenbelt legislation and regional *greenlands* are regulated by Halton Region's tree by-law.

The city's Official Plan includes a number of policies for protecting wooded natural heritage features, as well as a number of area-specific policies supporting protection of trees outside of recognized natural heritage features. The term "significant trees" is used but not defined.

Under By-law 116-1986, most types of development within the city are subject to the site plan approval process. As part of this process, applicants must submit a Tree Saving Plan (TSP), when applicable, along with other documents and drawings. The city's Site Plan Application Guidelines (2005) enable the city to retain securities against damage to trees and to require that applicants replace removed trees on an *aggregate-caliper* basis where possible on-site. TSPs are reviewed by a city arborist. Inspection of the implementation of tree protection measures specified in TSPs is currently limited.

Site plan approval is required for most *greenfield* developments as well as re-development in older residential areas and downtown where many of the city's mature trees in the urban area are found.

Boundary trees are protected under the provincial *Forestry Act*. The city has guidelines to address the protection of *boundary vegetation*, including boundary trees, during the development process in its Site Plan Application Guidelines (2005) and its Site Plan Requirements and Urban Design Guidelines for Low Density Residential Zones and North Aldershot (2009). These guidelines apply to all vegetation located within three metres of the subject property's boundaries and require either that the adjacent property owner be consulted regarding the proposed development and sign-off or that a certified arborist confirm in writing that the proposed development will not negatively impact the boundary vegetation. Boundary vegetation approved for removal is typically replaced with plans subject to review by a city arborist.

3.3 Consultation Input

A strong message that came out of consultations with city staff is the need for a comprehensive set of tree protection standards for use by all departments, including specifications for different land use contexts, as well as a need for more site inspections by trained staff.

In all consultations, the importance of balancing tree protection with the need for greater infill development and infrastructure renewal as the city's population grows, particularly in the urban area, was expressed. Many stakeholders were of the opinion that tree protection on private property must be more strongly supported by policies, standards and guidelines. Some expressed support for a private tree by-law; others were concerned that such a by-law would be unnecessarily restrictive. It was recognized that the city is improving its tree protection practices but that more innovative and comprehensive solutions are required to protect and preserve the urban forest.

3.4 Best Management Practices

Municipalities across North America are increasingly realizing the importance of tree protection as a key step to achieving urban forest sustainability. Best management practices involve the application of planning tools, at the jurisdiction-wide and at the site-specific level as well as the implementation of proactive management of existing resource on the ground.

Trees on Private Property

Over 50 municipalities in southern Ontario have implemented public or private tree by-laws under the authority of the *Municipal Act* (2001). The majority of these by-laws have been enacted by regional municipalities and focus on protection of woodlands. However, a number of lower-tier municipalities with tree protection by-laws also regulate the cutting of individual trees on private property.

Currently, 16 lower-tier municipalities in Ontario have tree by-laws focusing on the protection of individual trees on private property. These typically protect trees above a certain diameter, although there is significant variation in the size of trees protected and the exemptions provided by different municipalities. What each municipality regulates depends on what the jurisdiction considers to be a significant tree and where it perceives the greatest threats to tree protection. The resources required to implement and enforce these by-laws are also an important consideration. Although many of these by-laws are relatively new, reports to date recommend that private tree by-laws be accompanied by adequate resources to both educate land owners and enforce regulations when required.

3.4 Best Management Practices (cont'd)

Official Plan policies are another tool for creating a planning framework supportive of urban forest protection. While most municipalities in southern Ontario have policies addressing woodland protection, few municipalities have policies providing explicit support for the urban forest as a whole, including trees outside natural heritage systems.

The *Planning Act* (in particular Section 41, site plan control) provides municipalities with the authority to identify trees for protection and require replacements on private lands subject to the development process. A number of municipalities in southern Ontario use this authority and require that all trees of at least 10 centimetres in diameter be assessed and inventoried and that detailed tree preservation plans be submitted as part of site plan application.

Boundary trees can become an issue when activities or development on one property have the potential to harm trees shared by the adjacent property owner. The *Forestry Act* (1990) makes it an offense to injure or destroy a boundary tree without the neighbour's formal consent. Research indicates that no municipalities currently have by-laws or policies to specifically address private boundary tree issues. However, a few municipalities manage boundary trees incidentally through their broader private tree by-laws (e.g. Mississauga, Orillia, Toronto and Markham), whereby a permit to impact such a tree will only be issued if the neighbour consents in writing. Research on this subject has also revealed that if neighbouring landowners cannot reach an agreement regarding boundary trees, they must solve the matter through a civil litigation process.

The definition of a "significant" tree varies considerably among municipalities. Thresholds for minimum tree diameters considered worth protecting through private tree by-laws range from 15 to 76 centimetres. Some municipalities consider all trees above a specified diameter to have some significance, while others exclude certain invasive species. Significance can also vary with land use context; for example, smaller woodlots may be considered more significant in an urban setting than a rural setting, for social and environmental reasons rather than ecological ones. Determining what trees are "significant" in Burlington will require consideration for the existing treed resources, the distinction between the city's urban and rural areas and consultation with the community.

Several municipalities also prescribe minimum standards for arborist reports to support tree protection on construction sites. Generally, these reports require tree inventories and tree-specific protection guidelines and must be written by a certified arborist or professional forester. The most comprehensive report guidelines require regularly documented site inspections by the project consulting arborist before, during and after construction in order to ensure that tree protection methods remain intact throughout the course of the works.

3.4 Best Management Practices (cont'd)

Trees on Public Property

On city lands, particularly in urban areas, tree protection often means protecting tree roots during development or construction. In rural areas, tree protection typically relates to woodlots, hedgerows and other forested areas. Protection of trees along roadway allowances is also an issue. In all areas, effective protection means preventing the tree and its roots from being damaged and implementing measures and specifications suited to different land uses (e.g. a park versus a parking lot).

One of North America's most progressive municipalities in terms of tree protection is the City of Palo Alto, California, where tree protection and habitat design best practices for a variety of land uses and projects are compiled in a "Tree Technical Manual." The manual supports the local Tree Protection Ordinance, which applies to both public and private lands, and is readily available to all residents.

The Region of York and the City of Nanaimo, British Columbia, have compiled similar manuals. The Town of Markham recently developed a "Treescape Manual" that addresses the challenges of urban forest tree protection and replenishment. Few other municipalities have synthesized tree-related standards, specifications and guidelines into one document. However, many have tree protection specifications for construction sites.

Some cities are increasingly turning to innovative technologies, such as directional boring, hydraulic and pneumatic soil excavation and "tree-first" design, to protect existing trees affected by construction and development. The critical barrier resides in the implementation of these practices, which are not well known and can be more costly than traditional approaches.

Trees and Construction

Construction activities that can seriously damage trees include root injury by trenching and excavation; soil compaction by heavy machinery or materials storage; trunk abrasion and branch injury from inadequate clearance and poor operation; defoliation from exhaust heat; and poisoning from spilled chemicals.

Construction-related damage can often be prevented by having trained arborists on site during construction to supervise activities and to work with staff and contractors on site.

3.5 Opportunities for Improvement

Trees on Private Property

The city's Official Plan should build on its current woodland and tree protection policies by adding general policies to recognize the many services provided by the urban forest, as well as contain the following:

- a definition of what constitutes a "significant tree" in the city (in either the Official Plan or supporting guidelines)
- policies that support tree protection and urban forest enhancement wherever possible
- policies supporting development of management plans for city-owned woodlots, as well as city or conservation authority-owned creek blocks, and
- policies that support monitoring the status of the urban forest and its associated canopy cover.

To comply with current best practices, the city's Site Plan Application Guidelines should be revised to require an inventory of all trees of at least 10 centimetres in diameter on site and to ensure opportunities for tree protection and replacement are considered.

Standards cannot be effective without compliance and enforcement. The city needs to ensure that specifications outlined in Tree Saving Plans and arborist reports are implemented, maintained and monitored after plans are submitted. There are several means to accomplish this: staff inspectors may be trained to better understand and evaluate tree protection requirements, additional resources may be allocated to enable more frequent inspections by planning and/or urban forestry staff, and standards to require regular arborist inspections may be included as part of site plan application guidelines and capital project requirements.

Currently, wooded areas in the city greater than one hectare are regulated by Halton Region's tree by-law (By-law 121-05). The city is in the process of extending this authority to woodlands between half and one hectare (i.e., the size of one to four football fields) by finalizing and approving a delegation by-law being developed to this effect. Once this by-law is approved, it will make Burlington consistent with adjacent municipalities and provide more comprehensive protection for privately owned woodlands across the city.

In addition, some type of a private tree by-law should be considered for individual significant trees. Currently, individual trees on private property are retained or removed at the landowner's discretion, except during the development process when landscaping and tree preservation plans are typically required as part of site plan approvals. The city should undertake a detailed study of options for protecting significant trees not in woodlands, and not part of the development process, on private lands in the city.

The recommended private tree by-law study should determine these:

- if protection of "significant" trees should be pursued solely through education and awareness or through education and legislation (i.e. designation of identified trees under the *Ontario Heritage Act, 1990* or a private tree by-law under the *Municipal Act, 2001*), and
- if a private tree by-law is to be pursued, it should
    - include a regulatory definition of "significant trees"
    - examine if the application area is to be the urban area alone or if it is to include the urban areas and rural settlement areas
    - consider including some reasonable permit exemptions and exceptions
    - identify the resources that will be required to educate residents and enforce the by-law
    - be exclusive of lands regulated by Halton's tree by-law and
    - consider input obtained through a broad-based consultative process.

Burlington already has a reasonable approach for managing boundary tree issues during the development process. Recommendations included in this plan further strengthen this approach. If a private tree by-law is developed, a procedure for dealing with boundary trees should be included to regulate their potential damage or destruction outside the site plan approval process.

Trees on Public Property

The City of Burlington is in the process of completing a review and update of its Public Tree Protection By-law 19-1975, which focuses on protection of all trees on city-owned lands. Key aspects of the by-law that require updating include making the by-law consistent with current tree protection provisions under the *Municipal Act* (2001) clearly defining boundary trees and implementing a standardized approach for tree replacement.

Development of a co-ordinated and comprehensive series of city-wide specifications for tree preservation and habitat would be a useful tool for city staff as well as for contractors and even residents. Such specifications should build on the standards already adopted by the city and could also be applied to developments on private lands.

In order to be effective, these standards must be consistently implemented. This will require regular site inspections by trained inspectors and qualified arborists to supervise the work of contractors, both those working for the city and for third parties within rights-of-way. Inspection reports should become a condition of site plan approval and be required for all capital projects that may affect trees.

There is also an opportunity for better coordination of tree protection (and replacement) when roadwork is undertaken by Halton Region or the Ministry of Transportation in the city.

PROTECTION AND PRESERVATION 3.6 RECOMMENDATIONS	Priority	Resource Implications	Target Timing
City Policies and Guidelines			
14. Amend the city's Official Plan: • to specifically acknowledge the benefits provided by urban trees and green infrastructure • to include specific policies supporting the development of management plans for city-owned woodlots and other wooded natural areas including creek blocks and • to include policies supporting the ongoing management and monitoring of the urban forest.	High	Low (One-time)	2011
15. Develop a policy-based definition of "significant trees" to guide tree protection during the planning process and to include in the Official Plan and the Site Plan Application guidelines.	High	Low (One-time)	2011
16. Amend Site Plan Application Guidelines and guidelines for larger scale developments: • to include wording from the *Planning Act* (1990) that supports tree preservation as a condition of Site Plan approval • to include an objective of maintaining and expanding the city's tree canopy • to require that all trees of at least 10 centimeters in diameter be assessed and documented • to require securities for trees to be protected, and retain securities until an arborist report is provided at least two years after completion of construction confirming tree health and • to require a qualified arborist to conduct site inspections to ensure tree protection measures are implemented and all work proceeds as approved.	High	Low (One-time)	2011
17. Strengthen the city's current guidelines for addressing boundary vegetation and boundary trees during the development process by incorporating the legal justification provided through the *Forestry Act* (1990).	High	Low (One-time)	2011
18. Develop policies that allow for engineering guidelines to be adjusted, in consultation with staff and others as required, in order to retain existing grades in support of tree preservation.	Med	Low (One-time)	2012

Resource Implications: Low = existing staff work plan and/or existing resources, Med = moderate impact to staff work plan and/or resources (~ $10,000), High = significant impact to staff work plan and/or resources (~ $50,000).

PROTECTION AND PRESERVATION 3.6 RECOMMENDATIONS (CONT'D)	Priority	Resource Implications	Target Timing
Tree Protection By-laws			
19. Complete the delegation of woodlands between 0.5 and one hectare to the Region (which already regulates all woodlands in the city of at least one hectare) under its tree by-law.	High	Low (One-time)	Underway (2010)
20. Complete the review and update of the city's Public Tree Protection By-law 19-1975 for protection of trees on city-owned lands.	Med	Low (One-time)	2011
21. Complete a detailed study to evaluate the effectiveness of private tree by-laws in other communities, the appropriateness of a by-law for Burlington and potential resource implications.	Med	High (One-time)	2016
Site Inspection and Staffing			
22. Require an arborist review all city capital projects with tree impacts and perform regular and documented site inspections.	High	Med (Ongoing)	Underway (2010)
23. Increase resources for city inspection and oversight of tree protection requirements on all project types, and provide training for city staff inspectors.	High	High (Ongoing)	2012
24. Introduce the arboriculture/landscape architecture skill set into the existing Planning department complement as soon as a recruitment opportunity arises.	Med	Low (One-time)	2012

Resource Implications: Low = existing staff work plan and/or existing resources, Med = moderate impact to staff work plan and/or resources (~ $10,000), High = significant impact to staff work plan and/or resources (~ $50,000).

4 Replenishment and Enhancement

4.1 Key Issues

Tree establishment to replenish leaf area and canopy cover lost through tree mortality and removal is a critical aspect of sustainable urban forest management. As new and infill development take place, urban infrastructure is built and maintained and aging trees are removed, the outcome of new tree establishment will determine the structure and function of the future urban forest.

The challenge of ensuring that newly planted trees reach their maximum genetic potential can be overcome by creating adequate space for trees through innovative site design, identifying areas in need of increased tree establishment and applying new techniques and technologies to provide optimal growing conditions in otherwise stressful environments. Tree establishment decisions must also consider species diversity and distribution, stocking targets, development needs and budgetary constraints.

The implementation of a range of sustainable practices will ensure that existing and newly planted trees contribute to urban canopy cover. Knowledge of differing requirements for different tree species, risk management and greater use of a diversity of native tree species where appropriate to improve the overall resilience of the urban forest are also key considerations.

4.2 Current Practices in Burlington

Policies and Guidelines

The North Aldershot planning area in the city is on the Escarpment and includes a number of significant natural areas. The Official Plan includes a requirement for North Aldershot that encourages "all development to preserve existing significant trees, wooded areas and hedgerows, and plant additional trees in accordance with good forestry management practices." The Official Plan also encourages establishment of native species and discourages planting of invasive non-native species in North Aldershot and in public areas on the waterfront.

The city's Site Plan Application Guidelines (2005) require the replacement of trees removed through the development process, if they serve a "deemed purpose" and also require replacement for preserved or transplanted trees that do not survive.

Replacement standards used by the city are one to one by the aggregate-caliper formula. This method is considered simple and fair and has been effectively utilized by the city for over two decades.

4.2 Current Practices in Burlington (cont'd)

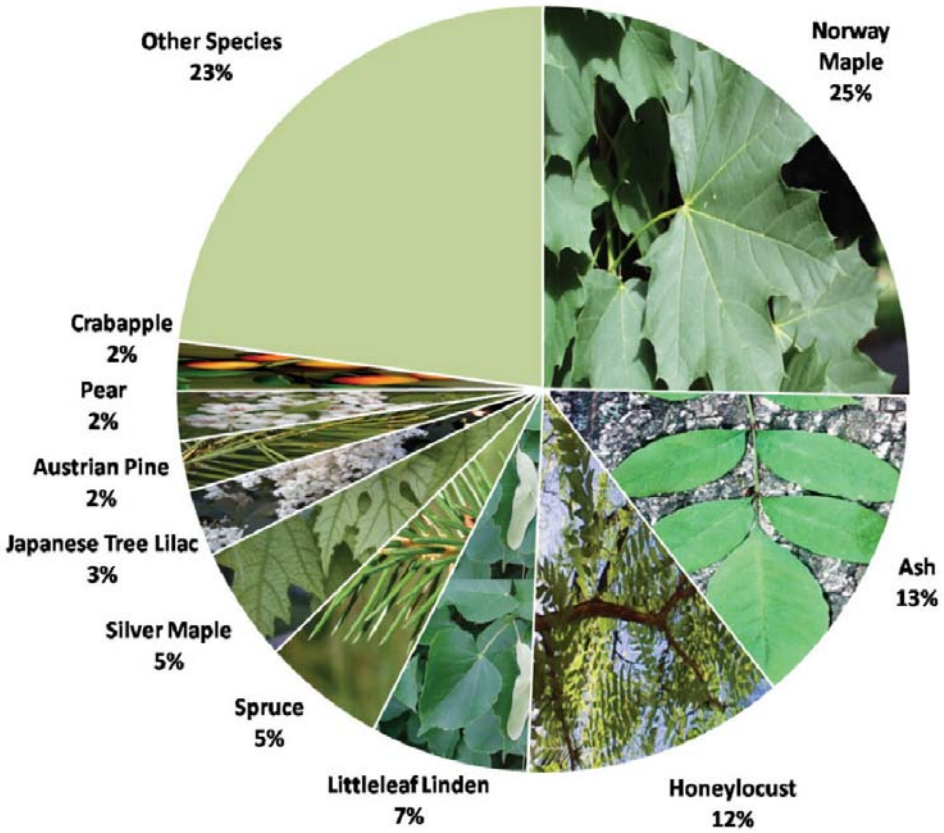
Species Selection

Selecting the appropriate species of trees for planting in urban areas can be challenging. Urban conditions differ greatly from those in natural areas, so some of the most common and hardy forest species, such as sugar maple, fare poorly on municipal streets.

Historically, urban areas in Burlington were planted with a small selection of predominantly non-native tree species, the most notable of which was Norway maple. Readily planted in the 1960s in the wake of the Dutch Elm disease epidemic, this non-native and invasive tree now accounts for 25% of the city's street trees. Approximately three-fifths (63%) of Burlington's street trees are introduced or exotic species. While many, such as Linden or London plane, are well-suited to urban conditions and present few problems for urban forest management, others present significant threats when they seed into natural areas. Too much of even a native species can be risky, as intensive use of ash the last 30 years has resulted in 13% of the city's street trees being vulnerable to the Emerald Ash Borer.

The city is committed to establishing a more diverse future urban forest and to working with contractors and developers to ensure a diverse range of native and non-native, non-invasive tree species get into the ground. The city no longer permits the planting of Norway maple or ash on city streets or in new developments and has made significant progress since 1979 when 36% of the street trees were Norway maples, 22% were ash, and 21% were honey locust. However, it will take time to achieve optimal levels of diversity.

Street Tree Species Diversity in Burlington (2009)



The sustainability and health of the future urban forest will rely on the selection and planting of a diversity of tree species, planted in appropriate locations and maintained until they are well established. While the use of native species is preferable, some non-invasive non-native trees are also suitable under difficult growing conditions.

4.2 Current Practices in Burlington (cont'd)

Tree Planting

Burlington plants approximately 1000 trees annually as replacements, through capital projects and in response to resident requests for street trees. Trees are typically planted in boulevard settings, but are also planted in parks. The city does not actively plant trees in naturalized areas, except as part of annual Arbor Day celebrations, and during annual plantings in cooperation with local stakeholders. Volunteer-based programs typically do not include plantings on road rights-of-way. Planting is conducted by three departments: Roads and Parks Maintenance, Engineering, and Parks and Recreation.

In new communities, trees are planted during development in accordance with the city's planning policies, typically with prior review by city forestry staff. During construction or maintenance of infrastructure, tree planting is typically included in the contract tendering process. For these projects, inspection of trees is the responsibility of the Engineering Department, but is not always conducted by someone with arboricultural expertise.

For local regional and provincial roadway projects, the city has an opportunity to comment on tree replacement.

4.2 Current Practices in Burlington (cont'd)

Tree Habitat

The city's street tree inventory identified over 700 vacant plantable spaces along city streets. Many of these vacant spaces, as well as those already occupied by trees, are found in boulevards or other locations where soil quality, soil volume, drainage, proximity to utility services, or other critical factors do not support the growth of future large-stature trees.

Almost 20% of Burlington's street trees are currently in some degree of conflict with overhead utility wires. This requires a practice of gradual replacement with smaller stature vegetation to avoid ongoing maintenance requirements and possible service disruptions. At the same time, consideration must be given to the impact on the streetscape to ensure a balance is found between the concerns with utility wire conflicts and the creation of a streetscape that is attractive and provides shade protection for pedestrians.

Engineering specifications currently require 1.73 cubic metres of soil volume for trees planted in pits along sidewalks and roadways. In parking lots, the minimum required planting bed width is 2.5 metres, with no minimum required soil depth or volume. In new developments, topsoil volumes are often inadequate to promote good root growth. Such limited rooting volumes will not sustain the large-stature, mature trees that provide so much value in the form of shade, storm water attenuation and air quality improvement.

The roots of trees planted along sidewalks and in boulevards must compete with the road sub-base, designed to support the weight of traffic and compacted to between 95% and 100% *Standard Proctor Density*. Street trees are also often subjected to physical damage, drought and high salt levels. These factors contribute to increased overall stress, inadequate access to air and nutrients, stunted growth and premature tree mortality.

Urban design guidelines in Burlington are beginning to include innovations such as group plantings of street trees, as opposed to more formally spaced linear plantings. The continuation and wider application of this practice may promote tree longevity. These guidelines are not currently extended to parking lots, however, and trees in lots are generally required to be planted at regular linear spacing between parking and traffic areas.

The intensity and extent of city tree establishment in Burlington is subject to available funding through the responsible departments, particularly Roads and Parks Maintenance. At a minimum, every tree removed for health or risk management reasons by the city is replaced. Limited additional planting occurs when resources permit. Tree establishment through Engineering Department projects is typically part of the tender process. Trees are typically installed through a contract with a two-year warranty. However, there is no dedicated annual budget for tree planting through Engineering, nor through Parks and Recreation projects.

4.3 Consultation Input

Consultations with staff from the three departments responsible for tree establishment revealed that there are shared concerns for the quality of trees being planted, as well as for the suitability of the environments where they are planted. An absence of procedures and a lack of available resources to inspect planting stock means that sub-standard trees, such as those with poor form, *girdling roots* or diseases, are sometimes planted as part of construction or development projects. It was also recognized that more could be done to improve growing environments through investigating innovative approaches to better integrate trees into the urban *hardscape* and that establishing a balance between the needs of trees and requirements for reliable, serviceable and cost-effective infrastructure is crucial. Stakeholders and residents also expressed concern about the city planting trees in poor locations where they stay small and need to be replaced every five to seven years.

City staff also raised their concern about the lack of up-to-date and co-ordinated planting specifications. For example, specifications used to tender infrastructure projects that include tree establishment differ from guidelines used by the Parks and Recreation Department. Municipal site plan application guidelines provide yet another series of planting specifications. One set of comprehensive tree and vegetation management requirements and guidelines is needed, tailored to different project types and land uses.

4.4 Best Practices

Species Selection

Communities across North America are increasingly adopting practices to ensure that the right trees are established in the right places, thereby reducing future maintenance costs and promoting tree longevity. Several cities have developed lists of acceptable species for plantings in municipal rights-of-way, often divided by habitat type. These species lists are also accompanied with the minimum soil volumes allowable per tree, by habitat type. A comprehensive list of acceptable species, with a mix of native and non-invasive, non-native trees (if required because of difficult urban conditions), ensures that urban forest diversity is promoted through planting, especially in new communities and as part of infrastructure projects.

In its strategic plan, the City of Peterborough committed to undertaking an innovative step to achieving long-term urban forest sustainability through species suitability trials. The Town of Oakville has made the same commitment. Some cities, such as Ithaca, New York, have also experimented with planting far less-costly bare-root nursery stock, with generally favourable growth results. Bare-root planting requires greater skill and knowledge than planting ball-and-burlap or containerized trees, but can be more successful if properly implemented.

4.4 Best Practices(cont'd)

Species Selection (cont'd)

Species selection should be based on a wide range of considerations. For example, research has shown that selecting the proper trees and placing them appropriately can significantly reduce energy usage for heating and cooling buildings. Planting small statured trees under utility wires can also reduce the need for costly corrective pruning.

Planting a diversity of native and non-invasive tree species is perhaps the most important consideration since doing so builds in resiliency to stressors such as insect infestations.

Trees Native to Burlington

Sugar maple, red maple, red oak, basswood, white pine and eastern hemlock are a few of the native woodland trees found in Burlington. Less common Carolinian tree species that occur naturally in the city include flowering dogwood, black oak, chinquapin oak and sassafras.

Tree Habitat

Research shows that healthy trees generally require between 75 centimetres and 120 centimetres of soil depth to achieve optimum growth, depending on soil quality and drainage. Minimum recommended soil volumes to grow a 40 centimetre diameter tree in areas which receive adequate rainfall (e.g. at least 750 millimetres per year) is around 30 cubic metres. Larger trees require proportionately more soil, and requirements can vary with species and soil conditions.

Soil quality is also critical, although rarely specified. Cities across North America and Europe are beginning to adopt techniques and technologies to provide enhanced rooting environments, while maintaining the ability to provide municipal services such as sidewalks and utilities. The objective of implementing any *enhanced rooting environment technology* is to provide the greatest amount of good quality soil suited to the tree species planted and the local drainage regime. Inadequate soil volume, quality, drainage and density are the chief limiting factors for tree growth in urban areas.

The two most common enhanced rooting environment techniques in use in other jurisdictions are engineered soils and soil cells. Engineered soils mix crushed gravel and mineral soil to form a supporting latticework that maintains essential *macropores*. Soil cells are containers constructed of modular plastic and steel cells designed to support loads without compacting the soil within them. While costly, both techniques have been extensively tested, with consistently positive results. Canadian cities including Winnipeg, Toronto, Whistler and Kelowna have experimented with soil cells in some parts of their cities.

Tree placement is another critical habitat consideration. Common design sensibilities still tend to favour regularly spaced, linear plantings, especially along roads and sidewalks. While mature roadside trees provide a graceful canopy, roadside boulevards rarely provide optimal growth conditions. For example, plantings in boulevards invariably perform worse than those in neighbouring front yards.

4.4 Best Practices(cont'd)

Tree Habitat (cont'd)

The tight spacing of many typical plantings leaves little room for full canopy development. In fact, research and experience suggest that tree establishment budgets can be optimized by planting fewer trees and reallocating funds to provide enhanced rooting environments. The established trees will grow faster, provide more benefits, require less maintenance and live significantly longer than a greater number of trees planted in poorer conditions.

4.5 Opportunities for Improvement

Policies and Guidelines

City Official Plan policies and Site Plan Application Guidelines should both be revised to include policies that require tree replacement, at least for all significant trees removed as part of development. Replacement should be calculated according to the city's current aggregate-caliper method, or an alternative standard applied equally to all projects. Policies should specifically support the integration of trees in open spaces and parking areas.

On public lands, the following targets should be adopted:

- No species should make up more than 10% of the inventory
- No *genus* should account for more than 20% and
- No *family* should make up more than 30% on any given street, park or new neighbourhood.

Planting a diversity of native trees should also be part of woodlot and creek block naturalization projects. Lists of suitable species for these types of projects are available through Conservation Halton.

Why Are Native Trees Important?

Native trees are adapted to a range of local conditions and provide habitat for a diversity of local wildlife. Although many native trees will not thrive in hardscape environments (e.g., boulevards), they can thrive without much additional care (e.g., watering, fertilization) once they are established (e.g., after their first five years) in parks, creek blocks and other open space settings. These trees will provide many benefits for people as well as habitat for local wildlife.

4.5 Opportunities for Improvement (cont'd)

Tree Planting

Currently, the city does not regularly inspect the quality of nursery stock prior to its establishment, relying instead upon the contractor to provide suitable trees and plant them correctly. This may occasionally result in poor quality tree planting. Enacting procedures to inspect a representative sample of planting stock prior to establishment will help ensure that site-appropriate and healthy trees are planted the first time around. This may require some additional resource allocation but would represent an important investment in the future of Burlington's urban forest. Beyond the expiry of the typical two-year warranty period, young trees still require care and maintenance. Typically, they require watering, mulching and important structural pruning to ensure they become well established.

The city does not have jurisdiction over trees planted on residents' property, and unfortunately some nurseries still promote non-native, invasive tree species for planting in these areas. Private lots often have much higher quality soil and greater rooting space than boulevards and are the ideal places to plant large-growing native trees. Increasing awareness and providing technical information to residents and environmental organizations that promote, support and undertake tree planting on private lands will contribute to increased canopy cover, species diversity and provision of urban forest benefits.

Although the city does not have jurisdiction over tree plantings on regional or provincial rights-of-way, it does have opportunities to comment on proposed tree replacements along these corridors and is responsible for maintaining trees on regional roads. The city should try to ensure that these plantings meet its objectives for diversity, density and quality.

Species Selection

Burlington's urban forest enhancement and replenishment program can become a key instrument in achieving urban forest sustainability and promoting species diversity across the city. For example, the inventory shows that some older neighbourhoods are heavily populated by large, old silver maples. These neighbourhoods should be targeted for increased infill planting with a diversity of native species before these large trees are removed to maintain some continuity in canopy coverage. The inventory also suggests that newer communities are heavily over-populated with Norway maple and ash trees; a wider range of species should be planted in these and newly developing communities.

4.5 Opportunities for Improvement (cont'd)

Tree Habitat

Implementing advanced rooting environment techniques and technologies increases the up-front cost of some projects, but cost savings can be realized by directing a larger share of funds for nursery stock towards lower-density, higher-quality plantings. Additional savings come from reduced costs of future tree maintenance, storm water management, energy use and even health care, as larger, healthier trees provide far more benefits than small trees, which require more frequent replacement.

In the downtown area, the city should investigate the feasibility of a range of enhanced rooting techniques, including, but not limited to, engineered soils and soil cells. This investigation should include several real-world feasibility and proof-of-concept studies, which would involve selecting appropriate locations, soil mixes and tree species.

The city should also promote native tree planting on the high-quality environments found in many front yards, some of which may fall at least partly into the municipal road allowance. Increasing public awareness about the importance of front-yard planting will play an important role in establishing more trees in high-quality habitat and promoting healthy urban forests.

Other opportunities for urban forest replenishment on lands not owned by the city include school grounds, conservation authority lands, industrial areas and business parks, institutional lands, golf courses and cemeteries.

All of these best practice considerations should be formalized and consolidated in city-wide Treescape Guidelines, including these:

- guidelines for tree habitat including adequate soil volumes, soil depths and basic soil quality requirements
- specifications for typical right-of-way cross-sections (arterial, collector, local, etc.), new subdivisions, parklands and open spaces that integrate appropriate tree rooting environments
- a list of recommended trees and shrubs that would indicate their suitability for different conditions and that would account for urban forest diversity targets and
- requirements for an arborist to review and supervise proper implementation of plans and to follow up both immediately and two years post-construction to assess survival.

REPLENISHMENT AND ENHANCEMENT 4.6 RECOMMENDATIONS	Priority	Resource Implications	Target Timing
City Policies and Guidelines			
25. Amend the city's Official Plan with these inclusions: • objectives that support replenishment and enhancement of the urban forest with a high diversity of predominantly native trees • specific policies supporting the replacement of trees removed through the development and/or infill process • the naturalization and reforestation of creek blocks and • the integration of trees in parks, open spaces and parking areas.	High	Low (One-time)	2011
26. Develop comprehensive city-wide Treescape Guidelines for tree protection and replacement with consideration for existing materials from various departments. Key areas to be addressed include minimum soil depths and volumes, recommended native and non-invasive species, specifications for different settings and requirements for inspections.	Med	Med (One-time)	2012
27. Amend the Site Plan Application Guidelines and guidelines for larger scale developments: • to include wording from the *Planning Act* (1990) that supports tree planting as a condition of Site Plan approval (where preservation is not feasible) • to change the term "trees serving a deemed purpose" to "significant trees" (once a definition for "significant trees" has been developed) and require their replacement and • to allocate a percentage of funds received for parkland dedications to tree planting and management in the city.	High	Low (One-time)	2011
28. Develop a standard methodology for tree valuation that would provide the basis for setting securities that reasonably reflect the value of private trees deemed to be protected or replaced through the development process.	High	Low (One-time)	2011

Resource Implications: Low = existing staff work plan and/or existing resources, Med = moderate impact to staff work plan and/or resources (~ $10,000), High = significant impact to staff work plan and/or resources (~ $50,000).

REPLENISHMENT AND ENHANCEMENT 4.6 RECOMMENDATIONS (CONT'D)	Priority	Resource Implications	Target Timing
Operations			
29. Increase resources and implement a formal program to plant in public spaces dominated by mature trees (so that regeneration is started before the mature trees must be removed).	Med	Med (Ongoing)	2013
30. Develop a program to identify and increase resources to plant more trees in city parks and vacant public locations in the urban areas not planned for development.	Med	High (Ongoing)	2013
31. Increase technical support for tree planting initiatives throughout the city, and engage residents, non-profit groups and other organizations to promote, support and undertake tree planting on private and public lands.	Low	Med (Ongoing)	2012
32. Increase inspection resources to ensure that new tree plantings are installed in accordance with standardized specifications and that they survive following installation.	Med	Med (Ongoing)	2012
33. Explore establishing long-term tree-growing contracts to ensure availability of high-quality native planting stock for city projects.	Low	Med (One-time)	2014

Resource Implications: Low = existing staff work plan and/or existing resources, Med = moderate impact to staff work plan and/or resources (~ $10,000), High = significant impact to staff work plan and/or resources (~ $50,000).

5 Tree Health Care and Risk Management

5.1 Key Issues

Trees in urban areas face many stresses, making them increasingly susceptible to pests and diseases. Stressed trees are also more prone to structural problems, which may be further compounded by long intervals between inspection and maintenance, as well as inadequate cultural practices. A co-ordinated approach to manage pests, diseases and invasive species, to maintain an optimal growing environment and to promote good tree form and structure is called Plant Health Care (PHC). PHC also recognizes the importance of other landscape plants such as shrubs and grasses and the positive or negative influence these plants may have on tree health.

Integrated Pest Management (IPM) is a similar concept, which aims to assess and control pest populations through a combination of early detection, cultural practices and pesticides, if required. A comprehensive PHC and IPM program, coupled with a detailed risk management strategy that includes regular inspections, cyclical maintenance pruning and an effective emergency response program, is critical in maintaining and promoting a healthy, safe and functional urban forest.

Improving tree health and safety will allow the urban forest to provide more benefits for Burlington's residents and also save taxpayer dollars as liability and insurance claims are reduced.

5.2 Current Practices in Burlington

The City of Burlington currently undertakes a variety of programs to ensure that the urban forest is maintained in a healthy and safe condition. These are described briefly in this section.

Inspection, Pruning and Risk Management

Many municipalities inspect and prune their trees in a scheduled manner. This practice is called "grid," "block" or "cyclical" maintenance. Burlington's street trees in the urban area are inspected and pruned on a seven-year cycle. Street trees are visually inspected for health, structure and risk and are pruned or removed, as required. When resources permit, neighbourhoods with a large number of older trees or trees that have had cabling systems installed to support weak limbs or *co-dominant* stems are visually inspected more frequently. This inspection data is not currently stored digitally or integrated with the street tree inventory.

Trees within falling distance of formal trails in parks and natural areas are inspected annually. Other park trees are generally inspected on a seven-year cycle. Pruning in parks is currently carried out on an as-needed basis.

Burlington Hydro inspects and prunes street trees on a three-year cycle, while Hydro One follows a six-year cycle with the key objective of eliminating conflicts with above-ground utility wires or transmission lines.

5.2 Current Practices in Burlington (cont'd)

Emergency Response

After-hours emergency requests for tree maintenance through a dedicated Emergency Services phone line and addressed by on-call Roads and Parks Maintenance staff. Working hours service requests are managed through the city's computerized work order system and are addressed on a priority basis.

Tree Health Care and Integrated Pest Management

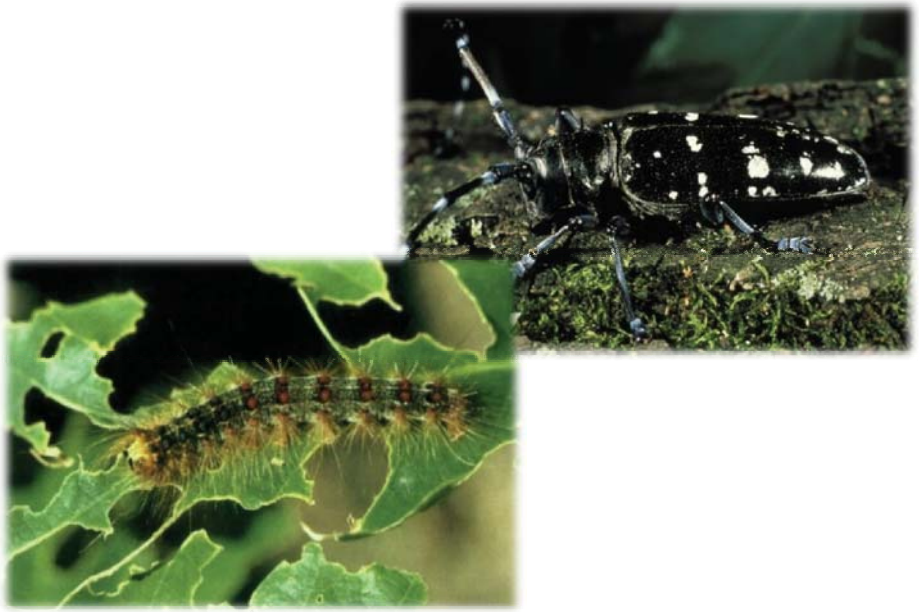
Burlington's approach to Plant Health Care currently includes limited watering and mulching of trees in high-stress environments. Tree maintenance is otherwise generally limited to pruning, although newly planted trees are watered and mulched after installation. There is also no co-ordinated program or plan to control invasive plant species in woodlots, parks and other natural areas.

In the past, the Roads and Parks Department has coordinated with residents to keep pest populations, specifically gypsy moth, under control through a number of IPM methods (e.g. egg mass scraping, installing sticky bands, using pheromones and aerial spraying). Burlington has also recently implemented an adaptive Emerald Ash Borer (EAB) management strategy to help manage this destructive beetle.

5.3 Consultation Input

Burlington's residents and other stakeholders recognize the importance of adequate growing spaces, effective pest management and tree species diversity in promoting urban forest sustainability. Many expressed concern for tree health and public safety, and wanted solutions to promote the health and longevity of the urban forest, while minimizing risks to people, property and infrastructure.

It was also noted that there is a need to manage invasive plant and pest species. A woodlot management strategy would help provide direction for sustaining the city's woodlots and creek blocks. Stakeholders asked that the inspection and pruning cycle, species and planting stock selection and data management protocols be reviewed and updated, as required.



5.3 Best Practices

Cyclical Inspection and Pruning

A sampling of municipalities across North America found that urban forest inspection and pruning intervals vary widely between municipalities, from short five-year cycles to a much longer 16-year cycles. A shorter cycle does not necessarily imply better management. Longer cycles can be supported by an urban forestry program dedicated to planting diverse, high-quality nursery stock in good habitat, resulting in fewer short-term maintenance requirements.

Another successful approach to cyclical pruning is to establish a different cycle depending on the age or species of the trees to be maintained. For example, most trees in Edmonton are pruned on a seven-year cycle, while elm trees are pruned on a four-year cycle. This targeted pruning enables earlier detection of Dutch Elm disease. Trees in Calgary are pruned on an eight-year cycle. Young trees, however, are inspected and maintained a minimum of three times in the first ten years. Maintenance during the "formative years" of a tree's life, which can be conducted from the ground at little cost, is the best possible investment in the future urban forest, and that early maintenance reduces future liability and management costs.

In a city like Burlington, which contains both a densely populated urban area and rural settlement areas, it is challenging to ensure that all street trees are maintained in a cyclical manner. Economic analyses demonstrate that scheduling tree maintenance by species, age class and location is ideal, but generally not feasible because of time and resource constraints.

A four- to five-year pruning cycle generally provides the optimum balance between operating costs and maintained tree value, but various municipalities successfully implement a wide range of different schedules and service delivery models.

Risk Management

The key to effective risk management is an operational policy that co-ordinates inspection, mitigation and proactive planning, in order to improve safety and reduce risk, uncertainty and liability. These are the key components of an effective risk management strategy:

- Policy statement, including scope and responsibilities
- Goals of the strategy
- Standard of care statement
- Determination of acceptable risk
- Minimum training and qualifications of risk assessors
- Frequency of assessment
- Management options
- Record-keeping protocols and
- Strategy funding, assessment and reporting.

European jurisdictions have among the most stringent risk management policies of those studied. For example, some districts mandate tree inspection frequencies between one and four years. Trees in close proximity to roadways, buildings or other intensively used areas are inspected on a more frequent basis, as are certain tree species known to be more prone to structural defects.

5.3 Best Practices (cont'd)

Emergency Response

Few municipalities have dedicated storm response protocols for the urban forest. However, innovations in hurricane-prone areas of the United States demonstrate the value of pre-storm planning to identify and mitigate potential hazards. Developing a directed emergency response plan within a broader risk management policy helps ensure that risks are mitigated as required and that the necessary resources are allocated to the planning through recovery stages of a significant storm event. The focus of post-storm inspections should be the retention of as many trees as possible because the most failure-prone component parts were likely to have failed during the storm.

Plant Health Care and Integrated Pest Management

Dedicated programs to identify and manage plant health issues, including pests, reduce urban forest stressors and consequently lead to lower tree mortality. Leading municipalities implement programs to control vegetation pests such as noxious weeds and invasive species in natural areas and also run programs to create and expand *mulch beds* shared by multiple trees. Others have begun tree hardiness trials to assess the suitability of diverse species and use watering bags for new trees. For example, Winnipeg's comprehensive IPM program applies non-pesticide approaches, such as sticky banding and monitoring, in combination with the targeted application of chemicals. In southern Ontario, several municipalities currently undertake annual gypsy moth and Emerald Ash Borer surveys.

5.4 Opportunities for Improvement

Cyclical Inspection and Pruning

Burlington's seven-year grid pruning cycle is comparable with those of many municipalities and ranks among the shorter cycles. There are, however, three opportunities to improve the pruning cycle, described below.

1. New developments and rural settlements are currently not included in the cycle. New urban and suburban communities should be integrated into the grid pruning cycle, and rural street trees should be regularly inspected and maintained on an as-needed basis.

2. Newly planted street and park trees should be pruned at least three times in the first ten years after planting.

3. The pruning and inspection cycle should be integrated into the city's asset management system, which can facilitate maintenance and progress tracking, decision-making and work order processing.

Emergency Response

Burlington does not currently operate a web-based tree service or inspection request system, nor is there a cohesive emergency response plan to deal with major storms. Implementing these measures may result in increased opportunities to mitigate risk and better co-ordinate emergency response activities, enabling a greater number of mature trees to be retained and reducing liability posed by potential tree failures.

5.4 Opportunities for Improvement (cont'd)

Plant Health Care and Integrated Pest Management

Burlington's current plant health care and pest control activities are implemented as part of daily urban forest management. However, there is no overarching policy to recognize the holistic and integrative approach of either Plant Health Care (PHC) or Integrated Pest Management (IPM). Formalizing these approaches through implementation of this plan will support the city's commitment to urban forest sustainability and environmental stewardship. It will also provide a basis for the expansion of services to include increased mulching and watering of trees, monitoring and control of invasive plant and insect species, and selection and establishment of suitable trees, shrubs and groundcovers in appropriate locations.

The city should undertake replicated and controlled trials to test these:

- the usability and success of bare root (as opposed to container or ball-and-burlap) stock
- the effectiveness of providing tree watering bags with newly planted trees on boulevards
- the suitability of different native tree species (including Carolinian species) for tolerance to urban conditions and
- the effectiveness and feasibility of enhanced rooting environment technologies for integrating trees in paved areas, such as parking lots and downtown sidewalks.

Risk Management

There are several opportunities to improve Burlington's risk management practices. A formal urban forest risk management policy should be developed to confirm successful inspection and pruning practices currently in place and further develop these programs to enhance risk management. A dedicated policy will set minimum standards for risk inspection and documentation, resulting in consistency of assessment and sustained resources for inspection over the long term. This should include the installation of signs at the entrances of city-owned woodland trails that direct users to stay on the trails and enter at their own risk.

TREE HEALTH CARE AND RISK MANAGEMENT 5.6 RECOMMENDATIONS	Priority	Resource Implications	Target Timing
34. Evaluate innovative and alternative planting techniques, approaches and products that support increased tree resilience and longevity.	Low	Med (Ongoing)	2012
35. Formalize the city's process for evaluating trees and identifying those requiring removal or risk mitigation.	High	Med (One-time)	2012
36. Develop a web-based tree service or inspection request system and an effective implementation strategy so that responses can be prioritized and documented in a consistent and effective manner.	Low	Med (One-time)	2015
37. Modify the city's Level of Service to ensure that newly planted trees are pruned within the first two years of planting and twice more within the first ten years of planting.	Med	High (Ongoing)	2014
38. Undertake a benefit/cost analysis of implementing a five-year pruning and inspection cycle Level of Service.	Low	Med (One-time)	2021-2025
39. Integrate rural communities into the city's seven-year grid inspection cycle.	High	Med (Ongoing)	2012
40. Formalize programs for and integrate the city's following current practices that are consistent with best practices into the Avantis Maintenance Management System: • the grid pruning and inspection cycle data (currently at seven years) • inspection of cabled trees (annual) • inspection of formal trails in city-owned woodlands (annual) and • inspection of mature trees (bi-annual).	High	Med (Ongoing)	2010

Resource Implications: Low = existing staff work plan and/or existing resources, Med = moderate impact to staff work plan and/or resources (~ $10,000), High = significant impact to staff work plan and/or resources (~ $50,000).

GLOSSARY

Adaptive Management: A systematic process for continuously improving management policies and practices by learning from the outcomes of previously employed policies and practices. In active adaptive management, management is treated as a deliberate experiment for the purpose of learning.

Aggregate-Caliper: A method for assessing tree removal compensation planting, whereby the combined caliper (diameter) of trees to be planted must meet or exceed the diameter of the tree removed.

Atmospheric Carbon: Carbon dioxide gas (CO^2) suspended in the Earth's atmosphere. A greenhouse gas, atmospheric carbon dioxide is known to be a primary contributor to climate change.

Boundary Tree: "Every tree whose trunk is growing on the boundary between adjoining lands is the common property of the owners of the adjoining lands," as defined by the *Forestry Act, 1990.*

Boundary Vegetation: All existing vegetation within three metres of a subject property, as defined in Burlington's Site Plan Application Guidelines, 2005.

Co-dominant: With respect to tree stems, where two or more of similar diameter are emerging from the same location on the trunk. Co-dominant unions are typically weak and face a higher risk of failure than normal unions. Commonly found on improperly maintained trees, and more common among certain tree species.

Critical Root Zone: In Burlington, an area beyond the Tree Protection Zone where works are permitted but may still damage important roots unless proper root-sensitive procedures are implemented.

Enhanced Rooting Environment Technology: Methods and materials implemented and installed to provide urban trees with greater soil volumes and higher quality soils than used in most current practices, with the objective of promoting improved root growth and urban tree health.

Family: For plants, the family includes plants with many botanical features in common and is the highest classification normally used. Modern botanical classification assigns a type plant to each family, which has the distinguishing characteristics of this group of plants, and names the family after this plant.

Formal Trails: Pathways through parks and natural areas established and maintained by a municipality for the purpose of promoting recreation.

Genetic Potential: A tree's inherent potential to reach a maximum size, form and vigour. Achievement of maximum genetic potential enables a tree to provide the greatest number and extent of benefits possible. Urban trees are frequently unable to reach their genetic potential.

Genus: For plants, the genus is the taxonomic group containing one or more species. For example, all maples are part of the genus called *"Acer"* and their Latin or scientific names reflect this (e.g. Sugar maple is called *Acer saccharum*, while Black maple is called *Acer nigrum*).

Girdling Roots: Tree roots that grow in a circling orientation, rather than spreading. Such roots, commonly found among certain species such as Norway maple, as well as in areas with poor-quality soils, may ultimately deprive a tree of water and nutrients by effectively choking off internal transport vessels.

Green Infrastructure: A concept originating in the mid-1990s that highlights the contributions made by natural areas to providing important municipal services that would cost money to replace. These include storm water management, filtration of air pollution and provision of shade.

GLOSSARY (CONT'D)

Greenlands: Areas in Halton Region that have been designated through the provincial Greenbelt Act (2005) as part of the 1.8 million acres of environmentally sensitive and agricultural land around the Greater Golden Horseshoe protected through the act. These lands include the Oak Ridges Moraine and the Niagara Escarpment.

Greenfield: A site to be used for development purposes, whose previous land use was predominantly agriculture but may also include natural areas.

Grid Pruning: The maintenance and inspection of municipally owned trees at regularly scheduled intervals. This type of management is often planned on a grid-based pattern for ease of implementation.

Hardscape: A landscape, generally found in urban areas, where the predominant features are pavements, sidewalks, roads or other impermeable or semi-permeable concrete- or asphalt-based surfaces.

Integrated Pest Management (IPM): An integrated approach to managing pest populations that reduces or eliminates the use of pesticides. Key components of IPM may include setting thresholds, population monitoring, trapping, cultural practices (e.g. tree species selection), mechanical or biological controls and chemical pesticide application.

Invasive Species: A plant, animal or pathogen that has been introduced to an environment where it is not native may become a nuisance through rapid spread and increase in numbers, often to the detriment of native species.

Key Natural Heritage Features: As per Section 3.2.4 of the provincial Greenbelt Plan (2005) include: significant habitat of endangered species, threatened species and special concern species, fish habitat, wetlands, Life Science Areas of Natural and Scientific Interest (ANSIs), significant valleylands, significant woodlands, significant wildlife habitat, sand barrens, savannahs and tallgrass prairies and alvars.

Macropores: Cavities that are larger than 50 nanometres that may occur in the soil and are created by agents such as plant roots, fungi or soil fauna. Macropores are important for tree growth as they increase the hydraulic conductivity of the soil, allowing water and air to infiltrate faster and deeper.

Mulch beds: Continuous expanses of wood chips or other mulch spread at the base of trees and tree groupings. Mulch beds promote tree health by regulating soil moisture and temperature, reducing competition from weeds and reducing soil compaction.

Native Species: A species that occurs naturally in a given geographic region that may be present in a given region only through natural processes and with no required human intervention.

Plant Health Care (PHC): A holistic approach to improving the health and quality of landscape vegetation, especially trees, through a wide range of practices, including proper species selection and planting, mulching, watering, fertilization, protection, pruning and risk mitigation. Particular attention is paid to the rooting environment, as a majority of plant health issues originate as a result of below-ground stressors.

Qualified Arborist: A person who maintains his or her certification through the International Society of Arboriculture and/or the American Society of Consulting Arborists as a competent practitioner of the art and science of arboriculture.

Replacement Value: A monetary appraisal of the cost to replace one or more trees, as described by the Council of Tree and Landscape Appraisers.

Right-of-Way: A portion of land granted through an easement or other legal mechanism for transportation purposes, such as for a rail line, highway or roadway. A right-of-way is reserved for the purposes of maintenance or expansion of existing services. Rights-of-way may also be granted to utility companies to permit the laying of utilities such as electric power transmission lines (hydro wires) or natural gas pipelines.

GLOSSARY (CONT'D)

Species at Risk: In Ontario, a "species at risk" is any naturally occurring plant or animal in danger of extinction or of disappearing from the province. Once classified as "at risk," they are added to the Species at Risk in Ontario (SARO) List. Such species can also be designated at the federal level.

Root Pruning: The selective and targeted removal of tree roots prior to construction to minimize the potential for damage associated with soil excavation. A key objective of root pruning is to minimize loss to significant structural and feeder roots, while preventing interference with necessary works, which may result in further root damage.

Sensitive Excavation: The implementation of excavation methods such as hydraulically or pneumatically assisted excavation to uncover roots prior to large-scale excavation, in order to enable effective root pruning.

Standard Proctor Density: The maximum dry density of a soil determined in accordance with Ontario Provincial Standards.

Street Trees: Municipally owned trees, typically found within the road right-of-way along roadsides and in boulevards, tree planters (pits) and front yards.

Tree Protection Zone (TPZ): An area within which works such as excavation, grading and materials storage are generally forbidden. The size of a TPZ is generally based upon the diameter or drip-line of the subject tree.

Urban Forest: Generally refers to all trees and associated woody vegetation (e.g. shrubs), within a given jurisdiction, typically one with a significant urbanized component or one that is entirely urbanized. This includes trees in natural areas as well as trees in more manicured settings such as parks, yards and boulevards. In the City of Burlington, the urban forest encompasses trees in both the urban and rural areas within the city but is called the "urban" forest because this is the convention that has developed.

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This Urban Forest Management Plan is the product of a collaborative effort between the City's Project Management Team and the project study team.

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LOCAL STAKEHOLDER ORGANIZATIONS

Burlington Green, Burlington Lions Club, Friends of Kerncliff Park, Royal Botanical Gardens, Conservation Halton, Halton Region, Burlington Historical Society, Region of Halton Police Services, Hydro One, Burlington Hydro, Field & Stream Rescue Team, Hamilton Halton Home Builders Association, Sustainable Development Committee (SDS), Halton Agricultural Advisory Committee, Halton District School Board, Halton Catholic District School Board and Burlington private schools.

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PHOTO CREDITS

All photos in this document were provided courtesy of the City of Burlington's Communications Department, Urban Forest Innovations Inc. and Beacon Environmental Ltd.

Management and Implementation ~ Community Engagement and Stewardship ~ Protection and Preservation

Replenishment and Enhancement ~ Tree Health and Risk Management

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