



**Town of Aurora
Environmental Advisory Committee
Meeting Agenda**

Date: Monday, May 13, 2024
Time: 7 p.m.
Location: Holland Room, Aurora Town Hall

Meetings are available to the public in person and via live stream on the [Town's YouTube channel](#). To participate, please visit aurora.ca/participation.

	Pages
1. Call to Order	
2. Land Acknowledgement	
3. Approval of the Agenda	
4. Declarations of Pecuniary Interest and General Nature Thereof	
5. Receipt of the Minutes	
5.1 Environmental Advisory Committee Meeting Minutes of April 15, 2024	1
1. That the Environmental Advisory Committee Meeting Minutes of April 15, 2024, be received for information.	
6. Delegations	
7. Matters for Consideration	
7.1 Memorandum from Energy and Climate Change Analyst; Re: 2024 Energy Conservation and Demand Management Plan Draft Report	5
1. That the memorandum regarding the 2024 Energy Conservation and Demand Management Plan Draft Report be received; and	
2. That the Environmental Advisory Committee comments regarding the 2024 Energy Conservation and Demand Management Plan Draft Report be received and referred to staff for consideration and further action as appropriate.	
8. Informational Items	

9. **New Business**

10. **Adjournment**



**Town of Aurora
Environmental Advisory Committee
Meeting Minutes**

Date: Monday, April 15, 2024
Time: 7:00 p.m.
Location: Holland Room, Aurora Town Hall

Committee Members: Councillor Rachel Gilliland (Chair)
Councillor Wendy Gaertner (Vice Chair)
Nicole Arsenault
Shun Chen
Pippette Eibel
Alain Godin
Denis Heng
Kristen Martens
Ken Turriff

Other Attendees: Natalie Kehle, Analyst, Energy and Climate Change
Linda Bottos, Council/Committee Coordinator

1. Call to Order

The Chair called the meeting to order at 7 p.m.

2. Land Acknowledgement

The Committee acknowledged that the meeting took place on Anishinaabe lands, the traditional and treaty territory of the Chippewas of Georgina Island, recognizing the many other Nations whose presence here continues to this day, the special relationship the Chippewas have with the lands and waters of this territory, and that Aurora has shared responsibility for the stewardship of these lands and waters. It was noted that Aurora is part of the treaty lands of the Mississaugas and Chippewas, recognized through Treaty #13 and the Williams Treaties of 1923.

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3. Approval of the Agenda

Moved by Alain Godin

Seconded by Nicole Arsenault

That the agenda as circulated by Legislative Services be approved.

Carried

4. Declarations of Pecuniary Interest and General Nature Thereof

There were no declarations of pecuniary interest under the *Municipal Conflict of Interest Act, R.S.O. 1990, c. M.50*.

5. Receipt of the Minutes

5.1 Environmental Advisory Committee Meeting Minutes of February 26, 2024

Moved by Ken Turriff

Seconded by Denis Heng

1. That the Environmental Advisory Committee meeting minutes of February 26, 2024, be received for information.

Carried

6. Delegations

None.

7. Matters for Consideration

7.1 Memorandum from Energy and Climate Change Analyst; Re: 2024 Energy Conservation and Demand Management Plan Draft Report Presentation

Patrick Darby, Energy & Carbon Team Manager, and Kayden Toffolo, Energy Engineering Intern, of WalterFedy presented the Energy Conservation and Demand Management Plan (ECDMP), highlighting key topics including: the project targets and milestones, the addition of PCP

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Milestone 1-3 to the plan, the corporate assets including town-owned facilities and greenhouse gas (GHG) emissions from solid waste, new targets implemented into the plan including 20% reduction in GHG emissions from 2018 and a net zero goal by 2050, and the change in GHG emissions since the 2019 ECDMP targets were established. They further discussed the breakdown of the Town's corporate emission profile, including utility use trends such as natural gas and electricity, the percentage of corporate GHG emissions from town facilities, and planned projects included in the ECDMP, including short term, medium term, and long term. They concluded with additional recommendations, highlighting energy performance monitoring, investigating low-carbon electricity generation opportunities, and purchasing carbon offsets to meet GHG reduction targets, then identified the progress towards goals.

Staff commented on the progress made from the previous ECDMP, highlighting the focus on GHG reduction practices, collecting and tracking significant data including from fleet, waste and public lighting, the shift towards decarbonization, and the acquisition of new properties and their contributions towards the emission profile and assets.

The Committee discussed the newly designed Aurora Town Square and its environmental design features, the improvement of targets set in the ECDMP, possibility of alternative energy methods such as hydrogen and microgrids, sustainability building standards to reduce GHG emissions and reach net zero, how carbon offsets can be successful as an alternative recommendation. They further discussed how the Town pays a carbon charge based on emissions in the natural gas bills, the introduction of a waste audit and where corporate waste is being disposed, and how the short term plans will be incorporated in the budget process.

The Committee also sought clarification on the electricity consumption reductions from the wastewater pumping stations since 2018 and how pet waste diversion is included in the plan, and expressed concerns regarding the Ontario grid electricity security with the electrification of Town fleet and buildings system, the need for more alternative energy sources such as waste-heat recovery, Town employee shift in habits to conserve energy

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and need for employee buy-in, and investments needed at Town Hall to address occupancy comfort and improved lighting controls.

Moved by Kristen Martens

Seconded by Pippette Eibel

1. That the memorandum regarding the 2024 Energy Conservation and Demand Management Plan Draft Report Presentation be received; and
2. That the Environmental Advisory Committee comments regarding the 2024 Energy Conservation and Demand Management Plan Draft Report Presentation be received and referred to staff for consideration and further action as appropriate.

Carried

8. Informational Items

None.

9. New Business

The Committee announced that the Town's Annual Spring Community Clean Up will be taking place on Saturday, April 20, 2024.

Staff announced that the Electric Vehicle Showcase will be taking place at Stronach Aurora Recreation Complex on Sunday, April 28, 2024.

10. Adjournment

Moved by Alain Godin

Seconded by Nicole Arsenault

That the meeting be adjourned at 8:54 p.m.

Carried



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Aurora, Ontario
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aurora.ca

Town of Aurora

Memorandum

Planning and Development Services

Re: 2024 Energy Conservation and Demand Management Plan Draft Report

To: Environmental Advisory Committee

From: Natalie Kehle, Energy and Climate Change Analyst

Date: May 13, 2024

Recommendation

1. That the memorandum regarding the 2024 Energy Conservation and Demand Management Plan Draft Report be received; and
2. That the Environmental Advisory Committee comments regarding the 2024 Energy Conservation and Demand Management Plan Draft Report be received and referred to staff for consideration and further action as appropriate.

Background

The Town of Aurora updated its Energy Conservation and Demand Management Plan (ECDMP), a requirement every five-years under the Ontario Regulation 23/25, Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans for public building energy use. In 2018, the Town Council committed to meeting the Partners for Climate Protection (PCP) Milestone framework, which is a Federation for Canadian Municipalities funded initiative that supports municipalities taking action on climate change. In order to meet the PCP requirements and the O. Reg. 23/25, the 2024 ECDMP update expands the scope of corporate greenhouse gas (GHG) emission sources covered in the plan compared to past ECDMPs. The 2019 ECDMP included energy use from public buildings, fleet and water/wastewater facilities. The new sources in the 2024 ECDMP update include GHG emissions from solid waste, propane, streetlights, and other public lighting. The 2024 inventory now consists of emissions from:

- Buildings (offices, recreation centres, Library, etc.)
- Fleet (vehicles and equipment)
- Water and wastewater (pumping stations)

2024 Energy Conservation and Demand Management Plan Draft Report

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-
- Corporate solid waste (from all Town-owned buildings and public receptacles)
 - Streetlights and other public lights (parks and trails, Town-owned parking lots)

The ECDMP includes Town-owned assets only. Emissions from homes, local businesses, community waste and personal and public transportation are captured under the Town's Community Energy Plan (CEP) and are excluded from this plan.

The 2024 ECDMP update includes:

- Setting short, medium and long-term GHG reduction targets
- Identifying municipal best practices for reducing corporate GHG emissions
- Reviewing completed initiatives from the 2019 ECDMP and estimated savings
- Updating the GHG emission inventory with the latest available data (2022)
- Identifying energy conservation measures for the short, medium and long-term
- Forecasting GHG emissions

The draft ECDMP incorporates the feedback and comments obtained from Town Departments, including Community Services, Operations, Planning and Development Services, Corporate Services and Finance. The full draft plan is provided to the Environmental Advisory Committee for comments and feedback. The draft plan is scheduled to be presented to Council on June 4th, 2024, at the Committee of the Whole meeting.

Attachments

Attachment 1 –Draft 2024 Energy Conservation and Demand Management Plan



ENERGY CONSERVATION AND DEMAND MANAGEMENT PLAN

APPENDICES TOWN OF AURORA

April 11, 2024



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A Appendix A: Additional Facility Information

A.1 Aerial Views of Facilities

Aerial views of Town of Aurora buildings are provided in the following figures.



Figure 1: 15171 Yonge St



Figure 2: 15165A Yonge St



Figure 3: Aurora Community Centre



Figure 4: Aurora Cultural Centre



Figure 5: Aurora Family Leisure Complex

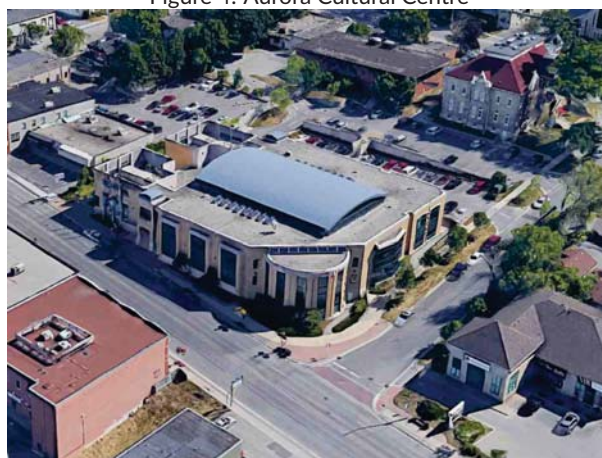


Figure 6: Aurora Public Library



Figure 7: Aurora Seniors Centre



Figure 8: Aurora Sports Dome



Figure 9: Aurora Town Hall



Figure 10: Joint Operations Centre



Figure 11: McMahon Clubhouse



Figure 12: Stronach Aurora Recreation Complex



Figure 13: The Armoury

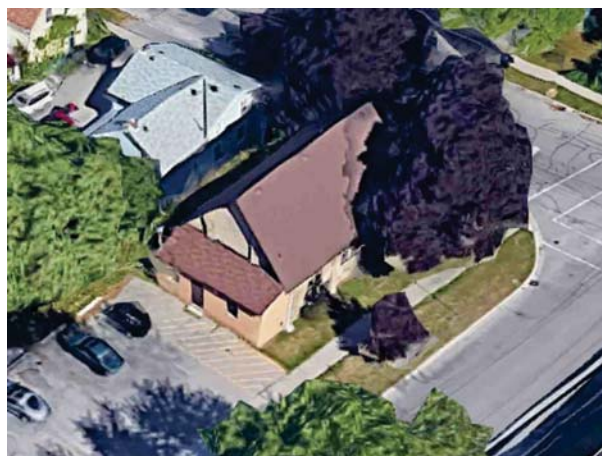


Figure 14: Victoria Hall

A.2 Vehicles in the Corporate Fleet

The corporate fleet considered under this Energy Conservation and Demand Management Plan are summarized in Table 1. Dashes indicate data that were not available at the time of review.

Table 1: Fleets summary

Category	Department	Vehicle ID	Description	Make and model
Fleet: Equipment	Fleet: Arboretum	Vehicle 27518	275-18: Tractor (Arbortreum)	John Deere X380
	Fleet: Arboretum	Vehicle 299	299: Tractor	John Deere 4320
	Fleet: Facilities	Vehicle 58022	580-22: Lawn Tractor	John Deere X350
	Fleet: Facilities	Vehicle 58122	581-22: Lawn Tractor	John Deere X350
	Fleet: Facilities	Vehicle 588	588: Scissor Lift	SJIII3226
	Fleet: Facilities	Vehicle 589	589: Telescopic Lift	Genie AWP .25s
	Fleet: Facilities	Vehicle 590	590: Ice Resurfacer	Olympia Millenium
	Fleet: Facilities	Vehicle 593	593: Ice Resurfacer	Zamboni 526
	Fleet: Facilities	Vehicle 595	595: Ice Resurfacer	Zamboni 526
	Fleet: Facilities	Vehicle 596	596: Ice Resurfacer	Zamboni 525
	Fleet: Facilities	Vehicle 597	597: Ice Resurfacer	Zamboni 526
	Fleet: Facilities	Vehicle 59920	599-20: John Deer 1575	John Deer 1575
	Fleet: Parks	Vehicle 216	216: Portable Welder	Red-D-Arc D300K
	Fleet: Parks	Vehicle 230	230: Off-Road Utility Vehicle	Kubota RTV 1100
	Fleet: Parks	Vehicle 23522	235-22: Off-Road Utility Vehicle	Kubota RTV 1100
	Fleet: Parks	Vehicle 23821	238-21: Backhoe	John Deere 310 SL / HL Backhoe
	Fleet: Parks	Vehicle 24020	240-20: Tractor	Massey Ferguson 1750MH
	Fleet: Parks	Vehicle 24120	241-20: Tractor	Case Farmall 75A
	Fleet: Parks	Vehicle 241	241: Tractor	John Deere 5225
	Fleet: Parks	Vehicle 242	242: Tractor	John Deere 5115M
	Fleet: Parks	Vehicle 243	243: Line Painter	John Deere F1435
	Fleet: Parks	Vehicle 245	245: Zero Turn Mower	Kubota ZD1211
	Fleet: Parks	Vehicle 246	246: Zero Turn Mower	Kubota ZD1211
	Fleet: Parks	Vehicle 247	247: Zero Turn Mower	Kubota ZD1211R
	Fleet: Parks	Vehicle 248	248: Zero Turn Mower	Kubota ZD1211R
	Fleet: Parks	Vehicle 249	249: Zero Turn Mower	Kubota ZD1211R
	Fleet: Parks	Vehicle 250	250: Zero Turn Mower	Kubota ZD1211R
	Fleet: Parks	Vehicle 251	251: Zero Turn Mower	Kubota ZD1211R
	Fleet: Parks	Vehicle 25219	252-19: Bobcat Mini Excavator	Bobcat E26
	Fleet: Parks	Vehicle 25319	253-19: Bobcat Skid Steer Track Loader	Bobcat T590
	Fleet: Parks	Vehicle 254	254: Articulating Compact Wheel Loader	John Deere 324J
	Fleet: Parks	Vehicle 25519	255-19: Wide Area Mower	Toro Groundsmaster 5910
	Fleet: Parks	Vehicle 25619	256-19: Wide Area Mower	Toro Groundsmaster 5910
	Fleet: Parks	Vehicle 270	270: Wood Chipper	Bandit Intimidator 12XP
	Fleet: Parks	Vehicle 272	272: Roto Tiller Attachment	Rotodairon / RD150N1VF
	Fleet: Parks	Vehicle 282	282: Snow Plow Attachment	HLA Snow Wing 4200W
	Fleet: Parks	Vehicle 377	377: Greens Mower	Toro Greenmaster 1000
	Fleet: Parks	Vehicle 3966	396-6: 21 inch Rotary Hand Mowers A	Model 22260 Lawn Boy
	Fleet: Parks	Vehicle 396	396: 21 inch Rotary Hand Mowers F	Model 22260 Lawn Boy
	Fleet: Parks	Vehicle 24021	Vehicle 24021	2021 Massey Ferguson

Table 1: Fleets summary (continued)

Category	Department	Vehicle ID	Description	Make and model
	Fleet: Parks	Vehicle 257	Vehicle 257	John Deere 997 Z TRAK
	Fleet: Parks	Vehicle 261	Vehicle 261	ZD 326RP
	Fleet: Roads	Vehicle 199	199: Forklift	Toyota 8FGCU25
	Fleet: Roads	Vehicle 4021	40-21: Street Sweeper	Pelican
	Fleet: Roads	Vehicle 41	41: Street Sweeper	Elgin Broom Bear
	Fleet: Roads	Vehicle 4419	44-19: Bobcat Skid Steer Loader	Bobcat
	Fleet: Roads	Vehicle 45	45: Front End Loader	Caterpillar 924K
	Fleet: Roads	Vehicle 46	46: Front End Loader	Caterpillar 924K
	Fleet: Roads	Vehicle 50	50: Sidewalk Tractor	John Deere 3720
	Fleet: Roads	Vehicle 5119	51-19: Articulating Trackless Sidewalk Tractor	Trackless MT
	Fleet: Roads	Vehicle 52	52: Sidewalk Tractor	John Deere 3720
	Fleet: Roads	Vehicle 54	54: Steam Jenny	Thompson
	Fleet: Roads	Vehicle 55	55: Portable Air Compressor	Sullair ST185
	Fleet: Roads	Vehicle 7019	70-19: Graco Line Painter /Zone Painter	Graco
	Fleet: Roads	Vehicle 87	87: Asphalt Roller	Caterpillar CB14
	Fleet: Water/Wastewater	Vehicle 110	110: Valve Turner (Electric)	Wachs
	Fleet: Water/Wastewater	Vehicle 112	112: Hydrant Pump	Shindaiwa
	Fleet: Water/Wastewater	Vehicle 56	56: Valve Exercise Trailer	EH Wachs Compact VMT
	Fleet: Water/Wastewater	Vehicle 81	81: Water Pump (Water) 3 inch	Honda WP 30x
Fleet: Heavy duty	Fleet: Parks	Vehicle 20721	207-21: 1 Ton 4x4 Pick-up	Ford F350
	Fleet: Parks	Vehicle 223	223: 3 ton Arborist Truck	Ford F550
	Fleet: Parks	Vehicle 225	225: 2 ton Dump Truck	Ford F450 DRW
	Fleet: Parks	Vehicle 22621	226-21: 2 Ton Dump Truck	Ford F450 DRW
	Fleet: Parks	Vehicle 227	227: 2 ton Dump Truck	Ford F450 DRW
	Fleet: Parks	Vehicle 22819	228-19: 2 ton Dump Truck	Ford F450 DRW
	Fleet: Parks	Vehicle 229	229: 3 ton Garbage Compactor	Ford F550
	Fleet: Roads	Vehicle 15	15: 2 ton Dump Truck	Ford F450 DRW
	Fleet: Roads	Vehicle 1617	16-17: 3 ton (Sign Truck) Diesel	Super Duty F-550 XL (Sign Truck) Roads
	Fleet: Roads	Vehicle 1721	17-21: 4 Ton Roll Off Truck	Ford F750
	Fleet: Roads	Vehicle 18	18: 1 ton 4x4 Pick-up	Chevrolet 3500 HD
	Fleet: Roads	Vehicle 2421	24-21: 2 Ton Dump Truck	Ford F450 DRW
	Fleet: Roads	Vehicle 2519	25-19: 6 ton Diesel Dump with Sander	Freightliner 108SD
	Fleet: Roads	Vehicle 2623	26-23: 6 ton Diesel Dump with Sander	Freightliner SD
	Fleet: Roads	Vehicle 26	26: 6 ton Diesel Dump with Sander	Freightliner 108SD
	Fleet: Roads	Vehicle 2719	27-19: 6 Ton Diesel Dump with Sander	International HV
	Fleet: Roads	Vehicle 2821	28-21: 6 ton Diesel Dump with Sander	International HV
	Fleet: Roads	Vehicle 28	28: 6 ton Diesel Dump with Sander	Freightliner FM2
	Fleet: Roads	Vehicle 2919	29-19: 6 ton Diesel Dump with Sander (Tandem)	Freightliner 114SD
	Fleet: Roads	Vehicle 30	30: 6 ton Diesel Dump with Sander	International 70S
	Fleet: Roads	Vehicle 3123	31-23: 6 ton Diesel Dump with Sander	Freightliner SD
	Fleet: Roads	Vehicle 32	32: 6 ton Diesel Dump with Sander	Freightliner 108SD
	Fleet: Roads	Vehicle 3422	34: 6 Ton Diesel Multi Purpose Dump (Tandem)	Freightliner 114SD
	Fleet: Roads	Vehicle 38	38: 3 ton Dump Truck	Ford F550
Fleet: Light duty	Fleet: Arboretum	Vehicle 297	297: Off-Road Utility Vehicle	Kubota RTV 1100C
	Fleet: By-Law	Vehicle 401	401: 1/4 ton 4x4 Pick-up	Nissan Frontier Crewcab SV
	Fleet: By-Law	Vehicle 402	402: 1/4 ton Pick-up	Nissan Frontier SV
	Fleet: By-Law	Vehicle 40319	403-19: Police Interceptor (Explorer SUV)	Ford Explorer
	Fleet: By-Law	Vehicle 40419	404-19: Police Interceptor (Explorer SUV)	Ford Explorer
	Fleet: By-Law	Vehicle 40518	405-18: Ford Van	Ford Transit
	Fleet: By-Law	Vehicle 40621	406-21: Ford Explorer Hybrid SUV	Ford Explorer
	Fleet: Facilities	Vehicle 50021	500-21: 1/2 ton Pick-up	Ford F150
	Fleet: Facilities	Vehicle 502	502: 1/2 ton Pick-up	Ford F150
	Fleet: Facilities	Vehicle 50321	503-21: 1/2 ton Pick-up	Ford F150
	Fleet: Facilities	Vehicle 504	504: 1/2 ton Pick-up	Chevrolet Silverado
	Fleet: Parks	Vehicle 20121	201-21: Hybrid SUV	Ford Explorer
	Fleet: Roads	Vehicle 1	1: 1/2 ton Pick-up	Ford F150
	Fleet: Roads	Vehicle 13	13: 1/2 ton Pick-up	Ford F150
	Fleet: Roads	Vehicle 2	2: Hybrid SUV	Ford
	Fleet: Roads	Vehicle 23	23: 1/2 ton Pick-up	Chevrolet Silverado
	Fleet: Roads	Vehicle 6	6: 1/2 ton Pick-up	Ford F150
	Fleet: Roads	Vehicle 721	7-21: 1/2 Ton Pick-up	Ford F150
	Fleet: Roads	Vehicle 618	Vehicle 618	2018 Ford F150
	Fleet: Water/Wastewater	Vehicle 10	10: 1/2 ton Pick-up	Ford F150
	Fleet: Water/Wastewater	Vehicle 63	63: 1/4 ton Pick-up	Chevrolet Colorado
	Fleet: Water/Wastewater	Vehicle 8	8: 1/2 ton Supercab Pick-up	Ford F150
	Fleet: Water/Wastewater	Vehicle 9	9: 1/2 ton Supercab Pick-up	Ford F150
Fleet: Medium duty	Fleet: Facilities	Vehicle 50119	501-19: 3/4 ton Cargo Van	Ford Transit

Table 1: Fleets summary (*continued*)

Category	Department	Vehicle ID	Description	Make and model
	Fleet: Facilities	Vehicle 505	505: 3/4 ton Cargo Van	Nissan NV2500
	Fleet: Parks	Vehicle 20019	200-19: 3/4 ton Pick-up	Ford F250 (3/4)
	Fleet: Parks	Vehicle 201	201: 3/4 ton Pick-up	Ford F250 (3/4)
	Fleet: Parks	Vehicle 20219	202-19: 3/4 ton Pick-up	Ford F250
	Fleet: Parks	Vehicle 203023	203-23: 3/4 Ton Pick-up	Ford F250 (3/4)
	Fleet: Parks	Vehicle 20422	204-22: 3/4 Ton Pick up 4x4	Ford F250
	Fleet: Parks	Vehicle 204	204: 3/4 ton Pick-up	Chevrolet Silverado
	Fleet: Parks	Vehicle 205	205: 3/4 ton Pick-up	Ford F250
	Fleet: Parks	Vehicle 206	206: 3/4 ton Pickup	Ford F250
	Fleet: Parks	Vehicle 208	208: 3/4 ton Pick-up 4x4	Ford F250
	Fleet: Parks	Vehicle 209	209: 3/4 ton Pick-up 4x4	Ford F250
	Fleet: Parks	Vehicle 21221	212-21: 3/4 Ton Pick-up 4x4 with Lift Gate	Ford F250
	Fleet: Parks	Vehicle 22417	224-17: 3/4 ton Pick-up Crewcab	Dodge Ram 2500
	Fleet: Roads	Vehicle 2221	22-21: 3/4 Ton Pick-up 4x4 with Lift Gate	Ford F250
	Fleet: Roads	Vehicle 2322	23-22: 3/4 Ton Pick-up 4x4	Ford F250
	Fleet: Roads	Vehicle 419	4-19: 3/4 ton Pick-up	Ford F250
	Fleet: Roads	Vehicle 521	5-21: 3/4 Ton Pick-up 4x4 with Lift Gate	Ford F250
	Fleet: Roads	Vehicle 2219	Vehicle 2219	2021 Ford F250
	Fleet: Water/Wastewater	Vehicle 61	61: 3/4 Ton Cargo Van	Nissan NV 2500
	Fleet: Water/Wastewater	Vehicle 62	62: 3/4 Ton Cargo Van	Nissan NV 2500
	Fleet: Water/Wastewater	Vehicle 6420	64-20: 3/4 Ton Cargo Van	Ford Transit 250
Fleet: Other	Fleet: Arboretum	Vehicle 710	Vehicle 710	Arboretum gasoline jerry can
	Fleet: Arboretum	Vehicle 711	Vehicle 711	Arboretum diesel jerry can
	Fleet: Facilities	Vehicle 706	Vehicle 706	ACC gasoline jerry can
	Fleet: Facilities	Vehicle 707	Vehicle 707	AFLC gasoline jerry can
	Fleet: Facilities	Vehicle 708	Vehicle 708	SARC gasoline jerry can
	Fleet: Facilities	Vehicle 709	Vehicle 709	SC gasoline jerry can
	Fleet: Parks	Vehicle 700	Vehicle 700	Parks gasoline jerry can
	Fleet: Parks	Vehicle 701	Vehicle 701	Parks diesel jerry can
	Fleet: Roads	Vehicle 702	Vehicle 702	Roads gasoline jerry can
	Fleet: Roads	Vehicle 703	Vehicle 703	Roads diesel jerry can
	Fleet: Roads	Vehicle 713	Vehicle 713	Diesel Transfer Tank
	Fleet: Water/Wastewater	Vehicle 704	Vehicle 704	Water gasoline jerry can
	Fleet: Water/Wastewater	Vehicle 705	Vehicle 705	Water diesel jerry can

B Appendix B: Methodology Details

B.1 Analysis Methodology

B.1.1 Scenario Analysis Definitions

The following terms are defined for clarity concerning the scenario analysis.

- **Measure.** An actionable opportunity to reduce utility use or GHG emissions pertaining to a specific asset.
- **Possible measures.** The set of measures that could potentially be implemented for each individual asset.
- **Measure implementation plan.** A plan for measures to be implemented at each asset, consisting of the following details.
 - A set of measures to be implemented and the asset for which each measure is to be implemented.
 - The year during which each measure is to be implemented, for each asset.
- **Scenario.** A possible iteration of a measure implementation plan.
- **GHG reduction roadmap.** The recommended measure implementation plan.

B.1.2 Scenario Analysis Methodology

The scenario analysis was completed according to the following methodology.

1. **Possible measures.** Each asset considered under this Energy Conservation and Demand Management Plan was reviewed and specific measures that could be implemented for each specific asset were identified. This included a review of Energy Audit reports completed by Stantec in 2017, the 2022 BCAs, and the identification of additional measures focused on reducing GHG emissions. Unless otherwise stated, where possible, the year of implementation for each measure corresponds with the year it's set to be replaced, as per the asset management plan. The feasibility of measures was then checked by performing interviews and workshops with staff, which are ongoing. As part of this process, the following were quantified for each possible measure.
 - Project cost estimated to implement the measure. For measures derived from Energy Audit reports completed by Stantec in 2017, project costs were taken from reports but updated to 2024 costs, assuming an average inflation rate of 3.2% based on data reported by Statistics Canada. For additional measures focused on reducing GHG emissions, project costs were approximated based on asset sizes / quantities. It should be emphasized that project cost estimates presented in this analysis are high-level approximations only. The primary intent of project cost estimates in this analysis is to evaluate scenarios relative to each other. It is recommended that more detailed project cost estimates be completed for project budgeting purposes.
 - The measure's expected impact on utility use, GHG emissions and utility costs.
2. **Scenario development.** For the scenario that was identified, a specific measure implementation plan that considers all assets in all sectors was developed. The development of the scenario involved selecting which of the possible measures would be implemented for each asset, and when, to achieve the objectives of that scenario. This process involved iteratively modeling the expected impacts on project costs / utility use / GHG emissions as measures were assigned to each scenario, to assure that the objectives of the scenario were reasonably achieved.
3. **Scenario utility analysis.** A utility analysis was completed for each scenario, in which the yearly utility use for each asset was projected from 2022 to 2050 (i.e. the evaluation period) for all utilities (i.e. Electricity, Natural Gas, Ethanol 10, Biodiesel 5, Propane, and Waste GHG), based on the measure implementation plan specific to each scenario. Also, yearly project costs, GHG emissions and utility costs were projected from 2022 to 2050 based on the yearly utility use projections for each scenario by applying the assumed GHG factors and utility cost rates indicated in Section B.2. All future financial expenditures were projected in current dollar values (i.e. future costs were not adjusted for inflation, and cumulative cost estimates were not discounted back to present value).

B.2 Analysis Assumptions

Assumptions applied throughout the utility baseline and scenario analysis are summarized as follows.

- The GHG emissions factor associated with Ontario's electricity grid was assumed to change over time. Where available, the past values were taken from the National Inventory Report (NIR) for historical emissions factors values. For values that weren't available from the NIR (2022 and beyond), these values were calculated based on projections made by the IESO, inferred from the IESO's *Annual Planning Outlook, December 2021*. Figure 15 presents the electricity grid GHG emissions factors assumed over the evaluation period.

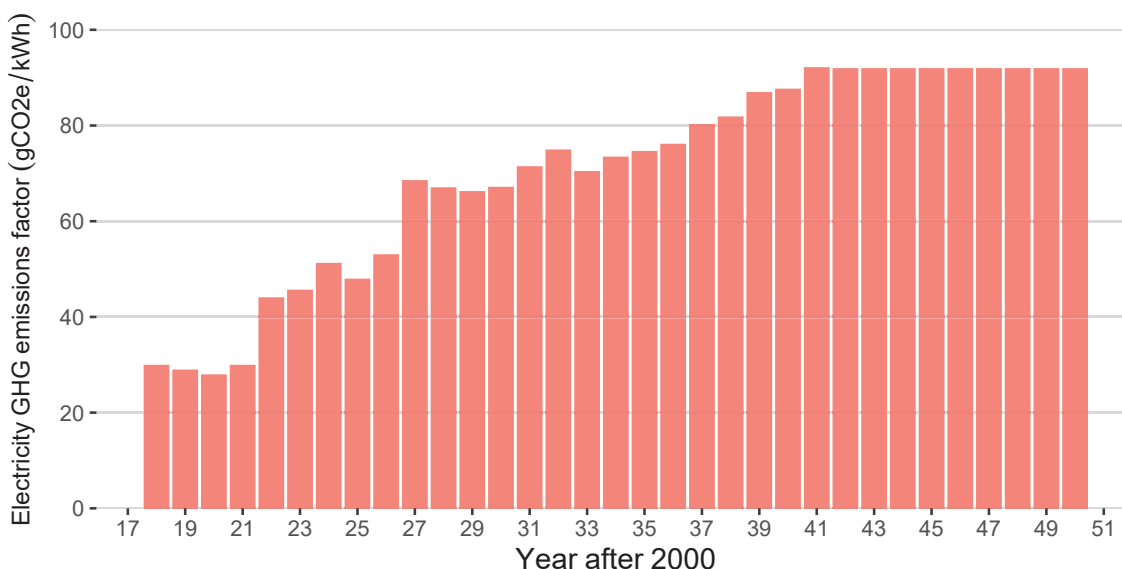


Figure 15: Electricity GHG emissions factor projection (Source: IESO Annual Planning Outlook 2021)

- Other GHG emissions factors were assumed as per Table 2 (source: 2022 National Inventory Report).

Table 2: GHG Emissions Factor Assumptions

Utility	Unit	Value
Electricity	[gCO ₂ e/kWh]	30
Natural gas	[gCO ₂ e/m ³]	1921
Propane	[gCO ₂ e/L]	1515
Gasoline	[gCO ₂ e/L]	2307
Ethanol 10	[gCO ₂ e/L]	2227
Diesel	[gCO ₂ e/L]	2680
Biodiesel 5	[gCO ₂ e/L]	2600

- Utility cost rate assumptions for the utility use baseline analysis are as per Table 3. Note that the federal carbon charge is delineated from associated fuel utility costs and accounted for explicitly, for greater granularity. Also note that the values presented are the values taken from 2018. Utility cost rates are typical for industry and were obtained from sources such as IESO, and carbon offset costs were obtained from Bullfrog power. These costs are projected to increase annually with an average inflation rate of 2.2%.

Table 3: Utility Cost Rate Assumptions

Utility	Unit	Value
Electricity	[\$/kWh]	0.14
Natural gas	[\$/m ³]	0.26
Propane	[\$/L]	0.6
Gasoline	[\$/L]	1.5
Ethanol 10	[\$/L]	1.5
Diesel	[\$/L]	1.5
Biodiesel 5	[\$/L]	1
Waste GHG	[\$/tCO ₂ e]	0
Carbon offsets	[\$/tCO ₂ e]	30.05
Federal carbon charge	[\$/tCO ₂ e]	0

- **Utility cost rates for federal carbon charge.** The federal carbon charge was assumed to change over time, based on existing legislation. In this analysis, the federal carbon charge is applied to all GHG emissions associated with scope 1 GHG emissions (GHG emissions due to direct fuel combustion). Figure 16 presents the federal carbon charge rates assumed over the evaluation period.

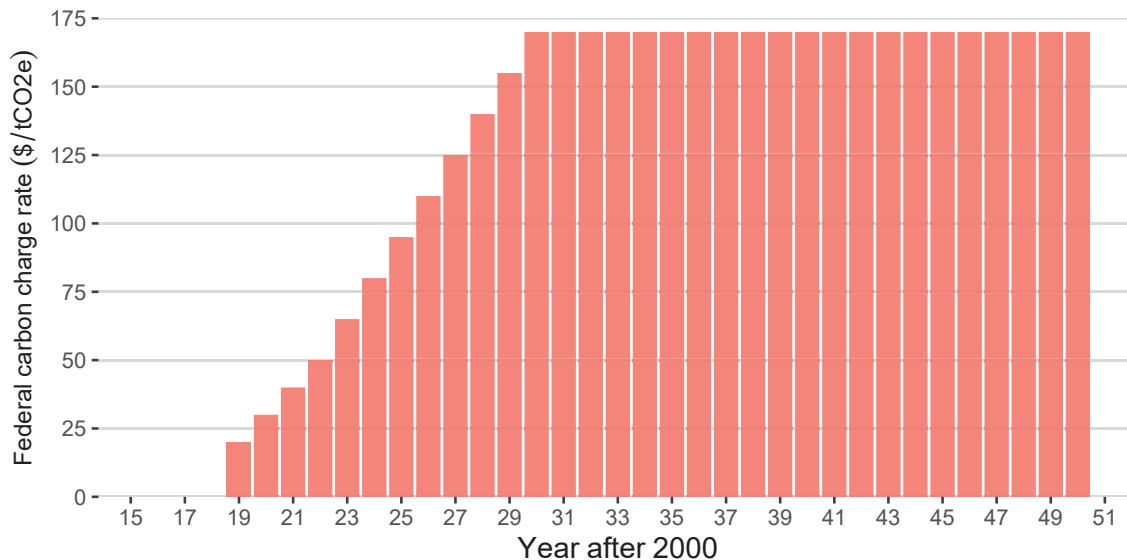


Figure 16: Federal carbon charge projection (Source: Government of Canada (up to 2030); Assumed (After 2030))

B.3 Waste Sector Emissions Calculation Details

The Town of Aurora does not own a landfill or waste incineration facility, and sends its waste to facilities owned by York Region. Two of these sites are landfill sites, and the other three are waste-to-energy centres. It is assumed that 50% of the waste is sent to a landfill site, and the other 50% is sent to a waste-to-energy centre.

The PCP protocol does not provide a methodology to calculate GHG emissions for waste-to-energy centres, so the approach used by the GHG Protocol for Cities is followed - as the waste is exported for energy generation outside of the boundaries of the Town, these emissions are excluded from this report.

For the waste sent to landfill, GHG emissions are calculated as per the PCP protocol, and the methodology is outlined below.

- The annual quantity of solid waste generated by the Town of Aurora is estimated.
 - For each corporate-owned facility, park, and public receptacle, the annual volume of waste is estimated.
 - This is done by measuring the garbage bin capacity and number, how full the bin usually is at pickup, and frequency of garbage pickup.
 - The waste volume is converted to tons by assuming a volume to weight conversion factor of 0.178 tonnes/m³.
 - The total annual mass of corporate waste is obtained by doing this for each corporate-owned waste receptacle and taking the sum.
- The waste composition is assumed as per the general municipal solid waste composition values for North America, provided by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, and listed in Table 4.

- For each waste category, the degradable organic carbon (DOC) factor is computed by taking the sum of the fraction of a waste category present in the waste stream times its DOC. Specific data for the waste composition was not available from the Town, so general numbers from a solid waste composition study are used, as per Table 4.

Table 4: Waste Composition Assumptions

Waste Category	Composition Percentage	Degradable Organic Carbon
Food	0.34	0.15
Paper/Cardboard	0.23	0.40
Wood Products	0.06	0.43
Textiles	0.04	0.24
Plastics and other inerts (glass, metal, etc.)	0.33	0.15

- The quantity of methane generated by the landfilled waste is calculated by multiplying the mass of waste by the DOC, fraction of DOC dissimilated (using the PCP protocol default value of 0.6), fraction of methane in the landfill gas (using the PCP protocol default value of 0.5), and stoichiometric ratio between methane and carbon (16/12).
- From this, the downstream GHG emissions (in tCO₂e) can be calculated by multiplying the quantity of methane by 21 (the global warming potential of CH₄), (1-OX) (where OX is the oxidation factor, using the PCP protocol default value of 0.1), and (1-f) (where f is the fraction of methane emissions recovered by the landfill gas collection system). f is calculated to be 0.65 based on the default values for a comprehensive landfill gas collection system.

B.4 Utility Use Baseline Recalculation

The 2018 baseline based on the data available from the 2019 ECDMP is presented below:

Table 5: Town of Aurora 2018 Energy Consumption and GHG Emissions Summary as Presented in the 2019 ECDMP

		Administrative Offices	Public Facilities	Indoor Recreation Facilities	Water/ Wastewater Facilities	Fleet	Total
Electricity Consumption	[kWh/yr]	1,299,380	1,220,316	6,761,361	118,358	-	9,399,415
Natural Gas Consumption	[m3/yr]	193,359	119,928	921,252	-	-	1,234,539
GHG Emissions	[tCO ₂ e]	421	279	2,030	5.1	491	3,226

Since 2018, the Town of Aurora has acquired new assets which must be considered in this plan, such as the Aurora Sports Dome and the buildings on Yonge street. Additionally, data for assets (such as some of the street lights and wastewater stations) was not available in 2018, but must be considered to comply with the PCP inclusion protocol.

To establish a fair basis of comparison, if assets did not have utility data available in a given year, it is assumed that the utility consumption in the baseline year was approximately the same as the consumption in the oldest year where utility use data is available. This is accounted for in the adjusted baseline data, presented in Table 6, as well as the historical utility use trends.

Baseline GHG emissions were calculated by multiplying yearly utility use by the respective GHG emissions factor (see the assumed GHG emissions factors in Table 2). Baseline utility costs were calculated by multiplying yearly utility use by the respective blended utility cost rates (see the assumed utility cost rates in Table 3).

The utility use baseline, for the baseline year of 2018, is summarized in Table 6.

Table 6: Town of Aurora 2018 Adjusted Baseline Energy Consumption and GHG Emissions Summary

Category	Utility	Unit	Value
Utility use	Electricity	[kWh/yr]	11,559,160
	Natural gas	[m3/yr]	1,337,896
	Propane	[L/yr]	705
	Gasoline	[L/yr]	144,831
	Diesel	[L/yr]	82,185
	Waste GHG	[tCO2e/yr]	416
	Carbon offsets	[tCO2e/yr]	0
GHG emissions	Electricity	[tCO2e/yr]	347
	Natural gas	[tCO2e/yr]	2,570
	Propane	[tCO2e/yr]	1
	Gasoline	[tCO2e/yr]	334
	Diesel	[tCO2e/yr]	220
	Waste GHG	[tCO2e/yr]	416
	Carbon offsets	[tCO2e/yr]	0
GHG emissions	Total	[tCO2e/yr]	3,888
Utility cost	Electricity	[\$/yr]	1,618,282
	Natural gas	[\$/yr]	347,853
	Propane	[\$/yr]	423
	Gasoline	[\$/yr]	217,247
	Diesel	[\$/yr]	123,278
	Waste GHG	[\$/yr]	0
	Carbon offsets	[\$/yr]	0
	Federal carbon charge	[\$/yr]	0
Utility cost	Total	[\$/yr]	2,307,083

C Appendix C: Additional Scenario Utility Use Results

C.1 Annual Plans

The annual plans considered in the scenario analysis are outlined in Table 7.

Table 7: Measure Implementation Plans

Plan	Year	Facility	Measure
GHG Reduction Plan	2025	Aurora Community Centre	Remaining low-flow water fixtures
	2025	Aurora Family Leisure Complex	Remaining exterior lights to LED
	2025	Aurora Family Leisure Complex	Remaining interior lights to LED
	2025	Aurora Family Leisure Complex	Remaining low-flow water fixtures
	2025	Aurora Public Library	Remaining interior lights to LED
	2025	Aurora Seniors Centre	Remaining exterior lights to LED
	2025	Aurora Seniors Centre	Remaining low-flow water fixtures
	2025	Aurora Town Hall	Remaining exterior lights to LED
	2025	Aurora Town Hall	Remaining interior lights to LED
	2025	Aurora Town Hall	Remaining low-flow water fixtures
	2025	McMahon Clubhouse	Remaining lights to LED
	2025	Stronach Aurora Recreation Complex	Remaining interior lights to LED
	2025	Stronach Aurora Recreation Complex	Remaining low-flow water fixtures
	2025	Victoria Hall	Remaining low-flow water fixtures
	2026	Aurora Family Leisure Complex	Pool cover
	2026	Aurora Public Library	High efficiency boiler replacement
	2026	Stronach Aurora Recreation Complex	Pool cover
	2028	Aurora Community Centre	Demand control ventilation
	2028	Aurora Seniors Centre	Demand control ventilation
	2028	Aurora Town Hall	Occupancy sensor in meeting rooms
	2028	Fleet: By-Law - Light duty	Decarbonize two vehicles
	2028	Fleet: Facilities - Ice Resurfacers	Ice resurfacer vehicle decarbonization
	2028	Fleet: Parks - Equipment	Decarbonize 10 pieces of equipment
	2029	Aurora Seniors Centre	Optimum HVAC scheduling
	2030	Aurora Community Centre	Arena low-e ceiling, if feasible
	2030	Aurora Community Centre	DHW to heat pump
	2030	Aurora Community Centre	HVAC to heat pump
	2030	Aurora Family Leisure Complex	DHW to heat pump
	2030	Aurora Family Leisure Complex	Pool heat to heat pump
	2030	Aurora Seniors Centre	HVAC to heat pump
	2030	Aurora Town Hall	HVAC to heat pump
	2030	Stronach Aurora Recreation Complex	DHW to heat pump
	2030	Stronach Aurora Recreation Complex	HVAC to heat pump
	2030	Stronach Aurora Recreation Complex	Increase roof insulation thickness
	2030	Victoria Hall	Increase roof insulation thickness
	2031	Aurora Town Hall	Increase roof insulation thickness
	2031	Fleet: Arboretum - Equipment	Equipment decarbonization
	2032	Aurora Community Centre	Electrification of ice resurfacing boiler
	2032	Aurora Family Leisure Complex	Electrification of ice resurfacing boiler
	2032	Aurora Seniors Centre	VVT or VAV system
	2032	Fleet: Water/Wastewater - Equipment	Equipment decarbonization
	2033	Fleet: Parks - Equipment	Equipment decarbonization
	2034	Aurora Community Centre	Electrification of dehumidification
	2034	Fleet: Roads - Equipment	Equipment decarbonization
	2036	Fleet: Arboretum - Light duty	Light vehicle decarbonization
	2036	Joint Operations Centre	Increase roof insulation thickness
	2037	Fleet: By-Law - Light duty	Light vehicle decarbonization
	2037	Stronach Aurora Recreation Complex	Electrification of dehumidification
	2038	Aurora Family Leisure Complex	HVAC to heat pump
	2038	Fleet: Facilities - Light duty	Light vehicle decarbonization
	2039	Aurora Sports Dome	HVAC electrification
	2039	Fleet: Parks - Light duty	Light vehicle decarbonization
	2039	Joint Operations Centre	DHW to heat pump
	2039	Joint Operations Centre	HVAC to heat pump
	2040	Fleet: Roads - Light duty	Light vehicle decarbonization
	2040	The Armoury	DHW to heat pump
	2040	The Armoury	HVAC to heat pump
	2041	Fleet: Water/Wastewater - Light duty	Light vehicle decarbonization
	2044	Aurora Cultural Centre	Solar PV electricity generation
	2045	Aurora Community Centre	Increase roof insulation thickness
	2045	Aurora Community Centre	Solar PV electricity generation

Table 7: Measure Implementation Plans (*continued*)

Plan	Year	Facility	Measure
	2045	Aurora Cultural Centre	HVAC to heat pump
	2045	Aurora Family Leisure Complex	Increase roof insulation thickness
	2045	Aurora Family Leisure Complex	Solar PV electricity generation
	2045	Aurora Seniors Centre	DHW to heat pump
	2046	Victoria Hall	HVAC to heat pump
	2048	Aurora Public Library	HVAC to heat pump
	2048	Aurora Seniors Centre	Solar PV electricity generation
	2048	The Armoury	Increase roof insulation thickness

C.2 Electricity

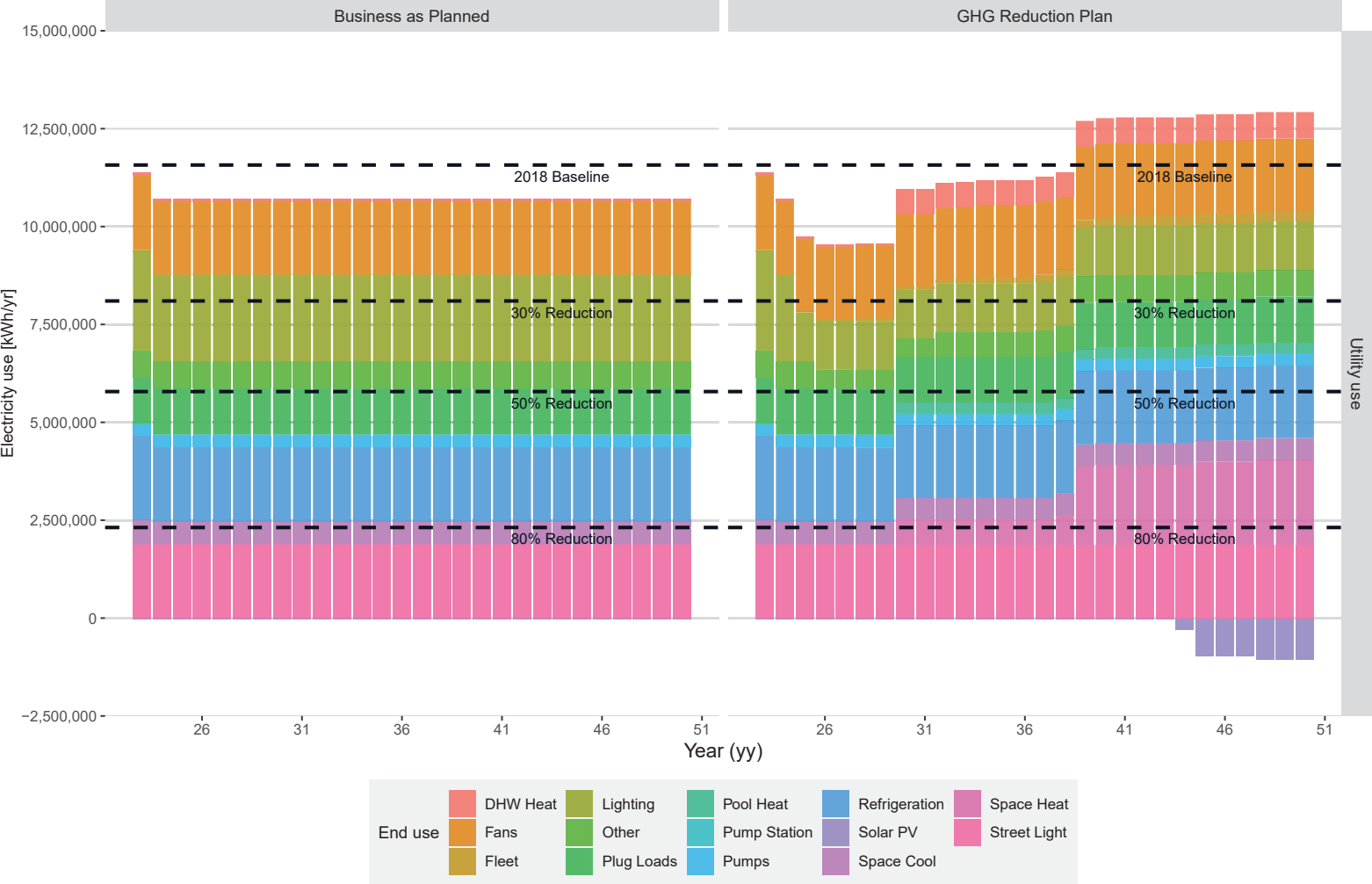


Figure 17: Electricity Utility Use Projection for Each Scenario

C.3 Natural Gas

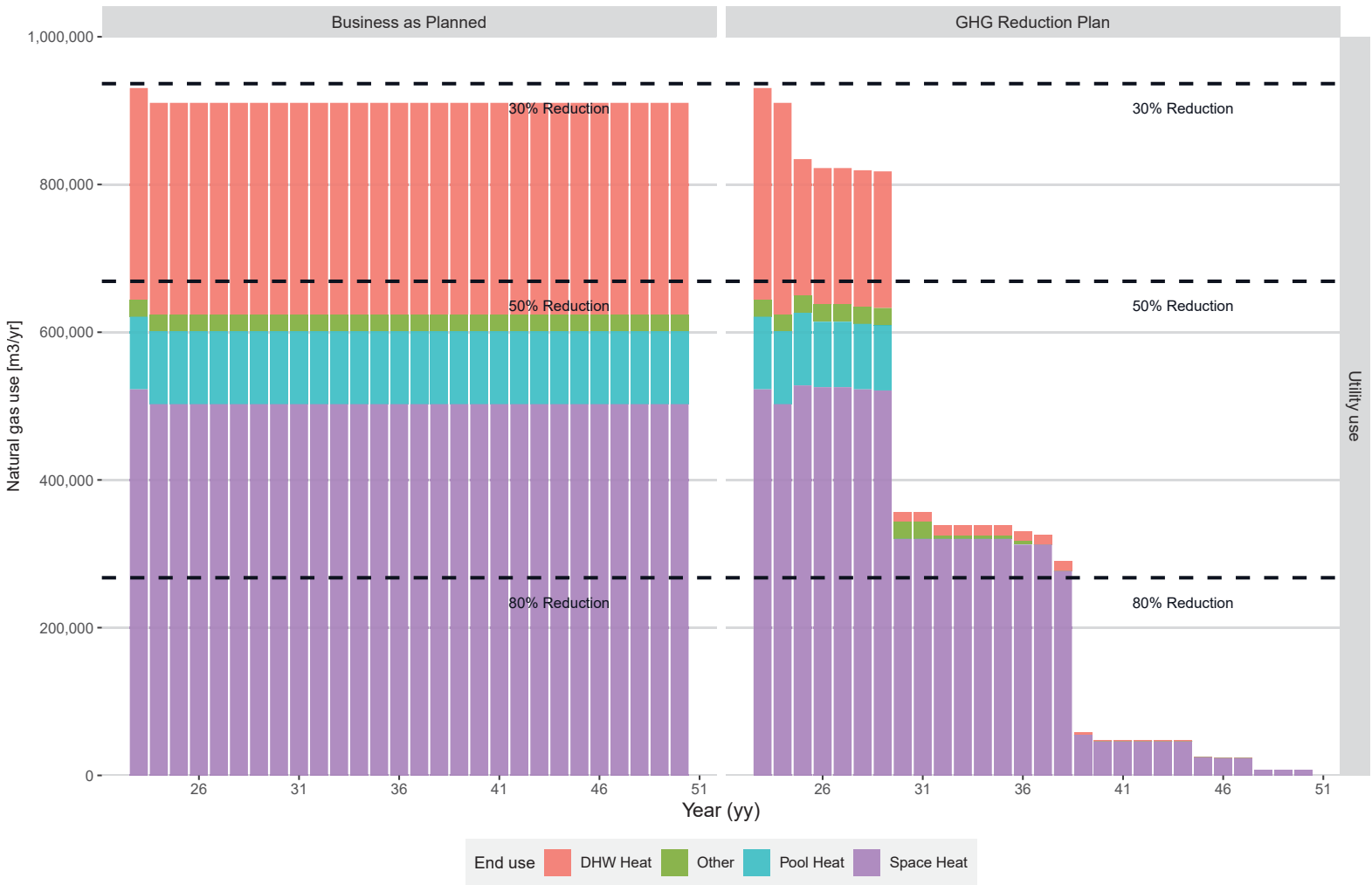


Figure 18: Natural Gas Utility Use Projection for Each Scenario

C.4 Propane

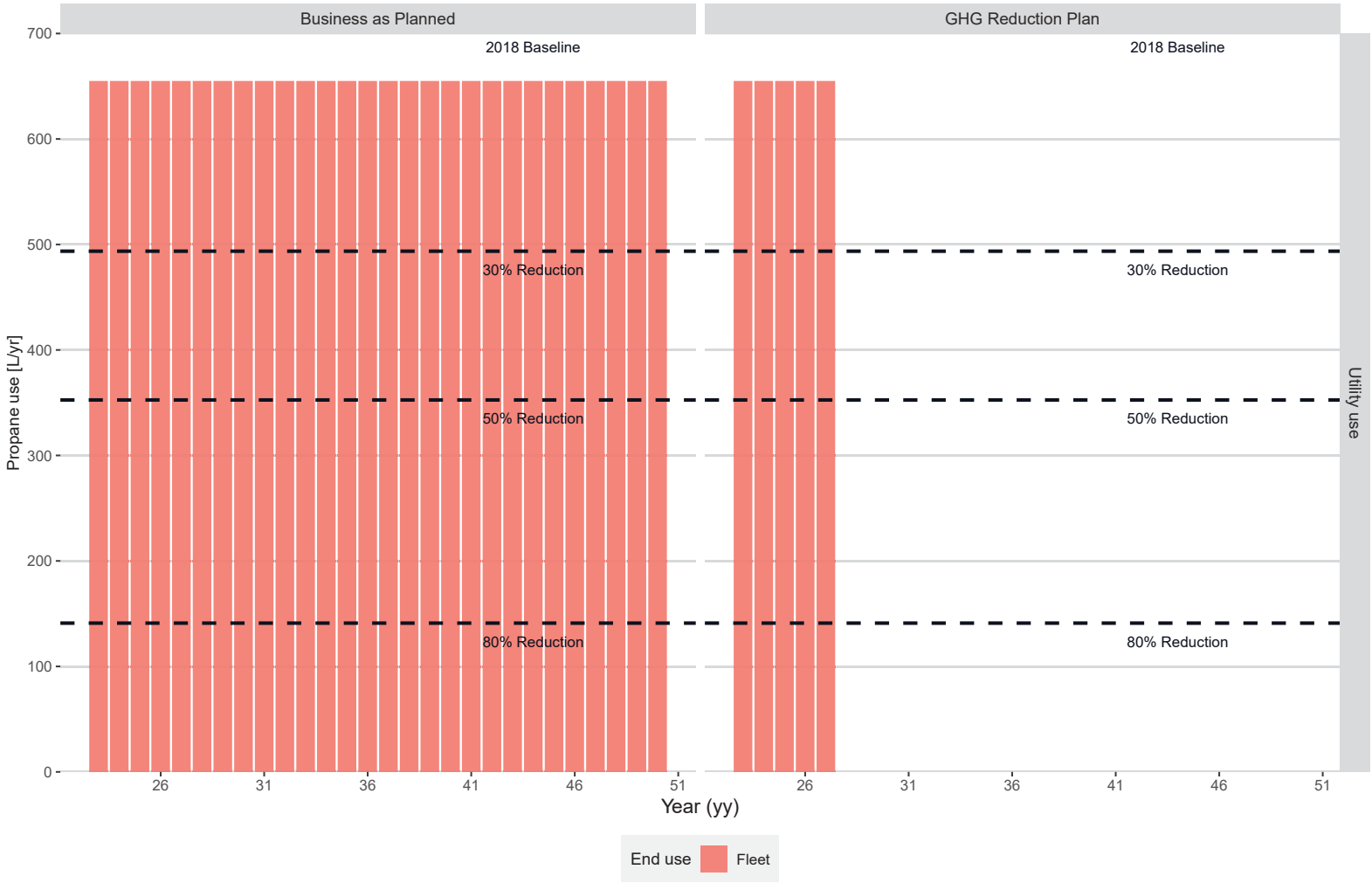


Figure 19: Propane Utility Use Projection for Each Scenario

C.5 Ethanol 10

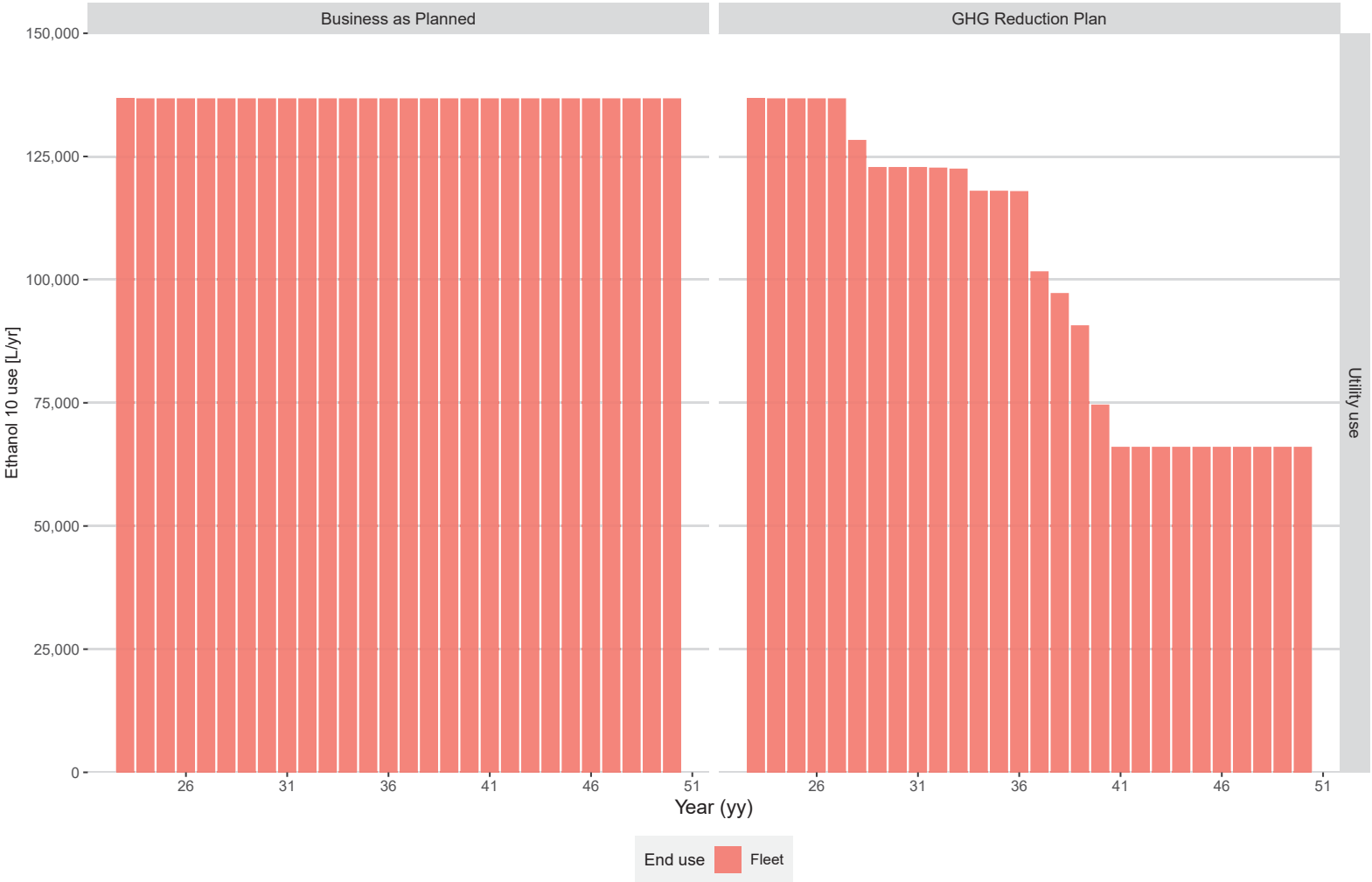


Figure 20: Ethanol 10 Utility Use Projection for Each Scenario

C.6 Biodiesel 5

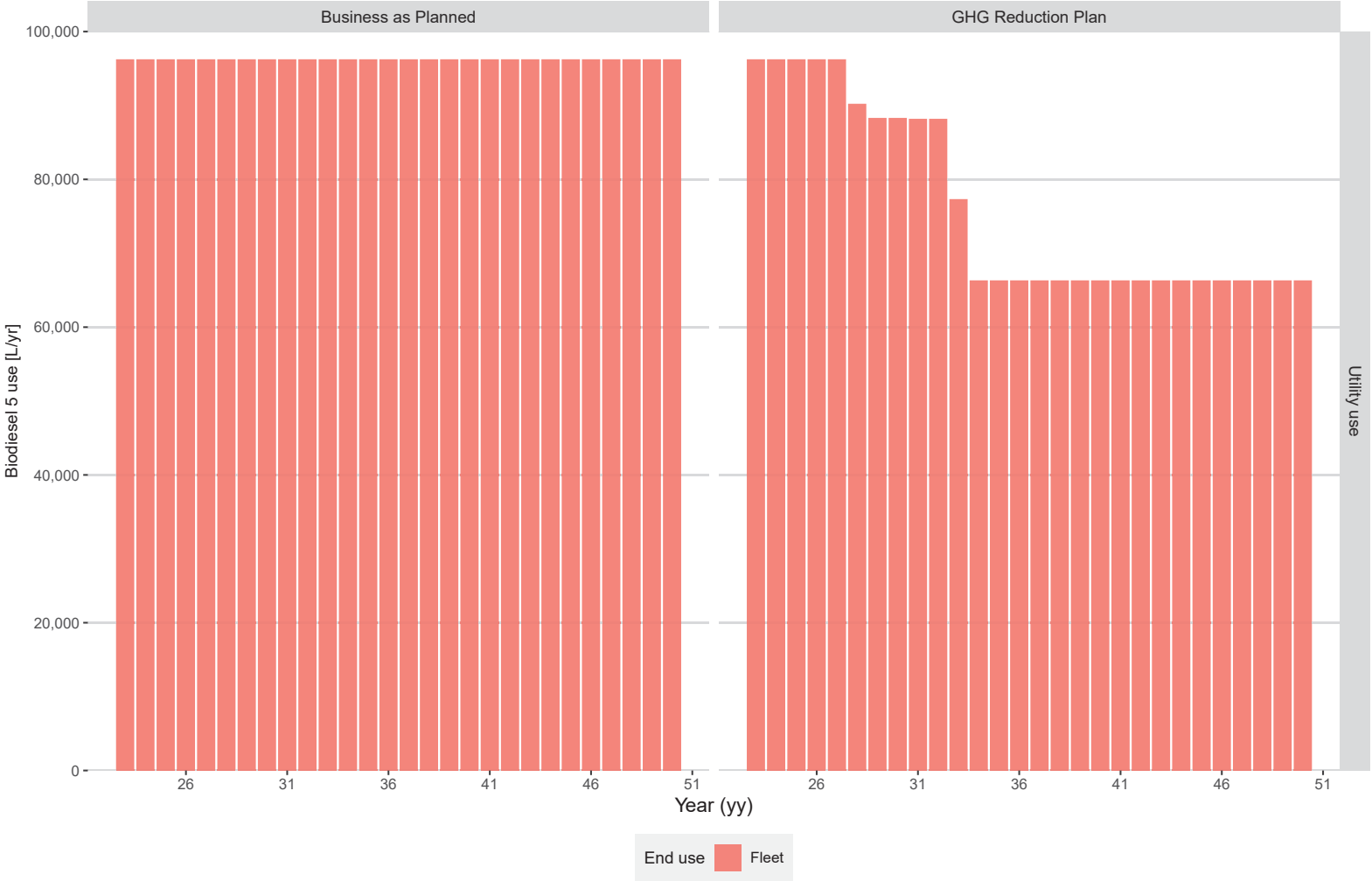


Figure 21: Biodiesel 5 Utility Use Projection for Each Scenario

D Appendix D: Best Practices Among Existing Municipalities

To identify best practices in GHG emission reduction strategies, the strategies implemented by other Ontario municipalities are reviewed. These strategies, as well as some strategies implemented by other municipalities in Canada and worldwide, are presented below.

D.1 Best Practices Among Ontario Municipalities

D.1.1 Toronto

Toronto's Corporate Energy Conservation and Demand Management Plan commits to achieving GHG emissions of 30% by 2020, 65% by 2030, and 80% by 2050 compared to 1990 levels. Toronto aims to have all city-owned facilities near zero GHG emissions by 2026 and all city-owned buildings retrofitted for an average of 40% energy savings by 2050. Notable projects include:

- **Increased building performance:**
 - LED lighting upgrades
 - HVAC upgrades
 - DHW heater upgrade to electric
 - BAS upgrades
 - Biomass boiler centre
- **Renewable energy technologies:**
 - Solar PV
 - Solar thermal DHW heating
 - Solar thermal air technology
 - Geo-exchange for building heating
 - Solar PV with storage
 - Biogas
 - Deep lake water cooling
- **Waste Strategy Programs and Initiatives:**
 - Reduce single-use and takeaway items
 - Community reduce and reuse programs
 - TOwaste app with information on the collection schedule, a sorting tool, and donation locations
 - Waste reduction community grants
 - Food waste reduction

These projects have aided the City of Toronto to make progress towards its goals. For instance, between 2014 and 2018, the City of Toronto operated 95 solar PV systems, and generated an average of approximately 3,600,000 kWh each year. Additionally, HVAC upgrades and LED retrofitting have contributed to a reduction in the natural gas consumption of Toronto's long-term care homes and performing arts theatres by 10% and 11%, respectively, from 2014 to 2018.

Because the City of Toronto is growing, in certain sectors, the apparent energy savings appear to be less notable. For instance, most of Toronto's public libraries decreased their energy consumption by an average of 13%. However, in the public libraries sector, they observed an increase in electricity consumption between 2014 and 2018, and the natural gas energy consumption was only observed to decrease by 2%. This is thought to be related to the expansion of multiple libraries between 2014 and 2018.

D.1.2 Peel

Peel's Corporate Energy Conservation and Demand Management Plan commits to achieving GHG emissions of 45% by 2030 and 80% by 2050 compared to 2010 levels. Notable projects include:

- **Incentivized natural gas conservation projects**
- **Increased energy efficiency:**
 - LED lighting upgrades
 - HVAC retrofits (e.g. heat pumps)
 - Envelope improvements
- **Renewable energy technologies:**
 - Combined heat & power generation
 - Micro hydro turbine
 - Solar PV
 - Solar DHW heating
- **Waste management:**
 - Design and deliver waste management services which meet the needs of the community
 - Increase focus on lowering waste generation by developing and implementing a Waste Reduction Plan
 - Increase focus on reuse activities by developing and implementing a Waste Reuse Plan
 - Implement education programs to increase capture of recycling cart and organics cart material, and decrease recycling and organics cart contamination
 - Research and implement green procurement practices

Peel has performed several lighting retrofit projects, as well as incentivised natural gas conservation (e.g. DHW heater electrification), which has contributed to a decrease in its electricity consumption by 9.7% and its natural gas consumption by 1.9% from 2014 to 2019. In addition, through renewable energy projects - the most effective of which are combined heat & power generation and solar DHW heating - the Region of Peel has generated 21,280 MWh of electricity and offset 95,974 m3 of natural gas.

Due to the higher GHG emissions intensity of natural gas, the reduction in energy consumption does not decrease GHG emissions as much as it could have if there were a larger reduction in natural gas consumption. To address this, in the 2019 ECDMP, there is an increased focus on natural gas conservation measures, such as HVAC upgrades and envelope upgrades to reduce the natural gas consumed for space heating.

D.1.3 Durham

At this point in time, Durham Region's goal is to achieve GHG emissions of 5% by 2015, 20% by 2020, and 80% by 2050 compared to a 2007 baseline. The region has not currently set intermediate targets for 2025 and 2030, but is in the process of establishing GHG emissions goals for these years. Notable projects include:

- **Energy conservation in buildings:**
 - LED lighting upgrades
 - Building Condition Assessments to identify opportunities for GHG emissions reduction
- **Renewable energy technologies:**
 - Solar PV
 - Biogas

At this point in time, Durham Region has not made much progress towards meeting its climate goals, and has seen an increase in both natural gas and electricity consumption from 2012 to 2018. This is thought to be because the majority of projects which Durham Region has completed focus on assessments to identify new projects with opportunities for GHG emissions.

D.1.4 Ottawa

The City of Ottawa has set goals to reduce emissions from City operations by 30% by 2025, 50% by 2030, and 100% by 2040 compared to a 2012 baseline. The City has also set goals to decrease community emissions by 45% by 2025, 68% by 2030, 96% by 2040, and 100% by 2050. Notable projects include:

- **Energy conservation in buildings:**
 - LED lighting upgrades
 - Integration of building automation systems
 - HVAC improvements
 - Occupancy control for lighting and environmental systems
 - Pool covers on swimming pools to reduce evaporation
- **Renewable energy technologies:**
 - Solar PV
 - Alternative energy sources for transit
 - Renewable natural gas

As of 2020, the City of Ottawa's corporate GHG emissions had decreased by 36% compared to 2012 emissions. The City attributes a significant portion of this to the efficiencies made at their Trail Road Waste Facility, where they implemented a landfill gas capture system with 90% efficiency.

The City has identified sectors with an anticipated increase in emissions, such as their Trail Road Waste Facility emissions, and are endeavouring to account for this in their emissions reduction planning. Also, the City of Ottawa noted that, despite their greater-than-planned reduction in corporate GHG emissions, the overall city emissions (including community emissions) have only decreased by 14% since 2012. It is more difficult to reduce GHG emissions associated with community action, but the City has implemented a framework intended to support the municipality as needed to assist them in meeting the climate goals.

D.1.5 Mississauga

The City of Mississauga is currently aiming to reduce GHG emissions by 1% each year. Notable projects include:

- **Energy conservation in recreational facilities:**
 - Pool heat recovery
 - Ice plant energy upgrades
 - Pool dehumidification energy upgrades
- **Energy conservation in buildings:**
 - Lighting upgrades (including LED retrofits, occupancy controls, and daylighting)
 - Energy management information system
 - Controls upgrades
 - Electrical upgrades to reduce distribution wastage
- **Renewable energy technologies:**
 - Solar PV
 - Solar DHW heating

- Solar lighting

From 2014 to 2018, the City implemented measures such as lighting and control upgrades and saw a decrease in GHG emissions of 8.1%. In the current ECDMP, recreational facilities (such as pools and ice rinks) were identified as a large source of GHG emissions, and many of the actions focus on conserving energy in these facilities.

D.1.6 Caledon

The Town of Caledon aims to reduce GHG emissions by 30% by 2030, compared to a 2005 baseline. As an intermediate goal, the Town has developed a target to conserve 15% of energy consumed by facilities by 2024, and divert 30% of waste generated in Town buildings, compared to 2017 levels. In addition, the Town aims to achieve a reduction in corporate emissions of 24% from 2017 to 2024. Notable projects include:

- **Retrofit, renewal, and GHG reduction:**
 - Equipment asset management
 - Whole systems approach to scoping projects
 - Commissioning and performance verification
 - Thermal energy conservation
 - Lighting conservation
 - Renewable energy strategy
- **Facility operations and maintenance:**
 - Preventative maintenance
 - Scheduling and set point optimization
 - Building automation systems
- **Purchasing, procurements, and standards:**
 - Corporate green building standard update
 - Corporate energy revolving fund
 - Energy procurement
 - Energy incentives
- **Fleet retrofit, replacement, and GHG reduction:**
 - Develop Green Fleet and Fuel Reduction Strategy
 - Identify low-carbon fleet fuel conversion options
 - Expand EV charging station network
- **Waste data, reporting, and performance analysis:**
 - Waste data analysis, benchmarking, and reporting
 - Conduct waste audits at Town-owned facilities
- **Waste reduction and diversion:**
 - Paper reduction strategy
 - Increase collection of organics
 - Expand battery collection
 - Reduce use of single-use plastics

From 2012-2018, the Town of Caledon implemented 140 energy conservation measures, including LED retrofits, and managed to reduce facility energy consumption by 12.6% compared to 2012 levels. In addition, the Town of Caledon achieved a corporate emissions reduction of 48% between 2007 and 2017.

D.1.7 Markham

The City of Markham's current goal stated in their 2019 Corporate Energy Management Plan is to achieve 5% energy reduction from 2019-2024, to progress towards achieving net-zero emissions by 2050. A list of ongoing projects is presented below:

- **Energy and environmental management policies:**
 - Municipal Energy Plan
 - Monarch friendly city
 - Battle of Buildings
 - Textile recycling
- **Energy conservation measures:**
 - Markham district energy
 - Develop and implement BAS
 - Install Combined heat and power at Angus Glen Community Centre
 - Design all new buildings to LEED Silver standard
 - Solar PV energy

Markham implemented several ECMs from 2014-2019, developing corporate BAS design standards, increasing their solar portfolio, and converting 50% of streetlights and 100% of arena lights to LEDs. This resulted in 8% facility energy reductions and 29% street lighting energy reductions from 2014-2018.

D.1.8 York Region

York Region's plan, with respect to a 2014 baseline, is to allow for a 4% increase in GHG emissions as it invests in infrastructure to support future population growth, with targets of a 16% reduction in emissions by 2030 and a 60% reduction by 2051. Some of York Region's main projects include:

- **Energy conservation to reduce demand:**
 - Deep energy retrofit of existing buildings
 - Development of a Sustainable Buildings Policy to conserve energy in new buildings
 - Water and wastewater facility energy conservation
 - Adaptive streetlight technologies
- **Improvements in energy efficiency to reduce fuel consumption:**
 - Transit service optimization
 - Upgrade building technologies to improve energy efficiency
- **Switching to renewable energy and low-emission fuel alternatives to aim for net-zero carbon:**
 - Solar PV and micro-hydro turbines
 - Wind powered systems
 - Renewable natural gas
 - Electrification of the corporate fleet
- **Reduce waste:**
 - Reduce use of single-use items
 - Circular Economy Roadmap to identify opportunities to integrate the circular economy into its operations
 - Provide tools and educational resources to assist the community in reducing waste and recycling where possible

As of 2019, York Region had not seen significant reductions in its GHG emissions. The Region is balancing population growth against reduced emissions, which makes it challenging for York Region to reduce GHG emissions. That being said, the Region has planned to undertake projects to allow it to reduce GHG emissions by 60% by 2051, even accounting for population growth.

D.1.9 Halton Region

Halton Region's current plan is a 5% reduction in GHG emissions in most sectors from 2019 to 2023, with a 10% reduction in GHG emissions related to the energy consumed to light street lights. Notable projects include:

- **Reduce energy consumption and greenhouse gas emissions:**
 - Lighting retrofit
 - Building control upgrades
 - Building envelope upgrades
 - Wastewater treatment plant optimization
 - Artificial intelligence software for distribution system
 - Alternative mixing for digesters
- **Recover energy from operations:**
 - Combined heat and power (CHP) for biogas energy recovery at wastewater treatment plants
 - SSO digestion facilities
- **Shift away from fossil fuel-based energy:**
 - Solar PV systems
 - Solar thermal energy

From 2014 to 2018, Halton Region implemented several ECMs, including lighting, control, and mechanical retrofits, street lighting conversion to LED, and water treatment plant improvements. These ECMs led to a 2% decrease in GHG emissions over that time frame, despite the simultaneous growth in the region. That being said, the growth of Halton Region poses a challenge to the Region's ability to make significant progress in reducing its GHG emissions, as a 2% decrease is only a slight improvement.

D.2 Best Practices Among Additional Municipalities

D.2.1 Vancouver

In Vancouver's Strategic Energy Management Plan, they outline a framework to achieve net-zero GHG emissions by 2050. Notable projects include:

- **Reduce natural gas consumption and overall energy intensity:**
 - HVAC upgrades to heat pumps
 - Lighting upgrades
 - Controls upgrades
- **Renewable energy technologies:**
 - Solar PV
 - Solar DHW heating
 - Wind
 - Geothermal heat pumps
 - Waste as an energy resource

To date, Vancouver has reduced their emissions in municipal buildings by more than 25%. In addition, as of 2020, 67% of Vancouver's corporate fleet is fully electric. Vancouver has also approved strategies to ensure that all new buildings are low carbon, and is restricting single-use items.

D.2.2 Global Municipalities

A brief overview of the climate strategies in other municipalities worldwide is provided below:

- **New York: Energy Management Program:** Focuses on renewable energy sources, reduced energy consumption through LED lighting retrofits, and the installation of electric vehicle charging stations to reduce transport emissions.
- **Madrid: Road Map to Climate Neutrality by 2050:** Targets high energy intensity centres, new transportation technologies, and electrification of heating systems.
- **Germany: MasterPlan 100% Climate Protection:** Focuses on energy savings and use of renewable energy sources and increased efficiency in mobility and transport sector.
- **Melbourne: Climate Change Mitigation strategy by 2050:** Emphasizes the priorities to be on 100% renewable, zero emissions buildings, zero emissions transport, and on reduction of impact of waste.

D.3 Recommendations

Based on actions being undertaken by other municipalities, some commitments that the Town could consider adopting for its updated ECDMP are listed below:

- **Energy conservation measures:** Most municipalities have listed lighting and control upgrades as a measure to reduce energy consumption, and the Town of Aurora is encouraged to complete their lighting and control upgrades to achieve the full benefits of LED lighting and to reduce unnecessary energy consumption. In addition, many municipalities have listed HVAC improvements and envelope upgrades among the measures which they are implementing. These measures can significantly reduce GHG emissions due to space heating. As space heating is the end use with the most GHG emissions in the Town of Aurora, we recommend considering these measures in the upcoming ECDMP.
- **Heat pumps:** Heat pumps are a frequently investigated energy conservation measure as they are several times more efficient than gas-fired space heating, and mitigate the emissions associated with natural gas consumption. Space heating is commonly the largest source of GHG emissions, and replacing gas-fired heaters with heat pumps can significantly decrease GHG emissions. The City of Toronto has identified geothermal heat pumps as a technology of choice, as the heat from the ground can heat buildings year-round. However, in cases where ground-source heat pumps are not practical, air-source heat pumps with backup are also very promising options to reduce the GHG emissions associated with space heating.
- **Renewable energy: solar:** Many municipalities are considering solar energy (solar PV and solar thermal) as a source of renewable energy. The Town of Aurora has existing plans for solar PV and has currently implemented solar PV in four locations as a part of their strategy for reducing GHG emissions. In addition to this, it could be beneficial to assess whether solar thermal DHW heating would be feasible.
- **Measures focused on recreational facilities:** In Mississauga, recreational facilities contributed to a significant portion of the City's GHG emissions. To mitigate this, several measures - for instance, pool heat recovery, and energy upgrades for the ice plants and pool dehumidification - focus on reducing GHG emissions from recreational facilities. Roughly 60% of the baseline GHG emissions in the scope of analysis for the Town of Aurora come from recreational facilities. This indicates that the emissions from recreational facilities must be addressed for the Town to be able to meet its targets.
- **Waste reduction:** Many municipalities have established, or are developing, Waste Reduction Plans. This could be a beneficial strategy for the Town of Aurora and help them to progress towards their GHG reduction goals. Such plans entail the availability of and education to use recycling and organics bins, reduction of single-use items, and considerations for green procurement and a circular economy.

In addition, based on the best practices of other municipalities, to be a climate change leader, the Town of Aurora should consider the possibility of achieving net zero GHG emissions instead of aiming for an 80% reduction in GHG emissions, as well as an intermediate target. Based on the current status of the Town of Aurora's GHG reductions, we recommend setting a target of 50% GHG reductions by 2035. The Town of Aurora should also consider implementing waste audits at Town-owned facilities, as the Town of Caledon reports doing, to be able to set goals and continue to progress in the corporate PCP milestone framework.

D.4 Frameworks

Frameworks for measuring and benchmarking success in GHG emission reduction are identified below:

- **ICLEI – Local Governments for Sustainability:**
 - Provides tools and resources to help local governments to measure and manage GHG emissions and develop action plans
 - Connects governments at the local, regional, national and global levels
 - Partners for Climate Protection Framework:
 - * 5-Milestone framework with resources to aid users in progressing towards their goals to meet emissions targets
 - * Milestones: Create an inventory, Set a target, Develop a plan, Implement the plan, Monitor the impact and advance the commitment
- **Global Covenant of Mayors for Climate & Energy:**
 - International alliance of cities and local governments with a standardized approach to measuring, reporting, and verifying GHG emissions
 - Offers support and more financial opportunities to fund measure implementation
 - In this reporting framework, all emission sources from stationary energy, transportation, and waste must be reported, and GHG emissions from industrial processes, agriculture, and forestry should also be reported.
- **The Carbon Disclosure Project (CDP):**
 - A global disclosure system for companies, cities, states, and regions to report their GHG emissions, as well as other environmental impacts
 - Evaluates response to help to identify gaps and areas of opportunity
 - Provides access to a range of additional services and tailored capacity building and support

E Appendix E - Plans Background Information

E.1 Ontario Legislation: O.Reg. 25/23

A summary of the requirements for the O.Reg. 25/23 ECDMP is presented below.

1. A summary of annual greenhouse gas emissions for each of the public agency's prescribed operations.
2. A description of the results of previous activities and measures to conserve the energy consumed by the public agency's prescribed operations.
3. The cost and saving estimates for the public agency's current and proposed activities and measures.
4. A description of any renewable energy generation facility operated by the public agency and the amount of energy produced on an annual basis by the facility.
5. A description of:
 - the ground source energy utilized, if any, by ground source heat pump technology operated by the public agency,
 - the solar energy utilized, if any, by thermal air technology or thermal water technology operated by the public agency, and
 - the proposed plan, if any, to operate heat pump technology, thermal air technology or thermal water technology in the future.
6. The estimated length of time the public agency's current and proposed activities and measures will be in place.
7. A confirmation that the energy conservation and demand management plan has been approved by the public agency's senior management.

E.2 PCP Milestone Framework Progress

A more detailed breakdown of the PCP Milestone framework is presented below:

1. **Milestone 1: Creating an Inventory.** A GHG emissions inventory can help you track and anticipate emissions, energy use and energy spending as well as measure your progress over time. Having a forecast also allows you to project future emissions based on assumptions about population, economic growth, fuel mix and technological change.
2. **Milestone 2: Setting a Target.** A GHG emissions reduction target sets the tone and direction for your emission reduction efforts. Targets should be achievable, while also inspiring ambitious action. We encourage you to adopt two targets: one for municipally owned operations and another for community-wide emissions.
3. **Milestone 3: Developing a Plan.** A local climate action plan outlines how your municipality will achieve its emissions reduction target through municipal operations and/or community-based initiatives. Stakeholder engagement is critical to your plan's development, and a feeling of joint ownership of the plan by both municipal staff and the community can help ensure its long-term success.
4. **Milestone 4: Implementing a Plan.** After your municipality has completed a greenhouse gas emissions inventory and forecast, set emissions reduction targets and created a local climate action plan, the focus must turn to implementing your plan. Once your plan is integrated and linked to your municipal budgeting process, elected officials and climate staff can make decisions based on short-term and long-term needs.
5. **Milestone 5: Monitoring the impact.** Monitoring helps you determine whether your initiatives are working and whether you'll meet your target. Use data you've collected to evaluate and adjust your activities. You can also use reporting to connect with stakeholders and funders to solidify support for future initiatives.

The following is a summary of the work the Town of Aurora has done for Milestone 4, Implementing the Action Plan.

The Town of Aurora has completed the following actions with regards to implementing the 2021 CEP:

- Completion of Green Development Standards Phase 1. The GDS will help guide the Town's new developments to incorporate higher accessibility for alternative modes of transportation.
- The Town of Aurora is developing an Active Transportation Master Plan (ATMP), which is scheduled to be completed in early 2023.
- EV Charging Station expansion across municipally owned facilities.

The Town of Aurora has completed the following actions with regards to implementing the 2021 GFAP:

- Purchased three hybrid SUVs.
- Re-fit trucks with LED lights and auxiliary batteries that reduced the need to idle a vehicle for long periods to operate lights and other necessary tools and equipment.
- Replaced lower tier diesel equipment.
- Adopted a biodiesel 5 blend in diesel fuel.
- Installed electric vehicle charging stations at Town facilities.
- The Joint Operations Centre (JOC) has also been upgraded with DEF dispensing equipment to support the new emission control technology in diesels.
- Resizing the Fleet which included disposal of antiquated equipment. (ongoing)
- Adopted Anti-Idling program
- Community anti-idling bylaw introduced.
- Implement driver education program, including anti-idling.
- Incorporate AGM batteries that do not emit gasses.
- Increased the use of hot water pressure washing to reduce the dependency on solvent-based parts washers.
- Incorporated ethanol fuel with a 10 percent ethanol blend in all its gasoline-fueled vehicles.
- AFS has incorporated green practices, such as using synthetic oils and extending the time between oil changes.
- Purchase fuel efficient, right-sized vehicles as a standard practice, if they are commercially available and meet operational needs.
- Replaced the oldest vehicles with cleaner, modern technology by continuing to accelerate the replacement of overdue vehicles through efficient life cycling procedures.
- Install electric plugs for truck block heaters where feasible, and develop a policy to ensure they are used by staff to reduce unnecessary vehicle idling.
- Automatic lubrication systems have been installed on all apparatus to extend the life of expensive parts, create less waste, and actually use less grease.

The Town of Aurora has completed the following actions with regards to implementing the 2018 CEAP:

- Development of a Green Fleet Action Plan (GFAP)
- Improvement of energy efficiency measures at Town-owned facilities (refer to CEAP progress reports for specific measures taken)
- Development of a Climate Change Adaptation Plan (CCAP)
- Development of Green Development Standards Phase 1

In addition, the Town of Aurora has made Council commitments to advance its progress towards meeting climate goals:

- In 2019, the Town Council declared a Climate Emergency

- The Town of Aurora joined the PCP program
- The Town joined the Blue Dot movement to commit towards maintaining a healthy environment for everyone

For Milestone 5, Progress Monitoring and Reporting, the Town of Aurora has been implementing ECMs based on recommendations from energy audits and engineering feasibility studies, leveraging incentives from local utility distribution companies to implement ECMs, and monitoring hourly and monthly energy consumption of facilities after ECMs are implemented.

E.3 2019 Energy and Conservation Demand Management Plan (ECDMP)

The 2019 ECDMP's main objectives were:

- Examining historical energy consumption and GHG emissions, as well as energy conservation measures (ECMs) that have been implemented since the 2014 ECDM plan.
- Examining whether the goals of the 2014 ECDM plan were met, and sets goals for the 2019 ECDM plan to be met by 2024.
 - The 2014 ECDM plan states that a 10-15% reduction in energy and GHG emissions is achievable based on ASHRAE Level 1 energy audits completed by the Town at the time. However, the 2014 ECDM plan did not establish an energy or GHG baseline so it cannot be confirmed if this goal was met.
- Examining what ECMs were already planned for the future, as well as additional ECMs which should be completed from 2019 - 2023 in order for the Town of Aurora to meet the goals established within this plan.

The scope included facilities, water/waste water facilities, fleet, and renewable generation. The 2019 ECDMP concludes with an action plan emphasizing the need to implement all in-progress and planned ECMs at the time, and to conduct new energy audits of the facilities to identify new potential measures for the 2024 ECDMP and to develop a green fleet plan. Additional strategies are also listed that include energy efficient behavioural recommendations for municipal employees, implement life cycle cost purchasing practices, establish energy efficiency equipment specifications, monitor savings progress, and improve communication and staff engagement.

The 2019 ECDM plan states that the overall goal is to reduce electricity consumption by 10.5% (990,963 kWh), natural gas consumption by 9.7% (119,584 m³), and GHG emissions by 15.9% (514 mtCO₂e) of the 2018 baseline by the end of 2023. This is expected to require an investment of approximately \$628,842.

The Town of Aurora is committed to a greenhouse gas emissions reduction target of 80% from 2018 levels by 2050. A part of this goal is the Town Fleet Division's goal of electrifying the corporate fleet to produce zero emissions by 2051.

E.4 2021 Green Fleet Action Plan (GFAP)

The 2019 ECDMP set a goal for fleet to reduce their GHG emissions by 50% by 2023. The ECDM Plan did not capture all the 2018 fleet fuel data due to fuel dispensing equipment issues. As a result of the data discrepancy, the Green Fleet Action Plan (GFAP) set what is believed to be a more accurate and realistic reduction target of 50% reduction by 2028, rather than by 2023, based on a complete year's data. In the long term, the Fleet Division is aligning with York Region's goal of electrifying the corporate fleet to produce zero emissions by 2051.

The key objectives outlined in the GFAP are:

- Reducing demand and analyzing data to maximize performance and efficient resource use.
- Improving maintenance and management practices.
- Converting to alternative and renewable low carbon fuels.
- Continuing to provide efficient, cost-effective services with focus on Green Technologies.

- Providing Education and Outreach Initiatives.

The GFAP details specific actions and their impact to help meet each of the above objectives.

E.5 2021 Community Energy Plan (CEP)

The following areas are evaluated and strategies suggested to reduce emissions.

- **Homes.** First strategy is to create a tiered building code or green standard for developers to promote greater energy efficiency in new homes. The second strategy is to encourage homeowners to undertake deep energy retrofits of their existing homes.
- **Businesses and Institutions.** The same strategies to create a tiered building code or green standard and to encourage deep energy retrofits are expected to be applied to businesses and institutions.
- **Industrial buildings.** The CEP expects local industries to already be implementing good energy management practices because they are motivated to reduce their energy costs.
- **Transportation.** The first transportation strategy is "mode shifting" to encourage residents to walk, cycle, or take public transit instead of personal vehicles. The second strategy is to improve electric vehicle charging infrastructure to promote the purchase and use of electric vehicles.
- **District Energy Systems (DES).** The first step is to conduct a feasibility to assess where DES solutions are practical in the Town of Aurora. The plan also encourages identifying good locations for solar PV installations on Town property. The Town is also encouraging homes, businesses, and the industrial sector to install solar PV arrays.
- **Land Use Planning.** Effective planning can have long term impacts on the environment. The CEP recommends building compact, mixed-use communities where residents can live, work, and play.

The strategies outlined in the CEP are expected to reduce annual emissions in the Town of Aurora by 72,361 tonnes CO₂e in 2030 and 212,364 tonnes CO₂e in 2050. This is a 22 percent reduction in emissions from 2018 levels and a 65 percent reduction in emissions in 2050. However, this plan does not meet their goal of an 80% reduction in GHG emissions by 2050 compared to a 2018 baseline.

E.6 Corporate Environmental Action Plan (CEAP) and progress reports

The purpose of the Corporate Environmental Action Plan (CEAP) is to:

- Protect and enhance the natural environment
- Be a catalyst for local initiatives that promote environmental sustainability, integrity and conservation of our resources and ecosystem; and,
- To enhance environmental stewardship within the community.

For context, in 2016, the Town Council passed the Blue Dot motion that stated that all people have the right to live in a healthy environment, including:

- The right to breathe clean air;
- The right to drink clean water;
- The right to consume safe food;
- The right to access nature;
- The right to know about pollutants and contaminants released into the local environment; and
- The right to participate in decision-making that will affect the environment.

The five areas that the CEAP focuses on are Water Conservation, Sustainable Urban Development, Waste Reduction and Diversion, Biodiversity and Natural Heritage, Climate Change and Energy, and Environmental Awareness.

Water Conservation

Objective W1: Reduce corporate water consumption.

- Action 1: Reduce corporate water consumption.
- Action 2: Implement a water loss reduction strategy.

Objective W2: To reduce the uncontrolled and inadequately controlled stormwater areas with respect to both quality and quantity by following recommendations of the Town's Comprehensive Stormwater Management Master Plan.

- Action 1: Investigate ways to enhance and optimize the functioning of the current stormwater management facility inventory.
- Action 2: Improve stormwater quality in all new road reconstruction projects.
- Action 3: Encourage at source storm water management control measures on private property.
- Action 4: Investigate new practices that may enhance pollution prevention.

Sustainable Urban Development

Objective S1: Foster a sustainable green development and alternate methods of transportation to improve the quality of life of Aurora's residents and Town staff.

- Action 1: Promote Sustainable Transportation to Town staff.
- Action 2: Implement Sustainable features in the construction or reconstruction of Town infrastructure including buildings, facilities and roads.
- Action 3: Set up new areas for additional community gardens in Aurora.

Waste Reduction and Diversion

Objective D1: Implement sustainable construction practices to reduce waste, incorporate sustainable design and reclaim or recycle materials.

- Action 1: Implement sustainable construction and building practices for town buildings and facilities that considers 'Sustainable Sites Guidelines'.
- Action 2: Develop a Green Procurement Policy for the Town of Aurora and its contractors.

Objective D2: Reduce waste going to landfill disposal.

- Action 1: Implement Waste Reduction Strategies.

Biodiversity and Natural Heritage

Objective B1: Enrich Aurora's ecology by protecting and preserving biodiversity.

- Action 1: Encourage ecological design in landscaping of parks and retrofit projects.
- Action 2: Improve natural heritage significant wildlife habitat.
- Action 3: Implement the Urban Forest Management Plan.
- Action 4: Implement the Invasive Species Act in partnership with York Region and the Province.

Climate Change and Energy

Objective C1: Prepare a Climate Change Adaptation Plan

- Action 1: Identify climate change risks by completing a vulnerability risk assessment of key departmental priorities.
- Action 2: Develop a Climate Change Adaptation Action Plan that will assist the Town to mitigate the risks of climate change. The Plan would benefit from climate change planning partnerships with other municipalities, conservation authorities and York Region.

Objective C2: Implement the Provincial Climate Change Plan Actions

- Action 1: Province Propose amendments to Municipal Act.
- Action 2: Require electric charging in surface lots.
- Action 3: Set green development standards.
- Action 4: Eliminate minimum parking requirements over the next 5 years for municipal zoning bylaws.
- Action 5: Make climate change mitigation and adaptation mandatory in municipal official plans.

Objective C3: Reduce the Town's greenhouse gas emissions by town staff and at town facilities.

- Action 1: Implement an anti-idling initiative.
- Action 2: Develop a Green Fleet Plan.
- Action 3: Improve energy efficiency of existing building and business operations.
- Action 4: Consider all green infrastructure options as part of new corporate builds.

Environmental Awareness

Objective A1: Encourage the stewardship of Aurora's natural resources and advance green initiatives by promoting community involvement.

- Action 1: Promote the use of reusable water bottles in conjunction with the new water bottle filling stations.
- Action 2: Increase overall community awareness of climate change.
- Action 3: Develop an urban forest communication plan that delivers key messages to target audiences within the community.
- Action 4: Develop a community based communications strategy to help protect and enhance our biodiversity.

Based on the 2019, 2020, and 2021 CEAP Progress Reports, energy use increased in 2019 and then has decreased by just over 20% compared to the 2018 baseline year. It is suspected that the majority of there energy saving are due to COVID-19 building closures and working from home. It is suspected that energy use will have increased again in 2022 and 2023 as building occupancy has increased again.

Here is the reported energy consumption for the Town of Aurora from 2018-2021 based on the CEAP Progress Reports.

- 2018: 23,180,806 equivalent kilowatt-hours
- 2019: 24,641,678 equivalent kilowatt-hours
- 2020: 19,860,541 equivalent kilowatt-hours
- 2021: 19,828,350 equivalent kilowatt-hours

The 2019-2022 progress made towards accomplishing the actions from the CEAP is presented in Table 8.

Table 8: CEAP Progress (2019-2022)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
Water Conservation Objective W1: Reduce town owned facility water consumption	Action 1: Reduce corporate water consumption (CWC)	CWC Facility Total. Tasks: Develop annual CWC reduction targets.	Town acquired RETScreen Expert software to track/monitor progress. Staff are collecting water data for analysis.	No update for 2020	COVID relief fund included	Nothing was done in terms of new water reduction methods. Coming in 2023 is Town Square which will be conducting rainwater harvest through underground storage tank installations; water caputre will be used for irrigation.	Rainwater harvesting is a process/practice of collecting and storing rain for reuse, rather than letting the water run off and be absorbed into the ground. Benefits of Harvesting Rainwater: Conserves water, lowers demand on freshwater resources, slows erosion in dry environments, reduces flooding in low-lying areas.
	Action 1: Reduce corporate water consumption (CWC).	CWC Parks Total. Tasks: Add CWC to Progress Report	The JOC desgin included drought resistant plantings and H5rain water harvesting used in green houses and for vehicle and equipment wash bay	No update for 2020	In ground holding tank being installed at library square to harvast greywater off splashpad to water landscape/annual planters.	Nothing more implemented in terms of Greywater systems; Town square system will be operational next year (2024). Nothing else in terms of water reduction strategies for 2022.	
	Action 2: Implement a water loss reduction strategy	Number of Water meters installed per year. Tasks: Add KPIs to Progress Report	600 residential meters and 200 commercial meters	The Town changed 1150 water meters in 2020	17,280 residential meter and 602 commercials changed	Number of water meters installed (changed) in 2021: 315. Number of water meters installed (changed) in 2022: 1000 (104.2% increase compared to 2021)	Number of water meters installed in 2022 (Compared to 2021): 104.2% increase compared to 2021
	Action 2: Implement a water loss reduction strategy	Sanitary sewer Km relined per year. Tasks: Add KPIs to Progress Report	0 km. The Town only relines as needed and nothing has come up in the last several years. Though some sanitary mains have been replaced through Capital Projects that are managed be Engineering.	0 km. The Town only relines as needed and nothing has come up in the last several years. Though some sanitary mains have been replaced through Capital Projects that are managed be Engineering. The Town replaced 167 sanitary laterals, which are the sewer pipes that carries wastewater from homes property lines (toilets, sinks, showers, laundry, floor drains, etc.) to the public sanitary sewer main.	0 km. The Town only relines as needed and nothing has come up in the last several years. Though some sanitary mains have been replaced through Capital Projects that are managed be Engineering.	Total kms of sewers relined in 2022: Nothing from last year. Big project 2023, bid going out with consultant to go over CCTV data, put a workplan together, and put a package together with specifications to repair those spots. Ongoing project for the next 4 years.	Maintaining the Town's core assets. Allow for more efficient and effective transport of sewage from residential/commercial sources to treatment plant/disposal.

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
Water Conservation Objective W2: To reduce the uncontrolled and inadequately controlled storm water areas with respect to both quality and quantity by following recommendations of the Town's Comprehensive Storm water Management Master Plan	Action 1: Investigate ways to enhance and optimize the functioning of the current storm water management facility inventory	Number of storm water ponds enhanced and optimized from their current function . Tasks: 1 to 2 ponds enhanced and optimized from their current function	A comprehensive investigation undertaken by LSRCA is ongoing with respect to the Town's SWM pond inventory. This will result in a series of recommendations related to the ponds' OandM, clean-up, retrofit and enhancement	1) A comprehensive investigation undertaken by LSRCA is ongoing with respect to the Town's SWM pond inventory. This will result in a series of recommendations related to the ponds' OandM, clean-up, retrofit and enhancement; 2) Tamarac SWM dry pond is currently under construction and is being enlarged by York Region, completion anticipated in 2021	1) A comprehensive investigation undertaken by LSRCA is ongoing with respect to the Town's SWM pond inventory. 2) Tamarac Pond Retrofit to enlarge its quantity control capacity to handle larger storm events should be completed in 2022. 3) Pond WC3 by Deerhorn and Kennedy Street is having sediment removed from it currently and should be completed in 2022. The retrofit will reduce pond cleanout maintenance frequency, causing less disturbance to the environment and potentially improving water quality released from the facility.	Luigi maintains stormwater ponds. Maintenance includes: Fence repair, signage, driveway entrances, phragmite spraying, cleanouts of inlets and outlets, vegetation removal. LSRCA inspects ponds and provides reports with identified deficiencies. Ongoing projects: Funding approved by Council this year (\$400,000 total for 2023); Snow disposal facility substantially completed with new quantity and quality controls; Installation of OGS unit design completed in 2022 and installation will be conducted in 2023; 2022 engineering divisions with Operations completed a pond retrofit of SWM facility WC3 near Deerhorn crescent and Kenedy Street west; with upgrade - enlarged permanent pool provided and pond cleaned out. Total ponds enhanced/optimized: 1 SWP	Stormwater ponds includes a permanent pool of water in its design, through the collection of runoff from rain and melted snow, and is used to manage stormwater runoff to prevent flooding, downstream erosion, and improve water quality in adjacent bodies of water. Maintenance of Stormwater ponds is an important process to help maintain the health of streams, lakes, and aquatic life as well as provide opportunities for human uses of water by mitigating the effects of urban development.
	Action 2: Improve storm water quality in all new road reconstruction projects.	Km's of road treated by oil grit separators or Low Impact Development controls. Tasks: As opportunity arises as determined during design of road reconstruction projects	No update for 2019	Bio-swales are being constructed on Johnson Road and Holman Crescent, Davidson Road and Bailey Crescent as well as an enhanced oil/grit separator on Davidson Road, as part of 2020 road reconstruction projects, completion anticipated in 2021	Bio-swales have been constructed on Johnson Road and Holman Crescent, Davidson Road and Bailey Crescent as well as an enhanced oil/grit separator on Davidson Road, as part of 2020 road reconstruction projects. These features are currently under warranty.	Total Number of OGS Cleaned Out in 2021: 10 units. Total Number of Catch Basin Cleaned Out in 2021: 1,499 units. Total Number of OGS Cleaned Out in 2022: 7 units (35.3% decrease compared to 2021). Total Number of Catch Basin Cleaned Out in 2022: 1,682 units (11.5% increase compared to 2021). Total Disposal in 2022: 105 Tonnes (2.5% increase compared to 2021). Unit represents: one structure = 1 OGS structure and 1 catch basin sump. Glen: oil/grit separator in Lambert Wilson Snow Disposal Facility.	Oil/grit separators are underground storage tanks with three chambers designed to remove heavy particulates, floating debris and hydrocarbons from stormwater. Therefore, the more OGS installed the less particulate matter found within stormwater.

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	Action 3: Encourage at source storm water management control measures on private property.	Number of source storm water management control measures on private property installed that the Town is aware of / year. Tasks: Encourage residents to install private LIDs such as rain barrels during public engagement and design of road reconstruction projects	0; Town is unaware of any stormwater management control measures on private property being installed in 2019	0; Town is unaware of any storm water management control measures on private property being installed in 2020	0; Town is unaware of any stormwater management control measures on private property being installed in 2021	2022 Operations provided maintenance to LID (Permeable Pavers) at the ACC parking lot. Operations will perform maintenance on LIDs that require maintenance, and is based on recommendations listed by the LSRCA which is conducted every year, in terms of inspections.	LIDs - development which through its low negative environmental impact either enhances or does not significantly diminish environmental quality.
	Action 4: Investigate new practices that may enhance pollution prevention	Number of new practices implemented to enhance pollution prevention. Tasks: 5 new practices to enhance pollution prevention by 2023	Staff investigated updating the Sewer Bylaw to include restrictive provisions for pools/ hot tub discharge. Due to limited staffing resources for enforcing such an update to the Bylaw, staff have postpone the update until resources come available.	Town's new Site Alteration By-law was enacted in December of 2019 it regulates the quality of fill imported to sites and erosion and sediment controls used on sites to ensure no sediment contaminates adjacent properties or streams.	1) Town's new Site Alteration By-law was enacted in December of 2019 it regulates the quality of fill imported to sites and erosion and sediment controls used on sites to ensure no sediment contaminates adjacent properties or streams. 2) Staff investigated updating the Sewer Bylaw to include restrictive provisions for pools/ hot tub discharge. Due to limited staffing resources for enforcing such an update to the Bylaw, staff have postpone the update until resources come available.	Adopting access soil regulations into Engineering designs and construction tenders. O.Reg 406/19 to improve the reuse of soils. York Region reduction of landl Standard (Infiltration and Inflow of sanitary sewers), this will be adopted in Engineering standard for future projects. Bylaw on pool drainage controls implemented - Public Education. Upgraded snow disposal facility became operational - Lambert Wilson Park, connects to Town-JOC.	Purpose of the Standard: To focus on watertightness and minimizing or eliminating Inflow and Infiltration in new sanitary sewers. Benefits: Reduces cost of treating stormwater as sewage, helps maintain and extend the life of constly infrastructure; helps ensure there is enough capacity for wastewater to move through system, reduces the amount of external water sources from entering the sewage system.
Sustainable Urban Development Objective S1: Foster a sustainable green development and alternate methods of transportation to improve the quality of life of Aurora's residents and Town staff.	Action 1: Promote Sustainable Transportation to Town staff	Annual Smart Commute designation Award (Maintain Gold Standard). Tasks: Annual update on Progress Report Q1	The Town maintained Gold Standard status for 2019	Update from HR on the development of flex work and telecommuting policies. Staff presented to ELT in 2020 an updated flex work policy. The decision by ELT at the time was noting that most staff are working remotely, we should re-assess our draft policy based on the Future of Work post-pandemic. Currently staff are working with York Region municipalities to develop a common framework for safe return to work as well as for the development of policies that will include a telecommute or hybrid model. We expect the updated policies to be in place by the end of 2021. 2020 Smart Commute Gold Workplace Designation	The Town maintained Gold Standard status for 2021	Formal policy on Alternative Work Arrangements was approved in Feb 2023. This includes a Hybrid work option for those roles that are suitable. Approximately 65% of our employees are participating in hybrid which reduces the amount of commuting. A Project Team is continuing to automate HR processes including recruitment and onboarding as well as digitizing our HR files in an effort to create efficiencies and move away from paper / print environments to a digital file.	Policy will provide opportunity for staff to work from home, limiting the commute frequency. This in turn will help reduce over all Scope 3 GHG emissions that the Town is responsible for.

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	Action 2: Implement Sustainable features in the construction or reconstruction of Town infrastructure including buildings, facilities and roads	Number and types of sustainable features installed on construction projects. Tasks: 1 sustainable feature per construction project, when feasible	The JOC design includes water conservation low-flow hands-free plumbing fixtures, drought resistant plantings, rain water harvesting used in green houses and for vehicle and equipment wash bay. Two road reconstruction projects will be tendered in 2020 which will include the use of LIDs. Town's library square design includes 20 green design features (in line with LEED Gold) such as daylighting, high efficient HVAC, high water efficiency fixtures, thermal comfort and controls, improved thermal efficiency in the building envelope beyond the Ontario Building Code, low VOCs, electric vehicle charging stations, and LIDs such as permeable paving.	Bio-swales are being constructed on Johnson Road and Holman Crescent, Davidson Road and Bailey Crescent as well as an enhanced oil/grit separator on Davidson Road, as part of 2020 road reconstruction projects, completion anticipated in 2021	The JOC design includes water conservation low-flow hands-free plumbing fixtures, drought resistant plantings, rain water harvesting used in green houses and for vehicle and equipment wash bay. Bio-swales have been constructed on Johnson Road and Holman Crescent, Davidson Road and Bailey Crescent as well as an enhanced oil/grit separator on Davidson Road, as part of 2020 road reconstruction projects. Town's library square design includes 20 green design features (in line with LEED Gold) such as daylighting, high efficient HVAC, low flow fixtures, envelope thermal efficiency beyond the Ontario Building Code, low VOCs, EV charging stations, and LIDs such as permeable paving. OGS Unit to be installed on Murray Drive. Promote active transportation by enhancing safety through the implementation of traffic calming measures on Centre Street and Kennedy Street. Hallmark Ball Diamond Park construction includes LID features eg: bio swales.	No construction projects other than Town square (still in progress). Design of turtle crossing on Henderson Drive for wildlife conservation efforts. Designing new sidewalk on Edward street promoting Active Transportation for residents. Design new sidewalk projects in 2022 and construction planned for 2023; this is located at Industrial Parkway North.	Turtle Corssing: Promotes the conservation of local ecosystems, specifically the turtle population, as well as other wildlife. Sidewalk projects promotes Active Transportation efforts.
	Action 3: Set up new areas for additional community gardens in Aurora.	Number of community gardens. Tasks: Continue to explore opportunities to add additional community gardens as appropriate	No new community gardens in 2019 however a community garden is planned for a new park construction in the 2C lands.	No updates for 2020	Community garden is planned for a new park construction in the 2C lands - construction in 2022	Community garden is planned for a new park construction in the 2C lands - construction in 2022. Construction was deferred; Parks needs more funding from Council to commence construction. Hopefully 2023 start construction.	Expansion of natural features to promote conservation of wildlife and local habitats.
	Opportunity: Apply for green infrastructure grant funding.	Number of Town projects funded/year. Tasks: 2 Town projects funded	The Town signed an MOU with OPG to seek NRCan funding for the installation of electric vehicle charging stations at Town properties (50% of the cost to install and procure equipment).	No projects in 2020	The Town signed an MOU with OPG to seek NRCan funding for the installation of electric vehicle charging stations at Town properties in 2019 (50% of the cost to install and procure equipment) and the project was completed in 2021 with the installation of 18 public level 2 electric vehicle charging stations (plus another 4 at Aurora Town Square).	The Town applied for a grant from the GMF for the development of a Feasibility Study on the implementation of a Deep Energy Retrofit Program; Grant title: Community Efficiency Financing.	

Table 8: CEAP Progress (2019-2022) (*continued*)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
Waste Reduction and Diversion Objective D1: Implement sustainable construction practices to reduce waste, incorporate sustainable design and reclaim or recycle materials.	Action 1: Implement sustainable construction and building practices for all Town infrastructure including buildings, facilities and roads	Number and types of sustainable construction practices implemented that will reduce waste. Tasks: Development of best practices	No update for 2019	Recycled concrete material was included as a provisional item that Contractors could use as part of 2020 road reconstruction projects. However, no Contractor's utilized this option in 2020.	No update for 2021	Engineering: Right Turn construction (road widening) lane used recycled concrete used for granular at Yonge and Wellington	
	Action 1: Implement sustainable construction and building practices for all Town infrastructure including buildings, facilities and roads	Number and types of sustainable construction practices implemented that will reduce waste. Tasks: Implementation of best practices	The Town worked with a third party company for the disposal of Town Hall furniture from the second floor renovation. The third party works with local charities to reuse and recycle useful furniture. Library square is being built in line with LEED Gold standard (including reduced waste strategies based on LEED such as minimum recycled content requirements and a construction waste plan).	No update for 2020	No update for 2021	No updates in 2022.	

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	Action 1: Implement sustainable construction and building practices for all Town infrastructure including buildings, facilities and roads	Number and types of sustainable construction practices implemented that will reduce waste. Tasks: Update tender specifications to promote sustainable construction practices and waste reduction where feasible	No update for 2019	Roads continues to reuse construction materials as much as possible. Contractors are required to reuse interlocking on driveways, catch basin/manhole frames and lids and tactile plates if they are in good condition. Soil that is not disposed of by the contractor is transferred to the JOC where it is tested and disposed of as waste or cover for landfills. Other materials such as concrete and asphalt are all recycled at specific recycling locations.	Project for replacement of a retaining wall at 28 Wellington St reusing existing stone material to rebuild the wall. Staff are continuing to use a stock pile of top soil for projects that was generated through shredding stockpile of organic material stored at our community gardens. The use of Apps for infrastructure maintenance to reduce paper usage. The use of helical piles at Yonge and Kennedy railing replacement project to reduce the carbon foot print, produce fewer disturbances to the environment, and use fewer materials that will become waste upon structure replacement. The helical piles will be recyclable material. The use of CB shields for the WC3 storm pond reconstruction. The sidewalk inspection program and shaving of the trip hazards to maintain a safe infrastructure with less waste.	Engineering: At the end of Dunning, asphalt grindings were used to improve deteriorated pavement. Dan Nacarato look for additional information. When doing catch basin or manhole repairs try to reuse existing frames and lids. - Dan	
	Action 2: Develop a Green Procurement Policy for the Town of Aurora and its contractors.	Develop KPI as part of the Green Procurement Policy. Tasks: Prepare a Green Procurement Policy for Council consideration	Procurement is planning a Modernization project for Town-wide procurement practices. Green procurement will be reviewed and incorporated into the new policy. Project expected to start in 2021.	Procurement is planning a Modernization project for Town-wide procurement practices. Green procurement will be reviewed and incorporated into the new policy. Project expected to start in 2021.	The Modernization project for Town-wide procurement practices was kicked off in 2021. Green procurement policy included in the project, completion date in 2022.		

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
Waste Reduction and Diversion Objective D2: Reduce waste going to landfill disposal.	Action 1: Implement Waste Reduction Strategies.	Percent reduction of waste from facilities community/ year. Tasks: Develop baseline to measure the opportunities to reduce waste from Town facilities/ year	The Town is investigating costs to perform a waste audit of Town facilities. Council approved Strategies to Reduce Single-Use Plastic Straws at all Town Facilities and Town-run events. Community Waste Diversion Tracking: 2018 Aurora's diversion rate: 65%. 2019 Aurora's diversion rate: 65%. 2019 Multi-res participation: 28 buildings.	2020 Aurora's diversion rate: 64%. 2020 Multi-res participation: 29 buildings. Education Campaign for 3 bag limit through, mobile signs, door knockers, Website, in person events, recycle coach app, local ads, Town social media. Annually increasing the number of multi-residential buildings within the Town's recycling program, through building superintendent (95 gallon tote service or front end recycling), providing education material, through waste calendar, schedule of tote pickup and education flyers. Continued education through the Recycle Coach App which also provides insight to staff into search items for ongoing education campaigns. Current Waste By-law requires residents to source separate recyclables and organic materials, including electronic waste and batteries. By-law amendment is looking to add bag tag limit and textiles (2021). Bulky items and appliances being considered for future By-law update. Facilities waste audit is being requested once staff and programs are running again, possibly 2021.	2021 Aurora's diversion rate: 66%. 2021 Multi-res participation: 30 buildings. The Town is investigating costs to perform a waste audit of Town facilities (2021). January 2021 3 bag limit started enforcement, complaints and enforcement being tracked. Council approved in July 2021 add the bag tag purchase option, starting in January 2022. Due to COVID19 pandemic, facilities waste audit was not requested until staff and programs are running in facilities. Aurora Introduces Bag Tag Program. Town to start enforcement January 1, 2022.	2022 Aurora's diversion rate: 70%. 2022 Multi-res participation: 30 buildings. Bag Tag Program: The total number of bag tags purchased in 2021 totalled 138. The total number of bag tags purchased in 2022 totalled 3,560 (Increase of 185% compared to 2021). The total revenue generated from the bag tag program in 2022 totaled \$17,800, refund into GL account and use it as needed for programs in environment - Recycling Operations Grants GL Stewardship Programs: Continue Ewaste events (3 events per year) - Spring cleaning. Event 1: ewaste Jan, May, Oct. Event 2: Cleanup event: April and Sept/Oct - this to be implemented in 2023. Event 3: Compost giveaway program - Once a year. Event 4: Community garage sale; people take items and discount them at a better price. This is held in June, and been running for 3-4 years now. Still collecting blue box for residents for blue box program that will be done up until 2026.	Waste Diversion: As included in the Town's Community Energy Plan, the target for waste diversion by 2030 is 80%. The Town is slowly on track for this amount. In 2021, York Region reported a diversion rate of 65% (The Town of Aurora surpassed this rate by 1%). Bag Tag Program: Where does the revenue go to? Does diversion rate include number of water bottle usage reduced through those water dispensers located across town facilities? How many are there? The revenue generated from the Bag Tag Program is deposited into a Recycling Operations fund and used when needed to fund future environmental programs.
Biodiversity and Natural Heritage Objective B1: Enrich Aurora's ecology by protecting and preserving biodiversity.	Action 1: * Encourage ecological design in landscaping of parks and retrofit projects.	Add 1 ecological design feature in new parks and park retrofits / year. Tasks: Consideration of ecological design in all new park design and retrofits	1 Park Naturalized Designed. New park in 2C designed to be a natural park including, community gardens, pollinator gardens, naturalized playgrounds and one of the main trail entry locations to Wildlife Park.	Grasslands in Arboretum actively maintained to discourage tree growth	1 Park Naturalized Designed. New park in 2C designed to be a natural park including, community gardens, pollinator gardens, naturalized playgrounds and one of the main trail entry locations to Wildlife Park - construction 2022. - Hallmark Ball Doamond Park landscaping designed to include minimal maintenance of all surrounding landscapes other than playing fields - completion May 2022. - Boardwalk constuction across flood plain in partnership with SAC to connect Lakeview/WillowFarm Trail to Yonge/St.Johns.	Expanding second phase of the David Tomlinson Nature Reserve located in the 2C lands. Includes trails, boardwalks, native plantings, ecological features (all consistent of second phase project).	

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	Action 2: Improve natural heritage significant wildlife habitat.	List existing partnerships and note partnerships as they occur. Tasks: Ongoing partnerships with schools, Arboretum, Adopt-aPark and bird box program	Continued the Adopt a Park Program and Partnership development: two additional partnerships in 2019 (one promoting butterfly habitat, one eradicating invasive species and planting native species), making a total of 12 total partnerships. Eradication Efforts of Invasive Species: successful removal of invasive species from Rotary Park with assistance from the Town's Adopt a Park partner. Arboretum Committee continued work on pharmites control. Staff working to control pharmites within Wildlife Park. Trees Planted on Aurora lands.	No updates for 2020	Continued the Adopt a Park Program and Partnership development: one additional adopt a park partnerships in 2021 (Herb McKenzie Park), making a total of 13 total partnerships. Trees Planted on Aurora lands, included the Towns street tree planting program, planting days with Arboretum, LSRCA and Neighbourhood Network.	Online promotions were made to promote against feeding wildlife on town-property.	
	Action 3: Implement the Urban Forest Management Plan	Track the number of trees planted on Town property / year . Tasks: Plant an average of 1000 trees or shrubs / year on Town property.	Planted 2600 trees and shrubs on Aurora lands, included the Towns street tree planting program, planting days with Arboretum, LSRCA and Neighbourhood Network	Approximately 1500 trees and shrubs	Planted 1900 trees and shrubs on Aurora lands, included the Towns street tree planting program, planting days with Arboretum, LSRCA and Neighbourhood Network	Parks planted 1,933 trees in 2022.	
	Action 4: Implement the Invasive Species Act in partnership with York Region and the Province.	Complete 1 invasive species pilot project per year. Apply for 1 grants per 3 years. Tasks: Document partnership with other organizations.	Eradication Efforts of Invasive Species: successful removal of invasive species from Rotary Park with assistance from the Town's Adopt a Park partner (species are Phragmites, Garlic mustard, Giant Hog Weed, European Buckthorn). Arboretum Committee continued work on pharmites control. Staff working to control pharmites within Wildlife Park.	Region targeted Phragmites on regional frontage adjacent to Aurora parkland. Arboretum completed extensive buckthorn removal in park.	Eradication Efforts of Invasive Species (species are Phragmites, Garlic mustard, Giant Hog Weed, European Buckthorn): successful removal of invasive species from Rotary Park with assistance from the Town's Adopt a Park partner. Arboretum Committee continued work on pharmites control. Staff working to control pharmites within Wildlife Park and SWMP's.	Parks department/ Council approved Phragmites strategy in 2022, and operational funding for the next 4 years. Ongoing partnerships with residents/community Groups to remove invasive species; including Garlic mustard and Buckthorn; outreach programs implemented as well too.	
Climate Change and Energy Objective C1: Prepare a Climate Change Adaptation Plan	Action 1: Identify climate change risks by completing a vulnerability risk assessment of key departmental priorities.	Completion date of each climate change risk assessment . Tasks: Apply for funding, document proposal approvals	A risk and vulnerability assessment of Town assets is part of the Climate Change Adaptation Plan. Staff requested funds to retain a consultant in 2019. Council conditionally approved the project, based on the outcome of the York Region Climate Change Action Plan being released in 2020.	A risk and vulnerability assessment of Town assets is part of the Climate Change Adaptation Plan. Council approved the project in 2020 with a project start date in 2021.	The kicked-off the Climate Change Adaptation Plan in 2021, a risk and vulnerability assessment of the Town's infrastructure and creating a plan to increase the Town's resilience to climate change. Impelmentation plan will include a divisional-based priorities list. Expected project completion in 2022.	Implementation Plan was included as part of the Climate Change Adaptation Plan. Preliminary follow-up meetings have been conducted to all relevant departments.	

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
Climate Change and Energy Objective C2: Implement the Provincial Climate Change Plan Actions	Action 2: Develop a Climate Change Adaptation Action Plan that will assist the Town to mitigate the risks of climate change. The Plan would benefit from climate change planning partnerships with other municipalities, conservation authorities and York Region.	The preparation of a climate change action plan approved by Council . Tasks: consultant fee - 2020 budget	2020 Budget was conditionally approved by Council for a Climate Change Adaptation Plan in October 2019.	2020 Budget was approved by Council for a Climate Change Adaptation Plan to start in 2021.	The Town kicked-off the Climate Change Adaptation Plan in 2021, a risk and vulnerability assessment of the Town's infrastructure and creating a plan to increase the Town's resilience to climate change.Expected project completion in 2022.	Implementation Plan was included as part of the Climate Change Adaptation Plan. Preliminary follow-up meetings have been conducted to all relevant departments.	
	Action 1: *Province Propose amendments to Municipal Act.	RMOY is the approval authority for Official Plan, amendments and municipal consolidation. Tasks: Update the Town of Aurora's Official Plan	Official Plan Review project planning occurred in 2019, with plans to start in 2020. The project plans to incorporate changes to the Municipal Act.	Official Plan Review project planning occurred in 2019, with plans to start in 2020. The project plans to incorporate changes to the Municipal Act.	Official Plan Review project planning occurred in 2019, with plans to start in 2020. The project plans to incorporate changes to the Municipal Act.		
	Action 2: *Require electric charging in surface lots.	Develop KPI as part of GDS. Tasks: Add this requirement to the Town's Development Policy	To be developed as part of the Green Development Standard - project to start in 2021.	To be developed as part of the Green Development Standard - project to start in 2021.	Minimum charging infrastructure being added under the Green Development Standard - project completion in 2022. Town Municipal Parking Lot Management Plan completed in 2022 includes requirement for any resurfacing or new parking lots to assess EV infrastructure needs within Design phase.	Minimum charging infrastructure added under the Green Development Standard Tier 1 requirements - Phase 1 project completed in 2022. Town Municipal Parking Lot Management Plan completed in 2022 includes requirement for any resurfacing or new parking lots to assess EV infrastructure needs within Design phase. - Ask Michael	
	Action 3: *Set green development standards.	Develop KPI as part of GDS. Tasks: Prepare Green Development Standards (GDS) for Council	The Green Development Standard - project to start in 2021.	The Green Development Standard - project to start in 2021.	The Green Development Standard - project started in 2021, completion in 2022.	Green Development Standards Phase 1 completed in July 2022. The GDS applies to most new development applications. The Town's GDS are developed on five areas of focus including Energy, Ecology, Water, Complete Communities, and Building Materials. Based on these five areas, and municipal best practice review, a series of criteria have been developed to measure green development performance.	

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
Climate Change and Energy Objective C3: Reduce the town's greenhouse gas emissions by town staff and at town facilities. (* Actions pulled from the Provincial Climate Change Plan)	Action 4: "Eliminate minimum parking requirements over the next 5 years for municipal zoning bylaws.	Develop KPI as part of GDS. Tasks: Add this requirement to the Official Plan policy. Encourage TDM to replace parking requirements within development approval process	OP Review will consider the parking requirement. Reduced parking in the Promenade due to space restrictions.	OP Review will consider the parking requirement. Reduced parking in the Promenade due to space restrictions.	OP Review will consider the parking requirement. Reduced parking in the Promenade due to space restrictions.	Not looking into this at all. Maybe look into eliminating parking requirements in the DT area. Mayor put a motion in for this a few months back. Wanted to have zero parking in the Aurora Promenade. This was not favored by Coucillors. Marketability of new and existing developments would be affected if parking requirements were removed. This was said by the developers too.	
	Action 5: "Make climate change mitigation and adaptation mandatory in municipal official plans.	Develop KPI as part of GDS. Tasks: Add this requirement to the Official Plan policy	Official Plan Review to start in 2020 and will incorporate recommendations from the Community Energy Plan, updates to the Municipal Act and the Green Development Standard.	Official Plan Review to start in 2020 and will incorporate recommendations from the Community Energy Plan, updates to the Municipal Act and the Green Development Standard.	Official Plan Review to start in 2020 and will incorporate recommendations from the Community Energy Plan, updates to the Municipal Act and the Green Development Standard.	Yes this was devised in the new Plan that speaks to climate change.	
	Action 1: Implement an anti-idling initiative.	Full time staff completing anti-idling training / year. . Tasks: Year 1 include full time staff who drive Town vehicles. Train remainder of staff.	Staff initiated stakeholder consultation for a Town-wide Anti-Idling Policy, which aims to limit idling from residents, businesses and Town staff. Town staff training for anti idling will be incorporated into the Town's Green Fleet Action Plan, under development.	Council approved the Anti-Idling Policy, which aims to limit idling from residents, businesses and Town staff, public campaign kickoff in August 2021 to align with back to school. Town staff training for anti idling will be incorporated into the Town's Green Fleet Action Plan, under development.	Town launched Fall 2021 the Every Second Counts anti-idling public education campaignbased on Council-approved Anti-Idling Policy. Education campaign included: dedicated Town website on anti-idling education, busniess and school resources, Quiz, ByLaws provided education in the community, Mobile signs throughout the community, social mdeia campaign, etc. Town staff training for anti idling also included.	Town launched Fall 2021 the Every Second Counts anti-idling public education campaignbased on Council-approved Anti-Idling Policy. Education campaign included: dedicated Town website on anti-idling education, busniess and school resources, Quiz, ByLaws provided education in the community, Mobile signs throughout the community, social mdeia campaign, etc. Town staff training for anti idling also included. Social media outreach on Anti-Idling initiatives was pursued this year.	

Table 8: CEAP Progress (2019-2022) (*continued*)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	Action 2: *Develop a Green Fleet Plan.	Develop a KPI in process of preparing the Green Fleet Plan. Tasks: Prepare a Green Fleet Plan; Add to 2020 budget	Under development, expected in 2021.	Under development, expected in 2021.	The Council approved the Town's first Green Fleet Action Plan in 2021 (completed) and staff are in the implementation phase of this plan. Council approved the Electric Vehicle Charging Station Policy and Process to outline Town requirements and best practices in implementing and expanding EV charging stations at Town facilities. Staff installed 8 dual head level 2 EV chargers at Town-owned facilities including: SARC, AFLC, Town Hall, JOC and the Armoury. An addition 2 dual head chargers will be instilled as part of the Library Square Project. The Town joined Ontario's largest EV charging network, Ivy.	Green Fleet Action Plan was developed in 2019. Fleet is in progress of procuring an Electric Ice Re-surfacer and Ice Edger. The Fleet Division purchased a propane Ice Edger. Purchased plow trucks with most advanced higher Tier Diesel Engine. All new trucks are purchased with LED lights and auxiliary batteries that reduced the need to idle a vehicle. Replaced lower tier diesel equipment. Disposed of antiquated equipment (ongoing). Incorporate AGM batteries that do not emit gasses. Incorporated ethanol 10 in gasoline-fuelled vehicles. AFS has incorporated green practices, such as using synthetic oils and extending the time between oil changes. Purchase fuel efficient, right-sized vehicles as a standard practice. Replaced the oldest vehicles with cleaner, modern technology. Automatic lubrication systems have been installed on all apparatus to extend the life of expensive parts, create less waste, and actually use less grease. Participation in the SARIT project.	

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	Action 3: Improve energy efficiency of existing building and business operations	Estimated Annual energy savings of newly implemented energy retrofits in Town owned facilities . Tasks: Implement facility energy and water conservation measures within the Capital Plan	Base year: 2018. Baseline 2018: 23,180,806 equivalent kilowatt-hours. 2019 Update: 24,641,678 equivalent kilowatt-hours. Council approved \$50,000 for the implementation of energy efficiency measures at Town facilities under the 2020 capital budget. Town acquired an energy management software to track energy and water use, analyze trends, estimate energy savings from significant energy saving projects, and track GHG emissions. Historic energy consumption from Town Facilities were acquired from utility companies for software input.	Energy Use Tracking at Town Facilities: 2020: 19,860,541 equivalent kilowatt-hours. Monthly Building Performance meeting setup with Facility staff and Energy and Climate Change Analyst. Prepared TOR for LED lighting retrofits at Town facilities (2021 project). Integrated energy efficiency and waste disposal wording/ requirements in Facilities' procurement documents. Investigated a new technology for improving energy efficiency at SARC using the BAS. Due to COVID 19, facilities made operational changes to reduce energy consumption during the shutdownnn. Using the Town's energy management software, there was an estimated 4,000,000 equivalent kWh saved from implementing ECMs (23% savings).	2021: 19,828,350 equivalent kilowatt-hours. New properties added into the Town's portfolio thus increasing Town's emissions compared to previous years, include: Sports Dome, Yonge Street properties. Energy Conservation Measures implemented including energy management software, historic energy consumption data acquisition, BAS technology. LED lighting retrofits, motion and occupancy sensors, natural gas audit, and installed EV charging stations.	Facility Annual Energy Consumption (Natural Gas/Electricity). 2022: 19,386,242 equivalent kilowatt-hours (2.3% decrease compared to 2021). Monthly Building Performance meeting setup with Facility staff and Energy and Climate Change Analyst (ongoing since 2020). EV Charging Station 2022 Data: A total of 1,300 EV charging sessions and 12,244 kWh of energy were recorded, offsetting emissions of approximately 5.3mTCO ₂ e or 5,297 kgCO ₂ e for 2022. Solar PV Systems: The Town had generated 649,131 kWh of energy through its solar PV systems across four Town-owned facilities. Building Projects in 2022: BCA studies included energy conservation measures to all facilities; BAS projects coming in 2023-2024; upgrades systems; Council approved \$50,000 in 2022 budget for capital projects for energy conservation measures at Town-owned facilities. Council approved budget 2023: Potentially \$50,000	Energy Consumption (2022 compared to 2021): 2.3% decrease. EV Charging sessions (2022 compared to 2021): No data for 2021. Solar PV Systems (2022 compared to 2021): 5.6% increase
	Action 4: Consider all green infrastructure options as part of new corporate builds.	Number of green infrastructure options included in new corporate projects . Tasks: List chosen green infrastructure items implemented on Progress Report	Town's library square project is in line with LEED Gold and will include the installtion of electric vehicle charging stations.	No update for 2020	Aurora Town Square project is in line with LEED Gold and will include the installtion of electric vehicle charging stations.	No input for 2022 - Doug. LIDs, raingardens, permeable paving are things Parks are constantly looking at in respect to development and applications. Also internal designs for new parks. - Sara Tienkamp. Trees cut down during construction projects are replaced. Retaining wall project located at 28 Wellington Street West to apease property owner, planted 50 white cedars (these were not present before).	

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
Environmental Awareness Objective A1: Encourage the stewardship of Aurora's natural resources and advance green initiatives by promoting community involvement	Action 1: Promote the use of reusable water bottles in conjunction with the new water bottle filling stations. Communication campaign is aimed at the community including staff and should include but may not be limited to the following:	Number of existing community events sharing reusable water bottle information . Tasks: Prepare messaging to share at existing community based events.	No update for 2019	No update for 2020 due to events being canceled due to the COVID19 Pandemic.	No update for 2020 due to events being canceled due to the COVID19 Pandemic.	Shared York region social media messaging related to water quality. Partnered with the region to access Water related print materials that are given out at Access Aurora.	
	Action 2: Increase overall community awareness of climate change:	Number of existing community events sharing Climate Change information . Tasks: Prepare messaging to share at existing community based events.	2 Events: Town Staff presented the Community Energy plan to the public at two Farmer's Markets in the Summer of 2019. A designated Town Webpage was developed in 2019 dedicated to all the Town's climate change initiatives, including public engagement on the Community Energy Plan.	Public consultation on CEP occurred in October 2020. Council Approved the Anti Idling Policy in October 2020, which includes a robust public education campaign for Anti-Idling, launching in September 2021. Town Website updated to include Climate Change initiatives and Town Climate Change Plans. Participated in the ClimateWise Business Network's Mayor's Energy Challenge. The education campaign consisted of a video by the Mayor, news conference with local municipalities, social media promotion and the creation of a Town Website to support businesses with their reporting.	Due to events being canceled due to the COVID19 Pandemic, few public events occurred. Ongoing Town Website updates to include Climate Change initiatives and Town Climate Change Plans. Every Second Counts Town Anti-Idling education campaign in fall 2021, including public awareness, quiz, dedicated Website, quiz, Bylaw providing education material to drivers, social media campaign, Town staff education program, etc. Community Environmental awareness challenge GO Green Challenge in Summer 2021 - promoting and environmental initiatives at home. Town Staff Environmental awareness challenge GO Green Challenge in Spring 2021 - promoting and environmental initiatives at home.	Annual Emergency Preparedness Social Media Campaign, Annual Anti Idling Campaign, First Annual EV Showcase, Community Green Challenge. Aurora Chamber Street Festival - Presence of Enbridge Gas, as a Presenting Sponsor, providing information on Home Energy Rebate Plus (HER+) and Home Winterproofing Program (HWP). KPIs from event: 210 interactions; 45 signups for HER+.	HER+ Program: is a partnership between Enbridge Gas and the Government of Canada and is a program that provides every participant the opportunity to receive a rebate for installing an electric heat pump. HW Program: is a program targeting income qualified customers and is the only incentive program we deliver that provides energy efficiency measures at no cost to the participant.
	Action 3: Develop an urban forest communication plan that delivers key messages to target audiences within the community	annual Number of trees planted. Tasks: Continue to promote planting and naturalization projects	Planted 2600 trees and shrubs on Aurora lands, included the Towns street tree planting program, planting days with Arboretum, LSRCA and Neighbourhood Network. Streets trees are monitored and have a survival rate of 90-95%. Designed a naturalized park: New park in 2C designed to be a natural park including, community gardens, pollinator gardens, naturalized playgrounds and one of the main trail entry locations to Wildlife Park.	New adopt-a -park partner established who created a butterfly/bee habitat garden on Town blvd to encourage neighbours to grow species in their yards that can sustain bees/butterflies	Planted 1900 trees and shrubs on Aurora lands, included the Towns street tree planting program, planting days with Arboretum, LSRCA and Neighbourhood Network. Streets trees are monitored and have a survival rate of 90-95%. Designed a naturalized park: New park in 2C designed to be a natural park including, community gardens, pollinator gardens, naturalized playgrounds and one of the main trail entry locations to Wildlife Park.	Shared LEAF social media messaging regarding Backyard planting program, as well as Arboretum and LSRCA efforts. Parks always promotes adopt-a-park program to town residents. Also supported Arboretum planting, Neighborhood work, and tree planting and shrubs.	

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
CEAP Implementation	Action 4: Develop a community based communications strategy to help protect and enhance our biodiversity	Number of public outreach campaigns promoting and protecting biodiversity. Tasks: Increase signage Increase partnerships	No update for 2019	No updates for 2020	Developed and enhanced LDD strategy that includes monitoring, robust communication plan, burlap kits, watering and injection treatments of select prominent trees.	Shared LEAF social media messaging regarding Backyard planting program, as well as Arboretum and LSRCA efforts. Parks always promotes adopt-a-park program to town residents. Also supported Arboretum planting, Neighborhood work, and tree planting and shrubs.	
	Action 1: CAO to support the ongoing role of the Environmental Management Team (EMT) to manage the implementation of the CEAP. The implementation team will include representatives from all departments and will report to ELT.	CAO and ELT. Tasks:	No update	Ongoing	AMT reviews the CEAP progress report annually for comment.		
	Individual Departments, with the assistance of EMT, will consider the implementation of this Plan when developing departmental priorities and preparing budgets.	ELT and EMT. Tasks:	No update	As part of annual budget process	CEAP action items included into divisional annual operation/ capital budgets. Starting 2023 budget cycle, all capital projects will include a climate change considerations section where the environmental plan in which the project supports will be identified, including the CEAP.		
	Implementation of CEAP to flow through directors and CAO, who will be responsible for assigning respective departmental staff to implement.	CAO and ELT. Tasks:	No update	Ongoing	CEAP stakeholder group established for annual updates and review to the annual progress report		
	Staff are strongly encouraged to reference the relevant CEAP objectives in the Link to the Strategic Plan section of all Council reports.	Staff report writers. Tasks:	No update	New / ongoing	Climate Change Considerations Section added to Staff reports starting in 2022, where staff to reference any environmental plan in which report recommendations support, including CEAP.		

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	The Program Manager of Environmental Initiatives, to include a semi-annual informal progress update of CEAP's implementation to Council.	PDS - Engineering. Tasks:	No update	*New / Annual in Q3	Annual Progress reports provided to EAC and Council.		
	EMT, through department heads, to report to council by way of annual Progress Report regarding the progress of the CEAP's implementation.	ELT and EMT. Tasks:	No update	Annually in Q1	Annual Progress reports provided to EAC and Council.		

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	The Green Initiatives Reserve Fund (the Fund) is hereby established to receive and hold donations or budgetary contributions for purposes of funding or lending funding for projects or initiatives which further the objectives or support the strategic directions of the Town's Corporate Environmental Action Plan as amended from time to time. Council may direct that portions of revenues or saving arising from certain projects are to be contributed to the Reserve Fund. Balances in the Fund will be planned for specific projects recommended to or by Council during the annual budget process, or other times throughout the year, having consulted with the Environmental Advisory Committee. The Green Initiatives Reserve Fund was established in September of 2012.	FS- Finance. Tasks:	No update	Ongoing	Ongoing		

Table 8: CEAP Progress (2019-2022) (*continued*)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	During the next (second) review and enhancement of this plan, Stakeholders are seeking to strengthen the community component which will include a thorough and varied community consultation process which engages community members, local businesses, staff and council with the renewal of this Plan.	PDS-Engineering; CAO-Communications. Tasks:	No update	CEAP update to be added to 2022 capital budget	Capital project planning included for 2024 to hire a consultant to put CEAP renewal together, with strong public and town stakeholder consultation elements.		
	Develop, distribute and promote a staff Environmental Handbook; to be maintained and updated on the intranet and printed and distributed to new and existing staff during Earth Week annually. The handbook will highlight some new environmental initiatives as well as some basic energy saving and environmentally friendly living tips.	PDS-Engineering; CAO-Communications. Tasks:	No update	Complete version 1 of handbook by Q2 2020	Pending return to work to develop a Green Team at the Town, in which a handbook would be part of the work of the Green Team		
	Set up a green team of staff who are passionate about specific environmental initiatives to advise the project lead until the project is being implemented. This team should also help raise awareness, promote various environmental programs and choose to help at various environmental events throughout the year.	PDS-Engineering; CAO-Communications. Tasks:	No update	Form green team by Q1 2020	Pending return to work to develop a Green Team at the Town.		

Table 8: CEAP Progress (2019-2022) (continued)

Area	Actions	Key Performance Indicator (KPI) and Tasks	KPI Results for 2019	KPI Results for 2020	KPI Results for 2021	KPI Results for 2022	Significance of KPI / Outcomes
	Youth Engagement on Environmental Topics	PDS-Engineering; CAO-Communications. Tasks:	No update	Ongoing	The Community Energy Plan had local grade 8 students review, comment and present their comments on the CEP in 2021, delegated to Council.		

E.7 Climate Change Adaptation Plan

In the Town of Aurora's Climate Change Adaptation Plan (CCAP), the Town identified adaptation actions to acclimatize to these changing conditions. The CCAP was created to guide asset management planning and better prepare for the impacts of climate change. Short term priorities for adaptation actions are summarized as follows:

- For **Linear Engineered Assets**, actions are focused on improving the flood resilience of the stormwater system through proactive maintenance, evaluating future projected precipitation impacts to the system, and applying lot-level runoff controls. Other specific short-term actions include preparing road signage and traffic signals for increased power outages and maintaining stormwater management ponds in dry summer conditions.
- For **Water Infrastructure**, actions relating to flood management are important in reducing risks to the sanitary system. Otherwise, continued emergency response and increased surveillance planning are recommended to help reduce the worst impacts of flood risks to water infrastructure if issues can be detected and repaired quickly.
- For **Parks and Natural Heritage**, actions focus on preventing and repairing debris hazards through proactive landscape maintenance. An important recommendation from this study is to incorporate natural capital assets into asset management planning so that these can be monitored, maintained, and protected, and the benefits to climate adaptation and mitigation can be measured.
- For **Facilities**, actions relate to ensuring sufficient cooling capacity in critical buildings as temperatures and heatwaves increase, ensuring backup power is in place at facilities as needed, inspecting domed (bubble) roofs proactively and after high wind events, and considering flood preparedness and drainage systems of facilities.

Medium and long-term priorities for adaptation actions focus on three key themes:

- Incorporating climate change projections into asset management planning to ensure that infrastructure designs, operations and maintenance procedures are prepared for future conditions,
- Managing risks through updated operation and maintenance procedures based on identified risks, and
- Planning for and implementing resilience interventions upon asset renewal, during major retrofits, or as needed when new risks are identified.

F Appendix F - Communications Strategy

To implement the plan outlined in the ECDMP, a communications strategy is presented in this section.

As per the 2019 ECDMP, a Steering Committee should be formed to ensure the successful implementation of the 2024 ECDMP. This committee should be made up of the following individuals:

- **Energy and Climate Change Analyst**
 - Oversee energy management within all facilities, and act as central resource and contact for energy efficiency matters.
 - Monitor and track energy use in Town of Aurora facilities.
 - Lead implementation of ECMs identified in the ECDM plan and otherwise.
 - Facilitate implementation of staff training programs and employee engagement strategies.
 - Oversee the implementation of Level 3 Energy Audits for facilities in corporate portfolio.
- **Water/Waste Water Supervisor**
 - Assist with monitoring and tracking of energy consumption.
 - Request input from Steering Committee Lead on decisions which may have energy impact.
 - Advise Energy and Climate Change Analyst on strategies to reduce energy consumption and GHG emissions.
 - Assist Energy and Climate Change Analyst with implementation of ECMs.
- **Fleet Supervisor**
 - Assist with monitoring and tracking of energy consumption.
 - Request input from Steering Committee Lead on decisions which may have energy impact.
 - Advise Energy and Climate Change Analyst on strategies to reduce energy consumption and GHG emissions.
 - Assist Energy and Climate Change Analyst with implementation of ECMs.
 - Oversee Green Fleet Action Plan progress and ensure that the Town stays on track to meet their fleet GHG reduction targets.
- **Facilities Manager**
 - Assist with monitoring and tracking of energy consumption.
 - Request input from Steering Committee Lead on decisions which may have energy impact.
 - Advise Energy and Climate Change Analyst on strategies to reduce energy consumption and GHG emissions.
 - Assist Energy and Climate Change Analyst with implementation of ECMs.
 - Assist Energy and Climate Change Analyst with implementation of Level 3 Energy Audits.
- **Waste Supervisor**
 - Assist with monitoring and tracking of energy consumption.
 - Request input from Steering Committee Lead on decisions which may have energy impact.
 - Advise Energy and Climate Change Analyst on strategies to reduce energy consumption and GHG emissions.
 - Assist Energy and Climate Change Analyst with implementation of ECMs.

- Oversee the regular conduction of corporate solid waste audits.
- Assist with development and implementation of Waste Reduction Plan.
- Oversee the communication and coordination with York Region to reduce waste GHG emissions by improving the landfill and incineration systems.
- **Engineering and Capital Delivery Manager**
 - Request input from Steering Committee Lead on decisions which may have energy impact.
 - Advise Energy and Climate Change Analyst on strategies to reduce energy consumption and GHG emissions.
 - Assist Energy and Climate Change Analyst with implementation of ECMs.
 - Assist with development of energy efficiency oriented procurement policies.
 - Assist with incorporation of life cycle analysis in budgeting, planning, and asset management.
- **Procurement Manager**
 - Assist with development of energy efficiency oriented procurement policies.
 - Assist with incorporation of life cycle analysis in budgeting, planning, and asset management.
- **Corporate Communications Manager**
 - Assist with improving communication of energy efficiency initiatives within the organization.
 - Assist with implementing staff engagement strategies.

G Appendix G - Funding Opportunities

FCM offers multiple funding opportunities through the Green Municipal Fund (GMF). Some of the funding opportunities which may help the Town of Aurora to fund the recommended ECMs are presented in Table 9 below. Note that these funding opportunities were obtained from the GMF website.

Table 9: FCM Funding Opportunities

Funding Opportunity	Summary	Description	Maximum Award	Target
Capital project: GHG impact retrofit	Retrofit a local recreational or cultural facility to reduce GHG emissions. Finance your upgrade with capital project funding.	Achieve a minimum 30 percent GHG emissions reduction through a retrofit of a community building when compared to baseline emissions. Eligible projects may be a single comprehensive community building retrofit, or a portfolio of buildings.	Maximum of \$5 million per project. Up to 25% as a grant and the remainder as a loan. Combined loan and grant for up to 80% of eligible project costs.	Projects must aim to achieve a minimum 30 percent GHG reduction from current or baseline performance. Eligible projects may be a single building retrofit, or a portfolio of buildings (across a single municipality or group of municipalities).
Study: GHG reduction pathway feasibility	Assess the feasibility to support near-term and long-term projects that reduce energy and GHGs, extend asset life and reduce cost of ownership for local recreational and cultural facilities. Determine the best approach to achieving near net zero buildings with a study grant.	Integrate energy and GHG reductions into longer-term management plans for local recreational and cultural facilities. Studies will include feasibility work to support near-term and long-term capital projects while mapping out a course to extend asset life and reduce cost of ownership (i.e., the total capital, operating and maintenance costs over the building's remaining useful life).	Single building: Grant for a maximum of \$65,000 to cover up to 80% of eligible costs. Portfolio of buildings: Grant for a maximum of \$200,000 to cover up to 80% of eligible costs (cost per building cannot exceed \$65,000).	This grant enables the identification of measures to be addressed in a GHG reduction pathway retrofit capital project. Studies will consider the unique objectives and constraints of the building owner (e.g., building condition, capital budgets, equipment renewal cycles, etc.), and provide a detailed exploration of multiple optimization scenarios.
Capital project: GHG reduction pathway retrofit	Retrofit a local recreational or cultural facility, or group of facilities, using an outcomes-oriented approach to achieving near-net zero carbon buildings over time. Finance your upgrade with capital project funding.	Make significant reductions in energy-use and GHG emissions by retrofitting community buildings over time. This funding enables the implementation of longer-term, multi-measure retrofit capital projects that contribute to a GHG reduction pathway.	Maximum of \$5 million per project. Up to 25% as a grant and the remainder as a loan. Combined loan and grant for up to 80% of eligible project costs.	
Study: New construction of energy-efficient facilities	Construct a net-zero municipal facility. Assess potential solutions with a study grant.	GMF funds feasibility studies of initiatives that target net zero energy performance in new municipal facilities. This funding helps Canadian cities and communities of all sizes use less energy, which reduces their greenhouse gas (GHG) emissions and improves their air quality.	Grant: Up to 50% of eligible costs to a maximum of \$175,000.	Your initiative must aim for net zero energy performance. That means any energy it requires should be generated through on-site, renewable or recovered power sources.
Pilot project: New construction of energy-efficient facilities	Evaluate net-zero efficiency measures in a new municipal facility. Develop a smaller-scale version of your project in real-life conditions with a pilot project grant.	GMF funds pilot projects of initiatives that target net zero energy performance in new municipal facilities. This funding helps Canadian cities and communities of all sizes use less energy, which reduces their greenhouse gas (GHG) emissions and improves their air quality.	Grant: Up to \$500,000 to cover up to 50% of eligible costs.	Your initiative must aim for a net zero energy performance. That means any energy it requires should be generated through on-site, renewable or recovered power sources.

Table 9: FCM Funding Opportunities (*continued*)

Funding Opportunity	Summary	Description	Maximum Award	Target
Capital project: New construction of energy-efficient facilities	Construct a net-zero municipal facility. Finance a new build with capital funding.	GMF funds capital projects of initiatives that target net zero energy performance in new municipal facilities. This funding helps Canadian cities and communities of all sizes use less energy, which reduces their greenhouse gas (GHG) emissions and improves their air quality.	Regular loans and grants: Receive a low-interest loan of up to \$5 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs. High-ranking project loans and grants: These qualify for a low-interest loan of up to \$10 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs.	Your initiative must aim for net zero energy performance. That means any energy it requires must be generated through on-site, renewable or recovered power sources.
Municipal fleet electrification	Reduce fuel costs and fleet GHG emissions.	GMF funds feasibility studies and capital projects to support the electrification of municipal and/or transit fleets - the transition to zero-emission vehicles (ZEVs) that have the potential to produce no tailpipe emissions, including battery-electric, plug-in hybrid electric and hydrogen fuel cell vehicles.		
Study: Reduce fossil fuel use in fleets	Reduce or avoid the use of fossil fuels in municipal service delivery vehicles. Assess potential solutions with a study grant.	GMF funds feasibility studies for projects that reduce or avoid fossil fuel use in any vehicle that delivers municipal services. This funding helps Canadian cities and communities of all sizes undertake environmental sustainability projects that reduce energy consumption/greenhouse gas emissions (GHGs) and improve their air quality. Your study may compare several options or assess the capacity of one option to reduce or avoid using fossil fuel in any vehicle that delivers municipal services.	Grant: Up to 50% of eligible costs to a maximum of \$175,000.	Your project should reduce GHG emissions by 20% compared to an existing or modeled baseline measurement.
Capital project: Reduce fossil fuel use in fleets	Reduce or avoid the use of fossil fuels in municipal service delivery vehicles. Finance a greener fleet solution with capital funding.	GMF offers combined loan and grant funding for capital projects that reduce or avoid fossil fuel use in any vehicle that delivers municipal services. This funding helps Canadian cities and communities of all sizes undertake environmental sustainability projects that reduce energy consumption/greenhouse gas emissions (GHGs) and improve their air quality. Your capital project should reduce or avoid the use of fossil fuel in your municipal fleet and should reduce GHG emissions by 20% compared to an existing baseline.	Regular loans and grants: Receive a low-interest loan of up to \$5 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs. High-ranking project loans and grants: These qualify for a low-interest loan of up to \$10 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs.	Your project should reduce GHG emissions by 20% compared to an existing or modeled baseline measurement.
Study: Retrofit of municipal facilities	Retrofit a municipal building to improve energy efficiency. Assess potential solutions with a study grant.	GMF funds feasibility studies of retrofits that improve energy efficiency by at least 30% in municipal facilities. This funding helps Canadian cities and communities of all sizes use less energy, which reduces their greenhouse gas (GHG) emissions and improves their air quality. Study a combination of energy efficient retrofits that together, reduce a municipal facility's energy consumption by 30% (minimum of 20% through energy efficiency and maximum of 10% through on-site, renewable energy).	Grant: Up to 50% of eligible costs to a maximum of \$175,000.	Your combination of retrofits must have the potential to reduce a building's energy use by at least 30%. A minimum of 20% must come from energy efficiency and a maximum of 10% can come from on-site, renewable energy. The 10% maximum does not apply to geothermal exchange systems. Retrofit changes must meet or exceed the national and provincial building codes (NECB 2011 or provincial derivatives).

Table 9: FCM Funding Opportunities (*continued*)

Funding Opportunity	Summary	Description	Maximum Award	Target
Capital project: Signature initiative		Our signature initiative funding (combined loans and grants) helps Canadian cities and communities of all sizes implement bold environmental projects that reduce GHG emissions and protect the air, water or land. This funding is designed to accommodate transformative, best-in-class municipal projects, meaning they're highly innovative and impactful.	Regular loans and grants: Receive a low-interest loan of up to \$5 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs. High-ranking project loans and grants: These qualify for a low-interest loan of up to \$10 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs.	Signature initiatives do not have pre-set environmental targets/thresholds because the projects are unique and evaluated on a case-by-case basis. We prefer projects that have built-in mechanisms to encourage replication and widespread adoption (e.g., innovative business models, partnership models, new financing mechanisms).
Study: Waste reduction and diversion	Divert municipal solid waste from a landfill. Assess potential solutions with a study grant.	GMF funds feasibility studies for initiatives that have the potential to help you divert at least 60% of municipal solid waste from your landfill, no matter how much you're already diverting (i.e., 0-59%). If your municipality has already achieved the 60% target, your project must demonstrate the potential to move beyond it. If you are from a remote community, your diversion project must target a diversion rate of 15% over your current baseline. This funding helps Canadian cities and communities of all sizes reduce, reuse and recycle material that would otherwise enter the waste stream.	Grant: Up to 50% of eligible costs to a maximum of \$175,000.	Divert at least 60% of municipal solid waste from your landfill, or move beyond the 60% mark if you have already achieved it. If you are from a remote community, achieve a diversion rate of 15% over your current baseline.
Pilot project: Waste reduction and diversion	Evaluate a solution for diverting municipal solid waste from a landfill. Develop a smaller-scale version of your project in real-life conditions with a pilot project grant.	GMF funds pilot projects for initiatives that have the potential to help you divert at least 60% of municipal solid waste from your landfill, no matter how much you're already diverting (i.e., 0-59%). If your municipality has already achieved the 60% target, your project must demonstrate the potential to move beyond it. If you are from a remote community, your diversion project must target a diversion rate of 15% over your current baseline. This funding helps Canadian cities and communities of all sizes reduce, reuse and recycle material that would otherwise enter the waste stream.	Grant: Up to \$500,000 to cover up to 50% of eligible costs.	Divert at least 60% of municipal solid waste from your landfill, or move beyond the 60% mark if you have already achieved it. If you are from a remote community, achieve a diversion rate of 15% over your current baseline.
Capital project: Waste reduction and diversion	Divert municipal solid waste from a landfill. Finance a waste reduction and diversion project with capital funding.	GMF funds capital projects for initiatives that divert at least 60% of municipal solid waste from your landfill, no matter how much you're already diverting (i.e., 0-59%). If your municipality has already achieved the 60% target, your project must move you beyond 60%. If you are from a remote community, your diversion project must target a diversion rate of 15% over your current baseline. This funding helps Canadian cities and communities of all sizes reduce, reuse and recycle material that would otherwise enter the waste stream.	Regular loans and grants: Receive a low-interest loan of up to \$5 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs. High-ranking project loans and grants: These qualify for a low-interest loan of up to \$10 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs.	Divert at least 60% of municipal solid waste from your landfill, or move beyond the 60% mark if you have already achieved it. If you are from a remote community, achieve a diversion rate of 15% over your current baseline.
Study: Waste stream management	Address specific waste stream challenges to improve local waste management. Assess potential solutions with a study grant.	GMF funds feasibility studies of initiatives that address specific waste stream challenges (e.g., biosolids, specific types of construction, renovation and demolition (CRD) waste, household hazardous waste, textiles, furniture, diapers, polystyrene, certain plastics, other substances). This funding helps Canadian cities and communities of all sizes improve their waste stream management.	Grant: Up to 50% of eligible costs to a maximum of \$175,000.	Address a particular type of item (e.g., diapers, polystyrene, gypsum), improve its waste stream diversion rate (by weight or volume) and offer other environmental benefits.

Table 9: FCM Funding Opportunities (continued)

Funding Opportunity	Summary	Description	Maximum Award	Target
Pilot project: Waste stream management	Evaluate a solution for addressing specific waste stream challenges to improve local waste management. Develop a smaller-scale version of your project in real-life conditions with a pilot project grant.	GMF funds pilot projects for initiatives that address specific waste stream challenges (e.g., biosolids, specific types of construction, renovation and demolition (CRD) waste, household hazardous waste, textiles, furniture, diapers, polystyrene, certain plastics, other substances). This funding helps Canadian cities and communities of all sizes improve their waste stream management.	Grant: Up to \$500,000 to cover up to 50% of eligible costs.	Address a particular type of item (e.g., diapers, polystyrene, gypsum), improve its waste stream diversion rate (by weight or volume) and offer other environmental benefits.
Capital project: Waste stream management	Address specific waste stream challenges to improve local waste management. Finance a waste stream management project with capital funding.	GMF funds capital projects for initiatives that address specific waste stream challenges (e.g., biosolids, specific types of construction, renovation and demolition (CRD) waste, household hazardous waste, textiles, furniture, diapers, polystyrene, plastics, other substances). This funding helps Canadian cities and communities of all sizes improve their waste stream management.	Regular loans and grants: Receive a low-interest loan of up to \$5 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs. High-ranking project loans and grants: These qualify for a low-interest loan of up to \$10 million and a grant worth up to 15% of the loan; cover up to 80% of your eligible costs.	Address a particular type of item (e.g., diapers, polystyrene, gypsum), improve its waste stream diversion rate (by weight or volume) and offer other environmental benefits.

H Appendix H - 10 Year Project Costs

Table 10 presents the annual costs of replacing relevant assets (HVAC equipment, roofs, etc.) with like-for-like substitutes, and Table 11 presents the annual costs of implementing the measures recommended in each scenario.

Table 10: Annual BCA Implementation Costs

Facility	Replacement	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Aurora Community Centre	Optimum start/stop	7,284										
Aurora Family Leisure Complex	Demand control ventilation	11,485										
Aurora Family Leisure Complex	Optimum start/stop	7,990										
Aurora Town Hall	Demand control ventilation	6,367										
Aurora Town Hall	Interior CFL to LED retrofit	106,112										
Aurora Town Hall	Interior pot light to LED retrofit	2,746										
Aurora Town Hall	Optimum start/stop	14,981										
Stronach Aurora Recreation Complex	Low-E ceilings	146,061										
Stronach Aurora Recreation Complex	Optimum start/stop	5,118										
Aurora Community Centre	Drywall ceilings renewal		50,000									
Aurora Community Centre	Occupancy sensors		8,364									
Aurora Cultural Centre	Interior LED Retrofit		24,968									
Aurora Cultural Centre	Occupancy sensors		5,992									
Aurora Cultural Centre	Programmable thermostat		4,369									
Aurora Public Library	LED exterior lighting retrofit		28,713									
Aurora Public Library	Occupancy sensors		6,367									
Aurora Public Library	Optimum start/stop		7,624									
Aurora Seniors Centre	Domestic hot water heater renewal		5,000									
Fleet: Equipment	Vehicle replacement		206,100									
Fleet: Heavy duty	Vehicle replacement		300,000									
Fleet: Light duty	Vehicle replacement		160,000									
Fleet: Medium duty	Vehicle replacement		400,000									
Aurora Community Centre	Domestic hot water storage tanks renewal			12,000								
Aurora Community Centre	Modified bitumen roof renewal			30,000								
Aurora Community Centre	TPO roof membrane renewal			175,000								
Aurora Seniors Centre	Replacement of rooftop HVAC			133,500								
Aurora Town Hall	Replace HVAC			119,000								
Fleet: Equipment	Vehicle replacement			175,000								
Fleet: Heavy duty	Vehicle replacement			775,000								
Fleet: Medium duty	Vehicle replacement			203,300								
Stronach Aurora Recreation Complex	Packaged A/C unit renewal			8,000								
Victoria Hall	Interior LED retrofit			250								
Victoria Hall	Replacement of roofing shingles			26,000								
Aurora Community Centre	Acoustic ceiling tiles renewal				12,500							
Aurora Public Library	Boiler replacement				120,000							
Fleet: Equipment	Vehicle replacement				516,400							

Table 10: Annual BCA Implementation Costs (continued)

Facility	Replacement	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Fleet: Heavy duty	Vehicle replacement				730,000							
Fleet: Medium duty	Vehicle replacement				280,000							
Stronach Aurora Recreation Complex	Lifecycle replacement of modified bitumen roof				515,000							
Stronach Aurora Recreation Complex	Replace asphalt flat roof				1,051,000							
Aurora Seniors Centre	Low-flow lavatories					250						
Fleet: Equipment	Vehicle replacement					921,600						
Fleet: Heavy duty	Vehicle replacement					817,500						
Fleet: Light duty	Vehicle replacement					206,700						
Fleet: Medium duty	Vehicle replacement					67,900						
Victoria Hall	Occupancy sensors					375						
Fleet: Equipment	Vehicle replacement						772,800					
Fleet: Heavy duty	Vehicle replacement						400,000					
Fleet: Medium duty	Vehicle replacement						69,100					
Victoria Hall	Low-flow lavatory fixtures						999					
Victoria Hall	Programmable thermostat						375					
Fleet: Equipment	Vehicle replacement							432,400				
Fleet: Heavy duty	Vehicle replacement							438,800				
Fleet: Light duty	Vehicle replacement							70,200				
Fleet: Medium duty	Vehicle replacement							203,400				
Aurora Community Centre	Make-up air unit renewal								25,000			
Aurora Family Leisure Complex	Water heaters renewal								40,000			
Fleet: Equipment	Vehicle replacement								350,900			
Fleet: Heavy duty	Vehicle replacement								875,200			
Fleet: Light duty	Vehicle replacement								71,400			
Fleet: Medium duty	Vehicle replacement								555,600			
Stronach Aurora Recreation Complex	Domestic water heater renewal								120,000			
Stronach Aurora Recreation Complex	Packaged AHU renewal								120,000			
Stronach Aurora Recreation Complex	Packaged HVAC unit renewal								80,000			
Aurora Town Hall	Ashphalt shingles (upper level) renewal									100,000		
Fleet: Equipment	Vehicle replacement									175,400		
Fleet: Heavy duty	Vehicle replacement									786,100		
Fleet: Medium duty	Vehicle replacement									410,000		
Stronach Aurora Recreation Complex	Packaged HVAC unit renewal									40,000		
Aurora Seniors Centre	Packaged RTU renewal										200,000	
Fleet: Equipment	Vehicle replacement										1,135,300	
Fleet: Heavy duty	Vehicle replacement										868,900	
Fleet: Medium duty	Vehicle replacement										173,400	
Fleet: Equipment	Vehicle replacement											542,400
Fleet: Heavy duty	Vehicle replacement											1,489,100
Fleet: Medium duty	Vehicle replacement											232,200
Total Costs		308,144	1,207,497	1,657,050	3,224,900	2,014,325	1,243,274	1,144,800	2,238,100	1,511,500	2,377,600	2,263,700

Table 11: Annual Measure Implementation Costs for GHG Reduction Plan Scenario

Facility	ECM	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Aurora Community Centre	Remaining low-flow water fixtures			499								
Aurora Family Leisure Complex	Remaining exterior lights to LED			16,853								
Aurora Family Leisure Complex	Remaining interior lights to LED			41,821								
Aurora Family Leisure Complex	Remaining low-flow water fixtures			1,373								
Aurora Public Library	Remaining interior lights to LED			64,292								
Aurora Seniors Centre	Remaining exterior lights to LED			2,497								
Aurora Seniors Centre	Remaining low-flow water fixtures			125								
Aurora Town Hall	Remaining exterior lights to LED			24,343								
Aurora Town Hall	Remaining interior lights to LED			53,056								
Aurora Town Hall	Remaining low-flow water fixtures			312								
McMahon Clubhouse	Remaining lights to LED			624								
Stronach Aurora Recreation Complex	Remaining interior lights to LED			159,169								
Stronach Aurora Recreation Complex	Remaining low-flow water fixtures			1,623								
Victoria Hall	Remaining low-flow water fixtures			499								
Aurora Family Leisure Complex	Pool cover				4,619							
Aurora Public Library	High efficiency boiler replacement				159,124							
Stronach Aurora Recreation Complex	Pool cover				3,246							
Aurora Community Centre	Demand control ventilation						8,489					
Aurora Seniors Centre	Demand control ventilation						6,866					
Aurora Town Hall	Occupancy sensor in meeting rooms						18,726					
Fleet: By-Law - Light duty	Decarbonize two vehicles						400,000					
Fleet: Facilities - Ice Resurfacers	Ice resurfacers vehicle decarbonization						1,250,000					
Fleet: Parks - Equipment	Decarbonize 10 pieces of equipment						1,200,000					
Aurora Seniors Centre	Optimum HVAC scheduling							6,492				
Aurora Community Centre	Arena low-e ceiling, if feasible								73,654			
Aurora Community Centre	DHW to heat pump								1,000,000			
Aurora Community Centre	HVAC to heat pump								3,000,000			
Aurora Family Leisure Complex	DHW to heat pump								800,000			
Aurora Family Leisure Complex	Pool heat to heat pump								3,250,000			
Aurora Seniors Centre	HVAC to heat pump								800,000			
Aurora Town Hall	HVAC to heat pump								1,500,000			
Stronach Aurora Recreation Complex	DHW to heat pump								6,000,000			

Table 11: Annual Measure Implementation Costs for GHG Reduction Plan Scenario *(continued)*

Facility	ECM	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Stronach Aurora Recreation Complex	HVAC to heat pump								8,000,000			
Stronach Aurora Recreation Complex	Increase roof insulation thickness								7,950,000			
Victoria Hall	Increase roof insulation thickness								150,000			
Aurora Town Hall	Increase roof insulation thickness									2,025,000		
Fleet: Arboretum - Equipment	Equipment decarbonization									240,000		
Aurora Community Centre	Electrification of ice resurfacing boiler										250,000	
Aurora Family Leisure Complex	Electrification of ice resurfacing boiler										250,000	
Aurora Seniors Centre	VVT or VAV system										13,607	
Fleet: Water/Wastewater - Equipment	Equipment decarbonization										480,000	
Fleet: Parks - Equipment	Equipment decarbonization											2,280,000
Total Costs		0	0	367,086	166,989	0	2,884,081	6,492	32,523,654	2,265,000	993,607	2,280,000



ENERGY CONSERVATION AND DEMAND MANAGEMENT PLAN

2024-2029 UPDATE
TOWN OF AURORA

April 11, 2024



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EXECUTIVE SUMMARY

As greenhouse gas (GHG) emissions continue to rise and contribute to global warming, there has been a growing recognition of the urgent need to mitigate climate change and minimize its adverse impacts. In response to this pressing challenge, various entities, including the Town of Aurora (Town), have taken proactive steps to reduce GHG emissions and mitigate the effects of global warming. In 2019, the Town declared a climate emergency, demonstrating its commitment to addressing climate change.

The 2024 Energy Conservation and Demand Management Plan (ECDMP) update embodies the Town's vision for a sustainable future. It sets ambitious GHG reduction targets for Town operations beyond the five-year cycle initiating a vision of net-zero emissions by 2050, recommending medium and long term planning initiatives to meet this goal. The energy and GHG emissions plan is centred on Town-owned assets, including emissions from buildings, fleet, corporate solid waste, public lighting and water/ wastewater facilities. The energy and emissions plan for the community is assessed under a separate plan, the Town's Community Energy Plan, which includes an emissions inventory and reduction plan for community buildings, transportation and corporate waste.

The Town joined the Partners for Climate Protection (PCP) program in 2018, which consists of a five-step Milestone Framework that guides action against climate change. The 2024 ECDMP fulfills the first three PCP Milestones for the first time by expanding emission sources being reported on to include lighting and waste, in addition to buildings, fleet, and water/wastewater stations. Milestone 1 to 3 includes creating a baseline emissions inventory and forecast, setting emissions reduction targets, and developing a local action plan. The remaining Milestones are implementation of the action plan and monitoring and reporting on progress which will be fulfilled going forward. By following this framework, municipalities can make informed decisions, engage the community, and contribute significantly to national climate change mitigation efforts.

The ECDMP also meets the requirements under the Ontario Regulation 25/23, Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans (O. Reg. 25/23), requiring public agencies such as municipalities to report their buildings' energy consumption and GHG emissions annually. O. Reg. 25/23 also requires these public agencies to develop ECDMPs and update them every five years.

Over the past five years, the Town has made remarkable progress, driven by a collective determination and innovation. From the Town's previous 2019 ECDMP, which included the planning window from 2019-2023, the Town decreased electricity consumption by 2% and natural gas consumption by 30%. This resulted in an overall reduction in GHG emissions of 20%, surpassing the goal of 16%. The completed and in-progress projects from the 2019 ECDMP are listed in Table 1.

Table 1: Summary of Measures Implemented During 2019 ECDMP

Status	Measure
Complete	Aurora Community Centre: Installation of new condensers and hot water boilers
	Aurora Community Centre: Upgrade ice plant motor controls, replace shell and tube chillers
	Aurora Cultural Centre: Demand control ventilation
	Aurora Cultural Centre: Occupancy sensors
	Aurora Cultural Centre: Programmable thermostat
	Aurora Public Library: Demand control ventilation
	Aurora Public Library: Interior lighting retrofit
	Aurora Public Library: Occupancy sensors
	Aurora Public Library: Replace rooftop HVAC
	Fleet: Develop Green Fleet Action Plan
	Fleet: Implement anti-idling initiative
	Fleet: Incorporate ethanol 10 in all gasoline-fueled vehicles
	Fleet: Measure vehicle distance traveled and fuel consumed
	Fleet: Purchase some electric and hybrid-electric assets
	Fleet: Replace low tier diesel equipment
	Stronach Aurora Recreation Complex: Low-flow lavatories and showerheads
	Stronach Aurora Recreation Complex: Replace screw compressor
	Stronach Aurora Recreation Complex: Replacement of pool liner
	Various: Lighting retrofits to LED
In progress	Aurora Community Centre: Replace compressors
	Aurora Community Centre: Replace fan coil units
	Aurora Community Centre: Replace two heating boilers with higher efficiency
	Aurora Family Leisure Complex: Replace humidicon equipment
	Aurora Town Hall: Replace forced air and gas furnaces
	Stronach Aurora Recreation Complex: Replace plumbing fixtures in arena change rooms
	Stronach Aurora Recreation Complex: Replace screw compressor
	Various: Lighting retrofits to LED

To continue progressing towards a 50% reduction in GHG emissions by 2035 and net-zero by 2050, the Town has identified short, medium, and long term plans in this updated ECDMP.

Table 2 summarizes the proposed actions to be undertaken until the next ECDMP update in 2029.

Table 2: Summary of Planned Actions to Undertake in the Short Term Planning Window (2024-2029)

Action	Reduction in GHG emissions (tCO ₂ e/yr)
Investigate and implement demand control ventilation	6
Remaining lights to LED	-23
Remaining measures from 2019 ECDMP	58
Remaining occupancy sensors to optimize lighting and HVAC use	0
Remaining water fixtures to low-flow	196
High efficiency boiler replacement	4
Optimum HVAC scheduling	4
Decarbonize two light-duty vehicles	18
Ice resurfacers vehicle decarbonization	1
Decarbonize 10 pieces of equipment	15
Pool covers at recreation facilities	25
ASHRAE Level 3 Energy Audits for all facilities	Unquantifiable
Net-Zero Pathway Feasibility Study - Facilities	Unquantifiable
Fleet electrification feasibility study	Unquantifiable
Renew Green Fleet Action Plan and continue to make operational improvements from following the plan	19
Perform solid waste audits and develop a Waste Reduction Plan	Unquantifiable
Employee training for operation and maintenance of new technologies for energy savings (annual budget)	Unquantifiable
Energy performance monitoring (annual budget)	Unquantifiable
Undertake Phase 2 of the Green Procurement Policy	Unquantifiable
Investigate opportunities to convert public lighting fixtures to LED	Unquantifiable

Note that a negative ("-") reduction in GHG emissions indicates that the Town's GHG emissions are anticipated to increase for that measure, although overall energy use would decrease. "Unquantifiable measures are those which either are not anticipated to result in a direct reduction in GHG emissions, or whose reduction in GHG emissions is difficult to quantify.

The Town is reaching a critical point in achieving a net-zero future. Through the implementation of the 2024 ECDMP, the Town is completing the remaining "quick-win" energy measures that are considered market-ready, higher payback projects as well as lower-cost operational changes and piloting smaller-scale projects. They are important measures to implement before making a more aggressive jump of switching to low-carbon technologies and renewable energy sources that often require major investment. Outlined in the 2024 ECDMP are crucial feasibility studies required to be completed in the short term to successfully consider newer, more complex technologies in the medium and long term such as infrastructure upgrades and employee training for implementation.

Achieving the carbon reduction goals requires concerted efforts in change management, ensuring seamless transitions towards greener practices. Deep engagement of stakeholders, including working groups with regular touch-points, will be instrumental in fostering ownership and support. Active tracking of progress is essential to monitor the Town's carbon reduction initiatives' effectiveness and make timely adjustments as required.

Based on the measures identified in Table 2, the estimated cost to implement the draft 2024 ECDMP is approximately \$4.77 million (Table 3).

Table 3: Cost Summary for the proposed 2024 ECDMP projects

Measure	Description	Short-term cost (0 to 5 years)	Available grant funding
Studies			
Energy Audits (every 5 years)	Perform energy audits for all facilities being considered for ECM implementation (12 facilities) to determine opportunities for net-zero retrofits, determine the feasibility of the ECMs detailed in this report, and generate more detailed design information for feasible ECMs.	\$254,500	
Net-Zero Pathway Feasibility Study - Facilities	Perform a facilities feasibility study for the identification of measures to be addressed in a GHG reduction pathway retrofit capital project. Studies will consider the unique objectives and constraints of the building owner (e.g., building condition, capital budgets, equipment renewal cycles, etc.), and provide a detailed exploration of multiple optimization scenarios.	\$150,000	FCM: GHG reduction pathway retrofit grants
Fleet Electrification Feasibility Study	Investigate the feasibility of fleet electrification by assessing the corporate electrical capacity. Upgrade electrical service as needed to install additional EV charging stations and vehicle replacement costs.	\$150,000	FCM: Municipal Fleet Electrification
Waste audit and waste reduction strategy	Perform regular waste audits to track GHG emissions from waste. In addition, develop a Waste Reduction Plan to determine strategies to reduce waste-related GHG emissions.	\$50,000	FCM: Waste reduction and diversion grants
Green Fleet Action Plan renewal	Renew the Green Fleet Action Plan to reflect current best practices and the current status of the fleet, and continue to take actions dictated by the plan.	\$25,000	
TOTAL Proposed ECDMP (Studies)		\$629,500	
Capital Projects			
Facilities - retrofits	The focus of these measures is on lighting and controls measures, such as converting all remaining lights to LED, investigating and implementing demand control ventilation and occupancy sensors, adding pool covers to the pools, high efficiency boiler replacement.	\$574,649	FCM: GHG impact retrofit and FCM: GHG reduction pathway retrofit grants
Fleet decarbonization	Replace the ice resurfacers with electric options (five ice resurfacers to replace), electrification of two light duty vehicles and 10 pieces of equipment (exact types of vehicles and equipment to be chosen by fleet manager based on which assets are feasible to decarbonize).	\$2,850,000	FCM Study: Reduce fossil fuel use in fleets
Employee training and capacity building	Train staff on energy efficiency and operation of new technology implemented during facility ECMs. Train staff on operation of new vehicles purchased during fleet decarbonization.	\$15,000	
Energy performance monitoring	Monitor each asset's energy consumption to verify that assets are meeting the targets from implementing ECMs.	\$7,500	
TOTAL Proposed ECDMP (Capital Projects)		\$3,447,149	
TOTAL Proposed ECDMP (Studies and Capital)		\$4,768,349	

Table 4 summarizes the baseline (2018) GHG emissions for each asset type, the current state of GHG emissions, and the projected GHG emissions if all the proposed actions are undertaken according to the 2024 ECDMP.

Table 4: Summary of Existing and Projected GHG Emissions From This Plan

Asset type	GHG Emissions (tCO ₂ e/yr)					Percent Reduction from Baseline (%)			
	2018	2022	2029	2035	2050	2022	2029	2035	2050
Buildings	2,857	2,072	2,073	1,321	909	27	27	54	68
Fleet	556	556	507	445	343	-0	9	20	38
Lighting	59	56	123	137	171	5	-110	-133	-192
Solid Waste	416	416	416	374	0	0	0	10	100
Water and Wastewater	1	1	2	2	3	11	-97	-118	-173
Total	3,889	3,100	3,121	2,279	1,426	20	20	41	63

Note that a negative ("-") percent reduction in GHG emissions indicates that the GHG emissions for that asset increased over the indicated time frame.

Important to note from Table 4 is that the carbon emission factor of the Ontario grid, also considered the emission intensity of the grid, is expected to increase between 2024-2029 and erode some of the Town's emissions reduction progress. An increased intensity means that even though electricity use by the Town decreases during that time, its GHG emissions nevertheless increase. This can be seen when looking at electricity consumed by public lighting and the water/wastewater pump stations. The electricity consumed by these assets is projected to remain constant over the next five years; however, the GHG emissions increase during this time. This also results in relatively constant overall Town GHG emissions from 2022 to 2029, because although the electricity and natural gas consumption is projected to decrease over this period through the plan's implementation, the increase in the electricity grid carbon intensity is projected to offset the progress.

The intent of the 5-year vision of this plan is to foster a more sustainable community by reducing electricity consumption by **11%**, natural gas consumption by **10%**, propane consumption by **100%**, ethanol 10 by **10%**, and biodiesel 5 by **8%**. Despite the projected increase in grid carbon intensity, it is anticipated that a GHG reduction of **20%** from 2018 by 2029 can be achieved as well as a decrease to the Town's the annual utility costs of **10%**.

Once the Town has established the necessary framework to take more aggressive actions to reduce their GHG emissions, the GHG emissions are projected to decrease by **41%** by 2035 and **63%** by 2050. This comes close to meeting the target of 50% reduction by 2035 and makes substantial progress towards achieving net-zero by 2050. To realize this vision and contribute meaningfully to global climate mitigation, it is recommended that the Town leverage insights from the Energy Audits performed in the short term, remain informed about cutting-edge technologies, implement the lowest-carbon alternatives wherever feasible, and consider the purchase of carbon offsets once the Ontario carbon offset market matures. The current plan would fall short of the net-zero target, but advances in technology are quickly evolving bringing the Town closer to a net-zero future.

1 Background

1.1 Climate Change Overview

GHG emissions have resulted in an increase in temperature and in extreme weather events in southern Ontario. This has caused heat waves, strong winds, and flooding in the Town of Aurora, and these effects are projected to grow more common and more intense if climate change continues to progress. Under the Town's risk and vulnerability assessment performed in the Climate Change Adaptation Plan in 2022, the most likely trend to occur is an increase in temperatures. This is expected to impact several climate and weather parameters between 2021 and 2050:

- Mean summer maximum temperatures are projected to increase by 9%.
- The number of heat waves are projected to increase from 1.2 to 3.6 per year.
- Cooling Degree Days (used for cooling system design and planning) are projected to almost double (increase of 86%).
- Heating Degree Days (used for heating system design and planning) are projected to decrease as winter temperatures are expected to increase, leading to a reduction in extreme cold risks, snow depth, and annual freeze-thaw cycles.
- Precipitation, wind, and low air quality events associated with wildfires are also projected to increase in the future.

These changes impact the Town's GHG emissions, as a projected decrease in heating degree days reduces the facilities' heating load (and accordingly the GHG emissions associated with heating energy use) in winter months, but a corresponding increase in cooling degree days would increase their cooling load.

Changes in winter conditions such as snow depth, and annual freeze-thaw cycles also impact Town fleet operations, with the number of snow and ice events requiring road and sidewalk clearing and re-icing.

1.1.1 Climate Emergency

In October 2019, Town Council joined 457 Canadian municipalities and declared a Climate Emergency and follow the principles from the Global Covenant of Mayors for Climate and Energy (GCOM). Over 13,000 cities are part of this movement as of 2024, and growing. Those cities have established a goal of accelerating ambitious, measurable climate and energy initiatives that lead to an inclusive, low-emission and climate resilient future, helping to meet and exceed the Paris Agreement objectives.

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.

1.2 Ontario Legislation: O.Reg. 25/23

Ontario Regulation 25/23, Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans (which has replaced Ontario Regulation 507/18) under the Electricity Act requires public agencies, including municipalities, to report on their building energy consumption and greenhouse gas (GHG) emissions annually, and to develop and implement an Energy Conservation and Demand Management Plan (ECDMP), to be updated every five years.

O. Reg. 25/23 also outlines specific items that must be included in the ECDMP. This includes a summary of annual GHG emissions, a description of previous activities and saving estimates for the municipality's previous measures, and the cost and saving estimates for the current and proposed activities and measures. Further details regarding the O. Reg. 25/23 ECDMP requirements are outlined in Appendix E.1.

The Town completed its first ECDMP in 2014. An update was undertaken in 2019 and now its third revision under the 2024 ECDMP update.

1.3 FCM's Partners for Climate Protection Milestone Framework

The Federation of Canadian Municipalities (FCM) created the Partners for Climate Protection (PCP) to support municipalities with acting against climate change by reducing their emissions. Council committed the Town to joining PCP program in 2018. The program fills a five step milestone framework for Community and Corporate GHG emissions. The milestones include:

1. Completing a GHG emission inventory and forecast
2. Setting a GHG reduction target
3. Developing a local action plan
4. Implementing the plan, and
5. Monitoring progress and reporting results

The Town has completed Milestones 1, 2, and 3 for the community through the development of Aurora's Community Energy Plan (CEP), endorsed by Council in January 2021. The Town is now working on Milestones 4 and 5, Implementing the Action Plan and ECDMP renewal, and Progress Monitoring and Reporting.

The 2024 ECDMP update fulfills, for the first time, the PCP Milestones 1-3 at the corporate level by including additional assets and utilities in the ECDMP.

Further details about the PCP Milestone framework and regarding the work done by the Town towards community Milestone 1 to 3 are presented in Appendix E.2.

1.4 Town of Aurora's Strategic Planning Review

1. 2014 and 2019 Energy and Conservation Demand Management Plans (ECDMP)

As required by O. Reg. 25/23, the Town has prepared an ECDMPs in 2014 and updated this document in 2019. These documents provide an overview of the Town's annual GHG emissions, examine the impact of the previous measures undertaken to reduce GHG emissions, and outline proposed measures to reduce GHG emissions in the next five year period.

The Town's 2014 ECDMP focused on six of the Town's facilities and aimed to reduce their GHG emissions by 10-15% by taking actions such as upgrading lighting fixtures to LED and replacing equipment with more efficient models.

The 2019 ECDMP broadened the scope to include more facilities, including water/wastewater facilities, fleet, and renewable generation. The 2019 ECDMP included an action plan emphasizing the need to implement all in-progress and planned energy conservation measures identified, and to conduct new energy audits of facilities to identify new potential measures for the 2024 ECDMP. Additional strategies are also listed that include energy efficient retrofits, developing a green fleet plan, implementing life cycle cost purchasing practices, establishing energy efficiency equipment specifications, monitoring savings progress, and improving communication and staff engagement.

More information regarding the 2019 ECDMP is presented in Section 4.2 and in Appendix E.3.

2. 2021 Green Fleet Action Plan (GFAP)

The Town's GFAP is a plan which outlines the GHG emissions associated with the corporate fleet and presents a series of actions to undertake which were intended to reduce GHG emissions by 50% by 2028. These strategies were incorporated into the fleet recommendations in the 2024 ECDMP to recommend strategies to reduce the Town's fleet GHG emissions in short, medium, and long term planning. Further information on this plan is presented in Appendix E.4.

3. 2021 Community Energy Plan (CEP)

The Town's 2021 CEP provides strategic direction to 2050 to improve energy efficiency, reduce energy consumption and GHG emissions, and foster a culture of conservation. The CEP focuses on community emissions, while the scope of the ECDMP covers the Town's corporate emissions. The ultimate goal for the Town of Aurora is reducing their greenhouse gas emissions by 80% from 2018 levels by 2050. The Community Energy Plan outlines a series of strategies that achieve a 22% reduction by 2030 from 2018 levels and a 65% reduction by 2050. These put Aurora on a path towards an 80% emissions reduction by 2050. Some of the completed and planned actions from the CEP (particularly actions taken to achieve objectives related to the area of climate change and energy) are relevant to the Town's annual GHG emissions, and planned actions from the CEP were considered while preparing the short, medium, and long term plans to reduce the Town's emissions in the 2024 ECDMP. More information on the CEP is presented in Appendix E.5.

4. Corporate Environmental Action Plan (CEAP) and progress reports

The Corporate Environmental Action Plan (CEAP) is a Town plan that captures all the Town's operations' environmental goals developed in 2018. The CEAP serves to protect and enhance the natural environment, promote environmental sustainability, integrity and conservation of resources and create a practice of environmental stewardship within the community. The purpose of the CEAP is to:

- Protect and enhance the natural environment
- Be a catalyst for local initiatives that promote environmental sustainability, integrity and conservation of our resources and ecosystem; and,
- To enhance environmental stewardship within the community

The 2024 ECDMP meets CEAP Objective C3: "Reduce the Town's greenhouse gas emissions by Town staff and at Town facilities."

The CEAP is reported on annually for its progress, details pertaining to this plan. For a more complete list of the objectives and actions included in the CEAP, refer to Appendix E.6.

5. Climate Change Adaptation Plan (CCAP)

In the Town of Aurora's Climate Change Adaptation Plan (CCAP), the Town identified adaptation actions to acclimatize to these changing conditions, such as improving flood resilience, performing proactive landscape maintenance to reduce debris hazards, and increasing the cooling capacity of public facilities. In addition to this, the Town is developing strategies to reduce its corporate GHG emissions to decrease its contribution towards climate change. The CCAP was created to guide asset management planning and better prepare for the impacts of climate change; more details are presented in Appendix E.7.

6. Town of Aurora Strategic Plan: 2011-2031

The Town's Strategic Plan identifies and assesses growth and development opportunities that ensure the future economic, social and environmental sustainability and health of Aurora. This Strategic Plan emphasizes the development of local assets which capitalize on the many strengths and opportunities in the area. The ECDMP aligns with the Town's strategic goal of "Supporting environmental stewardship and sustainability". This encourages the stewardship of Aurora's natural resources, and promotes and advances green initiatives.

2 Methodology

2.1 Analysis Methodology

The 2024 ECDMP follows municipal best practices in the development of its energy and GHG emission inventory by following the PCP Protocol while also meeting methodology outlined under the O. Reg. 23/25. To complete the analysis, the following methodology was applied.

1. **Measurement boundary.** The utility use baseline analysis measurement boundary was defined by the following baseline year and assets, and encompasses the utility use of the utilities identified below.
 - (a) **GHG emissions baseline year.** The GHG emissions baseline year of the Energy Conservation and Demand Management Plan is as follows.
 - 2018.
 - (b) **Asset identification.** The assets considered in the ECDMP are those that are owned by Town of Aurora within the following sectors. The assets are reviewed in greater detail in Sections 5 to 9.
 - Buildings
 - Fleet (propane use new to 2024 ECDMP)
 - Water and wastewater facilities
 - Lighting (new to 2024 ECDMP)
 - Solid waste (new to 2024 ECDMP)
 - Solar photovoltaic energy
 - (c) **Utility identification.** The utilities considered in the Energy Conservation and Demand Management Plan are as follows.
 - Electricity
 - Natural gas
 - Gasoline
 - Ethanol 10 (new to 2024 ECDMP)
 - Diesel
 - Biodiesel 5 (new to 2024 ECDMP)
 - Propane (new to 2024 ECDMP)
2. **Historical utility use.** The historical utility use was provided by the Town and serves as the primary data source for establishing baseline metrics (i.e. baseline GHG emissions and utility costs are calculated by applying assumed factors and rates to the actual measured utility use). The historical utility use data provided was analyzed and summarized in Sections 5.2 and 6.2. Note that the data presented in these sections includes all relevant utility use data received from the Town (i.e. no relevant utility use data that was received was omitted unless explicitly noted). For the corporate fleet's fuel consumption, it is assumed that the fleet consumed gasoline and diesel up until 2020, when the Cleaner Transportation Fuels regulation (O. Reg. 663/20) required a transition to ethanol 10 and biodiesel 5.
3. **GHG emissions analysis.** The baseline GHG emissions were analyzed to understand which assets, asset types, utilities, and sectors have the greatest contributions to yearly GHG emissions. Results are presented in Section 4.1.
4. **Waste GHG emission calculation.** GHG emissions due to solid waste are calculated according to the guidelines established by the PCP protocol. The Town does not own a landfill or waste incineration facility, ultimate management of solid waste is the responsibility of York Region. Two of these sites are landfill sites, and the other three are energy from waste centres. It is assumed that 50% of the waste is sent to a landfill site, and the other 50% is sent to a energy from waste centre. The GHG emissions from landfilled waste are calculated as per the PCP protocol, and the methodology is outlined in Appendix B. The PCP protocol does

not provide a methodology to calculate GHG emissions for waste-to-energy centres, so the approach used by the GHG Protocol for municipalities is followed: because the waste is exported for energy generation outside of the boundaries of the Town, these emissions are excluded from this report.

5. **Inclusion and exclusion protocols for GHG sources.** The PCP inclusion and exclusion protocols for each asset are listed below.

- **Facilities.**

- **Inclusion:** All facilities owned and/or operated by the municipality, including any which are leased to another entity.

- **Fleet.**

- **Inclusion:** All direct and indirect emissions generated by using motor fuels to operate corporate vehicles and equipment, including on and off-road vehicles owned and/or operated by the municipality.
- **Exclusion:** If the electricity consumed by a vehicle or piece of equipment cannot be distinguished from electricity consumed by a building, the electricity consumed by these vehicles can be reported with the facility emissions.
- **Business travel using personal vehicles:** Will be considered in a future ECDMP update.

- **Waste Sector.**

- **Inclusion:** All GHG emissions generated from the Town's corporate solid waste, including from the following sources: facilities receptacles, park receptacles, and other public receptacles in which the Town directly collects.
- **Exclusion:** All residential and local business' waste is excluded as they are collected through the Regional Municipality of York's waste system and GHG emissions from those sources are accounted for under the Community-level emissions inventory.

- **Water / Wastewater.**

- **Inclusion:** All Town-owned water and wastewater pumping stations.
- **Exclusion:** Emissions from water and wastewater infrastructure owned by a neighbouring municipality or York Region.

- **Public Lighting.**

- **Inclusion:** All indirect emissions generated from the use of electricity for outdoor lighting, including streetlights, traffic signals, and park lighting owned and/or operated by the municipality.
- **Exclusion:** Streetlight emissions from streetlights owned by a neighbouring municipality or York Region.

3 Targets

The original target outlined in the Town's 2019 ECDMP aimed to reduce GHG emissions by 16% by 2023, with no established medium or long-term objectives. However, in 2021, following the introduction of the Town's Community Energy Plan, a comprehensive Town-wide target was established to achieve an 80% reduction in GHG emissions by 2050, using 2018 as the baseline year.

Since the 2021, an increasing number of entities, including the Federal Government of Canada, the Intergovernmental Panel on Climate Change (IPCC), York Region, and numerous municipalities such as the City of Ottawa and the City of Markham, have committed to achieving net-zero emissions. The Town is urged to align with these best practices. To position itself as a climate change leader, it is recommended that the Town should commit to net-zero GHG emissions by 2050 and establish intermediate targets accordingly. To accomplish this, the Town should set the following GHG emissions targets, compared to the 2018 Baseline:

- Short term (2024-2029): 20%
- Medium term (2030-2035): 50%
- Long term (2035-2050): net-zero emissions by the end of 2050

4 Overall Corporate Emissions Analysis

4.1 GHG Emissions Analysis

The GHG emissions analysis is presented in the form of various plots, each representing the contributions to the Town's corporate GHG emissions for the year of 2022. Commentary on the findings of the GHG emissions analysis is provided in Section 4.1.2. Note that "Other" GHG emissions are assets which collectively contribute less than 1% to corporate GHG emissions, including EV charging stations, park lights, traffic lights, water/wastewater stations, ice resurfacers, and roads waste disposal.

4.1.1 GHG Emissions Breakdown

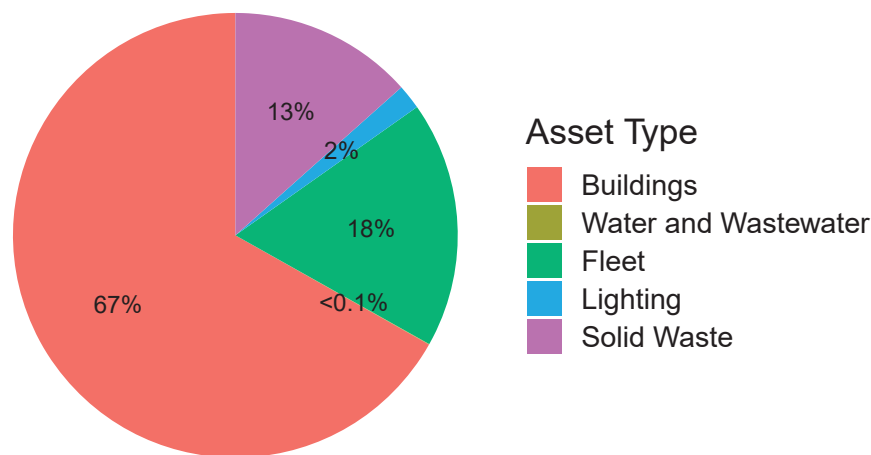


Figure 1: GHG Emissions Baseline by Sector.

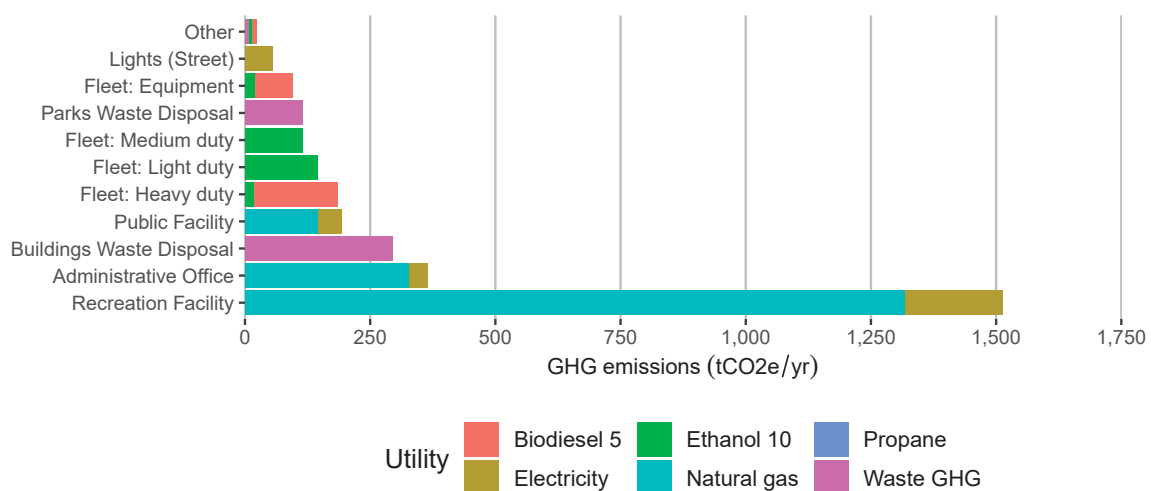


Figure 2: GHG Emissions Baseline by Type.

4.1.2 GHG Emissions Discussion

The following discussion summarizes observations that were made in analyzing the data presented in Section 4.1. The discussion focuses on identifying the most significant contributors to GHG emissions to inform the development of the GHG reduction roadmap scenarios.

- **Sectors**
 - Buildings have the greatest contribution to GHG emissions, followed by fleet and solid waste. Comparatively, the GHG emissions from lighting and water/wastewater stations is minor. Because of this, the GHG roadmap should prioritize reducing building, fleet, and waste GHG emissions.
- **Types**
 - Types refer to the various asset types within each sector. The type is used to break down the buildings sector based on the building's purpose and is used to break down the fleet sector into the departments that use the vehicles.
 - Indoor recreation facilities (which have arenas and pools) have the greatest contributions to GHG emissions among the building types. Most of their GHG emissions are due to natural gas consumption from ice resurfacing, water and space heating.
- **Utilities**
 - Natural gas use has the greatest contribution to GHG emissions. Natural gas use is predominately used in buildings. The largest contribution coming from indoor recreation facilities. As such, significantly reducing GHG emissions associated with natural gas use will involve retrofitting multiple buildings, focusing on recreation facilities.
 - Fleet GHG emissions come from a variety of utilities (i.e. fuels). Collectively, these utilities represent the second-greatest contribution to total GHG emissions. As such, significantly reducing corporate GHG emissions will require a reduction in fleet fuel use / fleet asset decarbonization.

4.2 2019-2023 Performance Review

In 2019, the ECDMP considered Town-owned facilities, water/wastewater facilities, and the corporate fleet. The objectives of this plan were to reduce electricity consumption by 10.5%, natural gas by 9.7%, and GHG emissions by 15.9% by 2023. The majority of the measures considered by this plan were the remaining control measures identified by the 2017 energy audits, including LED retrofits, low-flow water fixtures, occupancy sensors, and optimum start/stop ventilation.

However, since the 2019 ECDMP, the Town has acquired new assets (Aurora Sports Dome and the buildings on Yonge street), and new GHG emission sources have been added into the target (lighting and solid waste emissions) to comply with the PCP Protocol. To establish a fair basis of comparison, the 2018 Baseline was recalculated in this 2024 update.

For assets which did not have utility data available in 2018, it is assumed that the utility consumption in 2018 was the same as the utility consumption in the earliest year in which utility use data is available. This is accounted for in the adjusted baseline data, as well as the historical utility use trends.

Baseline GHG emissions were calculated by multiplying the annual consumption by the respective GHG emissions factor (see the assumed GHG emissions factors in Appendix B). Baseline utility costs were calculated by multiplying yearly utility use by the respective utility cost rates (see the assumed utility cost rates in Appendix B).

The original baseline GHG emissions, recalculated GHG emissions, and most recent utility use and GHG emissions data is presented in Table 5. Note that the "current" utility use is taken as the utility use in 2022, as this is the most recent year with complete utility use data available.

Table 5: Utility Use Comparison From Baseline Year

Utility	Unit	2018 (Original)		2018 (Recalculated)		2022		Reduction from baseline		
		Consumption	GHG emissions	Consumption	GHG emissions	Consumption	GHG emissions	Consumption	GHG emissions	Percentage
-	-	[unit listed]	[tCO2e/yr]	[unit listed]	[tCO2e/yr]	[unit listed]	[tCO2e/yr]	[unit listed]	[tCO2e/yr]	%
Electricity	[kWh/yr]	9,399,415	364	11,571,403	347	11,368,706	341	202,697	6	2
Natural gas	[m3/yr]	1,234,539	2,372	1,337,896	2,570	930,583	1,788	407,313	782	30
Gasoline	[L/yr]	91,544	211	144,831	334	0	0	144,831	334	-
Ethanol 10	[L/yr]	0	0	0	0	136,804	305	-136,804	-305	-
Diesel	[L/yr]	104,238	279	82,185	220	0	0	82,185	220	-
Biodiesel 5	[L/yr]	0	0	0	0	96,252	250	-96,252	-250	-
Propane	[L/yr]	0	0	705	1	655	1	50	0	7
Waste GHG	[tCO2e/yr]	0	0	416	416	416	416	0	0	-
Overall	[tCO2e/yr]		3,226		3,889		3,100		788	20

Note that a negative reduction in consumption or GHG emissions indicates that the consumption or GHG emissions increased. Also note that "-" is used to indicate cases where the percent change is not applicable (used for the fleet fuels, which was changed from gasoline and diesel in 2018 to ethanol 10 and biodiesel 5 in 2022)

4.2.1 Historical Utility Use Discussion

The following summarizes observations from the change in GHG emissions. Note that utility use data from 2023 is not included in the analysis because not all data from 2023 was available at the time that this report was written.

- GHG emissions decreased in 2022 compared to 2018.
- There is a slight decrease (1.8%) in the electricity consumption when comparing 2018 and 2022 utility use, and a much larger decrease (30.4%) in the natural gas consumption, with a corresponding decrease in GHG emissions.
- In 2022, it appears that certain buildings consumed less natural gas and more electricity, which could contribute to the decreased emissions due to natural gas usage.
- The reduced natural gas consumption in 2022 appears to be a result of reduced space heating. In 2018, approximately 1,300 tCO2e are emitted due to space heating, whereas in 2022, only 1,000 tCO2e are emitted for space heating. This is believed to be primarily the impact of energy conservation measures implemented from the 2019 ECDMP.

5 Facilities

5.1 Asset Information

The buildings considered under this ECDMP are summarized in Table 6. Central York Fire facilities have been accounted for as a third-party entity and are being excluded from this report at this time, although this can be re-assessed for future reports. Electric Vehicle charging stations are included but considered as a separate end use. See Appendix A.1 for aerial photos of each facility under consideration.

Table 6: Facilities Asset Summary

Type	Building name	Address	Construction	Gross floor area (ft ²)
Administrative Office	15165 A Yonge	15165 A Yonge	2000	10,520
	15171 Yonge	15171 Yonge	1991	750
	Aurora Town Hall	100 John West Way	1991	49,280
	Joint Operations Centre	229 Industrial Parkway N	2016	63,152
EV Charging Stations	Electric Vehicle Charging Stations	Varied	2022	-
Public Facility	Aurora Cultural Centre	22 Church Street	1885, 2024	17,500
	Aurora Public Library	15145 Yonge Street	2000	44,375
	Aurora Seniors Centre	90 John West Way	2005	13,934
	McMahon Clubhouse	76 Maple Street	1930, 1970	1,400
	The Armoury	89 Mosley Street	1874, 2018	8,400
	Victoria Hall	27 Mosley Street	1883	900
Recreation Facility	Aurora Community Centre	1 Community Centre Lane	1966, 1996	81,100
	Aurora Family Leisure Complex	135 Industrial Parkway North	1985	61,000
	Aurora Sports Dome	115 Industrial Parkway North	2005, 2018	89,485
	Stronach Aurora Recreation Complex	1400 Wellington Street East	2007	104,000
Solar PV	Solar Photovoltaic Energy	Joint Operations Centre, Aurora Public Library, Aurora Town Hall	Various	-

Note that SARC also has a solar array, but this does not belong to the Town, and it is omitted from this study.

5.2 Historical Utility Use

The Facilities historical utility use is presented in Figure 3.

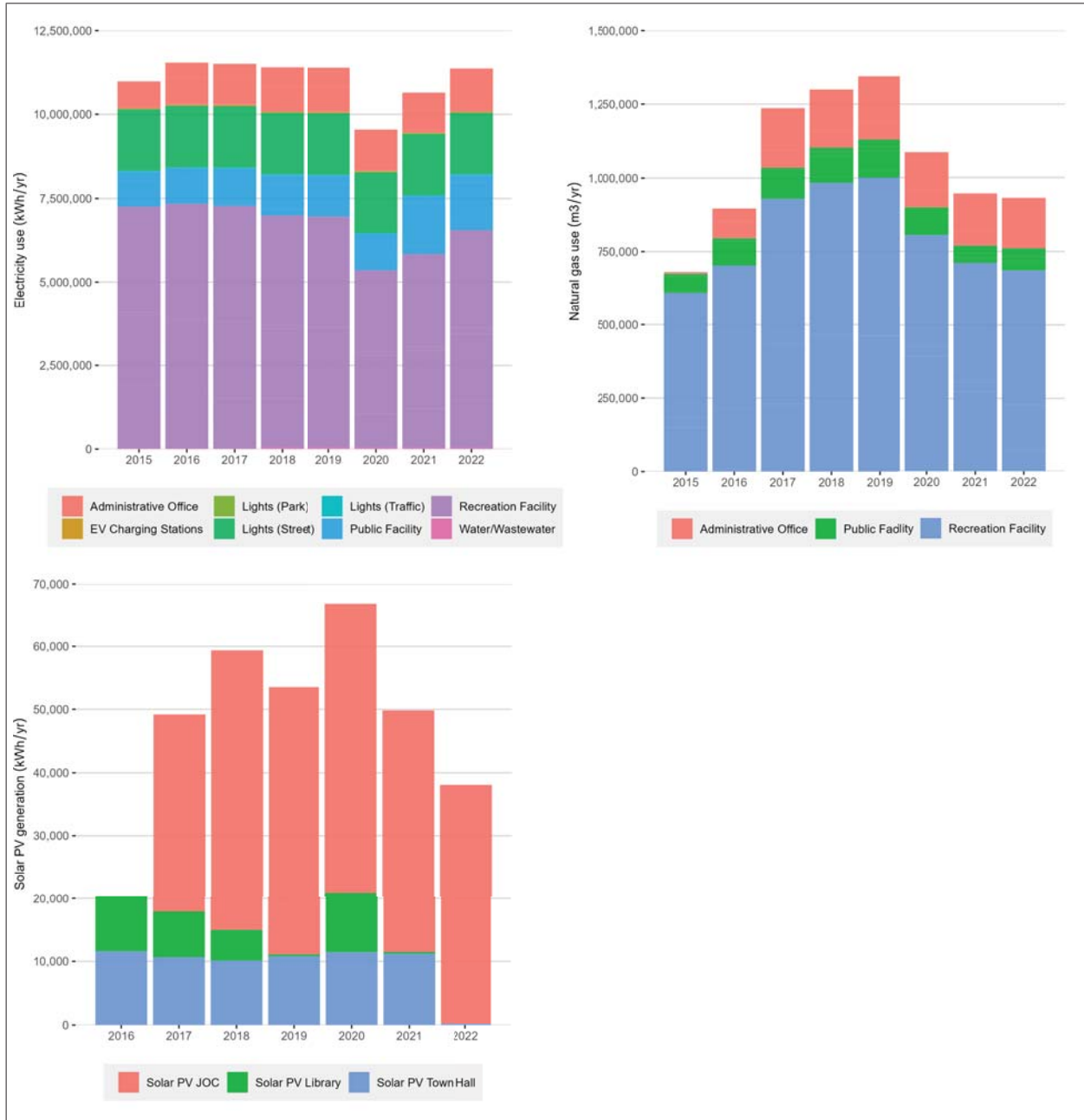


Figure 3: Facilities Historical Utility Use.

Electricity:

- Electricity use increased from 2015 to 2016 but has largely stayed consistent since then.
- There is a decrease in electricity consumption in 2020, which is likely a factor of reduced energy use due to the COVID-19 pandemic. This was increased in 2021, and electricity use returned to pre-COVID-19 levels in 2022.
- The number of cooling degree days, a measure of cooling demand for facilities, was 8% less in 2022 compared to 2018.

Natural gas:

- Metered natural gas consumption increased from 2015 to 2019. This is likely the result of certain buildings that did not have utility use information until 2016 or later.
- Natural gas usage drops significantly in 2020, which is the result of reduced operation due to COVID-19.
- Natural gas usage does not return to pre-pandemic levels, which is thought to be the result of implementing measures to reduce GHG emissions.
- In 2022, heating degree days, which measure heating demand for facilities, decreased by 2% compared to 2018. Although the heating demand was reduced in 2022, this alone cannot not explain the reduction in natural gas use observed in 2022.

Solar PV:

- The energy generated through each solar PV system has stayed relatively constant. In 2021 to 2022, the Aurora Public Library underwent renovations and the system was disconnected. In addition, in 2022, the PV systems at the Aurora Town Hall had issues with the energy generating tracking meter, but did not impact the energy generation at that site. This decreases the apparent solar energy generated in 2022, although the actual energy generation was likely similar to what it had been in 2021. The library had a similar issue in 2019, only impacting metering and not any generation.

Table 7: Building Energy Use Intensity in 2018 and 2022

Asset	Building type	Gross floor area	Total energy use (2018)	Energy use intensity (2018)	Total energy use (2022)	Energy use intensity (2022)
-	-	[ft2]	[kWh]	[kWh/ft2]	[kWh]	[kWh/ft2]
15171 Yonge	Administrative Office	750	58,000	78	62,000	83
Stronach Aurora Recreation Complex	Recreation Facility	104,000	8,411,000	81	7,777,000	75
Aurora Family Leisure Complex	Recreation Facility	61,000	4,263,000	70	2,508,000	41
Joint Operations Centre	Administrative Office	63,152	2,065,000	33	2,054,000	33
Aurora Public Library	Public Facility	44,375	1,436,000	32	1,378,000	31
Aurora Cultural Centre	Public Facility	17,500	413,000	24	541,000	31
Aurora Seniors Centre	Public Facility	13,934	424,000	30	390,000	28
Aurora Community Centre	Recreation Facility	81,100	4,201,000	52	2,246,000	28
Victoria Hall	Public Facility	900	72,000	80	22,000	24
Aurora Town Hall	Administrative Office	49,280	1,292,000	26	858,000	17
Aurora Sports Dome	Recreation Facility	89,485	861,000	10	1,227,000	14
The Armoury	Public Facility	8,400	109,000	13	106,000	13
15165 A Yonge	Administrative Office	10,520	82,000	8	115,000	11
McMahon Clubhouse	Public Facility	1,400	2,000	1	4,000	3

5.3 Best Practices

A study of best practices employed by other municipalities was referenced in the development of this ECDMP. There are a variety of measures and strategies being employed by municipalities, shown in more detail in Appendix D. Some of the best practices which it is recommended that the Town consider, excluding those which have already been implemented by the Town, are listed below:

- **Controls upgrades:** Controls upgrades such as HVAC improvements (demand control ventilation, occupancy sensors, HVAC scheduling, etc.) are often simple measures to implement to reduce energy with a low cost per GHG reduction.
- **Fuel switching:** Many municipalities are switching away from natural gas-fueled heating and implementing more and more electric equipment to reduce GHG emissions. Heat pumps are a popular technology to accomplish this, as in addition to reducing GHG emissions by replacing gas-fired equipment, air-source heat pumps usually have an average COP (Coefficient of Performance, a measure of efficiency) of at least 2.5 (corresponding to 250% efficiency), reducing the amount of energy consumed to maintain the temperature in a space.
- **Recreational facilities:** Recreational facilities often make up a large portion of a municipality's GHG emissions; to address this, many municipalities have measures to reduce the energy consumed by processes within these facilities. For instance, adding pool covers, arena e-ceilings, and implementing cold water flooding within ice rinks are often considered as measures to reduce GHG emissions from recreational facilities. Municipalities are increasingly seeking a whole-building retrofit approach as a way to achieve quicker emission reduction goals, instead of on an individual equipment asset renewal timeframe. Recreational centers, the highest intensity emitting municipal buildings, are being retrofitted to meet net-zero performance goals at the facility level.

5.4 Energy Conservation Measures (ECMs)

5.4.1 Previous ECMs

The following facility ECMs were completed under the first ECDMP between 2014 and 2019, and their status and estimated energy savings are presented in 8.

Table 8: Estimated Annual Energy Savings for Measures Implemented During ECDMP 2019

Status	Building	Measure	Completion Year	Electricity Savings	Natural Gas Savings
-	-	-	-	[kWh]	[m3]
Complete	Aurora Community Centre (ACC)	Interior LED retrofit	2017	172,576	-15,949
	Aurora Community Centre (ACC)	Arena LED retrofit	2017	6,599	0
	Aurora Community Centre (ACC)	Upgrade ice plant motor controls, replace shell and tube chillers	2017	-	-
	Aurora Community Centre (ACC)	Installation of new condensers and hot water boilers	2017	-	-
	Aurora Cultural Centre	Occupancy sensors	2023	14,536	20,685
	Aurora Cultural Centre	Programmable thermostat	2023	26,771	2,969
	Aurora Cultural Centre	Demand control ventilation	2023	1,478	2,244
	Aurora Cultural Centre	Exterior lights to LED	2023	2,369	0
	Aurora Cultural Centre	Interior LED retrofit	2023	10,035	229
	Aurora Family Leisure Complex (AFLC)	LED parking lot lights	2014	-	-
	Aurora Family Leisure Complex (AFLC)	Arena LED retrofit	2019	45,000	0
	Aurora Family Leisure Complex (AFLC)	Interior LED retrofit	2019	57,624	-3,606
	Aurora Family Leisure Complex (AFLC)	Pool LED retrofit	2019	28,048	-2,211
	Aurora Public Library	Interior lighting retrofit	2018	182,784	-2,352
	Aurora Public Library	Replace rooftop HVAC	2022	-	-
	Aurora Public Library	Demand control ventilation	2023	-7,038	2,541
	Aurora Public Library	Occupancy sensors	2023	12,447	-281
	Aurora Seniors Centre	Interior CFL and T8 to LED retrofit	2021	43,041	-2,628
	Aurora Town Hall	LED parking lot lights	2014	-	-
	Aurora Town Hall	CFL pot light to LED (floors 1-2)	2023	11,729	-2,719
	Aurora Town Hall	T8 Light to LED (floors 1-2)	2023	88,917	-2,719
	Stronach Aurora Recreation Complex (SARC)	LED parking lot lights	2014	-	-
	Stronach Aurora Recreation Complex (SARC)	Interior LED retrofit	2017	139,995	0
	Stronach Aurora Recreation Complex (SARC)	Arena LED retrofit	2017	293,599	0
	Stronach Aurora Recreation Complex (SARC)	Pool MH to LED	2017	240,416	0
	Stronach Aurora Recreation Complex (SARC)	LED retrofit: exterior	2017	-	-
	Stronach Aurora Recreation Complex (SARC)	Replace screw compressor	2017	-	-
	Stronach Aurora Recreation Complex (SARC)	Replacement of pool liner	2017	-	-
	Stronach Aurora Recreation Complex (SARC)	Low-flow lavatories and showerheads	2018	0	91,459
In progress	Aurora Community Centre (ACC)	Replace fan coil units	2020	-	-
	Aurora Community Centre (ACC)	Replace compressors	2021	-	-
	Aurora Community Centre (ACC)	Replace two heating boilers with higher efficiency	2021	-	-
	Aurora Family Leisure Complex (AFLC)	Exterior LED retrofit	2020	21,440	0

Table 8: Estimated Annual Energy Savings for Measures Implemented During ECDMP 2019 (continued)

Status	Building	Measure	Completion Year	Electricity Savings	Natural Gas Savings
	Aurora Family Leisure Complex (AFLC)	Replace humidicon equipment	2020	-	-
	Aurora Public Library	LED exterior lighting retrofit	2024	194,520	0
	Aurora Seniors Centre	Exterior LED retrofit	2019	5,790	0
	Aurora Town Hall	LED exterior lighting retrofit	2021	17,957	0
	Aurora Town Hall	Replace forced air and gas furnaces	2021	-	-
	Aurora Town Hall	CFL pot light to LED (3rd floor)	2023	11,729	-2,719
	Aurora Town Hall	T8 light to LED (3rd floor)	2023	88,917	-2,719
	Stronach Aurora Recreation Complex (SARC)	Replace screw compressor	2019	-	-
	Stronach Aurora Recreation Complex (SARC)	Replace plumbing fixtures in arena change rooms	2020	0	45,730
Planned	Aurora Community Centre (ACC)	Low-flow lavatory and shower	2022	0	19,487
	Aurora Family Leisure Complex (AFLC)	Low-flow lavatory and shower	2022	0	9,867
	Aurora Seniors Centre	Low-flow lavatories	TBD	0	1,710
	Aurora Town Hall	Low-flow lavatory and shower	2022	16,850	0
	Victoria Hall	Interior LED retrofit	TBD	1,313	-104
	Victoria Hall	Low-flow lavatory fixtures	TBD	916	0
	Victoria Hall	Occupancy sensors	TBD	224	0
	Victoria Hall	Programmable thermostat	TBD	76	420
On hold pending building automation system (BAS) upgrades	Aurora Community Centre (ACC)	Building system optimization - start/stop	2023	-10,166	10,585
	Aurora Community Centre (ACC)	Occupancy sensors	TBD	10,945	-309
	Aurora Family Leisure Complex (AFLC)	Upgrade of climate control	2021	-	-
	Aurora Family Leisure Complex (AFLC)	Demand control ventilation	2023	6,862	8,383
	Aurora Family Leisure Complex (AFLC)	Building system optimization - start/stop	2023	9,655	1,645
	Aurora Public Library	Building system optimization - start/stop	2023	3,588	3,894
	Aurora Town Hall	Demand control ventilation	2023	29,108	5,820
	Aurora Town Hall	Building system optimization - start/stop	2023	9,376	2,207
	Stronach Aurora Recreation Complex (SARC)	Building system optimization - start/stop	2023	7,889	911
On hold pending feasibility investigation	Aurora Family Leisure Complex (AFLC)	Arena low-E ceilings	2020	125,000	0
	Stronach Aurora Recreation Complex (SARC)	Arena low-E ceilings	2023	123,000	0

Additional actions undertaken from the 2019 ECDMP are listed below:

- Conducted a life-cycle audit of Town-owned infrastructure and equipment, and assessed opportunities for energy efficiency upgrades: BCAs were completed in 2022, providing a high-level energy assessment, though limited energy conservation measures were provided.
- Implemented a minimum green building standard of LEED Silver for all new town facilities: the Aurora Town Square is meeting a LEED Gold standard (without certification).
- Quarterly staff meeting to discuss building energy performances, best practices, operational changes, innovative technologies, and incentives.
- Explored strategic partnerships with Energy Services Company (ESCO) to identify and fund energy efficiency projects.

- Participated in the Enbridge Run it Right incentive program which provided free training to staff on operating changes to reduce natural gas use and incentives for ECMs which were installed in 2021-2022. It is estimated that natural gas use was reduced by 8% at participating facilities
- Developed the Green Procurement Policy.
- Implemented a Town-wide energy management system (EMS) that tracks energy use, trends, GHG emissions, and building performance. The implementation of life cycle cost purchasing practices was not completed but the development of the Green Procurement Policy was initiated. Staff are looking to develop supporting documents for this process.

Based on the measures which have been implemented, or are in the process of being implemented, the natural gas usage has been considerably reduced since 2018, in part due to the ECMs put in place in that time and the operational changes that occurred through staff education and building operations. In particular, the upgrades at the Aurora Public Library, Aurora Community Centre, and Aurora Family Leisure Complex have decreased the natural gas consumption.

The objectives in the 2019 ECDMP were to reduce electricity consumption by 10.5%, natural gas consumption by 9.7%, and overall GHG emissions by 15.9%. It was found that the electricity consumption decreased by 1.8%, which does not meet this goal. However, the natural gas consumption decreased by 30.4% since the 2018 baseline, contributing to an overall decrease of 20.3% in corporate GHG emissions from 2018 to 2022, which meets the overall target from the 2019 ECDMP. Not all items from the 2019 ECDMP have been actioned having faced challenges during this time: COVID-19 impacting Town priorities and staff allocation for ECM implementation and some measures are dependent on first upgrading or installing a Building Automation System (BAS), such as building climate controls and optimization of the start and stop of HVAC equipment.

5.4.2 Recommended ECMs

Recommended measures are summarized in Table 9. With respect to the possible measures, please note the following.

- Many of the building-specific measure concepts and data, including project cost estimate and utility use impact estimates, were obtained from Energy Audits completed in 2017. These measures were included to provide greater granularity and flexibility in scenario development. Please refer to Energy Audit reports for more detail. Note that for these measures, the cost was taken from the audits, updated to 2024 costs assuming an average inflation rate of 3.2measures, such as "Remaining lights to LED", the retrofits were partially completed (for instance, Town Hall LED retrofits occurred on the first and second floors, and are pending for the third floor), and the cost is halved compared to what was reported in the Energy Audits.
- Some measures were also taken from the 2022 BCAs. Note that energy audits were not completed alongside the BCAs in 2022, so cost and utility reduction information for these measures is assumed as it is in other recommended measures, as detailed in the next point.
- Some measures were also taken from the 2022 BCAs. Note that energy audits were not completed as part of the BCAs in 2022, so cost and utility reduction information for these measures is assumed as it is in other recommended measures, as detailed in the next point. ASHRAE Level 3 energy audits are recommended.
- In addition to measures obtained from the 2017 Energy Audits and 2022 BCAs, additional measures were developed within the scope of this ECDMP with the specific intent of reducing GHG emissions. Such measures typically involved fuel conversion initiatives to reduce fuel utility use and associated GHG emissions. While many measures from the Energy Audits reduce GHG emissions, measures for minimizing GHG emissions were not analyzed in some of the 2017 Energy Audits. For these additional measures, the cost and utility reduction information is assumed based on recent projects done on similar buildings. The cost estimates include all anticipated fees of implementing the project, including the design, equipment, installation, and electrical upgrades (where applicable). These costs include a design contingency of 25% and a construction

contingency of 10% to account for uncertainty in the cost. It is recommended that in the next ECDMP update, more accurate costs are taken based on the feasibility studies undertaken over the next five year period.

- The "Source" column in Table 9 indicates where the ECM data was obtained. "Energy Audit" entries come from the 2017 Energy Audit, "BCA" refers to the 2022 BCAs, and "Recommended" measures are the additional ECMs recommended for consideration.

Table 9: Recommended Measures

Facility	Measure	Project cost	GHG reduction	Utility cost reduction	Cost per GHG reduction	Implementation period	Source
-	-	[\$]	[tCO2e/yr]	[\$/yr]	[\$/tCO2e]	-	-
Aurora Community Centre	Arena low-e ceiling, if feasible	73,654	1	6,896	49,845	Medium Term	Energy Audit
Aurora Community Centre	Demand control ventilation	8,489	1	242	6,500	Short Term	Energy Audit
Aurora Community Centre	DHW to heat pump	1,000,000	32	-2,031	31,629	Medium Term	Recommended
Aurora Community Centre	Electrification of dehumidification	400,000	26	-13,109	15,119	Long Term	Recommended
Aurora Community Centre	Electrification of ice resurfacing boiler	250,000	26	-13,109	9,450	Medium Term	Recommended
Aurora Community Centre	HVAC to heat pump	3,000,000	77	-4,945	38,971	Medium Term	Recommended
Aurora Community Centre	Increase roof insulation thickness	4,575,000	5	904	938,334	Long Term	BCA
Aurora Community Centre	Remaining low-flow water fixtures	499	9	1,748	53	Short Term	Energy Audit
Aurora Community Centre	Solar PV electricity generation	1,687,500	13	59,787	131,718	Long Term	Recommended
Aurora Cultural Centre	HVAC to heat pump	2,000,000	57	-3,636	35,337	Long Term	Recommended
Aurora Cultural Centre	Solar PV electricity generation	1,012,500	8	35,872	131,718	Long Term	Recommended
Aurora Family Leisure Complex	DHW to heat pump	800,000	14	-903	56,905	Medium Term	Recommended
Aurora Family Leisure Complex	Electrification of ice resurfacing boiler	250,000	4	-2,128	58,212	Medium Term	Recommended
Aurora Family Leisure Complex	HVAC to heat pump	6,500,000	63	-4,034	103,513	Long Term	Recommended
Aurora Family Leisure Complex	Increase roof insulation thickness	4,950,000	4	737	1,244,601	Long Term	BCA
Aurora Family Leisure Complex	Pool cover	4,619	9	22,565	502	Short Term	Energy Audit
Aurora Family Leisure Complex	Pool heat to heat pump	3,250,000	12	-783	266,744	Medium Term	Recommended
Aurora Family Leisure Complex	Remaining exterior lights to LED	16,853	1	2,749	28,605	Short Term	BCA, Energy Audit
Aurora Family Leisure Complex	Remaining interior lights to LED	41,821	-4	24,271	-9,529	Short Term	BCA, Energy Audit
Aurora Family Leisure Complex	Remaining low-flow water fixtures	1,373	5	935	272	Short Term	Energy Audit
Aurora Family Leisure Complex	Solar PV electricity generation	1,012,500	8	35,872	131,718	Long Term	Recommended
Aurora Public Library	High efficiency boiler replacement	159,124	4	693	42,555	Short Term	Energy Audit
Aurora Public Library	HVAC to heat pump	2,000,000	27	-1,750	73,406	Long Term	Recommended
Aurora Public Library	Remaining interior lights to LED	64,292	-5	29,356	-12,112	Short Term	BCA, Energy Audit
Aurora Seniors Centre	Demand control ventilation	6,866	4	1,473	1,565	Short Term	Energy Audit
Aurora Seniors Centre	DHW to heat pump	10,000	3	-164	3,922	Long Term	Recommended
Aurora Seniors Centre	HVAC to heat pump	800,000	29	-1,884	27,282	Medium Term	Recommended
Aurora Seniors Centre	Optimum HVAC scheduling	6,492	4	1,954	1,748	Medium Term	Energy Audit
Aurora Seniors Centre	Remaining exterior lights to LED	2,497	0	602	19,370	Short Term	BCA, Energy Audit
Aurora Seniors Centre	Remaining low-flow water fixtures	125	0	37	618	Short Term	Energy Audit
Aurora Seniors Centre	Solar PV electricity generation	337,500	3	11,957	131,718	Long Term	Recommended
Aurora Seniors Centre	VVT or VAV system	13,607	1	-94	9,281	Medium Term	Energy Audit
Aurora Sports Dome	HVAC electrification	2,000,000	167	-82,984	11,942	Long Term	Recommended
Aurora Town Hall	HVAC to heat pump	1,500,000	40	-2,544	37,875	Medium Term	Recommended

Table 9: Recommended Measures (continued)

Facility	Measure	Project cost	GHG reduction	Utility cost reduction	Cost per GHG reduction	Implementation period	Source
Aurora Town Hall	Increase roof insulation thickness	2,025,000	3	465	807,302	Medium Term	BCA
Aurora Town Hall	Occupancy sensor in meeting rooms	18,726	0	220	68,398	Short Term	Energy Audit
Aurora Town Hall	Remaining exterior lights to LED	24,343	1	2,462	46,151	Short Term	BCA, Energy Audit
Aurora Town Hall	Remaining interior lights to LED	53,056	-2	11,273	-26,028	Short Term	BCA, Energy Audit
Aurora Town Hall	Remaining low-flow water fixtures	312	0	1,864	781	Short Term	Energy Audit
Joint Operations Centre	DHW to heat pump	15,000	20	-1,309	736	Long Term	Recommended
Joint Operations Centre	HVAC to heat pump	3,000,000	234	-15,054	12,802	Long Term	Recommended
Joint Operations Centre	Increase roof insulation thickness	3,375,000	15	2,751	227,384	Long Term	BCA
McMahon Clubhouse	Remaining lights to LED	624	-0	40	-86,743	Short Term	BCA
Stronach Aurora Recreation Complex	DHW to heat pump	6,000,000	450	-28,921	13,327	Medium Term	Recommended
Stronach Aurora Recreation Complex	Electrification of dehumidification	400,000	8	-3,786	52,350	Long Term	Recommended
Stronach Aurora Recreation Complex	HVAC to heat pump	8,000,000	379	-7,849	21,127	Medium Term	Recommended
Stronach Aurora Recreation Complex	Increase roof insulation thickness	7,950,000	13	2,447	602,202	Medium Term	BCA
Stronach Aurora Recreation Complex	Pool cover	3,246	16	10,431	206	Short Term	Energy Audit
Stronach Aurora Recreation Complex	Remaining interior lights to LED	159,169	-12	68,846	-12,786	Short Term	BCA, Energy Audit
Stronach Aurora Recreation Complex	Remaining low-flow water fixtures	1,623	180	33,440	9	Short Term	Energy Audit
The Armoury	DHW to heat pump	8,000	1	-93	5,519	Long Term	Recommended
The Armoury	HVAC to heat pump	500,000	17	-1,071	29,997	Long Term	Recommended
The Armoury	Increase roof insulation thickness	622,500	1	196	589,650	Long Term	BCA
Victoria Hall	HVAC to heat pump	45,000	3	-200	14,422	Long Term	Recommended
Victoria Hall	Increase roof insulation thickness	150,000	0	37	759,008	Medium Term	BCA
Victoria Hall	Remaining low-flow water fixtures	499	0	69	33,533	Short Term	Energy Audit
Total		70,087,409	1,975	180,811			

5.4.3 Measure Descriptions

Arena low-e ceiling

A low-e ceiling can be installed in arenas to block radiant energy from the ceiling structure. This reduces the amount of heat introduced to the arena, lowering the cooling load required to maintain the ice and reducing the energy consumption of the ice plant.

Boiler replacement

Replace boilers with high efficiency models (95% efficiency).

Daylighting

Add daylighting sensors to spaces with natural light. These sensors can detect how much light is in the space to dim or turn off the lights in the space when they are not needed and save electricity by reducing how often the lights are on.

Demand control ventilation

In demand control ventilation, CO2 sensors can be added to spaces or return ducts to measure the CO2 in a space and determine whether additional outside air is required. This reduces the amount of outside air brought into the building, as unoccupied rooms will not need as much ventilation to maintain comfortable CO2 levels, and reduces the amount of energy which must be used to heat or cool the outside air being introduced to the facility.

Electrification measures

Replace gas-fired equipment with electric equipment. Electricity from the Ontario grid has a lower GHG impact than natural gas and is often more efficient than gas-fired equipment.

Heat pumps

Replace heating system (DHW, boiler, HVAC, etc.) with heat pumps. In these measures, air-source heat pumps are considered, but each building can be surveyed to check whether a geothermal heat pump would be a suitable alternative. As with the general electrification measures, if the original equipment is gas-fired, the switch to electric equipment can reduce GHG emissions. Additionally, heat pumps are a high efficiency alternative to most existing heating systems, as air-source heat pumps typically have an average coefficient of performance (COP) of around 2.5 (corresponding to 250% efficiency), and geothermal heat pumps often have an average COP above 3.5.

Increase roof insulation thickness

Increase the insulation thickness in the roof to reduce heat lost to the outside air and decrease the heating load on the facility.

Occupancy sensors

Occupancy sensors can be added to rooms and connected to the HVAC and lighting system to improve HVAC efficiency and reduce the lighting when the room is unoccupied, saving energy in temperature control and in lighting.

Optimum HVAC scheduling

An optimum start/stop program can be integrated with the BAS and use sensors in the building, as well as the occupancy schedule from the BAS, to optimize the HVAC schedule within the building. This program will re-calculate the optimal time to start heating the building to maintain the space set point at the beginning of the day, and the optimal time to switch to a relaxed temperature setpoint at the end of the day, to reduce the amount of energy expended to maintain space conditions in an unoccupied building.

Pool cover

Add a pool cover to the main and therapy pools for use when the pool is unoccupied to reduce heat lost through evaporation. This will reduce the heating load of the pool, as well as the dehumidification load of the pool area,

reducing the energy required to operate the pool. Both a standard pool cover and a liquid pool cover can be considered as options in this measure.

Remaining lights to LED

Determine which lights in the facility have not yet been converted to LED, and replace them with LEDs.

Remaining low-flow water fixtures

Determine which water fixtures have not been converted to low-flow, and change to low-flow fixtures.

Solar PV

Implement solar PV arrays to generate renewable energy, to reduce GHG emissions by reducing electricity consumption.

Variable Volume and Temperature (VVT) or Variable Air Volume (VAV) systems

Retrofit constant air volume systems with variable volume and temperature (VVT) or variable air volume (VAV) systems. Variable volume systems can modulate the amount of air sent to different zones in the building, decreasing the amount of air which needs to be heated or cooled to reduce the energy used by the building.

5.4.4 Additional Recommendations

In addition to the measures listed, it is recommended that the Town investigate the following actions, listed below. These actions are either not anticipated to result in direct GHG emissions reductions (although many are expected to result in an indirect reduction in GHG emissions), or the reduction in GHG emissions is difficult to quantify.

- **American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Level 3 Energy Audits:** These Energy Audits should also entail an assessment of the electrical infrastructure to determine if upgrades are necessary to support the additional electricity demand from implementing heat pump or electrification ECMs.
- **Net-zero pathway feasibility study:** Assess the feasibility to support medium-term and long-term projects that reduce energy and GHGs, extend asset life, and reduce cost of ownership for local recreational and cultural facilities. Determine the best approach to achieving near net zero buildings with a study grant. FCM grants should be pursued for the feasibility study portion and any capital projects identified. It is particularly recommended that this is done for recreational facilities.
 - Explore various holistic GHG mitigation strategies / scenarios with a greater level of detail. FCM framework includes multiple stakeholder engagement workshops throughout; this allows stakeholders to provide feedback upfront and have it be considered when making final recommendations.
 - The FCM funds such feasibility studies under the Community Building Retrofit (CBR) program, and is designed for municipal buildings such as these ones.
 - The designs from these studies can be used to provide more accurate estimations of cost and GHG emissions reductions from implementing measures, as well as recommend new measures based on facility operation.
- **Asset renewal consideration for roofs:** Energy retrofits are the most economical at the time of asset renewal. Roof upgrades are particularly cost prohibitive due to their high costs. The following measures should be considered at the time of replacement, assessed for feasibility, cost, and incorporated into the design:
 - Increasing roof insulation thickness.
 - Installation of a photovoltaic system, system upgrade or expansion.
 - Envelope repair and enhancement.
 - White and green roof features.
- **Design**

- Based on the outcomes of the feasibility studies, engage design consultants to provide a detailed design for each measure.
- **Staff training and capacity building:** Provide energy management training to support staff in their efforts to reduce energy waste and maximize efficiency through building system control strategies and other operational measures, and training required to operate and maintain any new technologies identified in the feasibility study.
- **Complete measures from previous ECDMP iterations:** In addition to the measures outlined above, the measures currently listed as planned or in progress from the previous ECDMP should be completed over the next five years.
- **Building Automation System (BAS) installation and upgrades:** the Town's 10 year capital budget is prioritizing BAS installation and upgrade at the following facilities: ACC, AFLC, SARC, Town Hall and the Library. A building automation system (BAS) is a software program that uses data to automatically adjust building performance. Installing a BAS gives enhanced control over various building systems, including heating, ventilation and air conditioning (HVAC) systems, electrical grids, security systems and much more. They can vary in complexity, depending on the structure and purpose of the building. Smart HVAC controls help limit energy use in unoccupied building areas, detect and diagnose faults, and reduce HVAC usage overall, particularly during times of peak energy demand. After BAS upgrades, planned building control optimization measures from the 2019 ECDMP can be implemented.
- **Prepare for upcoming ECMs:** Steps should also be taken to plan the implementation of the measures set to be implemented shortly after this time frame (e.g. 2030-2034). For instance, the Town should reach out to the staff at Victoria Hall to discuss the construction required to increase the roof insulation thickness, currently planned for 2032.

5.5 Targets

In the short term, the Town's corporate electricity consumption is projected to be reduced by 11%, which is primarily a result of the measures recommended for the Town's facilities. This corresponds to a decrease of 18% since the 2018 baseline. In the medium term, the electricity consumption will be 4% lower than the baseline, due to the increased implementation of electrification measures in facilities and in fleet. In the long term, electricity use will be 3% higher than in the baseline year, although the corresponding reductions in the utilities with higher emissions factors will reduce the overall GHG emissions.

For natural gas consumption, in the short term, natural gas use should be reduced by 10%, corresponding to a decrease of 39% since the baseline year. In the medium term, the natural gas consumption should be 75% lower than the baseline, and in the long term, it should be 99% lower than the baseline year.

6 Fleet

6.1 Asset Information

The corporate fleet vehicles considered under this ECDMP are summarized in Table 10. A more detailed breakdown is presented in Appendix A.2. Note that vehicles from the Central York Fire Services are owned by the Town of Newmarket, and thus are not included in this study.

Table 10: Fleet Vehicle Distribution

Department	Equipment	Light duty	Medium duty	Heavy duty
Fleet: Arboretum	2	1	0	0
Fleet: By-Law	0	6	0	0
Fleet: Facilities	10	4	2	0
Fleet: Parks	30	1	12	7
Fleet: Roads	13	7	5	17
Fleet: Water/Wastewater	4	4	3	0

6.2 Historical Utility Use

The Fleet historical utility use is presented in Figure 4.

Gasoline, ethanol 10, diesel, and biodiesel 5:

- It is assumed that the fleet consumes gasoline and diesel up until 2020, when the Cleaner Transportation Fuels regulation required a transition to ethanol 10 and biodiesel 5, respectively.
- Gasoline and ethanol 10 consumption remains fairly constant from 2019 to 2022.
- Biodiesel 5 consumption appears to have been gradually increasing from 2020-2022.
- Light duty vehicles are responsible for the largest portion of ethanol 10 consumption, and heavy duty vehicles are responsible for the majority of biodiesel 5 use.
- Note that the "Other" vehicles category refers to fuel consumed from jerry cans, as it is unknown which category of vehicle was served by these cans.

Propane:

- Propane is used for the arena ice resurfacers.
- The overall annual propane use appears to have gradually decreased over the past 5 year period.
- There is a considerable drop in the propane consumption in 2020 and 2021, due to arena closures during COVID-19.



Figure 4: Fleet Historical Utility Use.

6.3 Best Practices

The most common strategy to reduce GHG emissions from the corporate fleet is fleet electrification (replacing vehicles with electric alternatives where possible). Additional strategies being implemented are:

- Fuel-efficient maintenance equipment
- Anti-idling policy
- GPS and route optimization
- Vehicle sizing to assign vehicles based on need instead of preference, to reduce unnecessary fuel consumption
- Active and sustainable transportation options (i.e. investigate opportunities to carpool or use public transit where possible)

6.4 Energy Conservation Measures (ECMs)

6.4.1 Previous ECMs

The 2019 ECDMP set a target of reducing fleet GHG emissions by 50% by 2023, which has not been done. As detailed in the Green Fleet Action Plan (developed as one of the actions recommended by the 2019 ECDMP), the 2019 ECDMP did not capture all fleet fuel data, and the GFAP set a more achievable plan of reducing fleet emissions by 50% by 2028. Additional actions undertaken from the 2019 ECDMP are listed below:

- Implement an anti-idling initiative.
- Measure distance traveled and fuel consumed of fleet vehicles at regular intervals to track progress.
- Consider opportunities to upgrade town-owned fleet vehicles to reduce costs and energy consumption.
- Develop a Green Fleet Action Plan.

Additional measures completed in this time include:

- Purchased three hybrid SUVs.
- Re-fitted trucks with LED lights and auxiliary batteries that reduced the need to idle a vehicle for long periods to operate lights and other necessary tools and equipment.
- Replaced lower tier diesel equipment.
- Adopted a biodiesel 5 blend in diesel fuel.
- The Joint Operations Centre (JOC) has also been upgraded with DEF dispensing equipment to support the new emission control technology in diesels.
- Resizing the Fleet which included disposal of antiquated equipment. (ongoing)
- Implemented driver education program, including anti-idling.
- Incorporated AGM batteries that do not emit dangerous gasses.
- Increased the use of hot water pressure washing to reduce the dependency on solvent-based parts washers.
- Incorporated ethanol fuel with a 10 percent ethanol blend in all its gasoline-fueled vehicles.
- Incorporated green practices, such as using synthetic oils and extending the time between oil changes.
- Purchased fuel efficient, right-sized vehicles as a standard practice, if commercially available and meet operational needs.
- Replaced the oldest vehicles with cleaner, modern technology by continuing to accelerate the replacement of overdue vehicles through efficient life cycling procedures.
- Installation of electric plugs for truck block heaters where feasible, and developed a policy to ensure they are used by staff to reduce unnecessary vehicle idling.
- Automatic lubrication systems have been installed on all apparatus to extend the life of expensive parts, create less waste, and actually use less grease.

6.4.2 Recommended ECMs

Recommended measures are summarized in Table 11. With respect to the possible measures, please note the following.

- Measures were developed within the scope of this ECDMP with the specific intent of reducing GHG emissions. Such measures typically involved fuel conversion initiatives to reduce fuel utility use and associated GHG emissions. The cost and utility reduction information is assumed based on recent projects done.
- Vehicle electrification measures are intended to be done gradually, while replacing vehicles at their end of useful life. This measure represents the completion of fleet electrification.
- Costs were estimated based on the number and size of the vehicles being replaced in each department.
- Negative GHG emissions reduction / utility cost reduction implies an increase in GHG emissions / utility cost.

Table 11: Recommended Measures

Facility	Measure	Project cost	GHG reduction	Utility cost reduction	Cost per GHG reduction	Implementation period	Source
-	-	[\$]	[tCO ₂ e/yr]	[\$/yr]	[\$/tCO ₂ e]	-	-
Fleet: Arboretum - Equipment	Equipment decarbonization	240,000	0	85	766,324	Medium Term	Recommended
Fleet: Arboretum - Light duty	Light vehicle decarbonization	200,000	0	99	1,203,814	Long Term	Recommended
Fleet: By-Law - Light duty	Decarbonize two vehicles	400,000	18	10,874	21,962	Short Term	Recommended
Fleet: By-Law - Light duty	Light vehicle decarbonization	800,000	55	32,953	14,495	Long Term	Recommended
Fleet: Facilities - Ice Resurfacers	Ice resurfacer vehicle decarbonization	1,250,000	1	282	1,305,073	Short Term	Recommended
Fleet: Facilities - Light duty	Light vehicle decarbonization	800,000	10	5,985	79,811	Long Term	Recommended
Fleet: Parks - Equipment	Decarbonize 10 pieces of equipment	1,200,000	15	4,103	79,592	Short Term	Recommended
Fleet: Parks - Equipment	Equipment decarbonization	2,280,000	44	12,179	51,592	Medium Term	Recommended
Fleet: Parks - Light duty	Light vehicle decarbonization	200,000	15	8,888	13,436	Long Term	Recommended
Fleet: Roads - Equipment	Equipment decarbonization	1,560,000	39	13,976	39,813	Long Term	Recommended
Fleet: Roads - Light duty	Light vehicle decarbonization	1,400,000	37	21,817	38,313	Long Term	Recommended
Fleet: Water/Wastewater - Equipment	Equipment decarbonization	480,000	0	160	1,788,845	Medium Term	Recommended
Fleet: Water/Wastewater - Light duty	Light vehicle decarbonization	200,000	19	11,633	10,265	Long Term	Recommended
Total		11,010,000	254	123,033			

6.4.3 Measure Descriptions

6.4.4 Additional Recommendations

In addition to the measures listed, it is recommended that the Town investigate the following actions, listed below. These actions are either not anticipated to result in direct GHG emissions reductions (although many are expected to result in an indirect reduction in GHG emissions), or the reduction in GHG emissions is difficult to quantify.

- **Renewable fuel content:** Incorporate fuel with higher blends of renewable content (e.g. biodiesel-20) during the summer months when this is feasible.
- **Renew the Green Fleet Action Plan:** Renew the Green Fleet Action Plan based on current practices and the existing state of the Town's assets. Examples of items to consider are:
 - Gradual decarbonization: As vehicles in the corporate fleet reach their end of useful life, they should be replaced with less GHG-intensive replacements where possible.
 - The year of implementation of decarbonization measures is meant to indicate the completion of these measures, based on the planned years of replacement of some of the vehicles, but it is recommended that this change be undertaken gradually, as each vehicle is replaced.
 - Plan the actions required to upgrade the Town's electric infrastructure to support the decarbonization of fleet vehicles.
 - Analyze the utilization factors of the fleet and check whether any further actions can be performed to right-size the fleet.
 - This plan should include a more detailed analysis of low-carbon vehicle options to replace existing assets, and evaluate the advantages and disadvantages of each alternative for different asset types.
 - Continue to take the actions listed in the Green Fleet Action Plan (reduce kilometres travelled by vehicle, perform preventative maintenance on vehicles to improve engine efficiency, etc.).
- **Fleet electrification feasibility study:** Investigate the feasibility of fleet electrification by assessing the corporate electrical capacity. Upgrade electrical services as needed to install additional EV charging stations.
 - Assess and upgrade electrical infrastructure to support the addition of electric vehicles as part of fleet decarbonization. Plan the actions required to upgrade the Town's electric infrastructure to support decarbonization.
 - Assess the available low carbon options for each vehicle being replaced. For equipment and light duty vehicles, there are typically many electric options available for purchase. Electric and hybrid vehicles can effectively reduce GHG emissions, although in some cases there may be issues with the battery life, and this would require building the Town's infrastructure to support charging these vehicles. Another option is hydrogen fuel cell technology; this can also reduce GHG emissions, although care should be taken to ensure that using grey hydrogen (hydrogen produced from natural gas with no carbon capture) as a fuel is avoided where possible.
- **Additional fuel consumption:** Construction Administrators in Engineering and Capital Delivery use their own vehicles to travel between sites, which is not accounted for in this report. It is recommended that this be added to the scope of future reports to provide a more complete understanding of GHG emissions due to corporate activities.

6.5 Targets

Based on selective fleet decarbonization and ethanol 10 and biodiesel 5 consumption will decrease by 10% and 8% in the short term, respectively. Propane use should be nearly eliminated in the short term due to the ice resurfacer vehicle electrification measures currently being implemented.

In the medium term, fleet equipment should be replaced with low-carbon (e.g. electric) alternatives where possible. Ethanol 10 consumption should be decreased by 14%, and biodiesel 5 should be decreased by 31% by

2035. In the long term, the use of these utilities should be decreased as much as possible with existing fleet decarbonization technology. With existing technology, light duty vehicles should be replaced with low carbon alternatives, which is projected to result in an overall decrease in utility use of 52% for ethanol 10, and 31% for biodiesel 5. In the long term, when replacing medium and heavy duty vehicles, low carbon alternatives should also be chosen if available.

By 2050, GHG emission reductions from the fleet measures are estimated to be decreased 40% from the 2018 baseline. In 2050, the ethanol 10 and biodiesel 5 emissions are anticipated to account for roughly 22% of overall GHG emissions. Currently, there is limited technology to electrify medium or heavy duty fleet vehicles, limiting the extent to which these emissions can be reduced. To mitigate this, the Town should seek opportunities to reduce the usage of medium and heavy duty vehicles where possible, and should stay aware of current technology to replace these vehicles with low-carbon options when possible.

7 Solid Waste Sector

7.1 Asset Information

The corporate solid waste sector tracks methane emissions that enter the air directly as waste decomposes at landfills as well as nitrous oxide and non-biogenic carbon dioxide emissions associated with the combustion of solid waste at incineration facilities.

York Region manages and processes the solid waste from the Town. The Region uses two landfill sites with methane gas collection systems and three energy from waste systems.

The Town estimates GHG emissions from its corporate waste based on the amount of solid waste collected from waste bins during the inventory year. This includes waste collected at corporate-owned buildings, as well as parks and public receptacles, and excludes waste collected at residences or local businesses. The composition and quantities of corporate Town waste going to each site is currently unknown and requires a detailed waste audit for more information.

For Town buildings, as well as parks and public receptacles, the annual volume of waste is estimated based on the number and capacity of waste receptacles, approximate fraction that it is filled at pickup, and frequency of pickup times. The expected GHG emissions for this volume of waste are approximated using the calculation methodology specified by the PCP protocol, outlined in Appendix B.

Waste diverted through composting and recycling initiatives are treated as zero emissions based on the PCP Protocol. Currently, corporate solid waste from Town facilities, parks and public receptacles are not diverted (composting nor recycling) due to the high contamination rate in the waste stream.

In 2022, a Dog Waste Diversion Program was implemented as a pilot project to divert dog waste to a facility where it can be repurposed to fuel, and the Town intends to gradually add more receptacles to the program. This initiative supports the reduction of contamination into the park waste receptacles, while also reducing GHG emissions by repurposing dog waste.

7.2 Historical Utility Use

Table 12: Solid Waste GHG Emissions Summary (2022)

Waste receptacle type	GHG emissions	Percentage of waste GHG emissions
-	[tCO ₂ e/yr]	[%]
Buildings Waste Disposal	294	71
Parks Waste Disposal	114	28
Roads Waste Disposal	7	2

Waste data prior to 2022 is not available; the annual trends are unknown. Based on the recent audit data, the majority of the contribution to corporate solid waste comes from waste disposed of in corporate-owned buildings.

7.3 Best Practices

Many municipalities have incorporated various strategies for waste reduction into their plans. Some of the best practices for waste reduction are listed below, and are incorporated into the recommendations from this plan:

- Perform regular waste audits.
- Develop a Waste Reduction Plan.
- Reduce the use of single-use items.
- Divert corporate solid waste with composting and recycling programs.

- Educate staff to decrease contamination and increase waste diversion to recycling and organics bins.
- Promote a circular economy.
- Commit to net-zero waste by 2050.

7.4 Energy Conservation Measures (ECMs)

7.4.1 Recommended ECMs

There are no quantifiable measures for the waste sector, due to the uncertainty pertaining to the extent to which the recommended actions will mitigate waste emissions. Instead, the GHG reduction plan estimates the progress expected to take place in reducing GHG emissions due to waste based on implementing the additional recommendations outlined below.

7.4.2 Additional Recommendations

It is recommended that the following actions be further investigated:

- Incorporate mandatory green bin and recycling collection at all Town facilities when tendering out the next waste collection contract in 2028.
- Continue expansion and support for the dog waste program at Town parks which reduces contamination of the waste stream at park receptacles, while also reducing GHG emissions by repurposing the dog waste.
- Perform regular waste audits to get a more detailed breakdown of how much waste is generated from corporate activities and where to focus efforts on reducing waste. These audits can also be used to identify new opportunities to reduce waste.
- Develop and implement a Waste Reduction Plan to raise awareness through community education and reduce emissions from corporate waste. The plan might entail the following:
 - Increase focus on reuse activities, possibly through an additional Waste Reuse Plan.
 - Ensure that recycling and organics bins are available at corporate buildings and public receptacles to enable waste diversion through organics and recycling.
 - Implement community and staff education to increase the amount of waste diverted through recycling and organics programs, and decrease recycling and organics contamination.
 - Consider hiring staff to separate waste and ensure that waste is in the proper bins, so that all waste that can be diverted is diverted.
 - Work with York Region to improve waste separation processes to improve recovery and reduce the amount of reusable materials which are landfilled or incinerated.
 - Reduce the utilization of single-use items.
 - Where possible, purchase goods which can be upcycled or recycled instead of landfilled.
 - Continuously research best green procurement practices which can be implemented to reduce the negative impact of waste.
 - Monitor the industry to remain aware of best practices.
 - Investigate opportunities to promote a circular economy to reduce waste. For instance, support circular procurement processes where possible.
 - Explore additional strategies to reduce contamination in recycling and organics bins.
- To reach net-zero GHG emissions, we recommend that the Town strive to achieve net-zero waste by 2050, in alignment with York Region's plan.

7.5 Targets

In the next five years, the goal for waste is to perform regular waste audits to identify the trends for waste and the most significant contributors. A Waste Reduction Plan should also be developed, and some of these actions should be implemented, in the short term. In the medium term, plans should be implemented to start decreasing the GHG emissions due to waste (it is assumed that this will reduce emissions due to waste by about 10%), so that in the long term, net-zero GHG emissions due to waste can be achieved.

8 Water and Wastewater

8.1 Asset Information

The water and wastewater sector tracks energy consumption and the corresponding GHG emissions generated by Town-owned municipal water and wastewater infrastructure: lift and pumping stations. Emissions in this sector can be produced directly from the combustion of fuels (e.g. natural gas used in boilers and furnaces) or indirectly from the use of grid electricity or district energy. All infrastructure owned and operated by York Region are excluded from this inventory, as per the PCP Protocol.

Water and wastewater stations considered under this ECDMP are summarized in Table 13.

Table 13: Water and Wastewater Pumping Station Locations

Station name	Address
Ballymore Lift Station	560 St Johns Sideroad East
Brentwood Lift Station	3 Woodland Hills Boulevard
Elderberry Trail Lift Station	12 Equestrian Drive
Mattamy Phase 4 Lift Station	25 Forest Grove Court
Mattamy Phase 5 Lift Station	39 Bridgepoint Court
Shimvest Phase 1 and 2 Lift Station	90 Scrivener Drive
State Farm Lift Station	24 State Farm Way
Temperance Street Lift Station	15140 Yonge Street
Vandorf Lift Station	385 Vandorf Sideroad
Vandorf Water Booster Station	85 Vandorf Sideroad

8.2 Historical Utility Use

There is very little water/wastewater station data available prior to 2022; this data constitutes a small portion of the overall electricity consumption and it is assumed that the electricity consumed by water/wastewater stations has remained relatively constant.

8.3 Best Practices

Generally, GHG contributions from pumping stations are minor; consequently, few municipalities have undertaken measures for water and wastewater stations. The most common measures considered for pumping stations are measures to add VFDs to the pumps, or upgrade the lighting and HVAC within the corresponding buildings.

8.4 Energy Conservation Measures (ECMs)

8.4.1 Previous ECMs

The 2019 ECDMP stated that electricity consumption for water/wastewater facilities should continue to be monitored and tracked as new facilities were brought online; no additional actions have been taken.

8.4.2 Recommended ECMs

It is recommended that the water and wastewater stations be investigated for opportunities to reduce their energy use (e.g. installing VFDs on the pumps). In addition, it is recommended that the Town investigate methane leakage at pumping stations. This effort should aim to quantify any identified leakage, which can be reported in future iterations of this plan.

8.5 Targets

Due to the critical nature of the pumping stations and minor emissions impact, no significant reduction in GHG emissions is expected for the water/wastewater stations under the 2024 ECDMP. For these facilities, the electricity consumption should be monitored annually to ensure that it does not increase beyond what is expected from population growth and opportunities for cost saving energy measures investigated.

9 Lighting

9.1 Asset Information

The streetlights and traffic signals sector tracks GHG emissions generated by the use of energy for streetlights, traffic signals and other types of outdoor public lighting, such as park and recreational area lighting. Emissions in this sector are typically produced indirectly from the use of grid electricity.

Public lighting assets represent the electricity use from streetlights, park lights, and traffic lights used by the Town of Aurora. There are 4,800 street lights within the jurisdiction, all of which were retrofitted to LED in 2018.

Parking lots at Town facilities: All town-owned parking lots at major facilities were retrofit to LED lighting between 2014 and 2018.

Public lighting assets represent the electricity use from streetlights, park lights, and traffic lights used by the Town of Aurora. There are 4,800 street lights within the jurisdiction, all of which were retrofitted to LED in 2018.

9.2 Historical Utility Use

Energy use from outdoor public lighting was not previously tracked until 2022; this data constitutes a small portion of the overall electricity consumption and it is assumed that the electricity consumed by streetlights, traffic lights, and park lights has remained relatively constant.

9.3 Best Practices

The most common ECM pursued by municipalities to reduce the electricity consumed by public lighting is to switch out the bulbs to LED.

As a best practice, energy and emissions data should be sufficiently disaggregated so as to enable comparisons of defined streetlight grids or different lighting types (e.g. park lights, traffic signals, etc.). Reporting energy and emissions data according to defined streetlight grids enables more detailed comparisons based on the average performance of fixtures in a select group of lights (e.g. tonnes CO₂e/fixture), and can reveal opportunities to invest in energy efficiency initiatives.

9.4 Energy Conservation Measures (ECMs)

9.4.1 Recommended ECMs

Most of the Town of Aurora's street lights have already been converted to LED, but it is recommended that all remaining street lights, park lights, stadium lights, and traffic lights are retrofitted to LED lights when possible.

9.5 Targets

No significant reduction in GHG emissions is expected for street lighting. The remaining outdoor public lights, such as lights in sports fields, should be retrofitted to LED. The electricity consumption should be monitored to ensure that it does not increase beyond what is expected from population growth.

10 Summary of Recommendations and Implementation Plan

10.1 Project plans

To achieve the Town's goals, a GHG Reduction Plan is developed, and compared to the Business As Usual plan, which is the projected scenario for if no recommended measures are implemented. Where possible, the year of implementation for a measure in the plan was selected based on the end of useful life for the equipment being replaced, obtained from the ten-year asset management plan as well as the most recent BCAs. The specific year-by-year implementation plan used in scenario development is presented in Appendix C.1. A communications strategy with more detail on a Steering Committee made up of Town staff to ensure the successful implementation of this ECDMP is presented in Appendix F.

10.1.1 Short Term Plan (2025-2030)

A five year project plan to reduce GHG emissions is outlined in Table 14. Incremental costs are based on costs from the 10 year asset management plan and 2022 BCA, where available. Note that "N/A" in columns for utility reduction indicate measures which will not have a direct impact on the utility. To implement these measures, consider funding opportunities such as Capital project: GHG impact retrofit and Capital project: GHG reduction pathway retrofit (See Appendix G for more information about funding opportunities). Ten-year project costs comparing those in the current asset management plan with those proposed by this plan are presented in Appendix H. Note that in the short term, the focus is on performing energy audits to develop the framework necessary to implement more effective ECMs in future years.

Additional steps to complete in the next five-year period are listed below. These steps are intended to provide the necessary framework so that the Town of Aurora can meet their GHG reduction goals in the medium-term and the long-term. More information on these actions is available in Sections 5.4, 6.4, and 7.4.

- Complete remaining measures from 2019 ECDMP.
- ASHRAE Level 3 Energy Audits for all facilities being considered for ECM implementation, including an assessment of electric infrastructure, to be used to determine opportunities for net-zero retrofits. The "Study: GHG reduction pathway feasibility" funding opportunity can help cover the costs of these audits.
- Continue to take the actions listed in the Green Fleet Action Plan.
- As vehicles in the corporate fleet reach their end of useful life, replace them with electric alternatives. Consider the Capital project: Reduce fossil fuel use in fleets funding opportunity for financial support.
- Perform regular corporate solid waste audits.
- Develop and implement a Waste Reduction Plan. The "Study: Waste reduction and diversion" and "Capital project: Waste reduction and diversion" funding opportunities could help in the development and implementation of this plan.
- Conduct energy efficiency training for staff as required. Training on energy and energy efficiency should be added as part of the Town's onboarding process, and additional training and refreshers can be performed as-needed.
- Implementation and monitoring
 - Implement measures according to the designs agreed upon by design consultants and stakeholders.

- Currently, the Town has an energy performance system for its facilities, updated and monitored quarterly and reported on annually. All assets under this ECDMP should be included into this energy monitoring and performance system, including fleet, water/wastewater facilities, propane use, waste and public lighting (when feasible). Each asset's energy consumption should be monitored with time and compared against historical data to verify that the assets are meeting the targets from the ECMs which have been implemented.
- Once the BAS have been upgraded, building conditions and system function should be monitored through the BAS. Through this, it can be verified that building conditions are being maintained as they should, and that no energy is wasted through system inefficiencies (e.g. different HVAC zones fighting each other, no energy is being consumed to heat the building if it is hot outside, etc.).
- Start tracking fuel consumed by personal vehicles owned by members of the Construction Administrators in Engineering and Capital Delivery department.
- It is recommended that life cycle cost analysis be incorporated into the Town's budgeting, planning, and asset management procedures. Life cycle costing can account for reduced costs over time due to lower energy use of more efficient equipment, to help justify purchasing energy-saving equipment with a higher capital cost that might result in cost savings in the long run while helping the Town of Aurora to meet their GHG reduction goals in the long run while helping the Town of Aurora to meet their GHG reduction goals.
- Develop sustainable building standard for new and major renovations.
- Investigate opportunities to reduce energy consumption from the lighting and water/wastewater sectors (i.e. opportunities to convert remaining public lighting to LED).

Table 14: Short Term ECMs to Implement (2024-2029)

Facility	Measure description	Project cost	Design cost	Incremental cost	GHG reduction	Electricity reduction	Natural gas reduction	Utility cost reduction	Simple payback
-	-	[\$]	[\$]	[\$]	[tCO2e/yr]	[kWh/yr]	[m3/yr]	[\$/yr]	[yrs]
All facilities	Remaining measures from 2019 ECDMP	0	0	0	58	658,935	20,046	99,388	-
All facilities	Remaining lights to LED	362,655	0	362,655	-23	1,070,012	-28,655	139,599	2.6
All facilities	Remaining water fixtures to low-flow	4,432	0	4,432	196	13,809	101,562	38,094	0.1
All facilities	Investigate and implement demand control ventilation	15,355	0	15,355	6	4,910	2,887	1,715	9.0
All facilities	Remaining occupancy sensors	18,726	0	18,726	0	1,256	123	220	>20
Aurora Family Leisure Complex	Pool cover	4,619	0	4,619	9	155,150	2,369	22,565	0.2
Aurora Public Library	High efficiency boiler replacement	159,124	0	159,124	4	0	1,946	693	>20
Aurora Seniors Centre	Optimum HVAC scheduling	6,492	0	6,492	4	9,412	1,786	1,954	3.3
Fleet: By-Law - Light duty	Decarbonize two vehicles	400,000	0	400,000	18	-19,458	0	10,874	>20
Fleet: Facilities - Ice Resurfacers	Ice resurfacer vehicle decarbonization	1,250,000	0	222,500	1	-1,151	0	282	>20
Fleet: Parks - Equipment	Decarbonize 10 pieces of equipment	1,200,000	0	383,400	15	-19,296	0	4,103	>20
Stronach Aurora Recreation Complex	Pool cover	3,246	0	3,246	16	55,862	7,330	10,431	0.3
Additional Recommendations	ASHRAE Level 3 Energy Audits for all facilities	254,500	0	254,500	N/A	N/A	N/A	N/A	-
Additional Recommendations	Net-Zero Pathway Feasibility Study - Facilities	150,000	0	150,000	N/A	N/A	N/A	N/A	-
Additional Recommendations	Fleet electrification feasibility study	150,000	0	150,000	N/A	N/A	N/A	N/A	-
Additional Recommendations	Renew Green Fleet Action Plan and continue to make operational improvements from following the plan	25,000	0	25,000	19	-8	N/A	12,045	-
Additional Recommendations	Perform solid waste audits and develop a Waste Reduction Plan	50,000	0	50,000	N/A	N/A	N/A	N/A	-

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Table 14: Short Term ECMs to Implement (2024-2029) (continued)

Facility	Measure description	Project cost	Design cost	Incremental cost	GHG reduction	Electricity reduction	Natural gas reduction	Utility cost reduction	Simple payback
Additional Recommendations	Employee training for operation and maintenance of new technologies for energy savings (annual budget)	15,000	0	15,000	N/A	N/A	N/A	N/A	-
Additional Recommendations	Energy performance monitoring (annual budget)	7,500	0	7,500	N/A	N/A	N/A	N/A	-
Additional Recommendations	Undertake Phase 2 of the Green Procurement Policy	0	0	0	N/A	N/A	N/A	N/A	-
Additional Recommendations	Investigate opportunities to convert public lighting fixtures to LED	0	0	0	N/A	N/A	N/A	N/A	-
Total	(Accounts for interactive effects and changes in the electricity grid emissions factor)	4,076,647	0	2,232,547	156	1,812,072	112,818	341,962	

Note that the focus of the short term plan is to implement "quick wins" (e.g. remaining LED retrofits and low-flow water fixture measures), and to set up the infrastructure required to implement more aggressive measures in the medium and in the long term. For instance, up-to-date Energy Audits are required for the facilities to assess the feasibility of the ECMs recommended in this report, suggest additional ECMs, and determined more detailed designs for the ECMs. In addition, for fleet, the Town needs to improve their electrical infrastructure (i.e. install EV chargers at more locations and perform upgrades to the electrical infrastructure as needed) before they can electrify the fleet. Because of this, there is not projected to be a large decrease in GHG emissions in the short term.

10.1.2 Short Term Implementation Plan

The short term implementation plan is outlined in Table 15. Further information regarding the funding opportunities is available in Appendix G.

Table 15: 5 Year Implementation Plan

Action	Description	Lead division/department	Project cost	Cost unit	Funding opportunities	KPIs
Facilities - retrofits and building optimization	The focus of these measures is on lighting and controls measures, such as converting all remaining lights to LED, investigating and implementing demand control ventilation and occupancy sensors, and adding pool covers to the pools. Details of the individual measures, anticipated GHG reduction, and estimated cost are outlined in Section 5.4.	Community Services-Facilities	574,649	\$	FCM: GHG impact retrofit and FCM: GHG reduction pathway retrofit grants	Annual energy use (electricity and natural gas consumption)
Fleet decarbonization	The Town should continue to implement actions according to the Green Fleet Action Plan, and when possible, decarbonize the fleet where possible (e.g. replacing the ice resurfacers with electric ones). Details of the individual measures, anticipated GHG reduction, and estimated cost are outlined in Section 6.4.	OPS-Fleet	2,850,000	\$	FCM: Reduce fossil fuel use in fleets	Annual fuel use (ethanol 10 and biodiesel 5 consumption)
Energy audits	Perform energy audits for all facilities being considered for ECM implementation to determine opportunities for net-zero retrofits, determine the feasibility of the ECMs detailed in this report, and generate more detailed design information for feasible ECMs.	Community Services-Facilities	254,500	\$		Completion date of each energy audit

Table 15: 5 Year Implementation Plan (continued)

Action	Description	Lead division/department	Project cost	Cost unit	Funding opportunities	KPIs
Net-Zero Pathway Feasibility Study - Facilities	Perform a facilities feasibility study for the identification of measures to be addressed in a GHG reduction pathway retrofit capital project. Studies will consider the unique objectives and constraints of the building owner (e.g., building condition, capital budgets, equipment renewal cycles, etc.), and provide a detailed exploration of multiple optimization scenarios.	Community Services-Facilities and PDS-Engineering	150,000	\$	FCM Study: GHG reduction pathway feasibility	Completion date of each energy audit
Electrical capacity assessment and upgrade	Investigate the feasibility of facility and fleet electrification by assessing the corporate electrical capacity. Upgrade electrical service as needed to support the medium and long term feasibility of electrification measures.	OPS-Fleet and PDS-Engineering	300,000	\$	FCM Study: Reduce fossil fuel use in fleets	Electrical capacity of main facilities (kW)
Green Fleet Action Plan renewal	Renew the Green Fleet Action Plan to reflect current best practices and the current status of the fleet, and continue to take actions dictated by the plan.	OPS-Fleet	25,000	\$		Development of GFAP and annual fuel use
Waste audit and waste reduction strategy	Perform regular waste audits to track GHG emissions from waste. In addition, develop a Waste Reduction Plan to determine strategies to reduce waste-related GHG emissions.	PSD-Engineering or OPS-Waste	50,000	\$	FCM: Waste reduction and diversion grants	Development of Waste Reduction Plan
Employee training	Train staff on energy efficiency and operation of new technology implemented during facility ECMs. Train fleet staff on operation and maintenance of new vehicles purchased during fleet decarbonization.	Community Services-Facilities, OPS-Fleet, and PDS-Engineering, as needed	15,000	\$/yr		Number of employees trained
Energy performance monitoring	Data tracking to monitor and report on the ECDMP emission sources.	PDS-Engineering	7,500	\$/yr		Number of assets being monitored
Incorporate life cycle cost analysis into procurement	Incorporate life cycle cost analysis to account for reduced costs over time due to lower energy use of more efficient equipment to encourage the purchase of energy-efficient equipment which can result in cost savings in the long run.	Finances - Procurement and PDS-Engineering	0	\$		Incorporation of life cycle cost analysis
Development of Sustainable Building Standard for new municipal builds and major retrofits	Develop a Sustainable Building Standard to ensure that new facilities are built while considering best practices regarding energy efficiency and reducing GHG emissions.	PDS-Engineering	0	\$		Development of Sustainable Building Standard
Investigate and Develop a Carbon Offset Policy/Procedure	Develop a Carbon Offset Policy/Procedure to prepare for the purchase of carbon offsets in the medium and long term.		0	\$		Development of Carbon Offset Policy

10.1.3 Medium Term (2030-2035) and Long Term (2035-2050) Plans

In the medium and long term, it is necessary to pursue more aggressive actions to significantly reduce GHG emissions. Using the feasibility studies completed in the short term, the medium and long-term strategies should focus on implementing measures such as HVAC upgrades to heat pumps in facilities and adopting more aggressive fleet decarbonization initiatives. Additionally, other ECMs identified in the Net-Zero Pathway studies should

be prioritized for implementation.

If the recommended measures prove insufficient to achieve the Town's GHG reduction targets in the medium and long term, the consideration of carbon offsets is warranted. Carbon offsets involve indirect GHG emissions reductions, often through activities like land restoration or tree planting to enhance global carbon storage. However, it is essential to recognize that carbon offsets do not directly reduce the Town's GHG emissions and should only be used if other measures fall short of meeting the Town's goals. Additionally, it should be noted that as more organizations adopt carbon offsets to address climate change, the cost of purchasing carbon offsets may rise significantly.

Projections suggest that by 2035, the Town may need to allocate approximately \$35,000 for carbon offsets to achieve a 50% reduction in GHG emissions, with an estimated annual expenditure of around \$110,000 by 2050 to achieve net-zero emissions. These estimates are based on quotes from the Quebec carbon offsets program, which currently prices carbon offsets at \$30.05 per tCO₂e, projected to increase to \$45.10 per tCO₂e by 2030, and assuming a general inflation rate of 2.2% beyond 2030.

General implementation plans for the medium and long term are outlined in Tables 16 and 17, respectively.

Table 16: Medium Term ECMs to Implement (2030-2034)

Facility	Measure description	GHG reduction	Electricity reduction	Natural gas reduction	Utility cost reduction
-	-	[tCO ₂ e/yr]	[kWh/yr]	[m ³ /yr]	[\$/yr]
Aurora Community Centre	Arena low-e ceiling, if feasible	1	49,255	0	6,896
Various Facilities	DHW to heat pump	496	-920,617	272,521	-31,855
Aurora Community Centre	Electrification of dehumidification	26	-133,980	15,864	-13,109
Various Facilities	Electrification of ice resurfacing boiler	31	-155,729	18,440	-15,237
Fleet	Equipment decarbonization	84	-105,140	0	26,400
Various Facilities	HVAC to heat pump	525	-851,304	286,367	-17,222
Various Facilities	Increase roof insulation thickness	16	0	8,281	2,948
Aurora Family Leisure Complex	Pool heat to heat pump	12	-22,619	6,696	-783
Aurora Seniors Centre	VVT or VAV system	1	-2,722	806	-94
Additional Recommendations	Implement additional ECMs identified from the Energy Audits	N/A	N/A	N/A	N/A
Additional Recommendations	Continue to take actions listed in the Green Fleet Action Plan	N/A	N/A	N/A	N/A
Additional Recommendations	Continue to take the actions determined by the Waste Reduction Plan	42	N/A	N/A	N/A
Additional Recommendations	Energy performance monitoring (annual budget)	N/A	N/A	N/A	N/A
Additional Recommendations	Continually research low-carbon electricity generation opportunities and feasibility	N/A	N/A	N/A	N/A
Additional Recommendations	If necessary, purchase carbon offsets in 2035 to meet GHG reduction targets	N/A	N/A	N/A	N/A
Total	(Accounts for interactive effects and changes in the electricity grid emissions factor)	842	-1,624,230	479,125	-42,055

Table 17: Long Term ECMs to Implement (2035-2050)

Facility	Measure description	GHG reduction	Electricity reduction	Natural gas reduction	Utility cost reduction
-	-	[tCO2e/yr]	[kWh/yr]	[m3/yr]	[\$/yr]
Various Facilities	DHW to heat pump	24	-45,256	13,397	-1,566
Stronach Aurora Recreation Complex	Electrification of dehumidification	8	-38,695	4,582	-3,786
Aurora Sports Dome	HVAC electrification	167	-848,156	100,428	-82,984
Various Facilities	HVAC to heat pump	401	-744,027	220,247	-25,745
Various Facilities	Increase roof insulation thickness	25	0	12,885	4,588
Fleet	Light vehicle decarbonization	136	-145,602	0	81,374
Various Facilities	Solar PV electricity generation	31	1,024,920	0	143,489
Additional Recommendations	Implement additional ECMs identified from the Energy Audits	N/A	N/A	N/A	N/A
Additional Recommendations	Continue to take the actions determined by the Waste Reduction Plan	416	N/A	N/A	N/A
Additional Recommendations	Energy performance monitoring (annual budget)	N/A	N/A	N/A	N/A
Additional Recommendations	Research new technology to identify additional opportunities to reduce GHG emissions	N/A	N/A	N/A	N/A
Additional Recommendations	Continue to purchase carbon offsets as needed until medium term (2035) GHG reduction target is met (annual budget: \$35,000 until 2040)	N/A	N/A	N/A	N/A
Additional Recommendations	If necessary, purchase carbon offsets in 2050 to meet long term (2050) GHG reduction target of net zero GHG emissions (annual budget)	N/A	N/A	N/A	N/A
Total	(Accounts for interactive effects and changes in the electricity grid emissions factor)	853	-718,171	330,727	115,369

11 Plan Results

The projected GHG emissions and utility costs for the GHG reduction plan compared to the business-as-usual case are presented below. For additional utility use plots, see Appendix C.

11.1 GHG Emissions

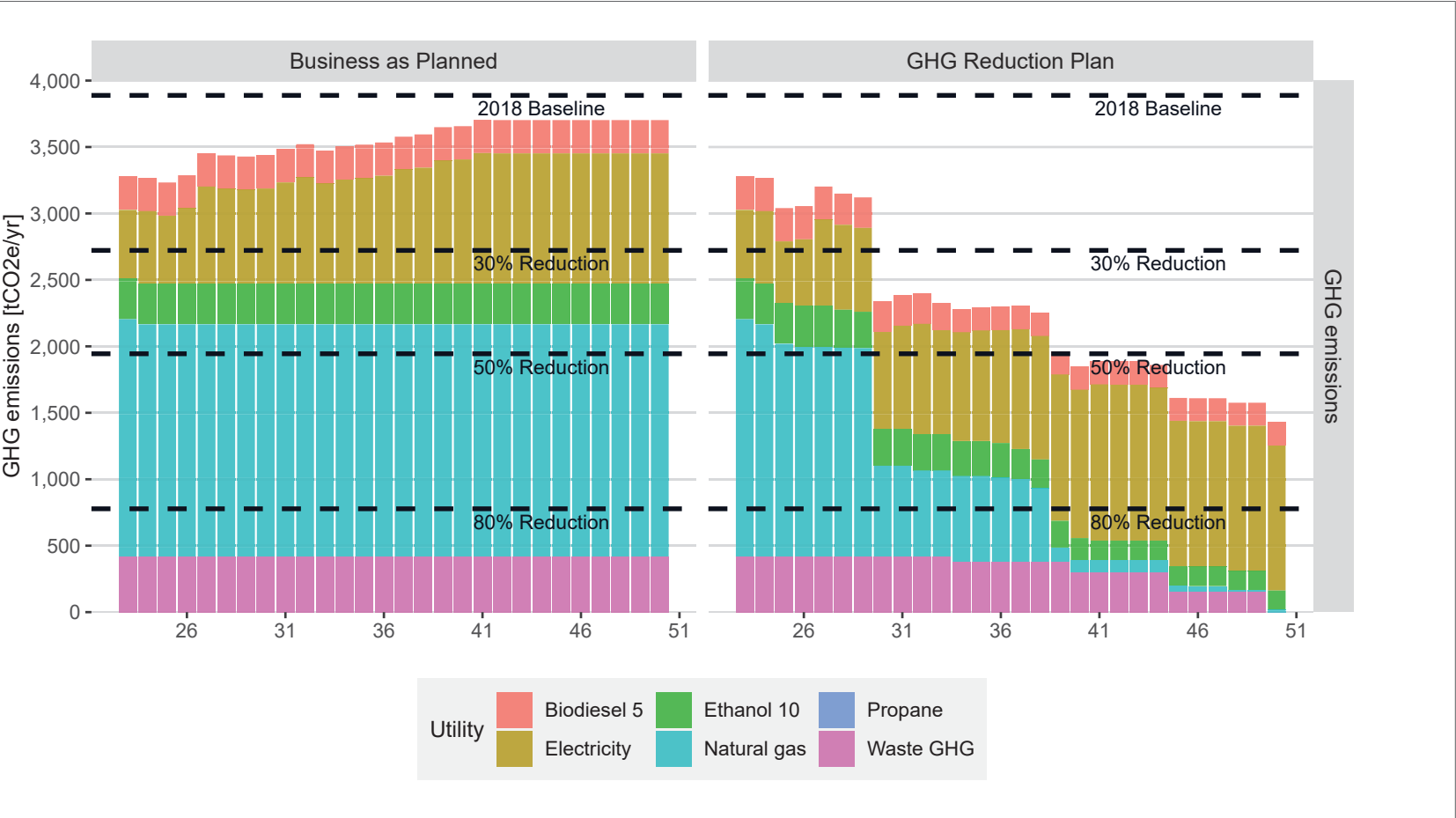


Figure 5: GHG Emissions Projection for Each Scenario

11.2 Utility Cost

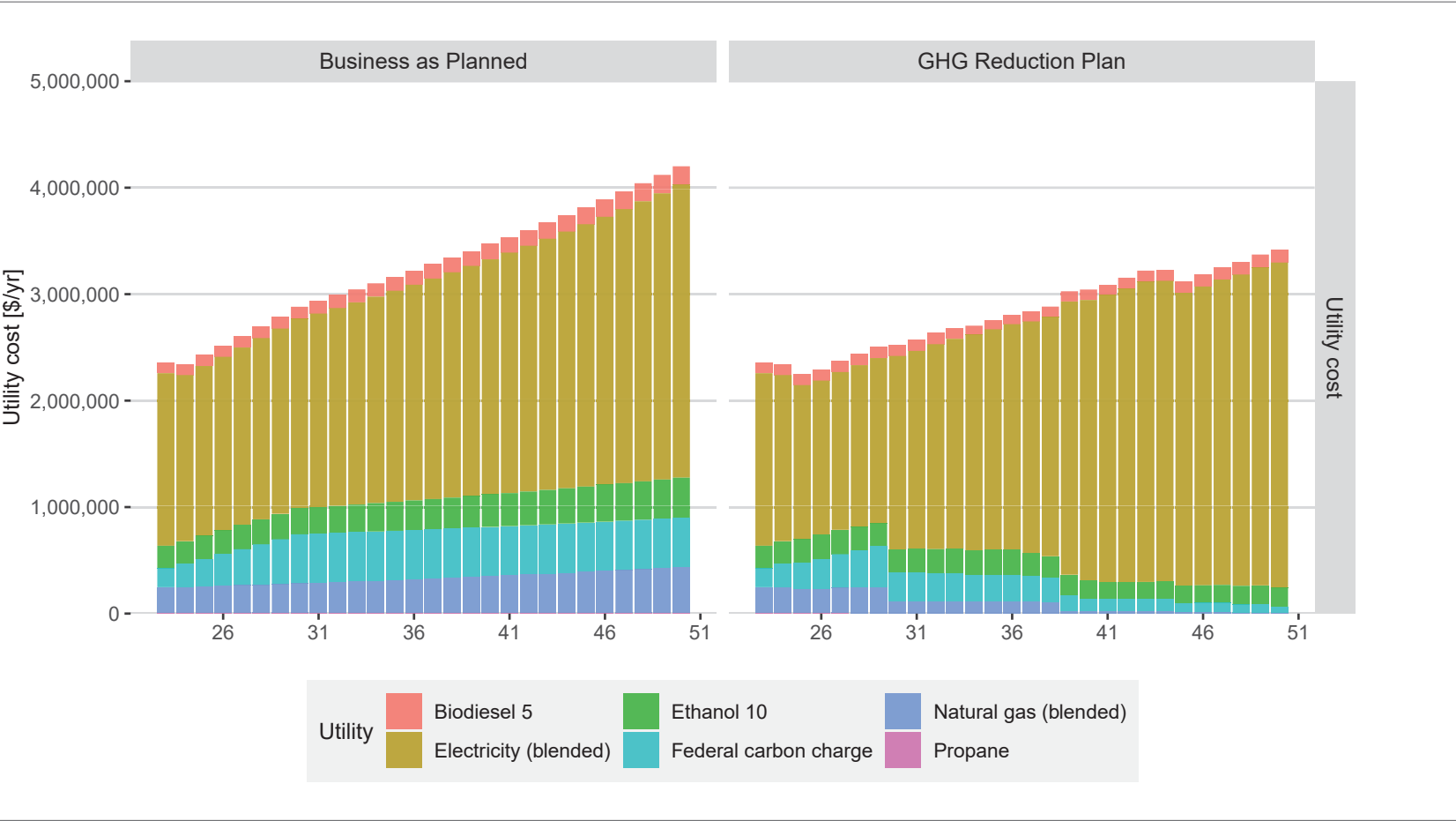


Figure 6: Utility Cost Projection for Each Scenario

11.3 Scenario Discussion

The following results are observed from the scenario analysis:

- The Business as Planned scenario is considered inviable, because it does not take specific action to achieve GHG targets. In 2050, it exhibits annual utility costs roughly \$781,907 (19%) higher than those in the GHG reduction pathway, due to the greater energy use and due to the federal carbon charge.
- The maximum GHG emissions that can be achieved by pursuing the ECMs outlined previously is 63%. This is contingent on being able to achieve net-zero waste emissions by 2050.
- Most of the significant reductions in GHG emissions are a result of measures taken in the medium and long term to reduce the consumption of fossil fuels through process electrification.
- There is also a projected increase in the electricity grid emissions intensity with time. The electricity emissions factor is still considerably lower than fossil fuel emissions factors, but this phenomenon will still make it more difficult for the Town to meet their GHG reduction targets through electrification ECMs. To counter this, the Town is encouraged to implement energy-efficient and renewable energy technology where possible.
- Remaining ethanol 10 and biodiesel 5 emissions are anticipated to account for roughly 22% of GHG emissions in 2050. Currently, there is limited technology to electrify medium or heavy duty fleet vehicles, limiting the extent to which these emissions can be reduced. To mitigate this, the Town should seek opportunities to reduce the usage of medium and heavy duty vehicles where possible, and should stay aware of current technology to replace these vehicles with low-carbon options when possible.

11.4 Plan Results Summary

Based on the plans identified, the anticipated progress towards reducing GHG emissions is presented in Table 18.

Table 18: Plan Results Summary

Term	GHG Emissions	Utility Cost	Electricity Consumption	Natural Gas Consumption	GHG Emissions Reduction	Additional Percent Reduction (From Baseline)	Cumulative GHG Percent Reduction
-	[tCO2e/yr]	[\$/yr]	[kWh/yr]	[m3/yr]	[tCO2e/yr]	[%]	[%]
Baseline	3,889	2,307,083	11,571,403	1,337,896	-	-	-
Current	3,100	2,133,708	11,368,706	930,583	788	20	20
Short Term Plan	3,121	2,502,895	9,518,549	817,766	-21	-1	20
Medium Term Plan	2,279	2,704,088	11,142,779	338,641	842	22	41
Long Term Plan	1,426	3,419,019	11,860,949	7,914	853	22	63

Note that the stagnating reduction in GHG emissions during the short term is because the focus of the short term plan is to establish the infrastructure needed to perform more aggressive measures, as was outlined in more detail in Section 10.1.1. Additionally, in the short term, there is a projected increase in the GHG emissions factor of the electricity grid (shown in Appendix B), which makes it more difficult to decrease GHG emissions in the short term.