

On-Street Electric Vehicle Charging Stations - Pilot Update

Date: December 20, 2021

To: Infrastructure and Environment Committee

From: General Manager, Transportation Services

Wards: Ward 10 - Spadina-Fort York; Ward 14 - Toronto-Danforth; Ward 19 - Beaches-East York

SUMMARY

This report provides an update on the one-year Residential and Downtown On-Street Electric Vehicle Charging Station pilots that were launched in October of 2020, including information on charging station utilization, GHG impacts, costs, revenues and measures taken to improve compliance by non-EV operators with the existing EV parking regulations.

At the request of Toronto Hydro, the report seeks City Council approval to continue collecting data on the sites that were part of the Downtown and Residential Electric Vehicle Charging Station pilots by eight (8) months. While uptake of the pilots' charging stations has increased over the past 12 months, the pandemic has had an impact on some of the findings. This ongoing review will allow time to collect additional data for a more accurate reflection of EV charging adoption as more of the workforce returns to work centres and EV owners require steady-state charging of their EVs. If approved staff will be seeking City Council authority to amend the existing participation agreements between Transportation Services and Toronto Hydro to reflect an extension to the pilots for eight more months.

The report also speaks to the plan for extending the first stage of the EV roll-out into a more comprehensive city-wide program. It is further anticipated that this program be transferred to the responsibility of the Toronto Parking Authority beginning in 2023 and that Toronto Parking Authority integrate this program with its network of public EV charging infrastructure that it is developing as part of its EV charging program.

RECOMMENDATIONS

The General Manager, Transportation Services, recommends that:

1. City Council approve the extension of the Downtown and Residential Electric Vehicle Charging Station pilots by eight (8) months until May 31, 2022.
2. City Council authorize the General Manager, Transportation Services to amend, enter into and execute existing participation agreements between Transportation Services and Toronto Hydro for the Downtown and Residential On-Street Pilot Projects, as per Part 1 of this report dated December 20, 2021 and on such other terms and conditions satisfactory to the General Manager, Transportation Services, and in a form satisfactory to the City Solicitor.
3. City Council request the General Manager, Transportation Services to report back to the Infrastructure and Environment Committee with the final results of the Downtown and Residential On-street EV Charge Station pilot at the end of the extended evaluation period in Q2 of 2022, should part 1 of this report be approved, and next steps on an expanded program for on-street electric vehicle charging with implementation on-street as early as 2022.
4. City Council request the General Manager, Transportation Services in consultation with Toronto Hydro and the Toronto Parking Authority to commence expansion of the City's On-Street Electric Vehicle Charging Station program, including siting criteria, costs, and any other requirements to ensure expeditious roll-out of further locations as funding becomes available in 2022, with existing charge stations and future new charge stations to be transferred to the responsibility of the Toronto Parking Authority in 2023.
5. City Council authorize and direct the appropriate City officials to take the action to give effect thereto.

FINANCIAL IMPACT

There are no additional funding implications resulting from the adoption of this report.

The Chief Financial Officer and Treasurer has reviewed this report and agrees with the financial impact information.

DECISION HISTORY

City Council, at its meeting of December 15, 16 and 17, 2021 adopted, as amended, the Infrastructure and Environment Committee Item IE26.16 entitled, "TransformTO - Critical Steps for Net Zero by 2040."

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2021.IE26.16>

City Council, at its meeting of December 15, 16 and 17, 2021 adopted, as amended, the Executive Committee Item EX28.1 entitled, "Toronto Hydro Climate Action Plan and Next Steps."

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2021.EX28.1>

City Council, at its meeting of November 7, 8 and 9, 2017 adopted, as amended, the Public Works and Infrastructure Committee Item PW24.7 entitled, "Preparing Toronto for Electric Vehicles."

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2017.PW24.7>

On September 26, 2016, the Public Works and Infrastructure Committee requested the Transportation Services and Environment & Energy Divisions report back on expanding electric vehicle charging stations in Toronto (item 2016.PW15.0):

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2016.PW15.9>

On July 11, 12 and 13, 2012, City Council approved a one-year pilot project (item 2012.PW16.4) to provide curb-side charging stations for electric vehicles.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2012.PW16.4>

On September 11, 2012, Council approved the designation of five electric vehicle charging station parking areas for the exclusive use of electric vehicle charging for a one-year pilot project, on Ed Mirvish Way, Elizabeth Street and Wellington Street West (item 2012.TE18.68).

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2012.TE18.68>

COMMENTS

The City of Toronto has committed to a net zero greenhouse gas ("GHG") emissions target by 2040. Transportation is a leading source of GHG emissions, accounting for 38% of GHG emissions in the City of Toronto¹. Plug-in electric vehicles ("EVs") will play an important role in achieving the City's ambitious climate goals. Access to public electric vehicle charging, including on-street charging opportunities, is critical for the transition to electric vehicles that is required to meet Toronto's goal of reaching net zero emissions by 2040.

In support of EV growth, Toronto Hydro and Transportation Services partnered to install seventeen (17) EV charging devices on nine (9) select streets across the city for a 12-month pilot period between October 1, 2020 and September 30, 2021. These stations are part of two separately approved Council pilots referred to as the Downtown and Residential Electric Vehicle Charging Station pilots, which aim to achieve the following goals:

- Understand charging usage in the City of Toronto
- Help permit parking holders gain access to on-street charging

¹ City of Toronto Electric Vehicle Strategy, December 2019, pg. 2, <https://www.toronto.ca/wp-content/uploads/2020/02/8c46-City-of-Toronto-Electric-Vehicle-Strategy.pdf>
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- Understand charging in combination with paid parking
- Support the reduction of GHG emissions and other emissions harmful to air quality

The pilots will help Toronto Hydro and the City of Toronto better understand the potential technical challenges associated with the installation and maintenance of EV charging stations, determine the impact of charging stations on the City's road maintenance procedures, and provide valued insight on market demand for on-street EV charging. They also add to the fabric of nearly 1,000 other publicly accessible charging stations across Toronto that Toronto Hydro has connected to the distribution system, and the nearly 2,000 stations at homes of EV users, which are also powered by Toronto Hydro².

As more is learned through these pilots, Toronto Hydro will be in a better position to help support an anticipated larger roll-out of on-street EV charging infrastructure in the future as funding is secured or accessed through grant programs or Federal programs such as NRCan's Zero Emission Vehicle Infrastructure Program. Toronto Hydro is awaiting the outcome of these grant programs and if approved could provide an opportunity for additional roll-out of EV charging stations as early as 2022. As part of further update report we will report out in Q2 on what we are able to implement on-street in 2022.

Pilots

Working in partnership, the Transportation Services Division and Toronto Hydro have installed curbside charging stations in the downtown core and in residential neighbourhoods. Through this experience, Toronto Hydro and Transportation Services have navigated site planning, community engagement, design and construction, and operational constraints and challenges.

Downtown On-Street Pilot

In 2012, City Council approved the installation of EV Charging Stations in the downtown core. However, it was later determined that certain provisions in the Ontario Energy Board (OEB) Act prevented Toronto Hydro from owning and operating EV charge stations because the chargers could not be used for the sole purpose of distributing electricity. Although a considerable amount of effort and staff time was expended by the City and Toronto Hydro to make the pilot a reality, the OEB rules forced the pilot to be delayed until they were amended in 2016. Subsequently, both parties agreed to expand the focus of the pilot to also include residential streets where opportunities for residents to charge on their own property was not available.

The agreement required Toronto Hydro to take ownership of the project and invest the funds necessary to purchase, install, maintain and operate all the curbside charging station devices. The final slate of pedestal-mounted stations was installed on Elizabeth

² As per ChargeHub, there are 864 public chargers in Toronto, details available at: <https://chargehub.com/en/countries/canada/ontario/toronto.html>
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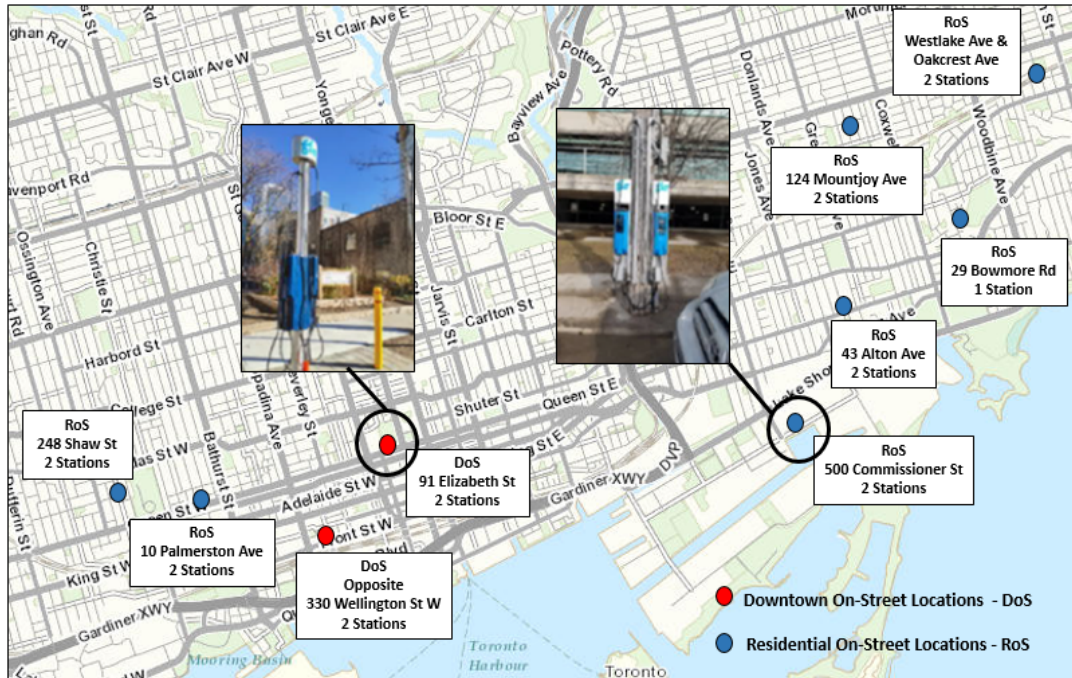
Street (two chargers in pay-and-display spots) and Wellington Street West (two chargers) in the third quarter of 2020, with the official launch of the pilots on October 1, 2020 (see Figure 1 – Pilot Locations).

Residential On-Street Pilot

In 2017, Toronto Hydro and Transportation Services received authorization from City Council to proceed with a one-year pilot of on-street charging stations in residential neighbourhoods for residents who rely primarily on on-street parking. The charging stations were mounted to existing utility poles to save on costs, and sites were selected based on permit parking subscription levels, electrical capacity, existing parking restrictions and utility pole placement along the sidewalk.

Thirteen (13) charging stations were installed at seven (7) locations including: 10 Palmerston Avenue, 124 Mountjoy Avenue, 248 Shaw Street, 29 Bowmore Road, 43 Alton Avenue, and Westlake Avenue at Oakcrest Avenue, with one additional non-residential location in front of Toronto Hydro's work centre at 500 Commissioners Street to develop installation standards and monitor functionality (see Figure 1 – Pilot Locations).

Figure 1 - Pilot Locations



**Pedestal Style - Dual Charger
(Elizabeth Street)**



**Pole-Mounted Charger
(Commissioner Street)**

Implementation

Site Selection

In both pilots, the charging stations are located in areas that have enough parking capacity to accommodate dedicated EV parking spots. These locations also provided existing pole placement configurations which allowed Toronto Hydro to install the charging stations safely and with minimal disruptions to pedestrians and the community.

In the case of the Downtown On-Street pilot, siting appropriate locations included avoiding major arterial roads where rush-hour periods would limit usage of the charging stations, 'No Parking' areas that could safely accommodate parking and at least one location within a pay-and-display area to assess EV charging in a paid parking scenario. Suitable parking spaces also needed to be within proximity of an existing hydro pole to minimize electrical installation costs while ensuring charging station equipment did not interfere with the accessibility requirements of pedestrians or those with disabilities.

The Residential On-Street pilot required different criteria for site selection including the following:

- In a permit parking area with available permits (i.e., < 90% capacity);
- On a street block with at least two fewer permits issued than parking spaces available;
- No daytime parking restrictions or alternate side of street parking;
- The presence of electrical or street light poles placed between the back of curb and sidewalk;
- On a street that allows for the placement of two parking spaces (ideally) end-to-end without encroaching on driveways, intersections, fire hydrants, or other significant encumbrance; and
- Location provides sufficient electrical capacity and can otherwise support the EV charge stations.

Once candidate locations were identified, these locations were communicated to each of the local Councillors for review, input and approval before finalizing the list for installation.

Marketing and Engagement

Prior to the launch of the pilots, Toronto Hydro and Transportation Services undertook several communication efforts to advise customers of the upfront construction activity and to publicize the pilots generally.

Once construction was complete for both Residential and Downtown On-Street pilots, Toronto Hydro and City coordinated a press conference on November 7, 2020, which Mayor Tory, Councillor Bradford and the General Manager of Transportation Services attended to promote the pilot and drive awareness for the need to electrify transportation in Toronto.

Communications teams for both the City of Toronto and Toronto Hydro also coordinated on website messaging to provide information to residents and visitors about the pilots.³ Toronto Hydro also shares promotional content on Twitter, Facebook and Instagram social media feeds.⁴

³ City of Toronto and Toronto Hydro launch new on-street electric vehicle charging station pilot, <https://www.toronto.ca/news/city-of-toronto-and-toronto-hydro-launch-new-on-street-electric-vehicle-charging-station-pilot/>

⁴ Toronto Hydro: Electric vehicle (EV) charging stations,

EV Charging Rates

Charging rates for the Downtown On-Street charging stations at Elizabeth Street and Wellington Street West were set to \$2 per hour. This rate remains unchanged when the vehicle's battery reaches a full state of charge, to encourage EV owners to move their vehicles and allow access for other EV drivers. Charging rates for the Residential On-Street charging stations were set at \$2 per hour between 8:00 a.m. and 7:59 p.m. and \$3 flat rate between 8:00 p.m. and 7:59 a.m. to allow overnight permit parking users to have their EVs reach a full state of charge without having to move their vehicles in the middle of the night.

Results to Date

The pilots have been measured with inputs including usage data, feedback from station users and from the community. Over the course of the first year, the project achieved sustained new-user growth with increasing usage and positive user feedback.

Usage

In the first year of operation (October 1, 2020 to September 30, 2021) usage generally increased month-over-month, with the Downtown On-Street charging stations increasing from a charger average utilization (i.e., average percentage of the month that stations were in use) of 0.24% in October 2020 to 15.3% in September 2021. The total number of charging sessions per month also grew over the same period, growing from only four (4) sessions in October 2020 to one-hundred and fourteen (114) sessions across both locations in September 2021, which is attributed to 192 users. The Wellington Street West site was consistently more popular than the Elizabeth Street site, as shown in the chart labelled 'Downtown On-Street Usage' (Attachment 1 - Figure 2). The Elizabeth Street location was impacted by non-EV drivers occupying these spots on a number of occasions impacting utilization.

Usage similarly increased over time for the Residential On-Street charging stations. The chargers' average utilization increased from 2.4% in October 2020 to 15% in September 2021. The number of sessions per month for the Residential On-Street locations also grew from eighty-one (81) to two-hundred and ninety-three (293) over the same period, which is attributed to 610 users. Utilization statistics are broken down by site in the chart labelled 'Residential On-Street Usage' (Attachment 1 - Figure 3).

Over time it can be expected that utilization at the existing pilot locations will improve. As EV drivers become more familiar with sites, and drivers once again make more frequent use of their EVs for their various daily trips, especially post-pandemic, and as EV ownership continues to rise, the utilization figures observed today are anticipated to be significantly higher in the future.

GHG Impact

Both pilots saw an energy consumption in total of 54,774 kWh over the first 12 months. At an average net GHG mitigation factor of 1.012 kgCO₂e/kWh, this represents over 55

metric tonnes of CO₂e that would otherwise have been emitted from Internal Combustion Engine (“ICE”) equivalents.^{5,6}

Revenues

Over the course of the first 12 months in operation, the Downtown On-Street pilot collected \$3,521 (exclusive of taxes) in revenue for an average of \$5.34 per charging session and the Residential On-Street pilot collected \$9,589 (exclusive of taxes) in revenue for an average of \$4.78 per charging session.

Costs

Two styles of charging dispensers were installed for the two pilots. For the pole-mounted application, the cost per-charger was around \$15,000 while the pedestal mounted station the cost was \$50,000. The pedestal stations were more costly due to the stations themselves along with additional civil work for underground power supply, concrete pedestal bases and pad-mounted meter and equipment enclosures.

Costs for only electricity and transaction fees in the first 11 months of operation for the Downtown On-Street pilot, were available at the time this report was written, and this amounted to \$2,470 for an average of \$6.61 per charging session. Costs for the Residential On-Street pilot over the same period amounted to \$8,307 for an average of \$4.89 per charging session.

Current fees for charging do not reflect the real cost of operating on-street charging stations such as monitoring, data analysis, management and maintenance of the site nor the capitalization expenses or depreciation and will need to be corrected in the long term to generate a revenue requirement according to the cost of service.

The Need for Rate Adjustments

As reflected in the above sections, current rates for charging a vehicle are insufficient to recover transaction fees and electricity costs. Given that this is a pilot, and was intended to provide insight on charging usage, the charging rates were set to generally recover

⁵ While EV efficiencies vary among makes and models, the estimated average for popular EVs is 18.7kWh/100km. The average efficiency for comparable Internal Combustion Engine (“ICE”) vehicles is 8.5L/100km. This means that, for every kWh consumed by an EV, a similar ICE vehicle would consume 0.45L of gasoline. At a factor of 2.3kgCO₂e/L of gasoline, every kWh represents 1.05kgCO₂e of avoided greenhouse gases (“GHGs”) from gasoline combustion. However, since Ontario’s electricity grid has an average annual emissions factor of 0.031kgCO₂e/kWh, on a net basis, every kWh of electricity consumed by EVs represents 1.012kgCO₂e of total avoided GHGs.

⁶ Natural Resources Canada, Fuel Consumption Rating Tool, available at: <https://fcr-ccc.nrcan-rncan.gc.ca/en>

Natural Resources Canada, AutoSmart - Learn the Facts: Fuel Consumption and Co₂, available at: https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oeef/pdf/transportation/fuel-efficienttechnologies/autosmart_factsheet_6_e.pdf

Toronto Atmospheric Fund, A Clear View on Ontario’s Emissions (2019), available at: <https://taf.ca/wpcontent/uploads/2019/06/A-Clearer-View-on-Ontarios-Emissions-June-2019.pdf>

the cost of electricity usage. The intension is to continue operating the charging stations beyond the pilot period, and therefore a modest adjustment to rates will align revenues more closely with observed costs while providing insights into price elasticity in the market and giving the charge-station service better sustainability prospects.

Compliance with EV Charging Station Parking Regulations

The on-street EV charging stations spots are regulated to allow Battery Electric Vehicles (BEVs) or Plug in Hybrid Electric Vehicles (PHEVs) to park only while actively connected to the charging station. During the 12-month pilot period (October 1, 2020 to September 30, 2021) parking violations were monitored to determine if vehicle operators were complying with the existing parking regulation for EVs. In total, there were 346 parking infractions totalling \$20,760. A breakdown of those infractions at each of the on-street EV charging spots is summarized in the table located in Attachment 2, appended to this report.

The most frequent parking infraction (95 percent of the time) occurred when a non-electric vehicle was parked in these designated EV parking spaces. The remaining parking infractions were associated with exceeding the parking time limit.

Although the EV charging spots are properly signed, motorists still mistakenly think that non-electric vehicle have equal access to these spots. One improvement that was introduced in October 2021, and hopefully will result in better overall compliance, was the pavement marking of these charging spots with EV symbols and delineation markings as shown in the image below.



Charging Location on Elizabeth Street

A further enhancement that will be introduced to improve compliance will be the modification of the parking time limit of four (4) of the EV locations where parking is currently limited to 'one-hour' parking. Users have frequently complained that the one-hour parking time limit is insufficient to adequately charge a vehicle and on a few occasions EV drivers have extended their time parked beyond the one hour, which has resulted in a parking infraction. Transportation Services will be submitting a follow-up report to the Toronto and East York Community Council seeking appropriate parking amendments to extend the current one-hour parking limit to a three-hour limit. This amendment should allow EV owners sufficient time to properly recharge their vehicles.

Impact of COVID-19 on Usage

The combination of non-essential business closures and work-from-home protocols has significantly impacted daily commuting habits. Subsequently, the amount of driving and refueling required has also decreased. It is not clear exactly what impact these changes may have had on the uptake EV charging station usage.

While uptake of the charging stations has increased over the past 12 months, the onset of the COVID-19 global pandemic impacted complete insight and information these pilots were intended to collect, specifically: understanding charging habits in Toronto; identifying technical challenges associated with the installation and maintenance of public chargers; and evaluating market demand for on-street charging.

It's likely that the current observations are not an entirely accurate reflection of adoption. As such, Toronto Hydro feel that it would be beneficial to continue operating these locations and continue collecting data for another eight (8) months to observe usage patterns as the workforce gradually returns to work centres and EV owners require steady-state charging of their EVs under more normal conditions.

Opportunities for Future Learnings and Implementation

The Downtown and Residential On-Street pilots offer valuable insights in building and operating EV chargers in the city. The lessons learned from operating them can further unlock future market opportunities for EV charging services, including improving product design, establishing market competitive rates, and best practices for community engagement to build services valued by Torontonians. The pilots also help Toronto Hydro and the Transportation Services Division understand EV charging behaviour in various settings, which will be crucially important as demand for the EV market expands in the latter half of the decade.

Continued operation with the rates for charging adjusted to better reflect service costs will allow Toronto Hydro and the Transportation Services Division to collect more valuable information for on-site usage, and reveal further opportunities for collaboration with City and industry partners on future transportation electrification initiatives. It will also ensure continued progress in transportation electrification as the City of Toronto begins comprehensive and holistic planning for a net-zero future that has been accelerated with the introduction of TransformTO's new Net Zero Strategy.

As such, Transportation Services and Toronto Hydro recommend the current EV Charging Station pilots be extended by eight (8) months and that the associated partnership agreements between Transportation Services and Toronto Hydro, for the Downtown and Residential Charging Station Pilots, be amended to reflect this change. Following this period Transportation Service will report back on the additional observed findings along with any additional program changes that would accommodate a complete city-wide roll-out of EV charging stations.

At the same time, based on the findings of these first installations, staff of Transportation Services and Toronto Hydro will continue to develop a comprehensive Staff report On-Street EV Charging Stations - Pilot Update

program in 2022, in consultation with the Toronto Parking Authority, for full roll-out of on-street charging stations in 2023, to be overseen by the Toronto Parking Authority. The Toronto Parking Authority will also continue development of an expanded EV Charging Program that will include publically accessible chargers at both its off-street parking facilities and within the on-street parking supply (i.e., on-street pay-and-display and residential locations).

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ATTACHMENTS

Attachment 1: Utilization Rates at Downtown and Residential Pilot Locations
Attachment 2: Parking Violations and Fines at EV Pilot Locations

Attachment 1

Figure 2: Downtown On-Street Usage (October 2020 to September 2021)

Location	Station ID	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
355 Wellington St	AAA-10796	0%	0.3%	1%	0.4%	13%	27%	15%	26%	20%	20%	39%	27%
	AAA-11133	1%	0.3%	2%	3%	2%	16%	4%	12%	7%	12%	19%	28%
91 Elizabeth St	AAA-11126	0%	0%	0.4%	0.3%	0.4%	1%	1%	0.8%	2.5%	2%	6%	2%
	AAA-11130	0.2%	1%	1%	1%	2%	4%	3%	11%	12%	7%	19%	4%

Source: Toronto Hydro

Figure 3: Residential On-Street Usage (October 2020 to September 2021)

Location	Station ID	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
10 Palmerston Ave	AAI-10200	5%	8%	10%	16%	30%	31%	29%	24%	31%	27%	21%	27%
	AAI-10204	2%	4%	1%	8%	9%	6%	9%	11%	13%	17%	21%	24%
124 Mountjoy Ave	AAI-10201	2%	1%	4%	3%	2%	2%	2%	4%	4%	5%	11%	17%
	AAI-10206	5%	5%	6%	5%	6%	5%	4%	2%	13%	16%	14%	20%
248 Shaw St	AAI-10207	3%	8%	15%	16%	15%	7%	12%	15%	21%	19%	31%	42%
	AAI-10209	4%	2%	4%	1%	3%	2%	0%	0%	11%	13%	24%	23%
29 Bowmore Rd	AAI-10202	4%	8%	11%	15%	11%	14%	16%	19%	22%	18%	11%	10%
43 Alton Ave	AAI-10203	1%	2%	5%	4%	5%	9%	6%	14%	10%	6%	9%	7%
	AAI-10210	2%	6%	17%	19%	18%	19%	17%	19%	23%	14%	11%	22%
500 Commissioners St	AAA-10390	2%	1%	0%	2%	0%	0%	0%	0%	0%	2%	0%	1%
	AAA-10396	1%	1%	0.1%	0.3%	0.5%	9%	3%	0.3%	0.4%	0.6%	0.2%	0.3%
Westlake Ave & Oakcrest Ave	AAI-10205	0.3%	4%	5%	0.1%	0.1%	0.3%	0.1%	0.6%	0.4%	5.7%	5.7%	1.1%
	AAI-10208	0%	1%	6%	8%	3%	1%	1%	7%	4%	3%	4%	5%

Source: Toronto Hydro

Note:

Percentage Utilization is found using the amount of time a charging head is spent connected to a vehicle. (i.e., Utilization Hours) divided by the amount of hours in a month and all described as a percentage

Attachment 2

Parking Violations and Fines at EV Pilot Locations (Oct. 2020 to Sept. 2021)

Locations	Number of Violation	Parking Fines (\$)
43 Alton Avenue	12	\$ 720
29 Bowmore Road	0	0
500 Commissioner Street	1	\$ 60
91 Elizabeth Street	109	\$ 6,540
124 Mountjoy Avenue	3	\$ 180
10 Palmerston Avenue	193	\$ 11,580
248 Shaw Street	24	\$ 1,440
355 Wellington Street W.	4	\$ 240
Westlake Avenue and Oakcrest Avenue	0	0
Totals	346	\$20,760

Note:

Set fine for parking violations at EV Charging spots set at \$60 (i.e., unauthorized vehicle, not actively charging or exceeding permitted time limit)