

# Initial Feasibility Study for the Installation of Electric Vehicle Charging Infrastructure at Parks

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November 2020



**King County**

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## II. Proviso Text

Ordinance 19021<sup>1</sup>, Section 50, Parks and Recreation, P1 provided that:

Of this appropriation, \$100,000 shall not be expended or encumbered until the executive transmits an initial feasibility study for the installation of electric vehicle charging infrastructure for public use at county parks and a motion that acknowledges receipt of the study and references the subject matter, the proviso's ordinance, ordinance section and proviso number in both the title and body of the motion, and a motion acknowledging receipt of the study is passed by the council.

The initial feasibility study shall include, but not be limited to:

- A. Best practices or findings identified by the city of Seattle and by county agencies with experience in electric vehicle charging infrastructure;
- B. Identification of at least two county parks for a public electric vehicle charging pilot. The selection of sites based on the potential availability of electrical infrastructure, the park's accessibility using public transit and the opportunity to offer charging access in those areas currently underserved by charging infrastructure;
- C. Identification of any opportunities to partner with utilities in the financing, installation, or maintenance of the charging infrastructure.

The executive should file the study and the motion required by this proviso by October 1, 2020<sup>2</sup>, in the form of a paper original and an electronic copy with the clerk of the council, who shall retain the original and provide an electronic copy to all councilmembers, the council chief of staff and the lead staff for the mobility and environment committee, or its successor.

## III. Executive Summary

This report provides an initial study of the feasibility of installing electric vehicle charging stations for public use at two King County park locations. Electric vehicles are becoming increasingly popular across the United States, and specifically in Washington State. There are over a half dozen electric vehicle options to choose from today, and a number of vehicle manufacturers are planning to bring new electric models to market over the next few years, in a variety of vehicle classes.

Technological advancements are resulting in increasingly longer driving range distances for electric vehicles, which expands the value and uses of electrified transportation. As battery powered vehicles become mainstream, the addition of charging infrastructure throughout communities has the potential to further catalyze the electric vehicle industry by offering greater flexibility to fully replace the broad types of vehicles and trips that have relied, for over a century, primarily on polluting internal combustion engines. There are numerous benefits that stem from the replacement of internal combustion engine-fueled automobiles and trucks with electric vehicles, including localized improvements in air quality and a reduction in greenhouse gas (GHG) emissions. Across King County, there is an expanding network of publicly available electric vehicle chargers, but there are no publicly

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<sup>1</sup> [Link to Ordinance 19021](#)

<sup>2</sup> [Link to Motion 15620](#), extending the due dates for reports, studies and other work products to be transmitted to the King County council to ensure executive agencies can prioritize responding to the COVID-19 outbreak in King County.

available electric vehicle chargers at any King County-owned parks. Across all of its operations, King County manages approximately 63 electric vehicle charging locations, many of them at park & ride lots.

This report provides descriptions of the three predominant types of electric vehicle chargers and their qualities, and best practices or findings identified by the City of Seattle and by county agencies with experience in electric vehicle charging infrastructure. Best practices include charger siting which takes into account both the current concentration of ownership of electric vehicles, as well as charging deserts or gaps in charging infrastructure, and user considerations such as impacts of chargers with long dwell times and fee structures. Based on guidance provided in the proviso text, initial criteria for electric vehicle charging infrastructure site selection at King County park locations are:

1. proximity to existing electric vehicle charging;
2. proximity to existing transit routes;
3. consideration of historically underserved communities; and
4. potential for utility financial support.

Based on available infrastructure in King County Parks, and meeting the initial criteria identified in this document, the Department of Natural Resources and Parks (DNRP) has identified two potential King County Park locations for electric vehicle charging infrastructure: Marymoor Park and Steve Cox Memorial Park. Marymoor Park, located near Redmond, receives over three million visitors annually. Steve Cox Memorial Park, located in the White Center neighborhood in unincorporated King County, is a multi-activity facility in a historically underserved community.<sup>3</sup>

Seattle City Light (City Light) and Puget Sound Energy (PSE) each have electric vehicle charging programs, some of which are pilot programs. PSE's electric vehicle charging pilot programs include education and outreach, residential and multi-family residence charging, workplace charging, and public charging. King County reached out to PSE to better understand the parameters of these programs and whether financial support of electric vehicle chargers at King County Park locations is available. PSE indicated that its public charging pilot program will install some types of electric vehicle chargers at a handful of locations in its service territory. PSE's selection criteria to establish initial charging locations is focused largely on customer preference, vehicle traffic, and proximity to amenities in targeted urban areas, such as shopping. In the near term, PSE's targeted charging locations do not include areas near King County park locations because they require 24-hour access.

City Light has two main programs for electric vehicle charging which are at-home residential and public fast charging. City Light currently does not have a program for its customers to build public charging stations. To date, City Light has been making public charging investments and owning the charging stations rather than paying other entities to do so. City Light has expressed interest in further discussions regarding the potential to install a City Light owned and operated electric vehicle station at a King County Parks facility.

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<sup>3</sup> <https://www.kingcounty.gov/services/parks-recreation/parks/parks-and-natural-lands/popular-parks/marymoor.aspx>

## IV. Background

**Department Overview:** The Department of Natural Resources and Parks (DNRP) works in support of sustainable and livable communities, and a clean and healthy natural environment. Its mission is to foster environmental stewardship and strengthen communities by providing regional parks, protecting the region's water, air, land and natural habitats, and reducing, safely disposing of and creating resources from wastewater and solid waste.

The Parks and Recreation Division (Parks) of DNRP operates and maintains a vast parks and recreation system with more than 200 parks, 175 miles of regional trails, 215 miles of backcountry trails and close to 30,000 acres of open space throughout King County. The King County Parks system includes regional treasures such as Marymoor Park, Cougar Mountain Regional Wildland Park, and the world-class Weyerhaeuser King County Aquatic Center. Parks provides recreational opportunities for King County residents and protects the region's public lands, leaving a legacy for future generations, with the majority of funding coming from voter-approved property tax measures.

**Key Context:** King County parks are accessed in a variety of ways, including by private vehicle, bicycle and public transportation. Over the past decade, electric vehicles have gained popularity across the nation and there are over 30,000 electric vehicles currently registered in King County.<sup>4</sup> Development of electric vehicles is evolving at a rapid pace. Although they have been mass produced in small numbers and in limited vehicle types for nearly a decade, numerous manufacturers are planning for more electric vehicles over the next few years.<sup>5</sup>

There are a number of personal and societal benefits resulting from the replacement of internal combustion engine-fueled automobiles and trucks with electric vehicles. These include reduced localized air emissions, reduced fuel costs, significantly greater fuel efficiency compared to internal combustion engines (i.e. less energy waste), reduced GHG emissions, and greater fuel price stability.<sup>6</sup> Most electric vehicles produced today have a driving distance range of greater than 200 miles between charges.

Regardless of vehicle driving range, battery charging infrastructure is a critical component of electric vehicle ownership. For most owners of electric vehicles, home or overnight vehicle charging infrastructure provides the majority of charging events. However, the availability of remote charging increases the functional use of an electric vehicle, and can play a significant role in a buyer's decision to purchase a battery powered vehicle.<sup>7</sup>

### Types of Electric Vehicle Chargers:

Most electric vehicle chargers come in one of three power levels. A charger with greater power enables a faster vehicle charge. However, the cost of the charger installation is generally in direct proportion to the charger level number. Table 1 shows the different electric vehicle charger levels and their associated

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<sup>4</sup> [Washington State Data \(https://data.wa.gov/Demographics/Electric-Vehicles-By-County/smxa-ttv3\)](https://data.wa.gov/Demographics/Electric-Vehicles-By-County/smxa-ttv3)

<sup>5</sup> <https://www.businessinsider.com/promises-carmakers-have-made-about-their-future-electric-vehicles-2020-1#ford-4>

<sup>6</sup> [https://afdc.energy.gov/fuels/electricity\\_benefits.html](https://afdc.energy.gov/fuels/electricity_benefits.html)

<sup>7</sup> <https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf>

pros and cons. The information in Table 1 is derived from a report by the U.S. Department of Energy called Costs Associated With Non-Residential Electric Vehicle Supply Equipment.<sup>8</sup>

Table 1 - Types of Electric Vehicle Chargers

Types of Chargers	Qualities
<b>Level 1</b>	<ul style="list-style-type: none"> <li>• provides charging through a 120-volt (V) alternating current (AC) plug</li> <li>• does not require installation of additional charging equipment</li> <li>• can generally provide two to five miles of range per hour of charging</li> <li>• most often used in homes, but sometimes used at workplaces</li> <li>• lowest cost to install</li> <li>• typically, not available as for-pay public chargers.</li> </ul>
<b>Level 2</b>	<ul style="list-style-type: none"> <li>• provides charging through a 240 V AC for residential, or 208 V or 240 V AC power for commercial connections</li> <li>• requires installation of additional charging equipment compared to Level 1</li> <li>• can deliver ten to 20 miles of range per hour of charging</li> <li>• used often in homes, workplaces, and for public charging</li> </ul>
<b>DC Fast Chargers (Previously known as Level 3 chargers)</b>	<ul style="list-style-type: none"> <li>• provides charging through 480 V AC input</li> <li>• requires highly specialized, high-powered equipment to control the charging as well as special equipment in the vehicle itself (plug-in hybrid electric/gas vehicles typically do not have fast charging capabilities)</li> <li>• can deliver 60 to 80 miles of range in 20 minutes of charging</li> <li>• due to the significant power needs, fast chargers are the most expensive to install</li> <li>• public charging stations along heavy traffic corridors are often fast chargers</li> </ul>

Level 1 chargers are typically used for homes, have a slow rate of charge, and are generally not available as for-pay public chargers. DC Fast Chargers are not capable of charging some hybrid gas/electric vehicles, and cost over \$50,000 each to install. Due to these factors, this report assumes any charging infrastructure placed in King County parks will be Level 2 chargers. This assumption is based on the faster charging ability of Level 2 chargers as compared to Level 1 chargers and avoidance of the logistical, vehicle, and cost barriers of DC Fast Charging.

**State and Local Context:**

At the state and local level, vehicle electrification is encouraged by stakeholders such as electric utilities, the Puget Sound Clean Air Agency, and non-profit groups such as Climate Solutions.

<sup>8</sup> [https://afdc.energy.gov/files/u/publication/evse\\_cost\\_report\\_2015.pdf](https://afdc.energy.gov/files/u/publication/evse_cost_report_2015.pdf)

In the [2015 King County Strategic Climate Action Plan](#) (SCAP), partnering to support electric vehicle charging network expansion is noted as a method of reducing GHG emissions in the transportation sector. As detailed in the 2020 SCAP, in 2018 in King County, seven percent of all new vehicles sold and one percent of all vehicles on the road were electric. The 2020 SCAP recommends a new target to increase the percentage of new electric vehicles sold in King County to 100 percent of light duty vehicles by 2035.<sup>9</sup>

Installing electric vehicle chargers directly aligns with priorities in the [King County Strategic Plan](#), in particular, mobility priorities such as increasing integration between transportation modes and all service providers, and preserving, and optimizing the mobility system. The healthy environment priority of the Strategic Plan includes reducing countywide GHG emissions by 50 percent by 2030. Electric vehicles are a significant GHG reducing option, as compared to standard gas and diesel fueled vehicles. Electrical vehicle charger installation also supports the [King County Equity and Social Justice Strategic Plan](#) by reducing localized air emissions and improving air quality in communities that have high impacts due to transportation-related emissions.

King County currently manages approximately 60 electric vehicle charging locations across the county, from park and ride locations to parking garages in downtown Seattle. Most of the existing chargers were originally installed with grant funds that King County received from the Department of Energy as part of the Federal Stimulus Program in 2009. Across the county, there is an ever-expanding network of publicly available electric vehicle chargers which can be found through the plugshare web portal.<sup>10</sup> Despite the growth in publicly available electric vehicle chargers, King County's parks have none.<sup>11</sup>

**Report Methodology:** This study was produced by DNRP and in consultation with Metro Transit, the Department of Executive Services, PSE and Seattle City Light. King County contracts with Chargepoint, a company that provides and supports electric vehicle charging infrastructure across the nation. Data on King County electric vehicle utilization included in this study was gathered from the Chargepoint charger management dashboard.<sup>12</sup>

The initial feasibility study obtained best practices and findings from the City of Seattle and King County, identified two county parks for a public electric vehicle charging pilot, and researched opportunities to partner with utilities in the financing, installation, or maintenance of the charging infrastructure. This study focused on gathering facts to identify whether electric vehicle charging at King County parks is technically practicable. Public outreach was not performed during the study. As a next step, public outreach should be conducted to clarify whether the public electric vehicle charging pilot proposed for two selected county parks would be beneficial to the communities surrounding the parks.

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<sup>9</sup> Light duty vehicles are passenger cars and light trucks such as minivans, passenger vans, pickup trucks, and sport-utility vehicles. [<https://www.transportpolicy.net/standard/us-vehicle-definitions/>]

<sup>10</sup> <https://www.plugshare.com/>

<sup>11</sup> There are two electric vehicle chargers for use by King County owned vehicles at Marymoor Park.

<sup>12</sup> <https://www.chargepoint.com/>

## V. Report Requirements

This study is organized to align with the proviso requirements. It addresses the feasibility of installing electric vehicle charging infrastructure at King County Park locations by identifying best practices or findings employed by the City of Seattle and King County agencies, finding at least two county parks for a public electric vehicle charging pilot, and identifying any opportunities to partner with utilities in the financing, installation or maintenance of the charging infrastructure.

- A. *Best practices or findings identified by the city of Seattle and by county agencies with experience in electric vehicle charging infrastructure;*
- B. *Identification of at least two county parks for a public electric vehicle charging pilot. The selection of sites based on the potential availability of electrical infrastructure, the park's accessibility using public transit and the opportunity to offer charging access in those areas currently underserved by charging infrastructure;*
- C. *Identification of any opportunities to partner with utilities in the financing, installation, or maintenance of the charging infrastructure.*

### A. Best Practices, Observations, and Findings

This section includes electric vehicle charging best practices and findings, including findings from a 2017 international report, input from King County Metro Transit and the Facilities Management Division which work on vehicle electrification, and from City of Seattle staff working on vehicle electrification at Seattle City Light.

A 2017 international report from The International Council on Clean Transportation on best practices for electrical charging infrastructure made the following four conclusions:

- public charging infrastructure is a key to growing the electric vehicle market;
- no universal benchmark exists for the number of electric vehicles driven in a region and how many public chargers are necessary to sufficiently satisfy the expectations of the owners of the vehicles;
- multifaceted and collaborative approaches have been most successful in promoting early charging infrastructure buildout; and
- barriers to the deployment of the ideal electric vehicle charging network remain, highlighting in particular, better data availability and open standards for charge payments.<sup>13</sup>

#### City of Seattle: Seattle City Light

Locally, over the past few years City Light has gained experience with electric vehicle charging infrastructure, through its support of home charging, and its expansion of the public charging network. City Light has five public Direct Current (DC) Fast Charger electric vehicle charging locations, with at least five more in various stages of planning throughout its service area, which includes Seattle, Burien, Lake Forest Park, Normandy Park, Renton, SeaTac, Shoreline, Tukwila, and parts of unincorporated King

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<sup>13</sup> [https://theicct.org/sites/default/files/publications/EV-charging-best-practices\\_ICCT-white-paper\\_04102017\\_vF.pdf](https://theicct.org/sites/default/files/publications/EV-charging-best-practices_ICCT-white-paper_04102017_vF.pdf)



County.<sup>14</sup> According to City Light staff, City Light wanted to maintain control of the ownership and long-term operation of the chargers, and has thus directly purchased the public chargers it has installed, rather than leasing them, with a typical DC Fast Charger site installation cost of approximately \$122,000. Instead of working with one charger company, City Light has purchased charging equipment from a number of different manufacturers. City Light’s public charging network is intended to pay for itself over a ten-year period from the charging station installation date. City Light has developed a four-year Transportation Electrification Strategic Investment Plan, which was approved in October of 2020 by the Seattle City Council and included best practices and actions specifically around charger siting and electric vehicle charger user considerations. Highlights from the plan are found in Table 2.<sup>15</sup>

Table 2 - City Light Electric Vehicle Charging Best Practices and Actions from Seattle City Light’s Transportation Electrification Strategic Investment Plan

Topic Area	Best Practices
<b>Charger Siting</b>	<ol style="list-style-type: none"> <li>1. Consider both the current concentration of ownership of electric vehicles, but also charging deserts or gaps without charging infrastructure.</li> <li>2. Close consideration should be given to charging infrastructure to underserved communities that may not currently have high levels of electric vehicle ownership.</li> <li>3. Site chargers in areas with multiple nearby amenities.</li> <li>4. Locate the chargers as close as possible to the existing electrical panel/switchboard.</li> <li>5. Have the chargers on their own electric meter. This action will likely have installation and operating cost impacts.</li> <li>6. Consider American Disabilities Act (ADA) compliance when placing the chargers. At least one charger at a multi-charger site should be ADA accessible.</li> <li>7. Consider tree roots near the chargers and the path of the underground conduit.</li> <li>8. If using DC Fast Chargers, consider pairing the fast charger with a Level 2 charger, for vehicles without DC Fast Charge capability.</li> <li>9. Reach out to communities before installing the chargers, to offer them a voice in the siting process.</li> </ol>
<b>User Considerations</b>	<ol style="list-style-type: none"> <li>1. Consider the impacts of chargers with long dwell times. Dwell time is when vehicles may be parked in a spot for a long period of time, often beyond the completion of a charging session.               <ol style="list-style-type: none"> <li>a. Parking for long periods (e.g. when shopping or participating in a lengthy recreational activity) can enable someone to add more mileage to the vehicle, but also restricts others from using the charger.</li> </ol> </li> </ol>

<sup>14</sup> City Light chargers can be found at this website:  
<https://www.google.com/maps/d/viewer?mid=1NGNmTvJZaf-RmEFrxNCqmFZvGwSDloGu&ll=47.611511639291706%2C-122.32725875&z=10>

<sup>15</sup> <http://seattle.legistar.com/LegislationDetail.aspx?ID=4078775&GUID=A91E660A-1F3A-4545-8D24-281916F6EDB4&Options=ID|Text|Attachments|Other|&Search=%22green+new+deal%22>  
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	<ul style="list-style-type: none"> <li>b. For vehicles with long dwell times, a potential charger user may be frustrated that the charging spot is unavailable, particularly if the vehicle parked in the spot has completed its charging session.</li> <li>c. Consider the potential to charge for idle time after charging is completed, and ticket vehicles illegally parked in the spaces while not charging.</li> </ul> <p>2. Design equitable usage fee structures that consider electric vehicle variables. Consider the fact that with electric vehicle charging the power that is dispensed is dependent upon a number of variables, including: charger type (Level 2 or DC Fast Charge), vehicle type (battery only or hybrid battery/engine), vehicle vintage, and the battery’s state of charge. Plug-in hybrid electric vehicles, older models and vehicles near or over 80% charged may have slower rates of charge.</p>
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### King County Programs

King County currently has 63 electric vehicle charging locations.

The most significant data for electric charger utilization for King County is available for park and ride locations. Of the total number of 63 chargers, 29 Level 2 electric vehicle chargers are installed at three King County-owned park & ride locations: Issaquah Highlands, South Kirkland, and Burien. King County contracts with the company Chargepoint to maintain the chargers, and to collect, and report on charger data. Table 3 shows existing electric vehicle chargers in King County. The remaining 34 electric vehicle charging stations are located at other publicly available locations as well as King County Fleet Division locations.

Table 3: King County Owned Level 2 Chargers

Location	Charging Ports	Average Charger Utilization (October 2019)
<b>Parks and Rides</b>	<b>29</b>	Not Available (NA)
South Kirkland	7	48%
Issaquah Highlands	12	20%
Burien	10	11%
<b>Other Public Locations</b>	<b>26</b>	<b>NA</b>
King Street Center	7	NA
Goat Hill Garage	6	NA
King County International Airport	1	NA
Fauntleroy Parking Lot	5	NA
Road Services Renton Complex	3	NA
Sound Transit Tukwila Sounder Station	4	NA
<b>King County Fleet Locations (not public)</b>	<b>8</b>	<b>NA</b>

The Village at Overlake Station	1	NA
Metro Bases	4	NA
Van Distribution Center	3	NA

King County Metro Transit provided observations and findings on electric vehicle charging infrastructure based on experience deploying electric vehicle chargers at park & ride locations. Key observations and findings noted by King County Metro Transit include the fundamental components of operationalizing an electric vehicle charging programs such as obtaining equipment, signage, utilization maximization and fee structure. These findings are as follows.

- *Consider leasing equipment.* Charger technology has been advancing rapidly. Because of this, Metro Transit is in the process of upgrading and modernizing 38 electric vehicle chargers located at the Issaquah Highlands and South Kirkland park & ride locations with new chargers that can accommodate evolving technology.
- *Post clear signage regarding legal use of the parking space.* It is a state parking infraction for vehicles to be parked in an electric vehicle parking station if the vehicle is not connected to charging equipment ([Revised Code of Washington \(RCW\) 46.08.185](#)). Educating users about appropriate use under the law can help minimize situations when chargers are not available for potential users.
- *Consider ways to maximize charger utilization.* Based on data from Chargepoint, which manages the county’s chargers, utilization of the chargers at King County park & ride locations varies by location, with the chargers at South Kirkland showing the highest utilization based on the available data. Utilization data also shows that the time needed to charge a vehicle or “charging session” is often much shorter than the time the vehicle is left at the charger.<sup>16</sup> Vehicles are charging on average for about half the time they are parked at a charger.<sup>17</sup> For example, at South Kirkland in October of 2019, the average charger usage per day was 4.5 hours while average occupancy during the month was approximately 9 hours per weekday. While this may be expected at a park & ride lot, unavailable chargers at other locations could cause frustration for potential users. Other utilization maximization approaches could include county vehicle charging during off-hours, and public charging during open hours.
- *Consider opportunities, including charger management systems and power sharing that maximize the use of the chargers.* The current fee for using a charger is a flat two dollars regardless of how long the session is or how much electricity is used. Per [King County Code 4A.700.700](#), the fee is not to exceed five dollars. Metro Transit is responsible for setting the fee.

## **B. King County Parks Electric Vehicle Charging Locations Pilot**

Per the requirements of the proviso, this section identifies two county parks where a public electric vehicle charging pilot could be established, based on the park’s proximity to: 1) electrical infrastructure, 2) to existing public transit routes, and 3) to existing electric vehicle charging, as detailed below. Parks used the criteria identified in the proviso to determine two parks that could be used as a pilot for electric vehicle charging infrastructure. The potential for utility financial support and making charging available for historically underserved communities further reinforced the idea of using Steve Cox Memorial Park as one of the park pilot locations. The three criteria were considered as follows:

<sup>16</sup> <https://www.chargepoint.com/>

<sup>17</sup> <https://www.chargepoint.com/>

1. Electrical Infrastructure Barriers and Cost - the distance between electrical circuit infrastructure and an electric vehicle charging station drives costs related to removing and replacing concrete and blacktop, and installing electrical wire. Three levels of complexity and cost are identified below.
  - Low: Sufficient power is available with adequate electrical power within 25 feet of the proposed charging site, and there is less than 15 feet of necessary removal and replacement of concrete for installing electrical connections.
  - Medium: Sufficient power is available with adequate electrical power located between 25 feet and 50 feet from the proposed charging site, and there is less than 25 feet of concrete disruption.
  - High: Sufficient power is available with adequate electrical power located more than 50 feet from the proposed charging site, and/or there is more than 25 feet of concrete disruption.
2. Proximity to Existing Electric Vehicle Charging - the distance to existing electric vehicle charging stations reflects gaps in service for electric vehicles, with the further distance reflecting the greater need for charging infrastructure.
  - Near: Less than 1/2 mile
  - Moderate: 1/2 mile to one mile
  - Far: More than 1 mile
3. Proximity to Existing Transit Routes - the proximity to existing transit routes reflects the ease with which park users can make transit connections.
  - Near: Less than 1/2 mile. If one or fewer routes, limited.
  - Moderate: 1/2 mile to one mile
  - Far: More than 1 mile

Table 4 shows recommended King County park locations to be considered for electric vehicle charging infrastructure.

Table 4 - King County Park Recommended Vehicle Charger Pilot Locations

Site	Electrical Infrastructure Barriers and Cost	Proximity to Existing Electric Vehicle Charging	Proximity to Multiple Existing Transit Routes (+ nearby routes)
<b>Recommended Pilot Locations</b>			
Marymoor Park	Low	Far	Far
Steve Cox Memorial Park	Low	Moderate	Near (#6, 60, 120, 12, 131, and 560)

#### Potential Pilot Vehicle Charger Sites

Based on the criteria detailed in the proviso, two locations are identified as the potential pilot locations for electric vehicle chargers. Parks staff estimated the cost of installing electric vehicle charging infrastructure based on the costs of previous charger and other underground electrical installations. The total cost for a two-charger Level 2 kiosk, including materials and labor, is estimated at \$15,000 to \$20,000 per site if performed by Parks operations staff, or \$30,000 to \$40,000 if performed by an

outside contractor. Due to the speed of advancements in electric vehicle chargers, it may be desirable to lease the charging equipment, to avoid having equipment become obsolete in a short period of time. Leasing would decrease initial installation costs, but increase annual operating costs. In addition to the initial installation cost, an annual charge of up to \$1,000 per site is required to cover charging company management and fees. Specific installation and/or installation costs will be detailed prior to the installation of any chargers. As part of the pilot, and pending financial support from City Light, a desirable approach may be to purchase the charger at one location, and lease at the other location based on the differing current practices of City Light and King County.

**Marymoor Park:** Located at 6046 West Lake Sammamish Pkwy NE, Redmond, Marymoor Park is King County's most popular County-owned park with more than three million visitors each year. Marymoor Park offers an extensive list of recreational activities available to park users. These include unique activities such as the velodrome, climbing wall, radio-controlled airplane field, and cricket, as well as baseball, soccer, an off-leash dog park, concerts, movies and other limited engagement performances. Such activities have an extremely wide geographic draw of attendees.

One of the largest challenges to electric vehicle charging at Marymoor may be the optimal siting of the equipment. For example, the charger location closest to electrical infrastructure appears to be near the tennis courts toward the northwest end of the park (see Figure 1 below). This location would appeal to tennis players, walkers, field users, play area users, and bike riders seeking to access the Sammamish River Trail. However, those visiting the park for activities such as special performances, the climbing wall, the dog park or radio-controlled plane field may find the location less than optimal. Based on the available infrastructure and the relative proximity to the multiple uses noted above, as well the relative proximity to concerts, movies and some special performances, the recommended location for a pilot electric vehicle charger installation is near the northwest tennis courts. To minimize electric vehicle charger installation costs, it may be necessary to move an Americans with Disabilities Act (ADA) parking spot directly to the west, taking over the adjacent standard parking spots. Following one of the best practices from City Light, the other current ADA parking space could be an ADA-accessible charger spot. Figure 1 shows a potential electric vehicle charging location within Marymoor Park and Figure 2 shows that Marymoor Park is at least one mile from the nearest electric vehicle charging station.

Figure 1 - Potential Marymoor Park Electric Vehicle Charging Location

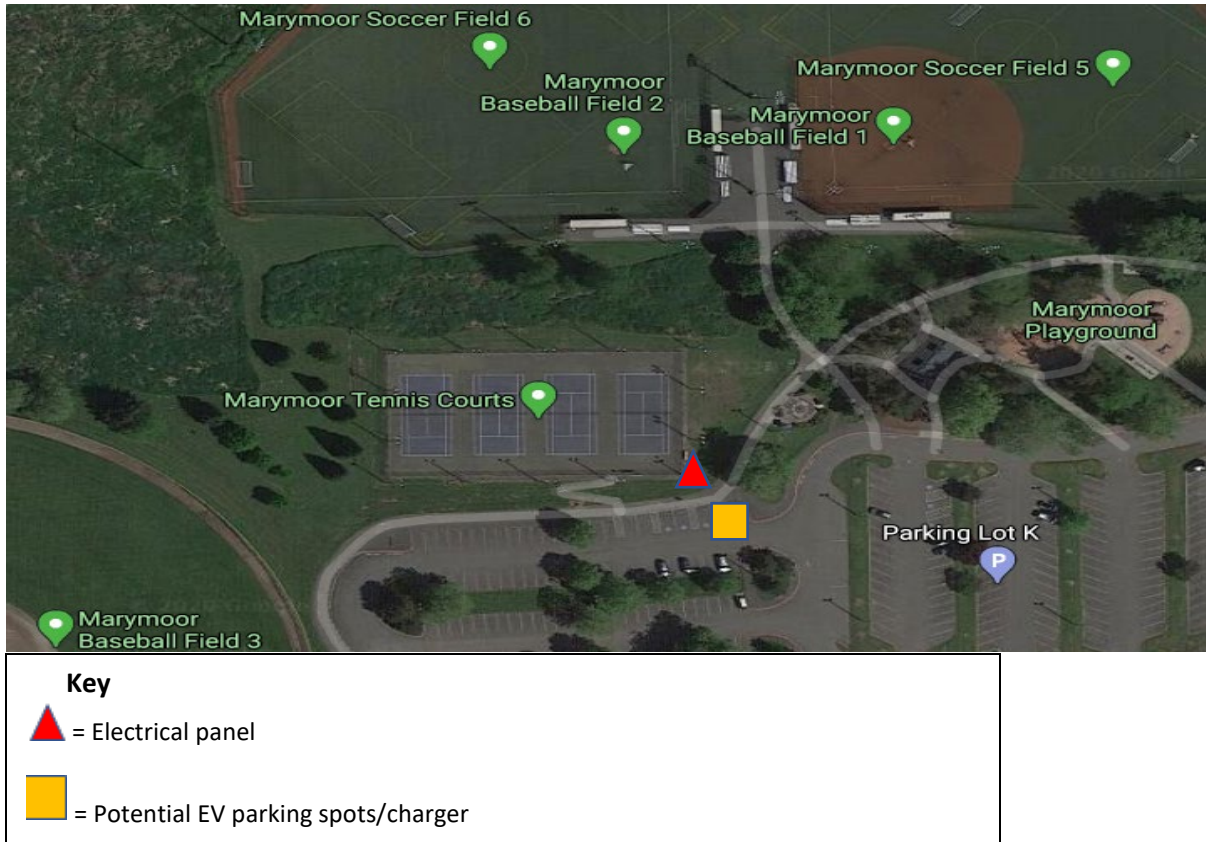
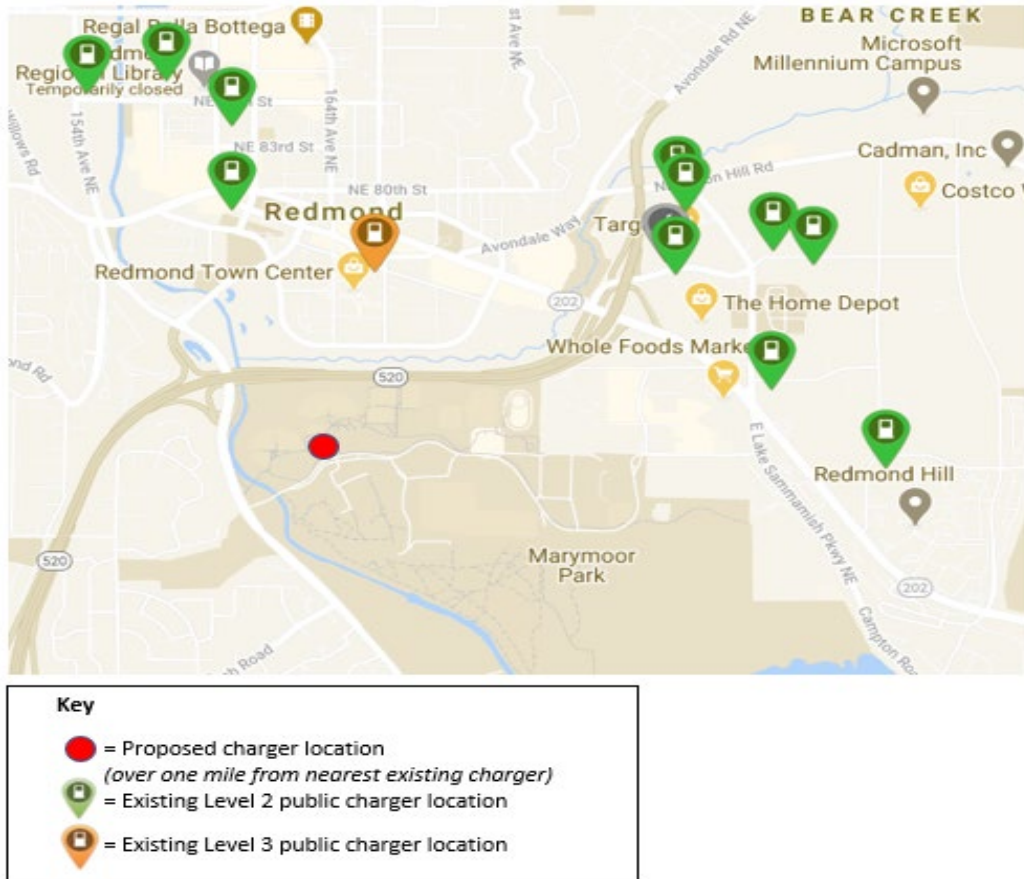


Figure 2 - Proximity of Marymoor Park from Other Electric Vehicle Charging Infrastructure



**Steve Cox Memorial Park:** Steve Cox Memorial Park is a regional facility located at 1321 SW 102nd St, Seattle, in the White Center neighborhood. In recent years, the park has been expanding and upgrading its facilities for a variety of recreational activities. The park includes Mel Olson Stadium, baseball fields, basketball courts, tennis courts, play and picnic areas, a boxing gym, and a foot reflexology walking path. It is also home to the White Center Community Center, an historical building constructed as a Works Progress Administration project in 1940. Also known as the "Log Cabin", the community center houses King County Parks' White Center Teen Program, which provides after-school recreational programming to neighborhood youth aged 12 to 19. Steve Cox Memorial Park is in White Center, which is a historically underserved community with much higher levels of racial/ethnic diversity and approximately half the median income of the county average.

City Light has partnered in the past with King County Parks to assist with the installation of solar panels on the roof of the community center. The addition of electric vehicle charging would be another environmentally sustainable attribute of the park. As noted in Section C below on partnership opportunities, although City Light indicated it does not have general direct assistance for electrical vehicle charging infrastructure, it has noted Steve Cox Memorial Park as a possible charger location in the past, and thus City Light may be open to installing a vehicle charging station there.

The current geographical draw and electric vehicle charger demand of the park is unclear. However, electric vehicle charging in the park could also be used by individuals visiting local businesses and living in the surrounding neighborhoods, in addition to park users. Figure 3 shows a potential electric vehicle charging location within Steve Cox Memorial Park, and Figure 4 shows that Steve Cox Memorial Park is at least a half a mile from the nearest electric vehicle charging station.

Figure 3- Potential Electric Vehicle Charging Location at Steve Cox Memorial Park



**Key**


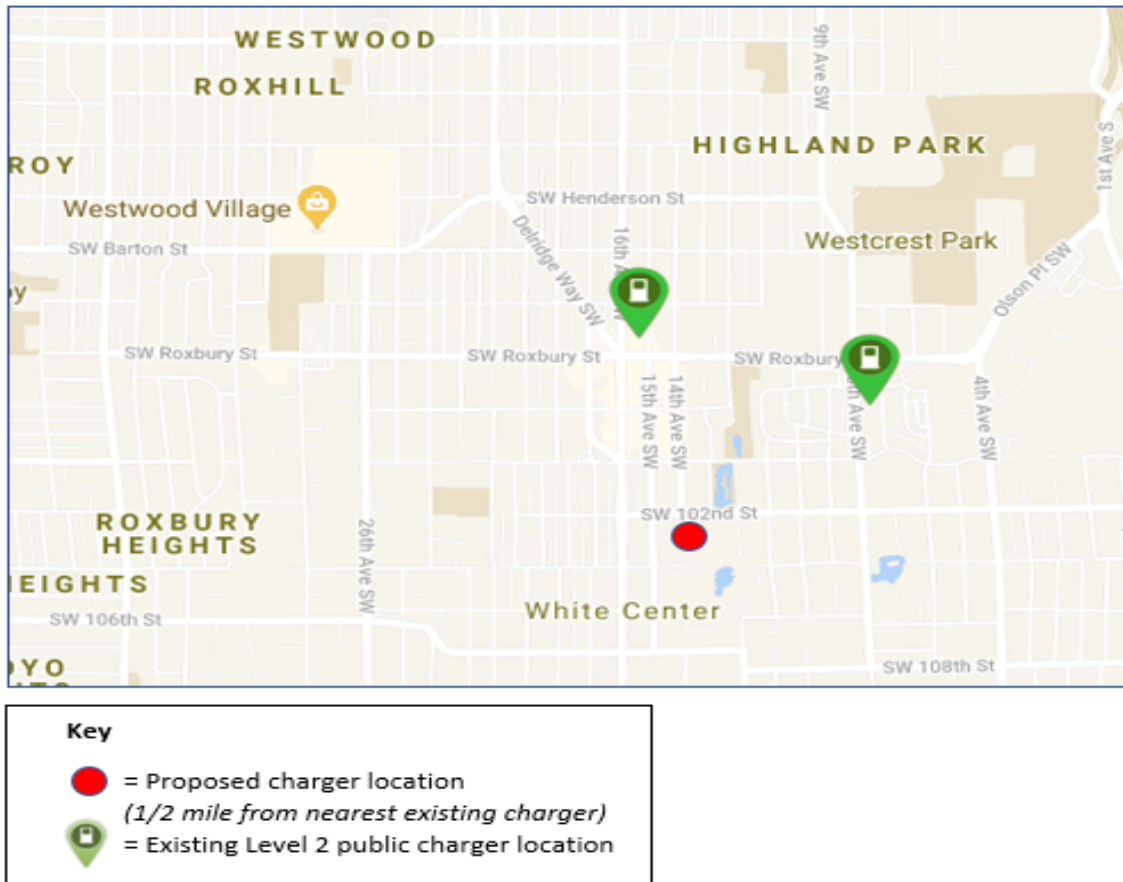
-  = Electrical panel
-  = Potential EV parking spots/charger



Figure 4 -Proximity to Other Electric Vehicle Charging Infrastructure



The requirements of this study are to identify, through best practices and findings from the City of Seattle and King County agencies, two county parks for a public electric vehicle charging pilot and opportunities to partner with utilities in the financing, installation, or maintenance of the charging infrastructure. Based on these requirements, this study centered on technical aspects of the feasibility of vehicle charging at King County parks. However, it is recommended that in the future, public outreach be conducted through surveys or other means to better gauge the public's interest in electric vehicle charging and to provide input to confirm potential pilot locations at King County parks.

In addition, based on interviews with staff from the City of Seattle and King County, it would be beneficial to consider additional factors when determining future vehicle charging locations. These additional criteria include but are not limited to, proximity to uses within parks, consideration for unique park activities such as disc golf and regional aquatics, distance to travel to parks, and impacts of installing charger infrastructure on the environment. Appendix A lists the supplemental criteria, which are not evaluated in this study, but are recurring themes of importance to the King County region and potential park electric vehicle charger locations. These additional criteria have significant impacts on charger installation costs and use and will be important to assess prior to charger installations at King County park locations. This list may be expanded based on analysis of pilot charger installation user and utilization data.

### C. Partnership Opportunities

This section identifies opportunities to partner with utilities in the financing, installation, or maintenance of the charging infrastructure.

Both PSE and City Light have electric vehicle charging programs. Based on conversations with PSE staff, the utility's public charging pilot program will install up to two fee-based Level 2 chargers and up to four DC Fast Chargers at a handful of locations in PSE's service territory. The program's selection criteria to establish initial charging locations focused largely on customer preference, vehicle traffic, and proximity to amenities in targeted urban areas, such as shopping. In the near term, PSE's targeted charging locations do not include areas near King County park locations, as 24-hour access is required. At this time, it does not appear that PSE would be able to provide financial support for the installation of an electric vehicle charger at Marymoor Park or other county park locations for public use.

City Light has developed a four-year strategic investment plan for transportation electrification that was passed by Seattle City Council on October 5, 2020. This plan is going to prioritize:

1. Education, specifically focused on environmental justice and low-income communities;
2. Public transit: Including support of Metro's public transit battery bus fleet conversion, WA State Ferries and other public transit
3. Fleets: Which may include assisting light, medium and heavy-duty fleet electrification in the commercial, local government and non-profit sectors;
4. Personal mobility, which may include:
  - Expanding at-home, near-home (focused on street locations available to multi-family residents), at-work charging and the public fast charging network
  - Electrifying high mileage vehicles
  - Accelerating transportation electrification adoption in environmental justice communities, including:
    - Charging infrastructure for community car share
    - Providing discounts toward the cost to charge electric vehicles for people with low to moderate incomes

Currently, City Light does not have plans to support public Level 2 charging investments made by others. However, City Light did indicate the potential to install a City Light owned and operated station at a King County Parks facility, such as Steve Cox Memorial Park. As City Light prepares to present its four-year plan to the Seattle City Council, King County staff are continuing conversations with City Light to attempt to secure support for a pilot charging station at Steve Cox Memorial Park.

In addition to continuing to remain in contact with the local utilities to discuss charging infrastructure financial support, if the pilot locations move toward installation, it would be necessary for King County to research other available public and private incentives and partnerships, to help minimize implementation costs to the County.

## VI. Conclusion and Next Steps

This study looked at City of Seattle and King County best practices and experience in electric vehicle charging, described potential local utility installation support from PSE and City Light, and identified two King County Parks as pilot sites. The sites are Marymoor Park in Redmond and Steve Cox Memorial Park

[Initial Feasibility Study for Installation of Electric Vehicle Charging Infrastructure at Parks](#)

in White Center. A pilot project would include installation of two Level 2 electric vehicle chargers that can each charge two vehicles at each site.

The specific future need for remote charging and public charging infrastructure is uncertain. The value of public charging was evident when battery vehicles had minimal driving range. With current ranges of most new vehicles reaching over 200 miles, there is a great deal of uncertainty about the future demand for distributed site-based public vehicle charging. To date, electric vehicle charging infrastructure has not necessarily followed the adage that, “If you build it, they will come.” Prudent investment of public dollars would dictate taking methodical steps and actions to ensure that any installed chargers are seen as a valuable park amenity that helps to reduce GHG emissions and transportation-related environmental impacts. It will be important to evaluate the financial impact of any charger infrastructure installations, to document best practices, and to strive for self-supporting charging stations, wherein user fees cover infrastructure installation and maintenance costs.

It is unclear how the lack of remote charging options impacts park visits, or the choice to use an electric vehicle. Specific to Parks, a key question to be asked is whether the lack of electric vehicle infrastructure is hindering the ability of individuals to participate in recreational opportunities and park uses, particularly for those seeking to visit parks from underserved communities. A secondary question, for households with more than one automobile and planning to drive to a park, is whether the choice to use an available electric vehicle (thereby providing environmental benefits) was hindered due to the lack of charging infrastructure at the park facility. Real-world experience after pilot chargers are installed will help Parks understand the specific needs of King County’s park users. Gathering information from the public regarding the interest level in electric vehicle charging and potential charging locations is recommended in the future.

The options and next steps provided in this document are listed if King County has the desire to expand electric vehicle charging infrastructure. It will be necessary to further evaluate the effectiveness of, and demand for, any chargers that are installed, as well as any future chargers installed beyond the pilot locations.

## **VII. Appendices**

Appendix A: King County Parks Specific Electric Vehicle Charger Site Selection and Charging Site Location Criteria

## Appendix A: King County Parks Specific Electric Vehicle Charger Site Selection and Charging Site Location Criteria

The following factors should be considered when determining future electric vehicle (EV) charging locations. This list is not exclusive and may be expanded as more is learned about utilization rates.

- A. *Proximity to electrical infrastructure* - One of the most significant cost drivers for electric vehicle charger installation siting is how close the station will be to sufficient electrical infrastructure to power the charger. Specifically, there is a need for sufficient 208V, 220V/240V electrical service. For the purposes of this document, minimum power requirements of 208V or 240V and one 20 Amp (A) circuit were noted. 40 A is preferred.
- B. *Equity and Social Justice* - Although early adopters of electric vehicles have been heavily tilted toward higher wage earners, the county has an opportunity to influence and educate underserved populations about EVs, and make the charging infrastructure available to populations that can benefit as electric vehicles become more popular. Questions to consider:
  - Are the demographics of the charger locations ethnically and economically diverse?
  - Is the area served by other public vehicle charging infrastructure?
- C. *Proximity to transit options* - Proximity to transit connections could be considered from various perspectives when seeking to site EV charging. Proximity to charging would enable a park user to access other travel modes. However, it could also be reasonably assumed that the lack of transit connections would increase the likelihood that someone would drive a vehicle to access a park, given the lack of travel alternatives.
- D. *Possibility of long-distance travel* - Those traveling longer distances to a park or facility may be more likely to use public electric vehicle charging, based on the driving range of the vehicle used.
- E. *Proximity to uses within the park* - Within a park, the location of the charger and its proximity to the desired park feature to be used will influence charger utilization. Given current information, it is difficult to determine the correlation between certain park uses within regional parks and EV charging demand.
- F. *Unique activities*: Unique activities such as regional aquatics, disc golf, and mountain biking may be a much larger draw of park users from a wide geographical area and create the potential need to charge for the return trip.
- G. *Impacts of installing charger infrastructure* - Because charging infrastructure can be expensive and has a carbon impact related to the manufacturing, construction and installation activities to install the chargers, it is important to closely evaluate potential charger sites. As such, it would seem prudent to “start small” and evaluate the effectiveness and demand for any installed chargers before investing significant dollars in a larger park charging network.

### User Decision Variables Possibly Impacting Charger Use

In consideration of placing electric charging infrastructure at King County Parks locations, location-specific considerations may include:

- A. *Cost of charging* - For vehicles that have sufficient driving range for the trip to the park facility, the cost of any remote vehicle charging infrastructure may need to be competitive with the cost of charging at the vehicle’s home charging base. It appears the county will require customers to

pay for charging, which historically has been \$2 per charge, because of the inability to gift public funds.

- B. *Location of chargers* - The ability to install charging near existing electrical infrastructure to reduce installation costs, and the customer convenience of the charger location (i.e. near the park entrance or activity), are not necessarily in alignment. Thus, an inconveniently located charger may not be used as frequently if the charging location is more remote (and the vehicle has plenty of remaining charge left).
- C. *Charging provider and charging convenience* - There are a number of different companies that provide charging services. The service support includes installing and maintaining all aspects of the charging station. Historically, King County has used Chargepoint for its electric vehicle charging services. Some networks require fobs or other pre-registration to use their charging system. Consideration of open access to any potential user may be important and ease of use, such as with a credit card, should be a priority.
- D. *Ability to reserve spaces* – For those making a visit to a park for which a charge is an absolute necessity for the return trip, such as a vehicle making a trip from outside the county to a concert at Marymoor Park, it may be critical to be able to ensure a charging space is available, so as not to become stuck without insufficient charge for the return trip. With this in mind, mechanisms to ticket and quickly tow vehicles that remain in charging spaces beyond their reserved times should be examined.