City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	October 15, 2017
From:	John Irving, P.Eng. MPA Director, Engineering	**File:**	10-6125-07-02/2017-Vol 01
Re:	**Electric Vehicle Charging Infrastructure - Requirements for New Developments**		

Staff Recommendation

1. That Richmond Zoning Bylaw 8500, Amendment Bylaw No. 9756, which adds Section 7.15 Electric Vehicle Charging Infrastructure, identified in the report titled "Electric Vehicle Charging Infrastructure – Requirements for New Developments" dated October 15, 2017, from the Director, Engineering, be introduced and given first reading;

2. That Richmond Official Community Plan Bylaw 9000, Amendment Bylaw No. 9520, which amends Section 8.5 Transportation Capacity and Demand Management and Section 14.2.7.E Electric Vehicle Charging both regarding electric vehicles, identified in the report titled "Electric Vehicle Charging Infrastructure – Requirements for New Developments" dated October 15, 2017, from the Director, Engineering, be introduced and given first reading;

3. That Richmond Official Community Plan Bylaw 9000, Amendment Bylaw No. 9520, having been considered in conjunction with:

   a. The City's Financial Plan and Capital Program; and

   b. The Greater Vancouver Regional District Solid Waste and Liquid Waste Management Plans;

   is hereby found to be consistent with said programs and plans, in accordance with Section 477(3)(a) of the Local Government Act;

4. That Richmond Official Community Plan Bylaw 9000, Amendment Bylaw No. 9520, having been considered in accordance with Official Community Plan Bylaw Preparation Consultation Policy 5043, is hereby found not to require further consultation.

John Irving, P.Eng. MPA
Director, Engineering
(604-276-4140)

Att. 4

REPORT CONCURRENCE		
ROUTED TO:	**CONCURRENCE**	**CONCURRENCE OF GENERAL MANAGER**
Law	☑	
Building Approvals	☑	
Development Applications	☑	
Policy Planning	☑	
Transportation	☑	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	**INITIALS:** CJ	**APPROVED BY CAO**

Staff Report

Origin

In January 2017, Council endorsed a stakeholder consultation program to develop electric vehicle charging infrastructure requirements for new private developments. This consultation also included opportunities for input on the City-owned network of public electric vehicle charging stations, and implementing electric vehicle charging infrastructure in existing buildings. A future report to the Public Works and Transportation Committee will address the City-owned network of public electric vehicle charging stations.

This report supports Council's 2014-2018 Term Goal #4 Leadership in Sustainability:

> *Continue advancement of the City's sustainability framework and initiatives to improve the short and long term livability of our City, and that maintain Richmond's position as a leader in sustainable programs, practices and innovations.*

Analysis

Background

In 2010, Council adopted targets in Richmond's Official Community Plan to reduce community greenhouse gas (GHG) emissions 33% below 2007 levels by 2020, and 80% below 2007 levels by 2050. Transportation accounts for more than half of the greenhouse gas (GHG) emissions in Richmond's Community Energy and Emissions Inventory, with personal transportation accounting for more than 40% of emissions.

Richmond's 2014 Community Energy and Emissions Plan (CEEP) outlines strategies and actions for the City to take to reduce community energy use and GHG emissions, including:

- **Strategy 7:** Promote Low Carbon Personal Vehicles
    - **Action 18:** Set minimum requirements for electric vehicle infrastructure in new developments.

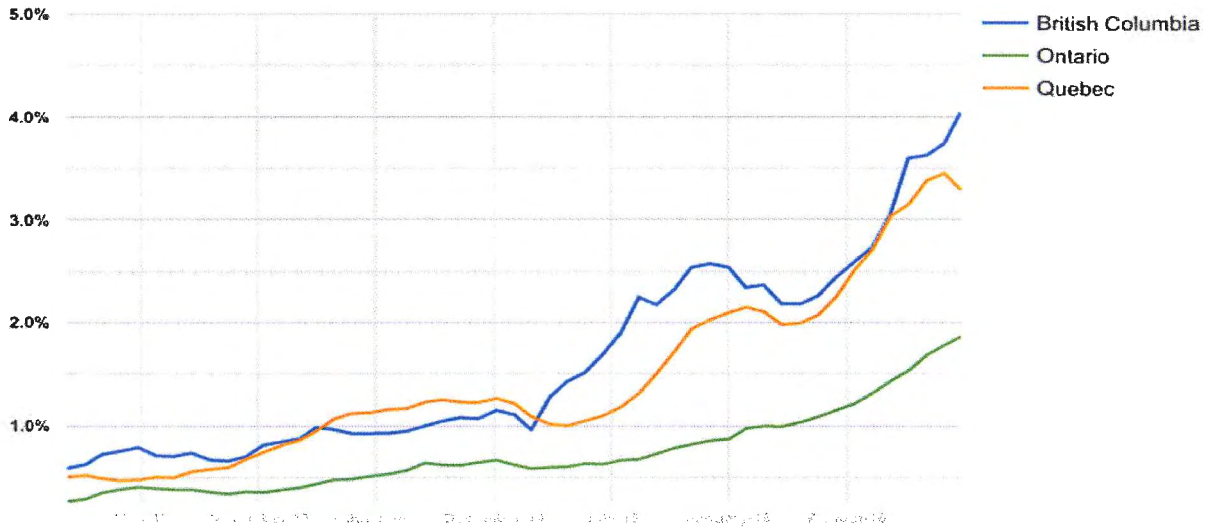
Modeling undertaken as part of the CEEP indicates Richmond's 2050 emissions reduction targets can only be achieved with the near-universal adoption of zero emissions personal vehicles by the 2040s, in addition to increasing transit ridership, walking, bicycling and rolling. The CEEP states that the City will pursue the widespread adoption of low carbon vehicles, in coordination with senior levels of government and industry.

Electric Vehicles (EVs)

Plug-in Electric Vehicles (EVs) include vehicles equipped with a plug and battery that can use electricity for propulsion. EVs realize near-zero GHG and air contaminant emissions when using power from BC's electric grid.

As of June 2017, EVs comprised over 4% of passenger cars sold in BC, and nearly 1.5% of all motor vehicles sold in the province (Figure 1 below). Most EV ownership is currently concentrated in single family and townhome housing with individual garages, as these household currently have more easy access to EV charging. Conversely, EV ownership in multi-family buildings is less common, due to difficulties to date in renovating buildings for access to charging infrastructure.

Figure 1: EVs as percent of passenger car sales in Canadian provinces (excludes SUVs and light duty trucks). Source: FleetCarma.



EVs' market share is growing rapidly as battery and subsequent vehicle costs decline and the number of available EV models increases. A number of analyses, including those by Morgan Stanley, BNP Paribas, Bloomberg New Energy Finance, and others, project that EVs could comprise 50% or more of the new vehicles sold worldwide by 2040, even in the absence of further government action. Many recent analyses note that increasing access to home charging, particularly in multi-family buildings, is key to enabling even greater adoption.

Other factors influencing EV uptake include: EV and battery cost trajectories; the adoption of shared and/or autonomous vehicle services, whose operations favours electrification; oil prices; consumer preferences; the availability of public charging infrastructure; and government policy. Notably, a growing number of countries have announced they will phase out sales of gasoline-only vehicles, including China, England (by 2040), France (by 2040), and Norway (by 2025), and other countries.

Likewise, many vehicle manufacturers made announcements in 2017 regarding their transition away from internal combustion vehicles and towards plug-in EVs: Volvo has committed to all its vehicles being electric or hybrid by 2019; General Motors announced plans to sell 20 models of electric vehicles by 2023 and states the company "believes the future is all electric"; Ford has committed to selling 13 new EV models by 2022; BMW will offer 25 EV models by 2025; Lincoln, Mazda and Volkswagen will offer EV versions for all their vehicle models by 2022, 2030, and 2030, respectively.

Advances in EV Charging Technologies for Residential Applications

The large majority (over 80%) of EV charging occurs at home, which is typically most convenient as well as lowest cost. As outlined in Attachment 3, there are two levels of charging that are used in home applications: Level 1 (120V – so called "trickle charging") and Level 2 (208V-240V). It is increasingly believed that Level 1 charging is insufficient for the next generation of EVs that feature greater battery capacity, and that Level 2 will be preferable for at home charging applications.

"EV Energy Management Systems" (also known as "smart charging", "power sharing" or "load sharing") refers to a variety of technologies and services that control the rate and timing of EV charging. These technologies allow multiple EVs to charge simultaneously while not exceeding the capacity of an electric circuit, and for charging to occur when power costs less.

EV Energy Management Systems are anticipated to be especially useful for enabling EV charging infrastructure in multi-family buildings. Implementing such technologies in multi-family buildings can significantly reduce the first cost of providing EV charging infrastructure, by reducing the size of building electrical systems that must be installed. These technologies can also ultimately reduce energy costs for users by optimizing the timing of vehicle charging to minimize consumer electrical costs, while still ensuring users receive sufficient charge. Use of EV Energy Management Systems has recently been enabled in the Canadian and BC Electric Codes, and EV charging service providers are active locally providing such systems. Figure 3 below illustrates the estimated average cost per parking stall for new multi-family developments to provide an outlet at each parking stall using two EV Energy Management configurations, versus dedicated circuits.

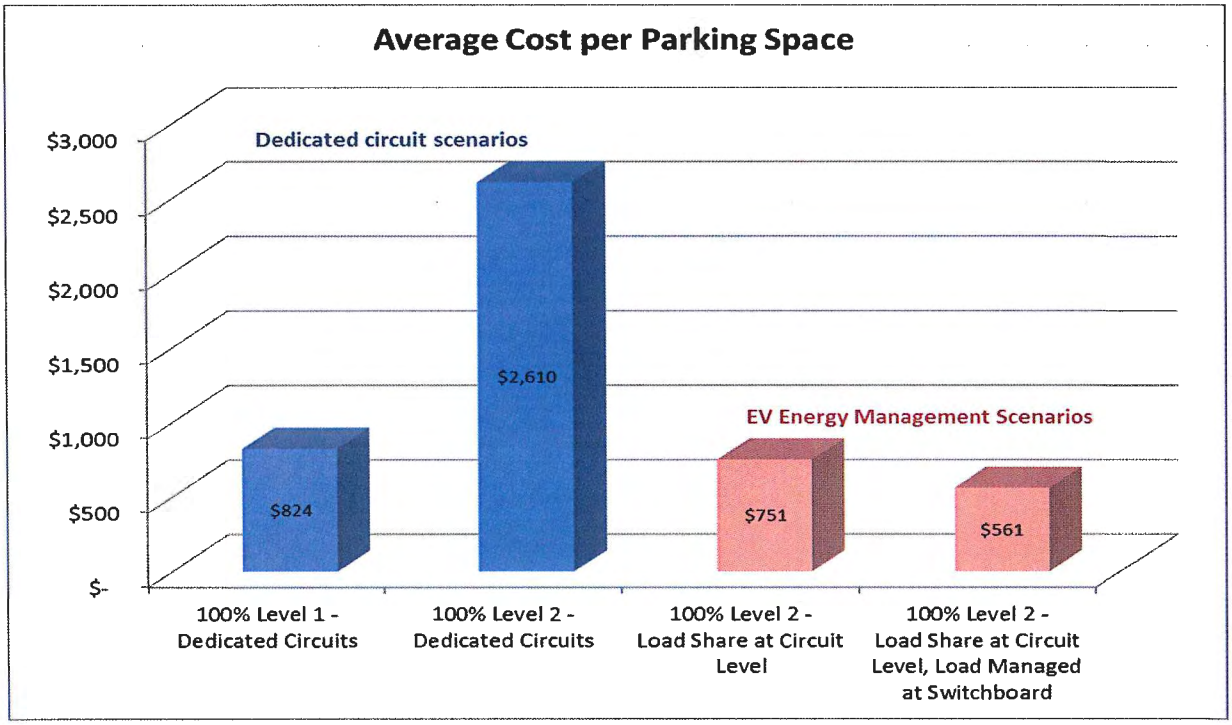


Figure 3: Average cost per parking space for EV charging infrastructure scenarios.

Figure 3 suggests that costs for new developments can be significantly reduced when using EV energy management systems. Indeed, the costs of energizing all residential parking spaces using energy management systems are comparable to energizing just 20% of stalls to Level 2 using dedicated circuits (as has been required in the City of Vancouver since 2011, and the City of North Vancouver as of 2017). Additionally, EV energy management systems with Level 2 charging can provide better quality of charging service than Level 1, at lower cost.

Lastly, EV energy management systems can lower the incremental increase in electrical capacity that new buildings constructed with EV charging infrastructure will feature. This will reduce the likelihood that larger electrical transformers will be required, and the potential for issues with BC Hydro electrical infrastructure impacting the streetscape fronting new developments.

Local Governments' Electric Vehicle Charging Infrastructure Requirements

The City has demonstrated leadership by being one of the first municipalities in the region to establish policy providing for home access to EV charging. Section 8.5.2 d of the 2041 Official Community Plan currently includes this policy for new private multi-family developments to include EV charging infrastructure. This policy specifies that "a minimum of 20% of parking stalls be provided with a 120 volt receptacle [e.g. "Level 1"] to accommodate EV charging equipment [and] ... an additional 25% of parking stalls be constructed to accommodate the future installation of EV charging equipment (e.g. pre-ducted for future wiring)". This policy is applied to developments requiring a rezoning and/or development permit applications.

Table 2 below summarizes current requirements amongst other local governments for electric vehicle charging in new developments. It is important to note that multiple local governments in the Metro Vancouver region report that they are in the process of considering updates to their EV charging requirements to strengthen their requirements. In addition to the municipalities noted in this table, other local governments are securing EV charging infrastructure in new developments as part of development processes, but do not yet have Council policies specifying requirements.

Table 2: Minimum EV charging requirements in municipalities in Metro Vancouver

	Multi-family	Single family, duplex, coach house[1]	Commercial	Policy Method[2]
City of Richmond (current)	20% Level 1 outlet; electric conduit additional 25%	None	None	Council policy
City of Vancouver	20% Level 2 outlet (dedicated circuits); electric room sized for 100%	100% Level 2 outlet	10% Level 2 outlet	Building Bylaw
District of West Vancouver	Aim for 100% outlet (Level not specified)	None	None	Council resolution
City of North Vancouver	20% Level 2 outlet (dedicated circuits); electric room sized for 100%	None	None	Sustainable development guideline
District of North Van.	20% Level 1 outlet; electric conduit for remainder	None	10% Level 2 outlet	Council policy

[1] As noted previously in this report, renovating access to EV charging is typically simpler for these building types.
[2] Requirements applied as "council policy" and "council resolution" are typically applied at rezoning or development permit

The City of San Francisco has adopted an Electric Vehicle Ready Ordinance that will provide sufficient electrical capacity for 100% of parking spaces to provide EV charging, and electrical conduit to all parking spaces; this is essentially equal in cost to a requirement for all stalls to feature an energized outlet. Other North American cities are considering requirements with similar levels of ambition. Likewise, the European Union is considering a Directive that would mandate that its member states adopt a requirement to future-proof all residential parking stalls in new developments with EV charging infrastructure.

Local Government Authority to Regulate EV Charging Infrastructure Requirements

Currently, the City uses a policy in the OCP to define EV charging infrastructure requirements in new developments. This report recommends integrating EV charging infrastructure requirements in the Richmond Zoning Bylaw, rather than policy. The Local Government Act (RSBC 2015), Chapter 1, 525(1)(b) states that a bylaw may "establish design standards for [parking] spaces", enabling design standards for EV charging. Integrating requirements into the Richmond Zoning Bylaw provides greater clarity for development applicants; allows for developments that are not undergoing rezoning or development permitting processes to be regulated; and is more administratively streamlined. The BC Building Act Guide notes that the BC Building Act does not restrict local governments from making requirements for EV charging infrastructure.

Local governments do not have authority to regulate how strata councils or building owners will ultimately manage EV charging infrastructure. In some instances, strata councils have chosen to disconnect electrical supply to parkades out of concern about paying for drivers use of electricity. However, other strata councils have implemented strata rules or bylaws to manage this issue, providing mechanisms for residents who drive EVs to pay for the cost of the electricity they use. Model strata bylaws have been developed by the Fraser Basin Council to address this issue, and can be provided to developers to assist in drafting the initial strata bylaws for the proposed development. Moreover, the province could enact so-called "Right to Charge" legislation, which would require that EV drivers be able to charge their vehicles with appropriate means of reconciling building owners or strata council common expenses. Right to Charge legislation was the subject of two successful resolutions at the 2017 Union of BC Municipalities convention, both forwarded by Metro Vancouver: B116 Resale of Electricity for Electric Vehicle Charging; and B132 Electric Vehicle Charging in Strata Buildings. The City will continue to work with developers and strata councils to encourage adoption of strata rules and bylaws that allow for appropriate management of EV charging infrastructure. Likewise, the City will continue to work with other local governments and stakeholders to encourage the province to adopt "Right to Charge" legislation.

EV Charging Consultation

In January 2017, Council endorsed a consultation program to inform the City's requirements for electric vehicle charging infrastructure in new private developments and action in existing buildings. This consultation also included opportunities for input on the City-owned network of public electric vehicle charging stations, per a second report titled "Electric Vehicle Fleet and Charging Infrastructure" adopted by Council in November 2016. A separate report relating to the City-owned network of public electric vehicle charging stations will be delivered to the Public Works and Transportation Committee in the future.

The City's EV consultation program consisted of:

- **Digital engagement:** An online Let's Talk Richmond webpage and survey. The survey was open to the public from May 14th to June 26th, 2017. It was distributed via press release, social media, and notifications by the Richmond Chamber of Commerce and other organizations. 484 visits to the webpage occurred, with 168 visitors completing the survey. Of survey respondents, 34% currently drove an EV and 78% were considering an EV for their next vehicle purchase.

- **A Public Open House:** The Open House included introductory information about EVs, their role in mitigating climate change, and the City's action to support EVs to date. 33 people signed-in to the Open House.

- **Stakeholder meetings:** Multiple meetings and conversations with representatives of different stakeholder groups including the Urban Development Institute, the Richmond Home Builders Group, the Richmond Chamber of Commerce, Plug-In Richmond, BC Hydro, the Condominium Home Owners Association, EV charging service providers, other local government staff and other organizations.

Both the survey and the Open House solicited participants' feedback on requirements for new construction, where in the city public EV charging infrastructure is desired, and how upgrades to existing buildings to facilitate access to EV charging can occur.

Attachment 4 summarizes the feedback received during stakeholder consultations relating to charging at home. Feedback regarding the public charging network will be included in a future Report to Committee.

Proposed EV Charging Requirements in New Developments

In light of feedback received during public consultations, it is recommended to amend the Richmond Zoning Bylaw to require that all residential parking spaces, excluding visitor parking, feature an electrical outlet capable of providing Level 2 charging; and update the Official Community Plan to amend current policy regarding EV charging in multi-family buildings; and introduce policy in the Official Community Plan that broadly supports EV charging "at home", "at work" and "on the go".

Bylaw 9756 proposes Richmond Zoning Bylaw amendments to require that all residential parking spaces, excluding visitor parking, in new buildings feature an adjacent electrical outlet capable of providing Level 2 EV charging. This approach is recommended because it:

- **Provides for Level 2 charging**. Level 2 home charging access is widely considered to be most appropriate for EV charging. Requiring Level 2 charging, as opposed to allowing Level 1, was supported by 97% of respondents to the City's survey and open house.

- **Accommodates more widespread access to EV charging.** This option provides all residential parking spaces with access to a source of electricity for Level 2 electric vehicle charging. This will make it less costly to install a charging station in any residential parking space, avoiding later electrical system renovations that are estimated to be 2-5 times more costly than integrating the infrastructure into new developments.

Furthermore, a requirement that all parking spaces have access to electricity avoids the problem associated with partial electrification of parking stalls in multi-family buildings, whereby some potential EV buyers would need to trade parking spaces; this is often a difficult process involving reassignment of property and/or breaking of long-term leases that has proven unworkable in practice. Lastly, it supports near universal adoption of zero carbon vehicles, which is necessary to achieve the City's emissions goals.

- **Allows for EV Energy Management Systems to reduce costs.** As noted above, EV Energy Management Systems can reduce the first costs of implementing EV charging infrastructure, as well as reduce end users' costs by coordinating charging to occur when power costs less and to minimize capacity charges. For multifamily buildings, it is estimated that designing for EV Energy Management Systems will cost approximately $560-$750 per parking space (Figure 3). Costs in single family homes and duplexes will typically be significantly less per parking space ($50-$200). The approach recommended in this report allows for developers and builders to implement such EV Energy Management systems. Variances in EV parking requirements may be considered in rare cases when a development implements EV Energy Management Systems, and yet can document significantly greater costs due to infrastructure upgrades or BC Hydro extension fees.

- **Supports charging in all new residential buildings.** The requirement pertains to all new residential construction, including single family homes, duplexes, townhomes, and multi-family buildings. Currently, the City's policy applies only to multi-family buildings. While renovating access to electricity for EV charging in a single family or townhome is typically less expensive in a multi-family apartment, it is still more expensive than providing it during new construction. Providing this source of electricity is typically low cost during construction of a new home ($50-$200). Requiring a source of electricity for EV charging in all types of new construction was supported by 97% of respondents to the City's survey and open house.

- **Demonstrates City leadership in sustainability.** The proposed amendments exceed the EV charging infrastructure requirements currently in place in other Metro Vancouver municipalities. Staff understand that Richmond's leadership may encourage other municipalities to increase their ambition. Providing for all residential parking spaces to be energized in the future best enables households to adopt EVs, which is required to achieve climate and sustainability goals.

These requirements would be effective for new construction that has not yet been issued a building permit as of April 1, 2018 (the "effective date"). In order to accommodate in-stream applications that may face greater difficulty adjusting the design of parking areas to provide for EV charging:

- Multifamily developments that have been issued Development Permits prior to the effective date, may apply for a Building Permit to construct in compliance with the previous requirements for duration of the time that their Development Permit is valid;

- Multifamily developments that have submitted acceptable Development Permit applications before the date of Council's adoption of Bylaw 9756, and are endorsed by the Development Permit Panel within 6 months of the date of Council's adoption of Bylaw 9756, will have until December 15, 2019, to receive their Building Permit in order to build under previous requirements.

Bylaw 9520 proposes Official Community Plan amendments that would remove reference to the previous policy requirements for multi-family buildings. These requirements are now proposed to be included in the Richmond Zoning Bylaw, as per Bylaw 9756. A new objective would be added to the OCP to support adoption of EVs and other zero carbon vehicles. Policies supporting this objective would also be adopted, supporting:

- The provision of electric vehicle charging infrastructure in new residential, commercial and mixed use developments;
- Renovations of existing buildings to implement EV charging infrastructure;
- The ongoing development of publicly accessible EV charging networks, including expanding the City-owned network of public electric vehicle charging stations; and

Staff will continue to secure commitments for new developments to implement "at work" and "on the go" charging infrastructure as part of rezoning and development approvals processes. Recommendations to establish requirements for "at work" and "on the go" charging infrastructure in the Richmond Zoning Bylaw may be brought forward in the future as more standardized strategies for these applications are identified.

Implementation Resources

Staff are preparing an information an information bulletin to explain the new requirements and implementation processes. The bulletin will be distributed to applicants. Staff are also developing technical bulletins to help designers, developers and builders cost-effectively comply with these requirements. Staff are engaging a group of stakeholders to inform a scope of work for materials that will be included in the bulletin, and review drafts of these materials. Invitees will include staff from other local governments, the Urban Development Institute, the Condominium Home Owners Association, the Province of BC, BC Hydro, and the EV interest group Plug-in Richmond. Materials being developed for inclusion the bulletin include:

- Descriptions of potential EV charging strategies applicable to multifamily buildings, including configurations for EV energy management systems.
- Electrical diagrams of cost-effective strategies to meet the proposed requirements.
- Model strata rule or bylaw content, to guide stratas in governing EV charging infrastructure.

OCP Consultation Summary

Staff have reviewed the proposed 2041 OCP amendment bylaw with respect to the *Local Government* Act and the City's OCP Bylaw Preparation Consultation Policy No. 5043 requirements. Table 4 clarifies this recommendation. Public notification for the public hearing will be provided as per the *Local Government Act*.

Table 4: OCP Consultation Summary

OCP Consultation Summary	
Stakeholder	**Referral Comment (No Referral necessary)**
BC Land Reserve Commission	No referral necessary, as they are not affected.
Richmond School Board	No referral necessary, as they are not affected.
The Board of the Greater Vancouver Regional District (GVRD)	No referral necessary, as they are not affected.
The Councils of adjacent Municipalities	No referral necessary, as they are not affected.
First Nations (e.g., Sto:lo, Tsawwassen, Musqueam)	No referral necessary, as they are not affected.
TransLink	No referral necessary, as they are not affected.
Port Authorities (Vancouver Port Authority and Steveston Harbour Authority)	No referral necessary, as they are not affected.
Vancouver International Airport Authority (VIAA) (Federal Government Agency)	No referral necessary, as they are not affected.
Richmond Coastal Health Authority	No referral necessary, as they are not affected.
Stakeholder	**Referral Comment**
Community Groups and Neighbours	No referral necessary, as they are not affected.
Utilities	The proposed amendments were referred to BC Hydro.
All relevant Federal and Provincial Government Agencies	No referral necessary, as they are not affected.
Urban Development Institute	The proposed amendments were referred to the Urban Development Institute.
Richmond Home Builders Group	The proposed amendments were referred to the Richmond Home Builders Group.
Richmond Chamber of Commerce	The proposed amendments were referred to the Richmond Chamber of Commerce.
Plug-in Richmond	The proposed amendments were referred to Plug-in Richmond.

Feedback was received from several of these groups and considered during refinement of the proposed amendments.

Richmond Official Community Plan Bylaw 9000, Amendment Bylaw No. 9520 having been considered in accordance with OCP Bylaw Preparation Consultation Policy 5043, does not require further consultation.

The public will have an opportunity to comment further on all of the proposed amendments at the Public Hearing.

Financial Impact

None.

Conclusion

This report recommends updating the City's electric vehicle charging infrastructure requirements, including new requirements in the Zoning Bylaw and updated policies and development permit guidelines in the Official Community Plan.

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Sustainability Manager
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Peter Russell
Sr. Manager, Sustainability & District Energy
(604-276-4130)

BM:bm

Att 1: Proposed Zoning Bylaw 8500 Amendment Bylaw 9756 (Electric Vehicle Charging Infrastructure)
Att 2: Proposed Richmond Official Community Plan Bylaw 9000 Amendment Bylaw 9520 (Electric Vehicle Charging Infrastructure)
Att 3: About EV Charging
Att 4: Consultation Feedback on At Home Charging

City of Richmond

Bylaw 9520

Richmond Official Community Plan Bylaw 9000 Amendment Bylaw 9520 (Electric Vehicle Charging Infrastructure)

The Council of the City of Richmond, in open meeting assembled, enacts as follows:

1. Richmond Official Community Plan Bylaw 9000 is amended at section 8.5 [Transportation Capacity and Demand Management], Objective 2, by deleting Policy d) in its entirety and renumbering the remaining sections accordingly.

2. Richmond Official Community Plan Bylaw 9000 is amended at section 8.5 [Transportation Capacity and Demand Management] by adding a new section as follows:

   "OBJECTIVE 4: Support the adoption of plug-in electric vehicles and other vehicle technologies that can emit zero greenhouse gas and air contaminant emissions.

   POLICIES:

   a) Support the use of plug-in electric vehicles, including bicycles and mobility scooters, through the provision of electric vehicle charging infrastructure in new residential, commercial and mixed use developments;

   b) Support renovations of existing buildings to facilitate the integration of electric vehicle charging infrastructure;

   c) Support the ongoing development of publicly accessible electric vehicle charging infrastructure networks, including expanding the City-owned network of public electric vehicle charging stations;

3. Richmond Official Community Plan Bylaw 9000 is amended at section 14.2.7. B [Parking Structures] by deleting section 14.2.7.B i) in its entirety and renumbering the remaining section accordingly.

4. This Bylaw may be cited as **"Richmond Official Community Plan Bylaw 9000, Amendment Bylaw 9520".**

FIRST READING	
PUBLIC HEARING	
SECOND READING	
THIRD READING	
ADOPTED	

CITY OF RICHMOND
APPROVED by
APPROVED by Manager or Solicitor

MAYOR

CORPORATE OFFICER

City of Richmond

Bylaw 9756

Richmond Zoning Bylaw 8500 Amendment Bylaw 9756 (Electric Vehicle Charging Infrastructure)

The Council of the City of Richmond, in open meeting assembled, enacts as follows:

1. Richmond Zoning Bylaw 8500, as amended, is further amended at Section 3.4 [Use and Terms Definitions] by adding the following definitions in alphabetical order:

"Electric vehicle	means a **vehicle** that uses electricity for propulsion, and that can use an external source of electricity to charge the **vehicle**'s batteries.
Electric vehicle supply equipment	means a complete assembly consisting of conductors, connectors, devices, apparatus, and fittings installed specifically for the purpose of power transfer and information exchange between a branch electric circuit and an **electric vehicle**.
Electric vehicle energy management system	means a system to control **electric vehicle supply equipment** electrical loads comprised of monitor(s), communications equipment, controller(s), timer(s) and other applicable devices.
Energized outlet	means a connected point in an electrical wiring installation at which current is taken to supply utilization equipment.
Level 2 charging	means a Level 2 **electric vehicle** charging level as defined by SAE International's J1772 standard."

2. Richmond Zoning Bylaw 8500, as amended, is further amended by adding a new Section 7.15 [Provision of Electric Vehicle Charging Infrastructure] as follows:

7.15 "Provision of Electric Vehicle Charging Infrastructure

7.15.1 For new **buildings**, **structures** and **uses,** all residential **parking spaces,** excluding visitor **parking spaces**, shall feature an **energized outlet** capable of providing **Level 2 charging** or higher to the **parking space.**

7.15.2 **Energized outlets,** provided pursuant to section 7.15.1 above, shall be labeled for their intended use for **electric vehicle** charging.

7.15.3 Where an **electric vehicle energy management system** is implemented, the Director of Engineering may specify a minimum performance standard to ensure a sufficient rate of **electric vehicle** charging."

3. This Bylaw may be cited as **"Richmond Zoning Bylaw 8500, Amendment Bylaw 9756"**, and is effective April 1, 2018.

FIRST READING _____

PUBLIC HEARING _____

SECOND READING _____

THIRD READING _____

ADOPTED _____

CITY OF RICHMOND
APPROVED by
APPROVED by Manager or Solicitor

_____ MAYOR

_____ CORPORATE OFFICER

Attachment 3: About EV Charging

SAE International (the Society for Automotive Engineers) defines different levels of EV charging, summarized in the Table below. It is increasingly believed that Level 1 charging is insufficient for the next generation of EVs that feature greater battery capacity, and that Level 2 will be preferable for at home charging applications.

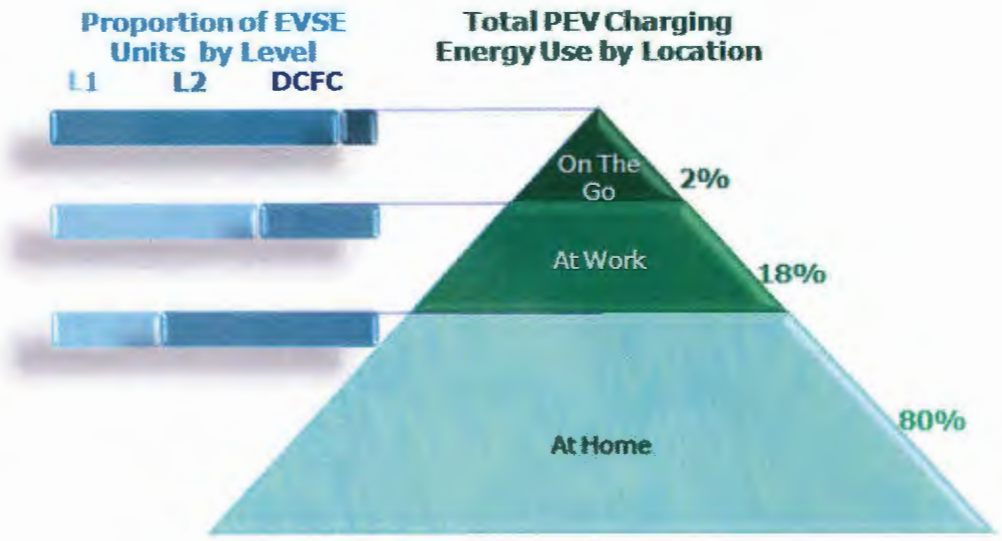
Table: Common EV service equipment charging levels.

Charging Level	Voltage	Amperage	Apprx km of range per hour	Time to fully Recharge	Applications
AC Level 1	120 VAC	12-16 A	~ 7 km/hr	5 to 60 hours	At home, at work
AC Level 2	208 / 240 VAC	<=80A (30 A most common)	15 – 45 km/hr	2 to 8 hours	At home, at work, public charging
DC Fast Charge	200–400 VAC	80–400 A	200+ km/hr	<10 min to 1 hour	Major public rapid-recharge locations

The "EV charging hierarchy" shown in the Figure below summarizes research on the amount of charging that occurs in different locations, as well as the charging levels used in those circumstances. The large majority (80%) of charging occurs at home, which is typically most convenient as well as lowest cost. For this reason, improving access to home charging is one of the most meaningful opportunities to grow the share of electric vehicles.

It is expected that workplace charging will comprise a significant portion of charging in the future as well, though it is currently limited in BC. "On the go" charging is important to provide confidence to EV drivers that they will not be stranded without access to charge, and to facilitate longer trips. However, "on the go" charging generally is a small percentage of total charging for drivers with access to charging at home or at work.

EV charging hierarchy. Source: Community Energy Association.



Attachment 4: Consultation Feedback on At Home Charging

What we heard...	Staff response
Support for EV charging infrastructure requirements in new construction - 97% of survey and Open House respondents support expanding requirements for access to an outlet for EV charging to all residential building types, including single family, duplexes and townhomes. - 97% of survey and Open House respondents support requiring an outlet capable of providing Level 2 charging, and disallowing Level 1. - 59% of respondents support requiring that 100% of parking spaces in multi-family apartments feature an adjacent outlet for EV charging. The remainder supported a partial provision of infrastructure. - Richmond Home Builders Group representatives supported the proposed requirements. - Members of the UDI Liaison Committee and broader development community noted that many buyers are beginning to request that their parking spaces feature EV charging infrastructure.	Proposed Richmond Zoning Bylaw amendments require a 100% of residential parking spaces (excluding visitor parking) in new developments to feature a Level 2 energized outlet for the purposes of EV charging.
Some support for subsidies for EV charger installation Some participants commented that they felt the City should provide subsidies for EV charging station installations at residences.	Staff are exploring its role with the Province, BC Hydro, Metro Vancouver, and other stakeholders in providing support for EV charger installations.

Some concern from development community about cost of implementing EV charging infrastructure - Some representatives of the multi-family development community expressed concern regarding the additional cost of providing energized outlets to all parking stalls in multi-family buildings. - Providing energized outlets to a smaller percentage of parking spaces was suggested. - Providing electrical conduit (as opposed to energized wires) to remaining stalls was suggested. - Some development community representatives noted that changing technologies (such as autonomous vehicle services, public charging) may make home parking and at home charging obsolete. - BC Hydro fee structure can, on rare occasions, result in disproportionately high incremental costs for developments featuring additional load from EV charging.	- Partial provision of EV charging infrastructure (e.g. conduit) can significantly increase costs to implement EV charging in the future. It is estimated to be 2-5 times more expensive to conduct electrical renovations than implement EV charging infrastructure during new construction. - EV Energy Management Systems can reduce costs, compared to application of dedicated circuits which has predominated until recent Electrical Code changes. - Staff are monitoring advances in shared and autonomous mobility services, and their impacts on the rationale for mandatory residential parking. - Reliance on public charging is typically more expensive and less convenient than at home charging. - A variance could grant exemptions from requirements, in the rare event that EV charging infrastructure results in a development being charged much higher fees for electrical connection by BC Hydro.
EV Charging in Existing Buildings Some stakeholders proposed that the City: - Require electrical renovations for multi-family buildings for EV charging; - Ensure "Right to Charge" in multi-family buildings. "Right to charge" legislation in some American states ensures that residents in multi-family buildings can upgrade electrical service in common parking areas; - Implement a voluntary program to assist stratas in voluntarily upgrading their parking areas to facilitate EV charging.	- The City does not have legislative authority to compel EV charging infrastructure improvements in existing buildings. - The City does not have legislative authority to ensure "Right to Charge". Efforts to update the Strata Property Act and/or Regulation are active at the provincial level. - City staff are exploring its role with the Province, BC Hydro, Metro Vancouver, and other stakeholders in implementing programs that would assist stratas in voluntarily upgrading parking areas for EV charging.
Representatives of the development and homebuilder industries expressed appreciation for the City's thorough consultation process	Staff appreciate the productive engagement of the development and homebuilder industry representatives.