Virginia Beach Electric Vehicle Community Charging Plan

CITY OF VIRGINIA BEACH

CONTENTS

GLOSSARY

AC	Alternating current.
ACCII	Advanced Clean Cars II. California zero emissions vehicle regulation, adopted in Virginia as Clean Cars Virginia in 2021.
AFC	Alternative Fuel Corridor as designated by the Federal Highway Administration.
AFDC	United States Department of Energy Alternative Fuels Data Center
BEV	Battery Electric Vehicle. A vehicle powered exclusively by electricity, such as the Nissan LEAF.
BIL	Bipartisan Infrastructure Law.
CCS	Combined Charging System. This is a direct current fast charging standard supported by Volkswagen, General Motors, BMW, Daimler, Ford, FCA, Tesla, and Hyundai.
CFI	Charging and Fueling Infrastructure Discretionary Grant Program
CHAdeMO	This is a direct current fast charging standard developed in Japan, originally supported by Nissan, Mitsubishi, and Fuji Heavy Industries (which manufactures Subaru vehicles). Toyota later supported the standard as well, and Tesla sells an adapter allowing its vehicles to use CHAdeMO chargers.
Charging Infrastructure	Above- and below-ground equipment and wiring that supports charging vehicles. In this document, charging infrastructure refers to both the charging station and to any utility or customer make-ready equipment needed for the station.
Charging Pedestal	A stand-alone piece of equipment capable of charging a vehicle. A charging pedestal is sometimes used interchangeably with the terms charger, machine, EVSE, or dispenser.
Charging Plaza	A set of one or more chargers at a single location operated by the same electric vehicle service provider.
Connector	The component of a charging station that connects with the vehicle and provides electricity. Connector is sometimes used interchangeably with the terms charge point or port. This document uses the term plug.
DAC	Disadvantaged Community.
DC	Direct current.
DCFC	Direct current fast charging (DCFC) equipment. DCFCs are sometimes called DC Level 3 (typically 208/480V AC three-phase input) and enable rapid charging of an electric vehicle.

DOE	United States Department of Energy.
DOT	United States Department of Transportation.
EJ	Environmental Justice.
Electrification	The switching of processes typically powered by a fossil fuel source (gasoline, diesel, or any other derivative of oil) to electricity.
EPA	Environmental Protection Agency
EV	Electric Vehicle. A vehicle powered, at least in part, by electricity. Unless otherwise noted, the term EV in this report refers to all plug-in vehicles and includes BEVs and plug-in hybrid electric vehicles (PHEVs, defined below). The term EV is synonymous with plug-in electric vehicle (PEV, defined below).
EVI-Pro Lite	Analytical platform developed by the National Renewable Energy Laboratory used to estimate the number of chargers needed for a given electric vehicle population in jurisdictions across the country. Available at: https://afdc.energy.gov/evi-pro-lite.
EVSE	Electric Vehicle Supply Equipment. Includes devices provide electric power to the vehicle and use that to recharge the vehicle's batteries. EVSE systems include the electrical conductors, related equipment, software, and communications protocols that deliver energy efficiently and safely to the vehicle
EVSP	Electric vehicle service provider. An EVSP provides the connectivity across a network of charging stations. Connecting to a central server, they manage the software, database, and communication interfaces that enable operation of the station.
FHWA	Federal Highway Administration.
GHG	Greenhouse gas. GHGs are gases that trap heat in the atmosphere, such as carbon dioxide, methane, and nitrous oxide.
GTSA	Grid Transformation and Security Act.
ICEV	Internal combustion engine vehicle. A vehicle that combusts fuel, such as gasoline or diesel, for power.
LDV	Light Duty Vehicle
IRA	Inflation Reduction Act
Level 1 Charging	AC Level 1 charging (often referred to simply as Level 1). Provides charging through a 120V AC port.
Level 2 Charging	AC Level 2 station. Offers charging through 208 V (typical in commercial applications) to 240 V (typical in residential applications) electrical service.

Level 3 Charging	Alternative term for DCFC charger.
LMI	Low- to-moderate-income.
Make-ready	Work or costs associated with connecting a charging station to the Electricity grid.
MHDV	Medium- and Heavy-Duty Vehicles. Vehicles over 10,001 lbs, which includes walk-in delivery vans, transit busses
MUD	Multi-unit Dwelling. Also called multi-family dwellings, these are apartments, condominiums, and group quarters. The other major housing category used in this report is single-family homes.
Micromobility	A small, manually, or electrically powered vehicles used to travel short distances. Examples include bicycles, e-bicycles, scooters, e-scooters, one-wheels, and skateboards.
MWCOG	Metropolitan Washington Council of Governments.
NHS	National Highway System.
Opportunity Charging	Charging an electric vehicle when a good opportunity arises (e.g., for 30 minutes at the grocery store when purchasing food), rather at a dedicated time and place each day (e.g., at home at night).
PHEV	Plug-in Hybrid Electric Vehicle. A vehicle powered by electricity or an internal combustion engine.
Plug	The component of a station that connects with the vehicle and provides electricity. Plug is sometimes used interchangeably with the terms connector, charge point, or port. This document uses the term plug.
Port	The component of a station that connects with the vehicle and provides electricity. Port is sometimes used interchangeably with the terms connector or plug. This document uses the term plug.
Public	Publicly accessible.
PUC	Public Utility Commission.
ROW	Right-of-way.
SCC	State Corporation Commission. Virginia regulatory agency whose authority encompasses utilities, insurance, state-chartered financial institutions, securities, retail franchising, and railroads.

Shared Mobility	The shared use of any form of transportation—bicycle, scooter, motorcycle, ICEV, or electric vehicle—in a way that reduces the need for personal ownership of these vehicles and devices.
V2G	Vehicle-to-Grid
VBCPS	Virginia Beach City Public Schools
VCEA	Virginia Clean Economy Act. Legislation designed to reduce the Commonwealth's greenhouse emissions to zero by 2050.
ZEV	Zero Emission Vehicle.

EXECUTIVE SUMMARY

This Virginia Beach Electric Vehicle Community Charging Plan (the "Plan") provides a framework for how the City of Virginia Beach can address electric vehicle (EV) charging infrastructure deployment in the coming years. Content is based on the latest literature, expert input, contributions from city staff, public engagement, and a spatial analysis. The Plan culminates in 34 recommendations and 70 actions for the City, described below.

The primary goal of this Plan is to understand current and future EV charging infrastructure needs in Virginia Beach and identify the roles that the City should play to support its residents, businesses, and visitors who require access to EV charging. This Plan aligns with federal funding requirements to ensure that EV charging infrastructure is deployed in Virginia Beach in a manner that increases access in underserved and overburdened communities and rural areas. Partnerships at the local, state and federal level and meaningful engagement with stakeholders are critical to ensuring that access to EV charging infrastructure is accessible to all members of the community.

The term "EV" in this Plan refers to both battery electric vehicles (BEVs), such as a Chevrolet Bolt, as well as a plug-in hybrid electric vehicle (PHEVs), such as a Prius Prime. The term "EV infrastructure" in this Plan refers to structures, machinery, and equipment necessary and integral to support recharging of an EV, including conduit/wiring, charging pedestals, ports, connectors, and other electric vehicle supply equipment (EVSE) componentry.

Motivation

National attention to vehicle electrification has risen significantly in recent years. General Motors (GM) introduced the first widely available Plug-In Hybrid Electric Vehicle (PHEV), the Chevy Volt, just over a decade ago in 2010. Fast forward to today, where there are over 150 PHEV and BEV models available to consumers in the United States (U.S.). In 2022, 918,464 EVs were sold in the U.S. and cumulative domestic sales are over 3,200,000 since 2010.[i] Short-range EVs are expected to reach cost parity with conventional internal combustion engine (ICE) vehicles in 2024-2025, and longer range EVs by 2026-2028, while offering significantly reduced fuel and operational costs for consumers.[ii] Automotive Original Equipment Manufacturers (OEMs) globally have announced initiatives to increase the number of EVs being manufactured, including some committing to phasing out fossil fuel vehicle production by 2040.[iii] Ford and GM have announced plans to invest at least $22 billion and $35 billion in electrification by 2025, respectively.[iv,v]

In conjunction with a rapidly growing marketplace, federal and state investment in programs to incentivize the deployment of EVs and charging infrastructure has soared. The 2021 Bipartisan Infrastructure Law (BIL) provides $7.5B specifically for build-out of a national EV charging network of 500,000 stations thought the National Electric Vehicle Infrastructure (NEVI) and Charging and Fueling Infrastructure (CFI) Program; the 2022 Inflation Reduction Act (IRA) provides consumers and commercial operators with tax credits for up to $7,500 for the purchase of a new EV. In total, there is over $100 billion in potential funding for EV programs in BIL and IRA, up from just $3.3 billion prior to their

implementation.[vi] At the state level, governments have already adopted policies to phase out the sale of new ICE vehicles[vii] and are funding a wide range of programs to incentivize local deployment of EVs and charging infrastructure.[viii] Electrification of the transportation sector has become a policy cornerstone throughout the U.S. at the federal, state, and municipal level to meet economic, sustainability and energy efficiency goals.

In March 2021, Clean Cars Virginia (HB1965[ix]) was signed into law, which puts Virginia on a pathway for all new light-duty vehicles (LDVs) sold in the state to be zero emissions vehicles (ZEVs) by 2035. As a result, projections suggest as many as 15,000 EVs in Virginia Beach by 2030 and 40,000 by 2035. This Plan was developed to help the City prepare for this transition by aniticipating charging demand and to organize local stakeholders around a unified view of the changing vehicle landscape. This Plan provides a framework of current initiatives, technologies and public perceptions related to EV charging in the city; projections of EV adoption and required charging infrastructure for the city; and reccomendations that will help Virginia Beach faciliate the equitable deployment of charging infrastructure.

Recommendations and Actions

The Plan is built around a set of 34 recommendations and 70 associated actions – including potential short, medium and long-term opportunities – that should be implemented to support effective deployment of EV charging infrastructure in Virginia Beach. See Chapter 6 for details on each recommendation. The recommendations address six key goals:

1. **Ensure charging is available and convenient** – *How to make charging easier?*
2. **Catalyze public engagement around EV charging** – *How do we increase awareness and participation?*
3. **Establish municipal EV programs** – *How can the City lead the way?*
4. **Enhance charger access at Municipal Sites –** *How do we expand charger deployment at municipally-owned sites?*
5. **Identify sources of funding for EVs and charging infrastructure** – *What federal, state, and local resources can the City utilize?*
6. **Prepare for the future –** *What issues need to be considered now for the long term*?

Table 1 shows specific recommendations related to each goal area.

Table 1. Community Charging Plan Goals and Recommendations

Goal 1: Ensure Charging is Available and Convenient	
1.A	Streamline Permitting
1.B	Adopt EVSE Design Standards
1.C	Adopt Zoning and Land Use Provisions for EVSE
1.D	Adopt EV Parking and Signage Requirements
1.E	Empower Residents and Owners of Multi-unit Dwellings
1.F	Establish Residential ROW and Curbside Charging Guidance
1.G	Promote Incentives and Policies for Residential Charging

1.H	Promote Incentives and Policies for Workplace Charging
Goal 2: Catalyze Public Engagement Around EV Charging	
2.A	Create EV Information Hub on City Website for Residents and Businesses
2.B	Implement Equity and Environmental Justice Community Outreach and Engagement Strategy
2.C	Promote Virginia Beach as an EV Capital City and EV Friendly Tourist Destination
2.D	Establish Workforce Development and Training Programs
Goal 3: Establish Municipal EV Programs	
3.A	Establish an EV Implementation Working Group
3.B	Set Deployment Targets
3.C	Benchmark Against State and Local Charger Deployment
3.D	Ensure implementation of Virginia Code 15.2-1804.1
3.E	Implement Plan for Electrification of City Fleet
3.F	Increase Coordination with Dominion Energy
3.G	Select Ownership Model for Public Charging on Municipal Properties
3.H	Municipal Capacity Building/Training
Goal 4: Enhance Charger Access at Municipal Sites	
4.A	Ensure Equitable Charger Access
4.B	Support rural electrification
4.C	Accelerate charging at tourist and municipal sites
4.D	DCFC installations on municipal properties
4.E	Pilot Public Curbside Charing
GOAL 5: Identify Sources of Funding for EVs and Charging Infrastructure	
5.A	Pursue Federal Formula and Discretionary Grant Opportunities
5.B	Leverage Federal Tax Incentive Programs
5.C	Capture Opportunities for Funding and Advocacy in State Government
5.D	Identify Opportunities for Funding and Advocacy with Dominion Energy
5.E	Adopt and Promote Utilization of C-PACE
Goal 6 Prepare for the Future	
6.A	Develop Shared Mobility Hubs
6.B	Technologies and Practices to Enhance Resiliency and Support Evacuations
6.C	Consider Opportunities for Bi-Directional Charging and V2G
6.D	Future Proof Charging Installations

Charger Projections

A key question for city planners is *how many chargers are needed in the future to support expected electric vehicle populations?* Chapter 4 uses two Pathways of future vehicle population to address this question. These Pathways are not meant to provide a conclusive forecast but rather to understand plausible future vehicle adoption rates and associated infrastructure needs.

The two Pathways are:

- **Current Pathway** – Continued implementation of the Clean Cars Virginia law with new standards going into effect in 2024. In this Pathway, EV sales reach 100% of new light duty vehicle sales in 2035. *This is the expected EV adoption pathway for Virginia Beach.*
- **Alternative Pathway** – Virginia Clean Cars is repealed, and electric vehicle sales grow at a similar rate to national level forecasts. In this Pathway, EV sales reach approximately 46% of total new light duty vehicles by 2035. *This Pathway will require policy intervention.*

Figure 1 shows the estimated number of charging plugs needed in Virginia Beach for the two Pathways. These charger projections are based on the National Renewable Energy Laboratory's Electric Vehicle Infrastructure Projection Tool.[x] If should be noted that these figures show the total number of vehicle charging ports (plugs) that will be required, not the number of total charging stations or pedestals.

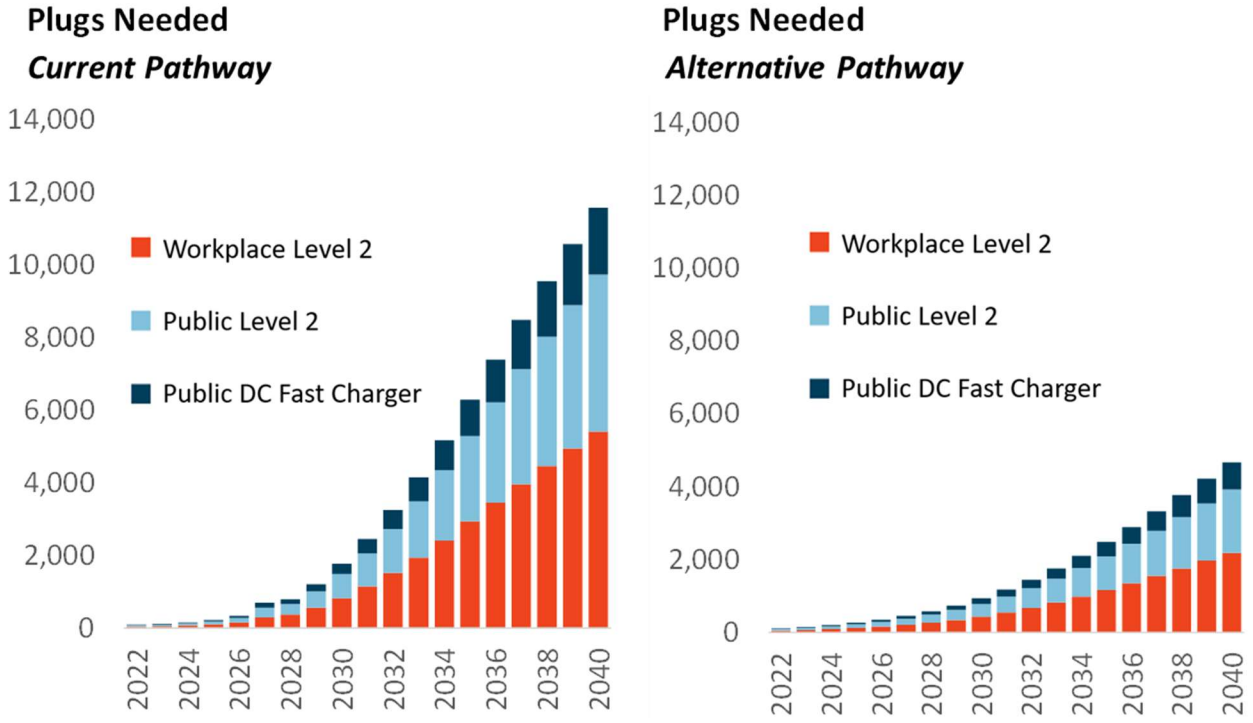


Figure 1. Two Pathways for Future Charging Needs in Virginia Beach

Note: The graphs show number of public Level 2 and DCFC plugs. Appendix E includes numerical values in graph.

The two graphs show the number of publicly accessible workplace, L2, and DCFC plugs needed. The anticipated number of residential chargers is expected to be tens of thousands in the next 10 years, even in the lower alternative Pathway. This is driven by the fact that most electric vehicle owners today prefer to charge at home overnight. As elaborated in Chapter 4, it is expected that approximately 61% of Virginia Beach residents will primarily be expected to charge their vehicle as home (~113,500 residential chargers).

However, in the long term the need for publicly accessible chargers will become more important as electric vehicle ownership will shift towards greater shares of renters, residents of multi-unit dwellings (MUDs), or others who are rely on street parking for their vehicle. In addition, providing charging access to visitors is of particular concern for Virginia Beach, which reached a population of 11.5 million in 2021, including 5.8 million overnight visitors.

In the Current Pathway – continued implementation of Clean Cars Virginia – as many as 1,800 new DCFC and 4,300 L2 publicly accessible charging plugs will be required by 2035, in addition to workplace and residential chargers. Note, these figures assume the number of vehicles owned and the vehicle miles traveled in Virginia Beach are the same in the future as they are today.

Organization of Content

Table 2 summarizes the organization of this document by chapter and appendices.

Table 2. Report Roadmap

Ch.	Title	Description
1	**Basics of Electric Vehicle Charging**	Provides introductory information about electric vehicles, chargers, and siting of chargers
2	**Context and History**	Describes electric vehicle initiatives undertaken in the region and compares electric vehicle deployment in Virginia Beach to that of other jurisdictions
3	**Community Perspectives on Charging**	Summarizes public engagement survey conducted in January 2023 with community stakeholders in Virginia Beach
4	**Current and Future Charging Needs**	Describes two Pathways to bound potential charging needs in Virginia Beach between today and 2050
5	**Priority Charging Locations**	Identifies high-priority areas and sites for future charging locations in Virginia Beach
6	**Recommendations and Actions for Virginia Beach**	Provides prioritized list of recommendations and actions to strengthen the City's charging infrastructure in the future
Appendices	**Appendix A**	Provides the number of registered electric vehicles in Virginia Beach by model type, as of 2022
	Appendix B	Provides the locations of current public L2 and DCFC EV charging sites in Virginia Beach as of 2022
	Appendix C	Provides data on assumptions made for projections of EV adoption in Virginia Beach
	Appendix D	Gives the numeric values of charging plugs needed across two future Pathways
	Appendix E	Provides forecasted electric load resulting from EV adoption.
	Appendix F	Provides detailed questions and responses to the public engagement survey launched in January 2023
	Appendix G	Gives specific locations of high-priority locations for chargers in Virginia Beach

Importance of Equity

The Plan works to ensure that equity and environmental justice is incorporated in all planning; recommending implementation considerations and the sustainment of structures and systems to advance equity and environmental justice; finding alignments and recommending implementation of policies designed to advance equity and environmental justice goals; and ensuring accountability related to the progression and transparency of work to advance equity and environmental justice.

Limitations and Opportunities for Future Consideration

The pace of electric vehicle adoption is accelerating by way of increasing vehicle availability, decreasing costs, and normalizing of the technology. This rapid pace creates new opportunities for the City to support policies and programs which enable the deployment of electric vehicle charging infrastructure. Many cities, communities, and states are in the process of developing similar strategies and implementing programs to pursue and identify best practices. As such, there is still much to be learned, and the body of evidence supporting best practices, policies, and programs continues to emerge and evolve. This Plan is based on information available at the time of its development and current factors such as the following:

- The adoption rate of electric vehicles and the existing and potential demand for electric vehicle charging infrastructure needs in Virginia Beach.
- The City's existing policies, practices, and plans.
- The status of electric vehicle policies at the regional, state, and federal levels.
- The resources and evidence underlying best practices, policies, and programs available to cities to advance electric vehicle adoption and support related charging infrastructure.
- An evolving electric vehicle and charging infrastructure industry and marketplace with numerous actors (such as battery and car manufacturers, automobile dealers, charging infrastructure companies, utilities, etc.), as well as evolving technology, business models, building and electric codes—all within an overall trend of a disruptive technology environment advancing multimodal transportation alternative mobility options.

While the City should prepare for the transition to electric vehicles, it does not see great value in playing a role in individuals' and businesses' purchase decisions. However, the City can both directly and indirectly support its residents and visitors by implementing policies and programs that make electric vehicle charging infrastructure available and accessible.

The following are notes regarding limitations of the Plan:

- Many of the recommendations provided in Chapter 6 do not have a robust literature or set of examples to understand the full range of implications. Rather, the recommendations are based on the best available information, as well as thoughtful consideration by City staff.
- The modeling conducted in Chapter 4 of future electric vehicle adoption; number of charging stations; electrical energy use and demand; and costs by individuals, businesses, utilities, private charging companies, and potentially the City are for informational purposes only. The modeling

results provide information on *possible* future Pathways of charging infrastructure needs and how the City can support more widespread adoption of electric vehicles and electric vehicle charging infrastructure given implementation of various policies and programs at the local, state, and federal levels. The modeling completed for this Plan is based on a relatively small current electric vehicle population and uses the best techniques currently available to provide the City with as much information as possible for future planning and policy decision-making.

- As more robust and expansive policies and programs emerge and advance supporting adoption of EVs and charging infrastructure, there will be need to reevaluate, refine, or pivot many of the recommendations in the Plan.
- This Plan is not intended as a standalone planning document for electric vehicle charging infrastructure needs, planning efforts, policy and program development, etc. Instead, this document should be used to help inform other relevant planning, policy, and programmatic efforts, including the Comprehensive Plan, Sea Level Wise Adaptation Strategy, zoning, parks and open space planning, affordable housing plans, economic development plan, the City's Capital Improvement Program, and the City's annual budget process.

As the City considers recommendations in this Plan, and as the electric vehicle and electric vehicle charging infrastructure industry evolves, trends that may be useful for the City to consider or necessary for future study or evaluation include the following:

- **Vehicle-to-Building and Vehicle-to-Grid Technologies Opportunities.** As electric vehicles emerge as opportunities to support building electric system and electric grid interactivity for cost savings, electric reliability and resilience, and energy system transition, pursuing better understanding of the opportunities and benefits of these technologies and capabilities for the City and the Virginia Beach community.
- **Freight, Offroad, Emergency Vehicles.** As electric vehicle technologies expand to various transportation segments, including freight hauling, offroad, and emergency vehicles, additional consideration may be needed to support such transportation needs. As these transportation segments have unique and individual use cases and needs, special infrastructure criteria will likely need to be taken into consideration.
- **Utility Business Models and Rates.** The utility business model is evolving with the disruption of renewable energy, interactive communications technologies, storage technologies, emerging market constructs, and ways to incentivize more productive and efficient use of electrical grid assets and systems. As such, utility business models and rates to support EV and charging infrastructure will be critical to follow, understand, and advocate for best practices to provide balanced and prudent investments, reasonable and appropriate allocation of costs, and necessary incentives and benefits to customers and the utility.

CHAPTER 1. BASICS OF ELECTRIC VEHICLE CHARGING

This chapter provides basic information about electric vehicles and electric vehicle charging infrastructure.

What are Electric Vehicles?

Both Plug-in Hybrid (PHEV) and Battery Electric Vehicles (BEVs) use electrical energy, stored in batteries in the vehicle, for propulsion via an electric motor. PHEVs can operate by also using gasoline to supplement the Electricity, whereas a BEV can only use the electrical energy stored in onboard batteries. Together, this report refers to PHEVs and BEVs as electric vehicles or EVs.[1]

BENEFITS OF ELECTRIC VEHICLES AND INFRASTRUCTURE

- **Saving Households Money.** EV have much lower costs for fuel and maintenance than internal combustion engine vehicles (ICEVs), resulting in hundreds of dollars of savings each year for the average household. EV owners participating in Time of Use charging programs can leverage lower cost electricity by charging during off-peak periods. With existing federal tax credits, many EVs have reached cost parity with ICEV counterparts.
- **Benefits to Electricity Grid**. Widespread transportation electrification increases the overall use rate of the grid if charging is shifted to off-peak periods. By strategically adding new electric load at the right times (such as when grid use is lowest overnight), EV adoption in Virginia Beach can support an increased use of renewable energy. EVs can also be used in demand response programs, whereby local utilities can strategically manage how and when charging occurs to improve grid operations.
- **Increased Local Fuels**. By transitioning toward greater numbers of electric vehicles, Virginia Beach can increase its dependence on locally produced fuels (electricity), thereby pushing jobs and economic benefits to its citizens rather than outside the state.
- **Economic Development**. Installation and operation of new charging stations, as well as maintenance of EVS, will provide new employment opportunities to local populations. Workforce development programs can be established to leverage this opportunity, particularly with targeted assistance to disadvantaged communities (DACs).
- **Health, Equity and Environmental Justice**. ICEVs produce air pollution through tailpipe emissions, which adversely affects health outcomes. Low- and moderate-income populations are particularly vulnerable to air pollution stressors and often live closer to roadways than people in other communities.
- **Reduced Greenhouse Gas Emissions**. On a life-cycle basis, electric vehicles are superior to ICEVs in Virginia Beach. For example, according to the Union of Concerned Scientists' online calculator, a Chevrolet Bolt driven in Virginia Beach emits an estimated 112 grams of carbon dioxide equivalent per mile, while a similarly sized gasoline vehicle emits 381 grams per mile. As renewable electricity generation increases, the benefits of electric vehicles will further increase compared to gasoline and diesel vehicles.

[1] Fuel cell electric vehicles—another type of electric vehicle—use energy stored in hydrogen onboard the vehicle in a fuel cell. Fuel cell electric vehicles are not discussed further in this report.

Today's PHEVs have an all-electric range of 20 to over 100 miles, which is slowly increasing as battery technology improves. The most common PHEVs in Virginia Beach include the Jeep Wrangler 4xe, Chevy Volt, and Toyota Prius Prime. BEVs have a range of 80 miles to more than 500 miles, depending on the model. As with PHEVs, the average BEV range has increased over time. Vehicle range is primarily driven by battery size (capacity), which states how much electricity can be stored in the battery pack. The most common BEVs in Virginia Beach today are the Tesla Models 3, S, Y, and X, the Ford Mustang Mach-E, and the Nissan Leaf.

What is Electric Vehicle Charging Infrastructure?

Charging infrastructure includes both the equipment used to charge electric vehicles as well as the wiring, conduits, substations, and transformers needed to provide electricity supply to the charger. Electric vehicle charging stations are typically either categorized by the power level or by the location type. There are three groups of chargers by power level: Level 1, Level 2, and Direct Current Fast Charger (DCFC) stations (also sometimes called Level 3). Classification by location type is typically public, workplace, and residential. The greatest amount of information is known about the publicly accessible chargers, which are tracked by data aggregators like the U.S. DOE Alternative Fuels Data Center (AFDC) and Plugshare.com.

Level 1 chargers include standard 120 V outlets or lamppost connectors with input power levels of 1.3 to 2.4 kW. Though the slowest charging option, Level 1 chargers offer the least expensive costs in terms of installation since no permits or supplemental equipment are typically needed beyond an electrical outlet. Due to the slow charge rate, Level 1 chargers are good for vehicles with long dwell times and relatively low daily mileage, such as for vehicles driven 30 miles or less per day and parked at work for most of the workday and at home at night. Level 1 chargers provide three to five miles per hour of charge.

Level 2 chargers require a 208 V to 240 V electrical circuit (similar to common household clothing dryers) and have a faster charge speed than a Level 1 charger, with input power levels up to 22 kW. Level 2 chargers require an electrical permit and a certified electrician for installation. Level 2 chargers comprise the vast majority of chargers in the United States and in Virginia Beach. A typical EV will take approximately eight hours to charge from empty to full.

DCFC chargers are currently rated at power levels of 50 kW to 350 kW and are the fastest chargers available today. Due to the infrastructure requirements, these are also the most expensive. Only BEV models are currently capable of using

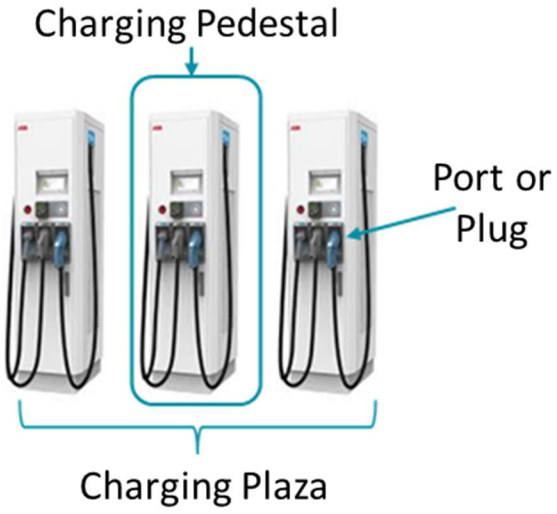


Figure 2. Component Descriptions of EV Charging

DCFCs.[2] Additionally, because of limitations in the battery management system in vehicles, 50 kW is the highest charging power that most vehicles can accept today (three models, the Tesla Model Y, Porsche Taycan and Lucid Air can charge at 350kW). The next generation of EVs in the US are all expected to power levels up to 350 kW. Electrify America and EVgo, both major providers of DCFC stations in the United States, primarily build DCFCs. The newest chargers are backward compatible with the older, slower charging vehicles (DCFCs have three different charger connectors). DCFCs rated at 50kW typically provide 200 miles per hour of charge; a 350kW station can provide 200 miles of charge in as little as 12 minutes.

QUICK FACTS: Virginia Beach & EVs

2,267 EVs in Virginia Beach
~70% BEV and ~30% PHEV

137 public charging ports
17 DC fast charging ports and 120 public Level 2 ports

108 light-duty BEV models
47 New models expected in 2023

1 charging port per 15 EVs
Compared to 5 to 10 in leading EV cities

>450,000 EVs by 2035
>120,000 by 2035

>7,000 public chargers by 2035
Over 1,000 DCFC and 6,00 Level 2 ports

What are Common Locations for Chargers?

Electric vehicle charging infrastructure can be sited in several different types of locations in Virginia Beach. Each charging typology has a different set of considerations for installation, power level, operations, fees, and equipment type. The bullet list below briefly describes each type that are available for public us or public access.

- **Residential chargers.** Residential chargers can be broadly categorized into chargers at single-family homes (in a garage, carport, or driveway) and chargers at multifamily dwellings (in parking garages or surface lots). Multifamily dwelling chargers can be either shared between multiple residents or dedicated for a single resident.
- **Workplace chargers.** These chargers are located in employee parking lots. Sometimes referred to as at-work chargers, these chargers include commuter park-and-ride lots or daily public parking at transit hubs. Electric vehicle drivers can use workplace charging as a replacement or supplement for residential charging. Workplace chargers are typically owned and operated by the employer and (less commonly) by Electric Vehicle Service Providers (EVSPs)[xi] Level 1 chargers are appropriate when the parking is assigned, and Level 2 chargers work well for parking that is not assigned or where valet service is available. Most electric vehicle drivers will

[2] The only exception is the PHEV model, Mitsubishi Outlander, which can use a DCFC.

not need a Level 2 charger for an entire workday, and employers should consider ways to ensure turnover of the parking spot during the day to avoid idle charging and to maximize charger use.

- **Publicly accessible chargers.** These chargers include any publicly available or shared-use charging station. Key categories of locations include attractions (like shopping centers, cafes, libraries, and parks), public right-of-way, interstate off ramps, and community charging hubs. Commercial parking areas can vary widely in the amount of time that cars sit dormant. Level 1 chargers are typically not appropriate for publicly accessible chargers unless a site has a long (e.g., 8 hours or more) dwell time. Best practice is to network these chargers, as they may be accessed by many unique users (see next section). Further, DCFC can be installed in parking areas that are publicly owned and publicly available (such as park-and-ride lots, public library parking lots, and on-street parking) or that are privately owned but publicly available (such as shopping center parking lots and commercial office parking garages). Commercial sites that are a good fit for DCFCs are areas where people spend 20 to 30 minutes, such as grocery stores, pharmacies, and convenience stores. Sites that are a good fit for Level 2 chargers are areas where people spend around one to four hours, such as movie theaters, libraries, museums, and sit-down restaurants.

MATCHING DWELL TIMES WITH CHARGING SPEED

Residential parking in single-family homes can use slower chargers since residents typically spend each night at home and can charge the car slowly and offers the lowest cost form of charging. Level 1 chargers are appropriate when average daily miles are relatively low (less than 30 miles per day), while Level 2 chargers work well for vehicles with higher daily mileage. For this typology, electric vehicle chargers are typically owned by the household.

What are Networked or Smart Stations?

Charging stations can be networked, with a connection to a central backend system via internet, or they may not be networked, where they are not connected to an IT system. All levels of chargers can be networked. Networked chargers typically require an ongoing monthly, per session, or annual networking fee to the user, site host, or both. The levels of communication available for a networked charger can include communication with the site host, utility grid, internet, and user.

Charging stations usually connect to a network by cellular, ethernet, or Wi-Fi. Garages can have network connection complications due to low signal strength, and repeaters may need to be installed to ensure communication capabilities. Networked chargers can communicate between and connect the following:

- Electric vehicle to parking space
- Electric vehicle to charging station
- User to payment network
- Charging station to site host
- User to vehicle

A high degree of information can be provided to the user via smart phone, radio-frequency identification tag, or computer. Many networked chargers use an application on a smartphone, though there is not one common platform for electric vehicle charging at this time. National interoperability standards and communications protocols are currently being developed.

What Types of Connectors are Used at Charging Stations?

Figure 3 shows the types of connectors associated with each of the three types of EV charging. Most chargers and electric vehicles use a standard SAE J1772 connector and inlet that is compatible with Level 1 and Level 2 chargers. The standardization of cords and connectors is an ongoing issue for DCFC. The combined charging system (CCS) connector is used by American- and European-made electric vehicles. The CHAdeMO connector is used by Japanese- and Korean-made electric vehicles. Tesla superchargers are only capable of charging Tesla vehicles.

However, Tesla vehicles are capable of charging at CHAdeMO connectors (but require an adapter). Final guidance regarding standards for federally-funded EV charging projects is currently in development, but interim guidance requires that all federally funded DCFC stations funded under the NEVI program must be equipped with both CCS and CHAdeMO connectors,[xii] in addition to other interoperability standards for communications and operations

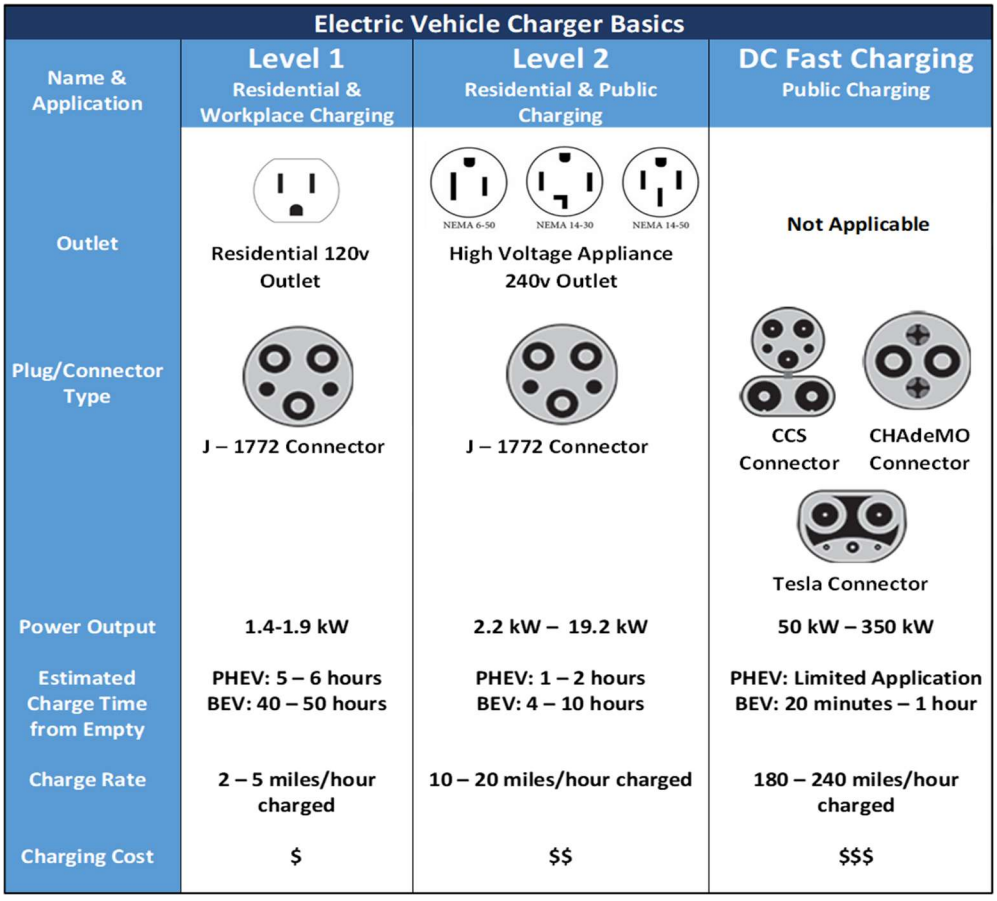


Figure 3. EV Charging Levels, Plug Types and Characteristics

Who Provides Public Electric Vehicle Charging Station Equipment?

There are numerous Electric Vehicle Supply Equipment (EVSE) and Electric Vehicle Service Provider (EVSP) companies operating in the U.S. These companies will partner with site hosts to provide and install charging equipment, and in many cases provide a service network and provide equipment operation and maintenance. Each company operates using different business models depending on the requirements of the specific site host, offering different services for installation and operation of EV chargers.

CHARGING-AS-A-SERVICE

Some EVSPs—such as EV Connect, SemaConnect, and Shell Recharge Solutions — provide charging-as-a-service. This service is designed for property owners who want a turnkey solution to charging, including at a workplace, apartment, or retail locations Charging as a service offers flexibility to commercial property owners, allowing them to pay for charging from their operating costs rather than capital budgets.

The most prevalent EVSP, ChargePoint, is primarily a technology provider who only provides charging equipment to site hosts and provides subscription software services, while individual site hosts are responsible for installation and maintenance of the equipment and establish fees that electricity is sold to customers for. Other EVSPs, such as SemaConnect or Electrify America, provide a turnkey solution to site hots, whereby they can fully operate and maintain the charging infrastructure

Charge Port Operator	Port Count in U.S.	Provides Charging Hardware	Installs, Maintains Hardware	Sets Station User Fee	Provides Cloud Networking
ChargePoint	52,476	x			x
Tesla	33,720	x	x	x	x
SemaConnect	5,896				x
FLO	4,851	x	x		x
Circuit électrique	3,809	x	x	x	x
Electrify America	3,709	x	x	x	x
Volta	3,190	x			x
Blink	3,122	x			x
Shell	2,835	x			x
eVgo	2,643	x			x
EV Connect	2,611	x	x	x	x

Figure 4. Services of Large EVSPs in the US (2022)

and set retail electricity prices. Figure 4 presents a summary of the largest EVSPs operating in the US.

Who Develops and Operates Public Electric Vehicle Charging Stations?

Development and operation of public charging infrastructure (Figure 5) requires close coordination across four primary entities: (1) **charging station providers**, (2) **site hosts**, (3) **electric utilities**, and (4)

governments. Each actor has a specific role to play to support the deployment of EV charging infrastructure, and each its own set of objectives and procedures for how and where charging stations are located, owned and operated.

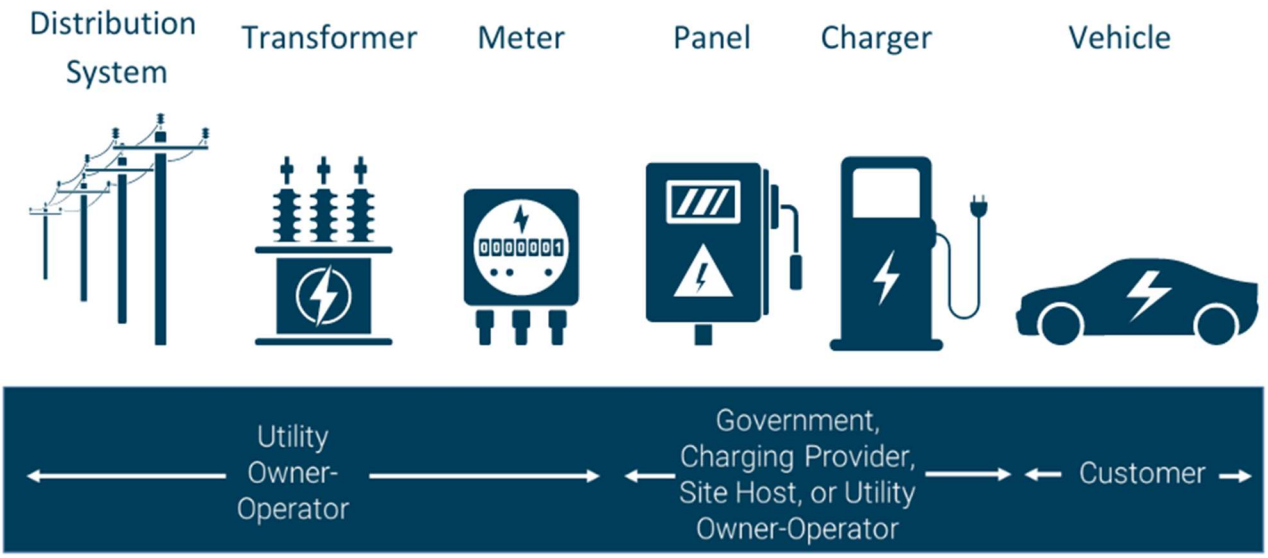


Figure 5. Components of Grid Connected Charging Infrastructure

1) **Charging Station Providers.** Charging station providers (or Electric Vehicle Service Providers (EVSPs), provide charging equipment, communications network services, and may provide ongoing operational services. Today, there are over 35 charging providers offering networked charging in the United States.[xiii] Not all providers have networks in every state. For example, California has 21 providers while Alaska has 6, and Puerto Rico has only 2. Charging providers fall into two main categories: (1) those who own and operate the stations and (2) those who sell equipment and/or network services to third parties (see Figure 4 above). Setting station fees involves a complex set of interrelated considerations, including whether to have a per minute or per kWh fee, whether to include a monthly or annual subscription fee, and whether to charge a penalty for idle charging. The type of fee is set either by the charging provider or by the site host, depending on the type of arrangement. EVSPs are typically engaged by sites hosts (including municipal entities) to install and operate charging infrastructure, partnering with utilities to ensure sites have necessary electrical infrastructure to enable provision of EV charging services.

2) **Site Hosts**. Site hosts typically view charging as an amenity that attracts visitors and are the primary actors in determining where publicly available charging will be installed. For example, commercial site hosts with EV charging often report higher sales inside their shops, restaurants, gas stations, etc. Similarly, employers use workplace chargers as an benefit to support hiring and employee retention, and multi-unit dwelling owners use it to attract tenants. Importantly, site hosts vary in

their preferences between rapid DCFC chargers versus slower Level 2 (L2) chargers, due to variations in parking dwell time (Figure 6). For example, gas stations prefer DCFC, while overnight hotels prefer L2. Site hosts can range greatly in type and operational profile, including municipal governments, which may have different motivations and operational requirements than private sector operators.

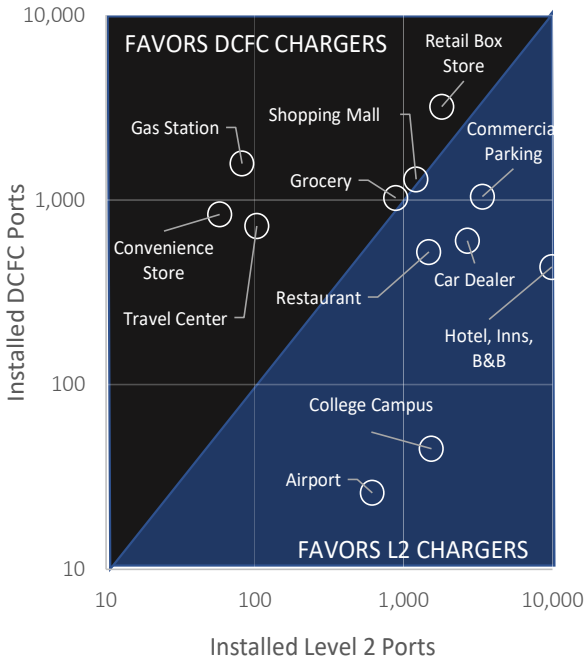


Figure 6. Installed DCFC and L2 Ports by High Volume Site Host Types in the United States
Source: Cadmus analysis of DOE AFDC data

3) **Electric Utilities.** Utilities play an intrinsic role for any EV charging project, ensuring that local grid infrastructure is capable of integrating new electricity demand. For electric utilities, charging infrastructure is attractive for two key reasons: (1) it can smooth peak demand and (2) it can bolster grid resilience. EV loads can be flexible and can be managed across time without impacting the ability of EVs to accomplish their primary goal of providing mobility services. If EVs are grid-connected for extended periods (i.e., when a vehicle is parked and plugged in to a charger), they can be managed to charge at off-peak times or can provide temporary battery backup through bidirectional charging. Electric utilities differ in their willingness to pay for charging infrastructure and support charging infrastructure in other ways, like demand charge mitigation and time of use rates. In some cases, utilities may act as the retailer and owner/operator of a public EV charging station; in other cases, they will only ensure reliable delivery of electricity to the project site.

4) **Governments.** At a high level, the key roles of government in relation to operation and deployment of charging infrastructure is that of facilitation and leadership. This may include removal of barriers to implementation, such providing information and tools to residents, streamlining of permitting processes, or enabling EVSPs to operate public charging services on municipal properties. This could also mean incentivizing development of charging stations in rural areas with low utilization to ensure spatial coverage, or prioritizing chargers in disadvantaged neighborhoods to maximize access and health benefits to vulnerable populations. Ultimately, government programs help to provide EV drivers with accessibility to the charging needed to procure and operate EVs, both in residential and public applications. While most public sector funding for charging infrastructure comes from federal or state programs, site approval occurs at the local level. It should be noted the public charging infrastructure will rarely be owned and operated by municipal governments. However, non-public chargers may be owned by governments to provide services municipal fleet vehicles, or they may partner with EVSPs to operate public charging on municipal properties.

CHAPTER 2. CONTEXT AND HISTORY

This chapter summarizes the history and current market conditions of EVs at the national, state and local level to help contextualize increased demand for EV charging infrastructure. The chapter has three sections:

1. National Electric Vehicle Market Summary
2. Commonwealth's Electric Vehicle Market Summary
3. Virginia Beach's Electric Vehicle Market Summary

National Electric Vehicle Market Summary

This chapter summarizes the current market status of EVs and chargers in the U.S., highlights key federal policies, and discusses key barriers to greater EV adoption.

Introduction

EV adoption has steadily increased since 2011—the start of the modern EV era. Annual sales of EV in the U.S. have grown from 25,000 in 2011[xiv] to 918,464 in 2022, with over 3.2 million cumulative PHEV and BEV sold in the US to date.[xv] Figure 7 shows monthly sales of BEVs and PHEVs through 2022.

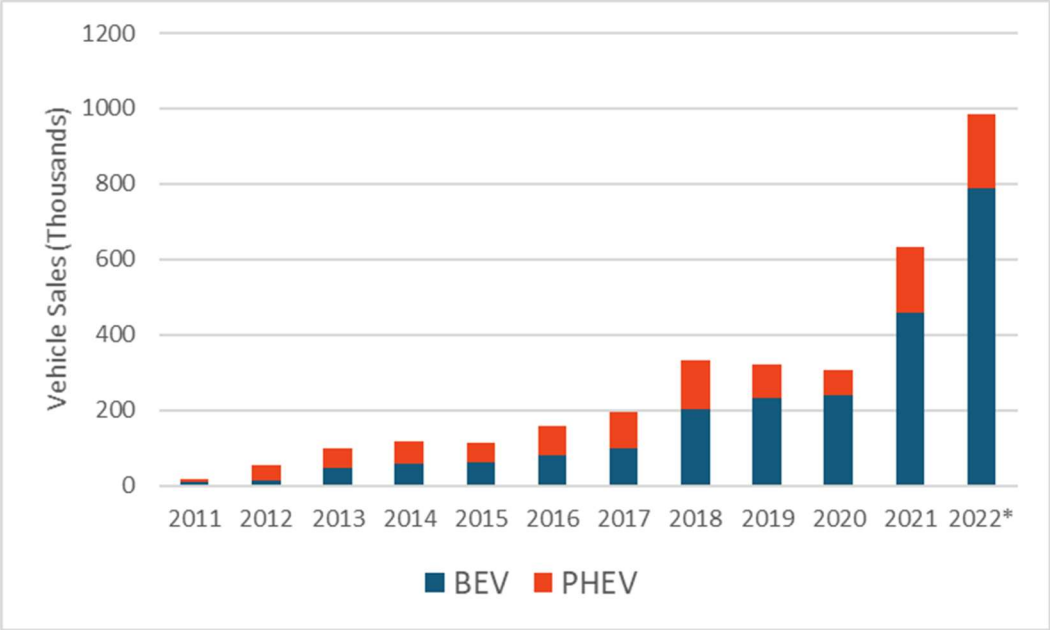


Figure 7. Monthly EV New Vehicle Sales in United States, through 2022
Credit: DOE Alternative Fuel Data Center, *estimated

Nationally, 95% of all trips taken are under 30 miles—well within the range of all BEVs currently available in the US (Figure 8). Note that Figure 8 shows average daily range only, and therefore does not capture the distribution of miles across a given year for a given individual. This distribution is critical to

market uptake of EVs because consumers tend to purchase EVs based on their maximum daily range needs, not average daily range.

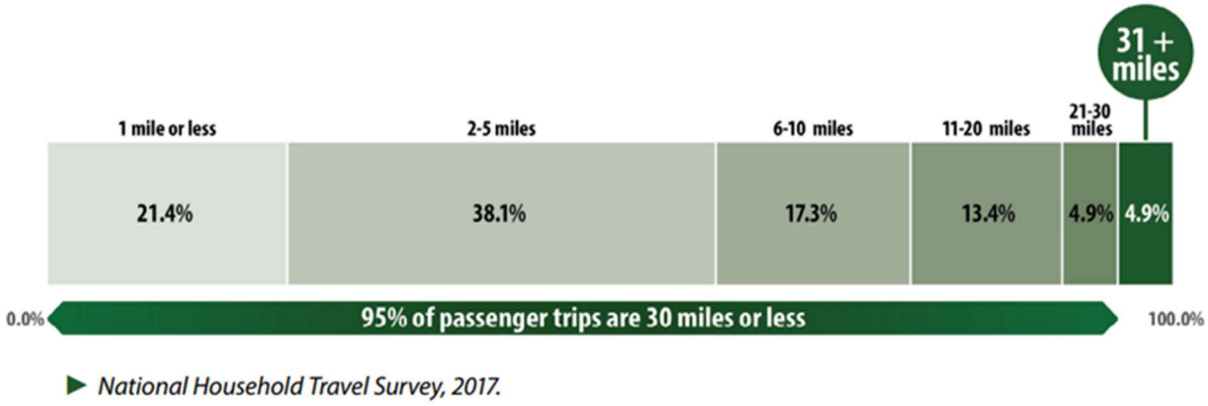


Figure 8. National Share of Passenger Vehicle Trips, by Distance

The average range of EVs has steadily increased since 2011. As shown in Figure 9, in 2011 the average range of EVs offered in the U.S. was 68 miles and a maximum range was 94 miles per charge. In 2022, the average range of EVs in the U.S. had increased to 274 miles per charge with a maximum range of 520 miles. Charge,[xvi] and several automakers have announced models with expected ranges in excess of 600 miles.

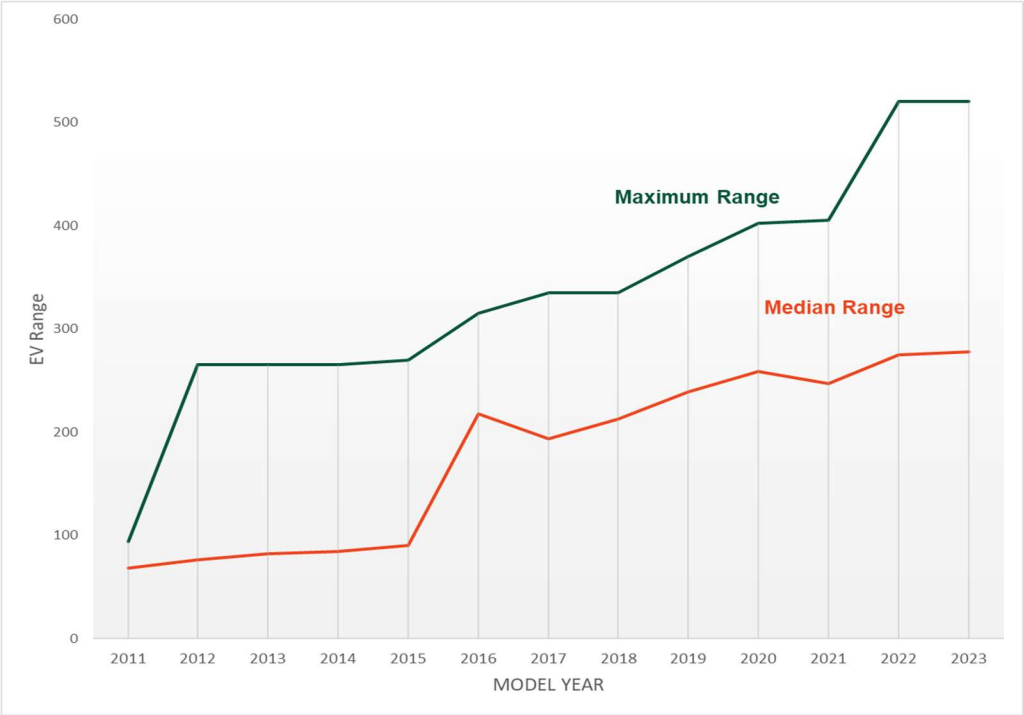


Figure 9. Range of EVs in the US, Model Years 2011-2023[1]

Source: DOE and EPA Fuel Economy Data

Federal EV Initiatives

On August 5, 2021, President Biden signed Executive Order 14037: Strengthening American Leadership in Clean Cars and Trucks, which established a goal of 50% of all new passenger cars and trucks to be zero-emission vehicles (ZEVs) by 2030. On November 15, 2021, H.R. 3684, the Infrastructure Investment and Jobs Act (IIJA) became law. Also known as the Bipartisan Infrastructure Law (BIL), this legislation provides billions of dollars in investment in national infrastructure systems. These actions began significant federal investment for EVs and charging infrastructure, including the establishment of a new Joint Office of Energy and Transportation. The new Office was created to facilitate collaboration between the Department of Energy (DOE) and Department of Transportation (DOT) and support of the deployment of zero-emission, accessible, equitable transportation infrastructure.

National Electric Vehicle Infrastructure Program

The largest program established for EV charging infrastructure through BIL was the National Electric Vehicle Infrastructure (NEVI) Program, administered by the Department of Transportation's (DOT) Federal Highway Administration (FHWA). This program provides $5 billion in funding to states for the development of a national EV charging network through 2026.

The goal of the NEVI program is to establish a network of public Direct Current Fast Charger (DCFC) charging stations across the country, with stations installed every 50 miles along FHWA Alternative Fuel Corridors. All charging stations constructed through the NEVI program as required to be located within one mile from interstate exists or highway intersections along designated corridors.

National Alternative Fuel Corridors

Between February and March each year, the Federal Highway Administration (FHWA) administers an application process for states to designate a national network of alternative fueling and charging infrastructure along National Highway System (NHS) corridors, consisting of EV charging, liquified petroleum gas (LPG), compressed natural gas (CNG), liquid natural gas (LNG), and hydrogen.

The FHWA designates highway corridors as either "Corridor-Ready" or "Corridor-Pending." The criteria for EV corridor designations are shown in Table 3 below. Corridor-Ready highways contain at least one charging station that meets the criteria outlined in Table 3 every 50 miles. These AFCs are considered complete and ready for interstate EV travel. If an AFC highway segment is designated as "Corridor-Pending," then it requires additional charging stations to be constructed in order to meet Corridor Ready criteria. A plan and timeline for how these additional stations will be constructed must have been submitted to FHWA.

Table 3. FHWA AFC EV Corridor Designation Categories

EV Charging Corridor-Ready NHS Segment Requirements	EV Charging Corridor-Pending NHS Segment Requirements
Public Direct Current Fast Charging (DCFC): • No greater than 50 miles between one station/site and the next on corridor.	A strategy/plan and timeline for public DCFC stations separated by more than 50 miles. Location of

• No more than 1 mile from interstate exits or highway intersections along the corridor. • Stations should **include four Combined Charging System (CCS) connectors – Type 1 ports** (simultaneously charging four EVs). • Site power capability should be no less than 600 kW (supporting at least 150 kW per port simultaneously across 4 ports). • Maximum charge power per DC port should not be below 150 kW	station/site – no more than 1 mile from interstate exits or highway intersections along the corridor.

[i] A corridor-ready corridor is defined as having a minimum of 2 stations. Final classifications will be made on a case-by-case basis.
[ii] If a corridor is being designated as corridor-pending and currently has no alternative fuel facilities located on it, then a strategy or plan and timeline for infrastructure build-out should be submitted.
[iii] Tesla charging stations are currently considered a proprietary network and do not meet the designation criteria of being publicly accessible. Therefore, these stations are not eligible for inclusion.
[iv] Exceptions are permitted for distance from Interstate exits or highway intersections and between stations along the corridor, if justified.

Any state or local agency is invited to nominate an Alternative Fuel Corridor (AFC) for designation. An eligible corridor is an interstate highway (e.g., I-10, I-80, I-95, etc.) or other highways on the National Highway System (NHS). The FHWA encourages nominations that focus on alternative fueling/charging infrastructure along Interstate corridors but may also submit nominations elsewhere on the NHS. Corridors within a single state and multistate corridors are eligible, with the goal of connecting communities, cities, states, and regions to develop a national network of alternative fuel facilities.

The deadline for states to nominate highway segments for AFC designation in Round 6 was May 13, 2022, and designations were announced on July 5, 2022. Requests for Round 7 nominations are expected in May of 2023.

Charging and Fueling Infrastructure Discretionary Grant Program

In addition to the NEVI Formula Program, BIL established the Charging and Fueling Infrastructure (CFI) Discretionary Grant Program, which provides $2.5 billion through two $1.25 billion discretionary grant programs to strategically deploy publicly accessible EV charging and alternative fueling infrastructure in communities and along designated AFCs. The two grant programs are:

- **Alternative Fuel Corridor Grants.** This $1.25 billion program will strategically deploy publicly accessible EV charging infrastructure along designated AFCs. This program is meant to fill gaps in infrastructure that were not addressed through the NEVI program.
- **Community Charging and Fueling Grants**. This $1.25 billion program will strategically deploy publicly accessible EV charging infrastructure in communities. This funding will be available to municipalities for the installation of charging infrastructure, with a focus on low-to-moderate income (LMI) groups, environmental justice (EJ), rural and tribal communities.

Other Key Federal Programs

Numerous other federal programs were established or gained additional funding through BIL that are applicable for the deployment of EV infrastructure, both through formula and discretionary (competitive) grants. Table 4 provides an overview of other key federal funding programs; see Chapter 6, Goal 5 for further information on sources of federal funding.

Table 4. Other Key Federal EV and Charging Infrastructure Funding Programs

Title	Description	Lead Agency	Funding ($ MM)	Funding Type	Funding Targets
Congestion Mitigation and Air Quality (CMAQ) Improvement Program	Expands eligible projects under the CMAQ program to include shared micro mobility as well as the purchase of zero-emission medium and heavy duty (MDHD) vehicles.	DOT	$13,200	Formula	MDHD, Charging
Carbon Reduction Program	Carbon reduction program to reduce transportation emissions. Eligible projects include efforts to reduce the environmental and community impacts of freight movement, as well as projects to support deployment of alternative fuel vehicles and reduce transportation emissions at port facilities.	DOT	$6,420	Formula	EVs, Ports
State Energy Program	State Energy Program mandate (in the Energy Policy and Conservation Act) amended to include: "programs to increase transportation energy efficiency, including programs to help reduce carbon emissions in the transportation sector by 2050 and accelerate the use of alternative transportation fuels for, and the electrification of, state government vehicles, fleet vehicles, taxis and ridesharing services, mass transit, school buses, ferries, and privately owned passenger and medium- and heavy-duty vehicles''.	DOE	$500	Formula	Buses, EV
Energy Efficiency and Conservation Block Grant Program	To assist states, local governments, and Tribes in implementing strategies to reduce energy use, to reduce fossil fuel emissions, and to improve energy efficiency.	DOE	$550	Formula and Competitive	Ports, EVs, Charging
Surface Transportation Block Grant Program (STBG)	The STBG program provides flexible funding that may be used by states and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.	DOT	$72,000	Formula	Charging, Transit

Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	The RAISE program provides an opportunity for the DOT to invest in road, rail, transit, and port projects that promise to achieve national objectives.	DOT	$7,500	Competitive	Charging, Transit
Rural Surface Transportation Infrastructure	Supports projects to improve and expand the surface transportation infrastructure in rural areas to increase connectivity, improve the safety and reliability of the movement of people and freight, and generate regional economic growth and improve quality of life.	DOT	$2,000	Competitive	Charging, Transit
Metropolitan Planning (PL)	This opportunity provides entities with a comprehensive framework for making transportation investment decisions in metropolitan areas.	DOT	$4,831	Formula	Charging

Equity and Environmental Justice

Historically, disadvantaged communities (DACs) have been disproportionately impacted by the negative consequences of transportation and energy systems. These communities have been unequally and adversely impacted by vehicular pollution, poverty, unemployment, chronic underinvestment in local transportation infrastructure, and have not been adequately represented in planning of new transportation systems. As EV adoption continues to grow in the coming years, it is critical that charging infrastructure be deployed in a manner that adequately supports disadvantaged and historically marginalized communities.

Executive Order 14008[xvii], enacted on January 27, 2021, attempts to combat this inequitable distribution of benefits in federal spending by establishing the government-wide Justice40 Initiative[xviii], which made it a goal that 40% of the overall benefits of certain federal investments flow to communities that are marginalized, underserved, and overburdened by pollution. In addition to directing all federal agencies to achieving environmental justice part of their missions by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, EO 14008 directed the publication of the EJScreen Environmental Justice and Screening Tool.[xix]

EJScreen provides a nationally consistent dataset and approach for combining environmental and demographic socioeconomic indicators. This publicly available resource enables users to see the demographic socioeconomic and environmental information for a particular region in order to understand the distribution of EJ communities. This tool was used to develop numerous other EJ tools for sector-specific review, including the Joint Office of Transportation and Energy Electric Vehicle Charging Justice 40 map.

Prioritizing EV charging locations in disadvantaged areas to expand EV ownership can reduce tailpipe emission exposure and the overall pollution burden in these communities. In addition, agencies are directed to work directly with disadvantaged and underserved populations in the development of new planning processes to ensure that the needs of these communities are adequately addressed in the manner that directly meets the needs of local populations.

The Commonwealth of Virginia's Electric Vehicle Market Summary

This chapter provides the context for the current EV market in the Commonwealth of Virginia (also referred to as the Commonwealth) and summarizes recent and forthcoming policy actions at the state and utility levels.

EV and Charger Adoption

At the end of 2021, there were 30,700 EVs and 15,800 PHEVs registered in the Commonwealth of Virginia, up from just 3,100 BEV and 4,200 PHEVs in 2016. As shown in Figure 10, Virginia had the 12th most EV registrations as a fraction of new vehicle registrations in 2021.[xx]

The number of EV models available to consumers has risen significantly over the past decade. While only two passenger vehicle models were available in 2011, today there are over 90 different vehicle makes available for purchase in Virginia. 18 of the 20 major global automotive OEMs have stated commitments to offer increased EV models in the coming years, including GM who has committed 100% of vehicle sales to be zero emissions by 2035,[xxi] and Ford by 2035 in leading markets and globally by 2040.[xxii] These commitments will translate to 50-75% of all new vehicle sales in the U.S. as electric by 2030.

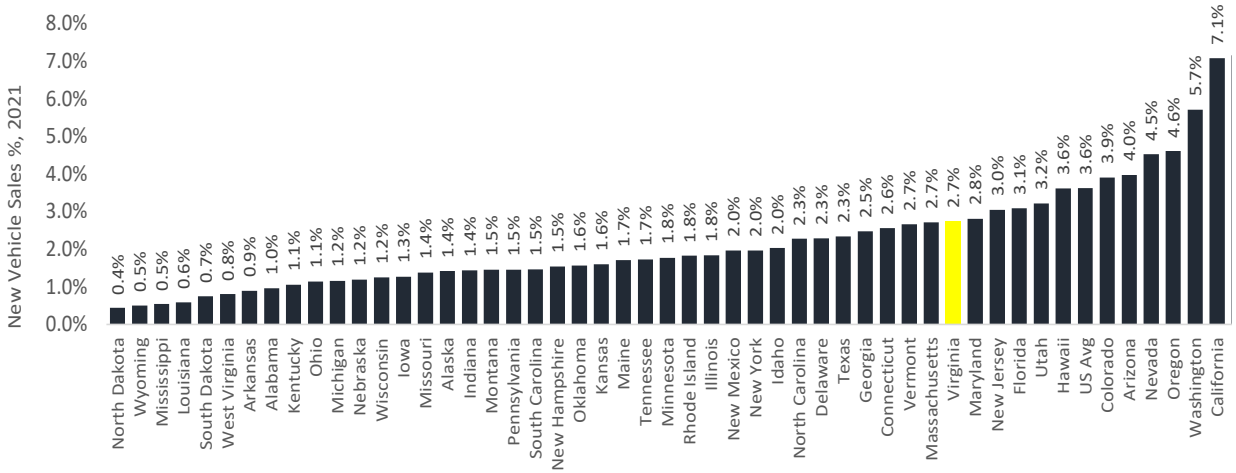


Figure 10. EVs as Portion of Total Vehicle Registration by State, 2021 Data

State and Local Actions Across the Commonwealth

Though not required, some municipalities across Virginia have developed and enacted plans related to EVs and charging infrastructure deployment. For example, in 2021, Fairfax County committed to converting its county buses and fleet vehicles to zero-emissions vehicles by 2035; and to ensure that EV

charging infrastructure is provided at new and renovated facilities where fleet and/or public vehicle EV charging is appropriate.[xxiii] In 2021, the City of Alexandria completed an Electric Vehicle Charging Readiness Strategy, and formally approved its first Alternative Fuel Policy, which includes the goals of replacing 25% of the City's 900 fleet vehicles with EVs by fiscal year 2024 and reducing overall vehicle emissions from the City fleet by 25% over the next 10 years.[xxiv] Richmond published its first Electric Vehicle Readiness Plan in March of 2013, and in 2020 Roanoke procured 17 EVs for its fleet.[xxv]

In December 2020, the Metropolitan Washington Council of Governments (MWCOG) Board of Director's adopted a 2030 regional Climate and Energy Action Plan with aggressive goals to achieve a 50% reduction in regional greenhouse gas emissions by 2030.[xxvi] This 2030 regional Climate and Energy Action Plan includes numerous actions to reduce greenhouse gas emissions across buildings, the electricity grid, waste, tree canopy, and transportation. Considering the reduction of greenhouse gas emissions from transportation, the plan includes actions to expand light-duty vehicle adoption, accelerate electrification of MDHD vehicles, and to build out the regional EV charging network. The MWCOG plan calls for significantly expanding workplace, publicly accessible Level 2 chargers, and DCFC locations. The plan acknowledges ways the MWCOG can support jurisdictions such as Virginia Beach, including support in adopting EV-ready new construction ordinances or incentives, conducting regional EV gap analysis to identify most critical gaps in EV charging network, and advocating for state and federal national incentives for EV charging deployment and technology advancement. The plan also acknowledges the ways member local governments can support building a regional EV charging network, such as the following recommended efforts:

- Conducting local EV planning, including public fleet, transit, and community-scale initiatives.
- Requiring new developments to install EV infrastructure or be EV-ready.
- Providing or promoting incentives EV infrastructure deployment in communities.
- Developing EV infrastructure plans for community deployment.
- Developing EV infrastructure strategies for the public fleet and for deploying EV charging infrastructure at public facilities, garages, and refueling facilities.
- Forming partnerships with utilities, transit agencies, and EV infrastructure providers to deploy charging infrastructure in the community.
- Implementing innovative pilot initiatives to advance new technologies, including vehicle-to-grid, regenerative power, and solar-powered EV infrastructure.

In addition, the plan emphasizes equity considerations in EV charging infrastructure planning and implementation, including prioritizing disadvantaged communities to ensure equitable access to charging and the benefits of public health, including reducing gasoline and diesel use where these fuels are the major causes of criteria air pollutants and associated adverse health impacts. EVs, which release no tailpipe emissions, can help to significantly reduce local air pollution.

Virginia Clean Economy Act

In 2020, the legislation passed the Virginia Clean Economy Act (VCEA), setting the Commonwealth on a path to achieve net-zero carbon emissions economy-wide by 2045 for all sectors including electricity, transportation, buildings, agriculture, and industry. While the VCEA's primary focus is to expand the renewable energy electricity generation and decarbonize Virginia's electricity grid, given the transition

of transportation to use electricity from the electrical grid as its primary fuel source, there is significant benefit to decarbonizing transportation. In July 2020, the Environmental Justice Act was passed in Virginia, establishing the Office of Environmental Justice within the Virginia Department of Environmental Quality. VCEA contains specific provisions to address EJ concerns through a commitment to invest 50% of the funding generated by Regional Greenhouse Gas Initiative (RGGI) auction proceeds towards energy efficiency for low-income housing. It also requires the state Public Utility Commission (PUC) to ensure that new or expanding energy facilities does not have a disproportionate impact on DACs. Additionally, the PUC must consider whether the placement of renewable energy facilities provides benefits to those communities and requires an annual Environmental Justice Review to ensure that low-income households are not burdened by the energy transition. VCEA protects consumers against spikes in electricity bills, instructing that no residential bill will increase by more than 10% at a time, which has a disproportionately negative impact on low-income households.

Virginia's Alternative Fuel Corridors and NEVI

The NEVI formula grant program makes $5 billion available to states over five years for deployment of EV charging infrastructure along AFCs within the NHS. Virginia currently eight AFC designated corridors for EV Charging shown in Figure 11. Four of these segments are currently designated at "Corridor Ready" and four are "Corridor Pending," as shown in Table 5. Both designation categories are eligible for projects funded through the NEVI program.

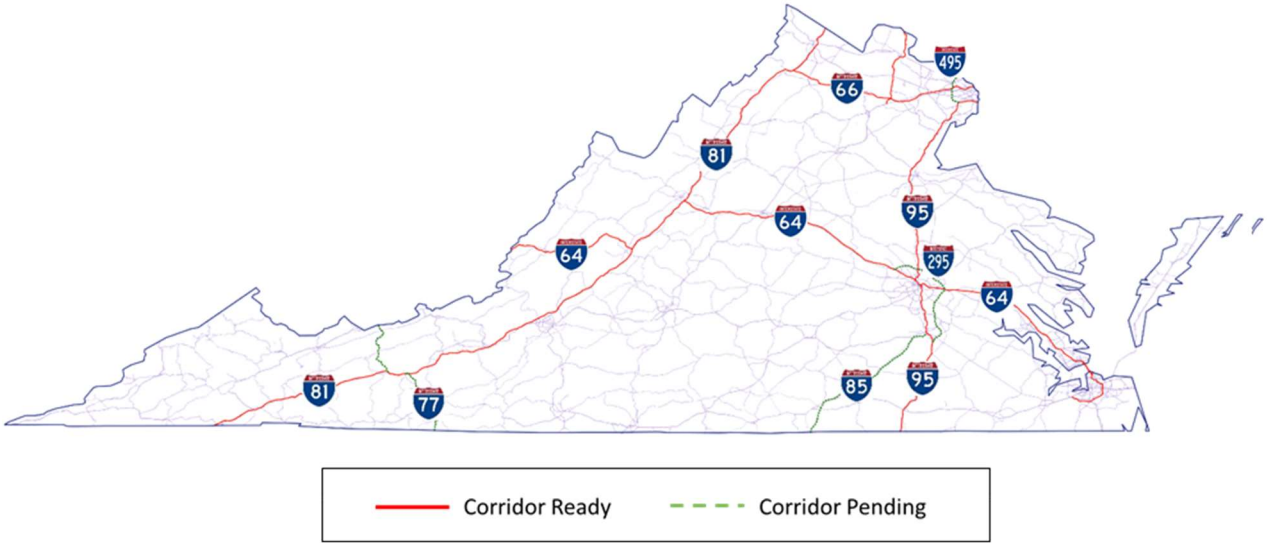


Figure 11. Virginia Round 6 AFC Corridor Designations

FHWA had designated five of these corridors in Rounds 1-5, and three additional designations were made in Round 6. Round 6 designations included:

- **I-77**: Between the VA/WV border and the VA/NC border.
- **I-295**: Between Short Pump and the I-295/I-95 interchange in Petersburg.
- **I-495**: Between Springfield and the VA/MD border.

Table 5. Virginia EV Charing AFC Designations

NHS EV Charging AFC Designations in Virginia, Rounds 1-6	
Corridor Ready	**Corridor Pending**
I-64	I-85
I-66	I-77
I-95	I-295
I-81	I-495

Those AFC segments listed as "Corridor Ready" in Table 5 already contain charging infrastructure as required by FHWA. Those highways that are designated as "Corridor Pending" require additional build out of charging infrastructure to achieve "Corridor Ready" status. NEVI funds distributed to Virginia will be allocated to construction of charging infrastructure along these highway segments in 2023.

Virginia is expected to receive $106,376,132 between 2022 and 2026 for the construction and operation of EV charging stations through the NEVI program. To obtain allocated formula funds under the NEVI program, each state was required to submit an EV Infrastructure Deployment Plan (Deployment Plan) that describes how it intends to use program funds. The Virginia Department of Transportation (VDOT) submitted a Deployment Plan to FHWA on August 1, 2022.[xxvii] While this plan does not identify all specific projects that will be deployed using the NEVI Formula funds, it provides a blueprint by which Virginia is expected to allocate funding under the program. The Virginia Electric Vehicle Deployment Plan was approved by FHWA on September 30, 2022.

The Deployment Plan will be updated at least annually, and VDOT will continue its outreach strategies throughout the 5-year NEVI program duration to further solicit stakeholder input, refine and adjust strategies, and evaluate whether Commonwealth and national goals are being achieved. Activities in support of the Deployment Plan in 2023 will include targeted stakeholder outreach and the release of a Request for Information (RFI) to secure feedback from EV charger developers, potential site hosts, and other interested parties.

Third parties will be used for the acquisition, installation, upgrading, and operations and maintenance of publicly accessible EV charging infrastructure. VDOT will develop an initial competitive funding opportunity that seeks developers to install or upgrade DCFC infrastructure along Virginia's AFCs in accordance with federal guidelines. NEVI program funds will offset up to 80% of project costs while the third-party entity will be responsible for the non-federal share. A scorecard will be developed that describes the minimum standards criterion which applicants will need to satisfy, including public access, charger power levels, number of chargers, maximum distance between charging stations, cost of acquisition and installation, and expected user cost of operation.

The initial build out of EV charging infrastructure is anticipated to occur during 2023 and 2024. The goal of the Deployment Plan in these first two years is to achieve Fully Built Out (FBO) status for all AFCs in the state. FBO designation requires EV charging infrastructure: (1) be installed every 50 miles along the AFCs and within 1 travel mile of the AFCs unless a discretionary exception has been granted; (2) includes

at least four 150 kilowatt (kW) DCFC stations capable of simultaneously charging four EVs; and (3) has minimum station power capacity at or above 600 kW and supports at least 150 kW per port simultaneously. Once FBO designation has been achieved for Virginia, VDOT will be given flexibility to allocate NEVI in priority locations throughout the state outside of AFC sites. During the years 2023 to 2026, VDOT anticipates seeking projects for Phase 2 NEVI funding focused on expanding the charging network beyond AFCs.

In the State Plan, VDOT identified 13 locations for implementation of NEVI funds in the first year of the program, as outlined in Table 6. 12 of the proposed sites are new construction; only one of the proposed sites would entail upgrading of a charging station to meet AFC requirements. It is of note that this location, ID 198938, is close proximity to Virginia Beach. However, this site does not fulfill requirements of designation of I-264 as an AFC, nor does it effectively serve the population of Virginia Beach.

Table 6. Proposed Virginia NEVI Charging Locations

State EV Charging Unique ID	Route	Location	Anticipated Network	Utility Territories
I-64001	I-64	Williamsburg, VA Region	New	Dominion
I-64002	I-64	Charlottesville, VA Region	New	Dominion
198938	I-65	1401 Greenbrier Pkwy Chesapeake, VA 23320	EVgo	Dominion
I-81001	I-81	Chilhowie, VA Region	New	Appalachian Power
I-81002	I-81	Christiansburg, VA Region	New	Appalachian Power
I-81003	I-81	Natural Bridge State Park Region	New	City of Radford/Dominion
I-81004	I-81	New Market, VA Region	New	Shenandoah Valley/Dominion
I-85001	I-85	Dinwiddie, VA Region	New	Co-op
I-85002	I-85	South Hill, VA Region	New	Dominion or Mecklenburg
I-95001	I-95	Petersburg, VA Region	New	Dominion
I-29501	I-295	Richmond, VA Region	New	Dominion
I-29502	I-296	Petersburg, VA Region	New	Dominion
I-77001	I -77	Carroll County, VA Region	New	Appalachian Power

Clean Cars Virginia

2021 saw the passage of HB 1965,[xxviii] known as Clean Cars Virginia, which directed the State Air Pollution Control Board to implement a low-emissions and zero-emissions vehicle program for motor vehicles with a model year of 2025 and later. Through this lawmaking, Virginia joined 12 other states and the District of Columbia in adopting California Low Emissions Vehicle (LEV) and Zero Emission Vehicle (ZEV) standards under the Advanced Clean Cars II (ACC II) regulation, which significantly strengthens regulations on tailpipe emissions on all new light and medium duty vehicles in Virginia. The law requires that beginning in 2024, an increasing percentage of new vehicles sold to Virginia dealerships be Zero Emissions Vehicles (ZEV), which will primarily BEV and PHEVs, or approximately 8% of new vehicles in 2025. These new standards also enact more stringent vehicle emissions standards for

criteria pollutants and greenhouse gas emissions for all new gasoline and diesel passenger cars, light-duty trucks and medium duty vehicles beginning in 2024 (Model Year 2025).

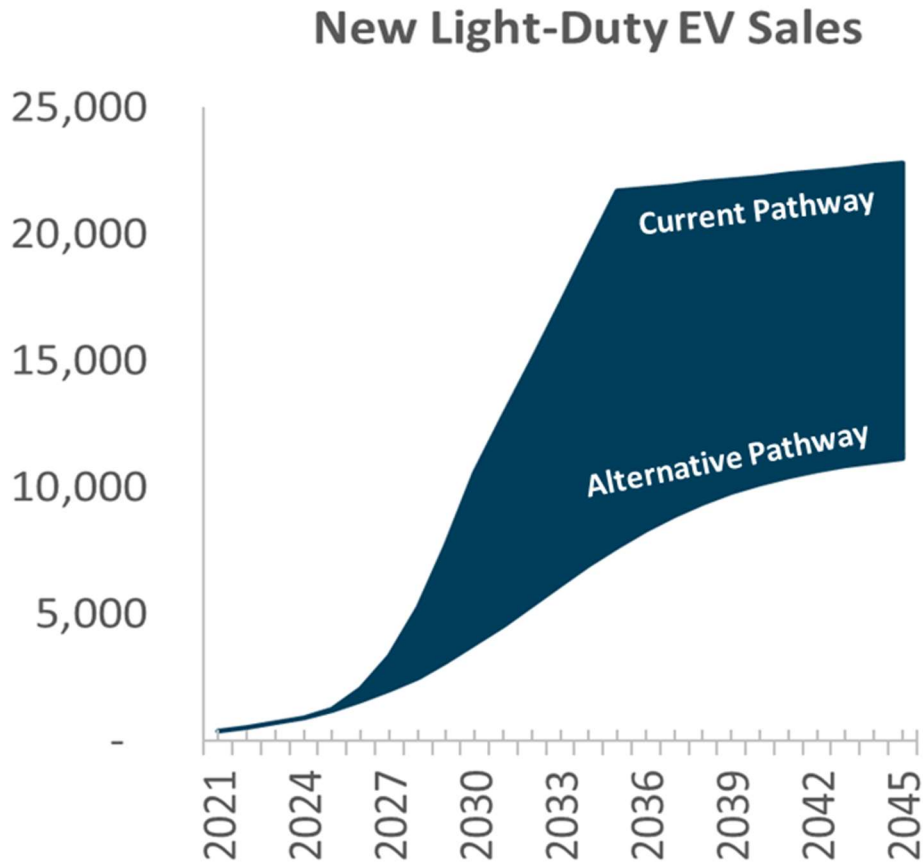


Figure 12. Estimate of EV Population (Stock) in Virginia Beach under Clean Cars Virginia

Clean Cars Virginia requires that between 12 to 35% of all new vehicles sold to Virginia dealerships be ZEV starting in 2026, increasing by 6-8% per year until reaching 100% ZEV sales in 2035. Under this rulemaking, PHEVs will qualify as a ZEV, however PHEVs cannot account for more than 20% of total ZEV vehicle sales. Clean Cars Virginia will not go into effect until Model Year 2024 vehicles in Virginia. This legislation will have significant impact on the deployment on EVs across Virginia, including Virginia Beach. As discussed in greater detail in Chapter 4 and shown in Figure 12, preliminary projections suggest as many as 15,000 EVs in Virginia Beach by 2030 and 40,000 by 2035, up from 1,500 today.

EV Rebate Program

In 2021, Virginia passed legislation related to EV and charging infrastructure deployment. HB 1979 created an incentive for the purchase or lease of any new and used EV through the Electric Vehicle Rebate Program. Virginia residents can qualify for a $2,500 rebate; LMI buyer requirements can receive an additional $2,000 rebate for a new EV and $500 for a used EV.[xxix] **This program is currently unfunded.**

In addition, HB 2282 was enacted with requires the State Corporation Commission (SCC) to deliver a report detailing utility programs that can accelerate transportation electrification, which was published in February 2022. SB 1223 amended VCEA to require a statewide analysis of charging infrastructure necessary to support a net-zero transportation sector by 2045. Lastly, SB 575 directs state fleet managers to use total cost of ownership (TCO) calculations to determine vehicle procurement beginning in 2023, which significantly increases the likelihood of BEV deployment across the state fleet.

Volkswagen Settlement

In 2016, as a result of the settlement between the U.S. Department of Justice, U.S. Environmental Protection Agency (EPA), and Volkswagen, the Commonwealth of Virginia received over $93 million to implement projects and programs to mitigate air pollution from transportation (Figure 13). The Volkswagen Mitigation Trust, administered by the Virginia Department of Environmental Quality, invests these funds in programs and projects to reduce transportation air pollution caused by Volkswagen's alleged violation.

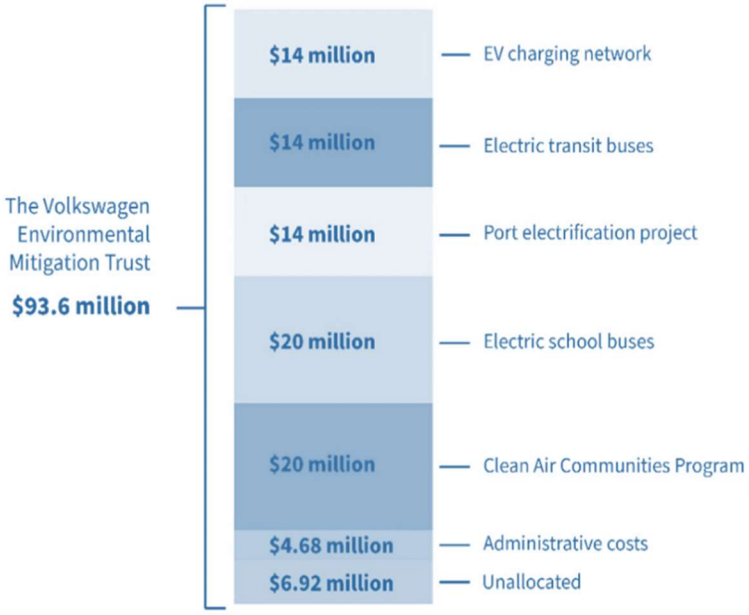


Figure 13. Allocation of Virginia's VW Settlement funding

Of the total Virginia Mitigation Trust funding, $14 million is dedicated to support installation of a network of Level 2 and DCFC EV charging stations in the Commonwealth with a focus along highly trafficked interstate corridors and in metropolitan areas, primarily in areas of Northern Virginia. Additionally, the Volkswagen Mitigation Trust supports spending nearly $20 million for Class 8 local freight trucks, Class 4-7 local freight trucks, Class 4-8 buses, airport ground support equipment, and associated EV charging infrastructure.[xxx]

Dominion Energy Programs

In Fall 2020, Dominion Energy Virginia launched the Smart Charging Infrastructure Pilot (SCIP) program to support EV adoption in Virginia as a result of SCC-approved investments through the GTSA. The SCIP provided rebates for qualifying EV charging station infrastructure and installation to support charging opportunities in multifamily dwellings, workplace charging applications, publicly accessible DCFC charging opportunities, as well as charging for public transit agencies transitioning to battery-electric buses. The SCIP program began implementation in 2021 and is operational through December 31, 2022; as of June 20, 2022, the program was fully subscribed for 2022.

In 2021, Dominion Energy began the EV Charger Rewards Program to help offset the cost of installation of a Level 2 residential charger. Under this Program, residents who enroll in the program are eligible to receive a one-time $125 rebate for installations of a Level 2 charger that was activation on or after March 1, 2021. Participants will be required to limit their charging during periods of peak energy demand and will receive an additional $40 annual incentive for program enrollment. Additional programs as expected to be implemented by Dominion in 2023 are provided in Chapter 6.

In 2019, Dominion Energy also began the Electric School Bus program, providing 50 electric school buses and charging infrastructure to 15 school districts in Virginia. In 2022, Dominion Energy announced that to support the implementation of the EPA Clean School Bus Program, they will provide utility coordination for school districts, including grid upgrades, construction, and charger installation. Dominion Energy will also cover the maintenance of the charger for 15 years and 50% of the cost of the battery warranty for those school districts who enter into a Participation Agreement.

Other State Actions

The Commonwealth's legislative branch implemented several actions in 2020 specific to promoting the adoption of EVs and support electric vehicle charging infrastructure operation. First, select state government agencies are now permitted to locate and operate retail, fee-based EV charging stations at their facilities and lands, thus providing publicly accessible charging stations opportunities. Second, Virginia Code now prohibits common interest community associations from prohibiting the installation of an EV charging station within the boundaries of a member's designated parking space, or, in the case of a property owners association, the boundaries of an owner's property. Provisions for installation and removal are also prescribed to support proper charging station installation. In addition, the Virginia Department of Motor Vehicles is permitted to lower registration fees for EV as an incentive for EV ownership. A summary of key provisions can be found in Table 7 below.

Table 7. Summary of Recent EV Laws and Regulations in Virginia

Virginia EV Laws and Regulations		
Name	**Summary**	**Legislation**
Aftermarket Electric Vehicle (EV) Conversion Regulations	Any motor vehicle, other than a motorcycle, that has been modified to replace the internal combustion engine with an electric propulsion system must be titled by and registered with the Virginia Department of Motor Vehicles (DMV) as a converted EV and. The vehicle must pass inspection and be equipped with the appropriate systems.	Virginia Code 46.2-602.3, 46.2-625, and 46.2-1001.1
Alternative Fuel Provider License	Alternative fuel providers, bulk users, and retailers, or any person who fuels an alternative fuel vehicle from a private source that does not pay the alternative fuels tax must obtain an alternative fuel license from the Virginia Department of Motor Vehicles (DMV)	Virginia Code 58.1-2244
Alternative Fuel Tax	Alternative fuels used to operate on-road vehicles are taxed at a rate of $0.262 per gasoline gallon equivalent (GGE)	Virginia Code 58.1-2217 and 58.1-2249

Alternative Fuel Vehicle (AFV) Grant Authorization	Local governments are authorized to establish a green bank to promote investment in clean energy technologies, including AFVs and related infrastructure.	Virginia Code 15.2-958.3:1
Alternative Fuel Vehicle (AFV) Tax Reduction Authorization	Local governments may reduce personal property taxes paid on AFVs and low-speed vehicles	Virginia Code 58.1-3506
Electric Vehicle (EV) Charging Station New Construction and Building Renovation Requirement	Any executive branch agency or institution designing new building construction of more than 5,000 square feet, or a renovation that costs more than 50% of the value of the building, must include EV charging infrastructure. EV charging infrastructure must be sufficient to support charging for every centralized fleet vehicle based at that building	Virginia Code 2.2-1182 and 2.2-1183
Zero Emission Vehicle (ZEV) Infrastructure New Building Requirement for Localities	Any locality designing new building construction of more than 5,000 square feet, or a renovation that costs more than 50% of the value of the building, must include sufficient ZEV charging and fueling infrastructure. The building must be capable of supporting projected ZEV charging and fueling demand over the first 10 years following building occupancy.	15.2-1804.1
Electric Vehicle (EV) Charging Station Policies for Associations	Homeowners Associations (HOAs) or condominium associations may not prohibit the installation of an EV charging station for personal use within the EV charging station owner's designated parking space. HOAs may establish restrictions on the number, size, placement, manner of installation, and insurance requirements for the EV charging station if it is installed on the exterior of the property or in a common area. HOAs are not liable for the EV charging station. A condominium association may prohibit the installation of an EV charging station if it is not technically feasible or practical due to safety risks, structural issues, or engineering conditions. Condominiums may establish requirements on the manner of installation, architectural design, insurance requirements, and community-related expenses for the EV charging station.	Virginia Code 55.1-1823.1, 55.1-1962.1, and 55.1-2139.1
Electric Vehicle (EV) Parking Space Regulation	Any vehicle that is not actively charging may not parking in a designated EV charging parking space. The penalty for violation is $25.	House Bill 450, 2022
Electric Vehicle (EV) Rebate Authorization	The Virginia Department of Mines, Minerals, and Energy is authorized to administer a rebate program for the purchase of a new or used EV. Rebates may not exceed $2,500. An additional rebate of $2,000 must be available for residents whose annual household income does not exceed 300% of current poverty guidelines. Eligible used vehicles may not have a purchase price of more than $25,000.	Virginia Code 45.2-1725 and 67-1900 through 67-1907
Public Entity Retail Electric Vehicle (EV) Infrastructure Authorization	Any state government entity, as well as any locality, park authority, public institution of higher education, or school boards, may operate retail fee-based EV charging infrastructure on its property. A locality may restrict use to employees of the locality and authorized visitors and may install signage that details these restrictions. Retail fee-based EV charging provided by state agencies must be offered at rates similar to those in competitive	Virginia Code 22.1-131, 56-1.2, 56-1.2:1, 56-232.2:1, and 2.2-614.5 and House Bill 443, 2022

	areas. EV charging infrastructure access must be restricted to employees, students, and authorized visitors only during school hours, and must be accompanied by appropriate signage.	
Vehicle Acquisition Total Cost of Ownership (TCO) Assessment Requirement	By October 1, 2022, the Virginia Department of General Services (DGS) must identify a publicly available TCO calculator to assess and compare the total lifetime cost of purchasing, owning or leasing, and operating light-duty internal combustion engine (ICE) vehicles and EVs. The calculator must consider vehicle make, model, age, annual mileage, lifespan, depreciation, and capital, maintenance, repair, and infrastructure costs. The TCO calculator must be updated on an annual basis to reflect current prices and vehicle models. Beginning January 1, 2023, DGS and all other state agencies must purchase or lease EVs instead of ICE vehicles if the calculator indicates EVs have a lower TCO. Beginning January 1, 2026, and triennially thereafter, DGS must report estimated cost savings and emissions reductions as a result of purchasing EVs instead of ICE vehicles. Emergency and law-enforcement vehicles are exempt from this requirement.	Senate Bill 575, 2022
Zero Emission Vehicle (ZEV) Infrastructure New Building Requirement for Localities	Any locality designing new building construction of more than 5,000 square feet, or a renovation that costs more than 50% of the value of the building, must include sufficient ZEV charging and fueling infrastructure. The building must be capable of supporting projected ZEV charging and fueling demand over the first 10 years following building occupancy. Alternatively, the building must earn a ZEV or electric vehicle charging credit from the Virginia Energy Conservation and Environmental Standards (VEES), the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating standard, or the Green Building Initiative's Green Globes building standard.	Virginia Code 15.2-1804.1

Virginia Beach Electric Vehicle Market Summary

EV Adoption in Virginia Beach

As of October 2022, the City of Virginia Beach had 2,267 registered EVs, including 1,583 BEVs and 684 PHEVs. Registrations in EVs in the city have grown significantly over the previous five years (Figure 15). Given the growth rate in EVs, there should be over 3,000 EVs in Virginia Beach by the close of 2023. Tesla currently accounts for over 50% of the registered EVs in the city (Figure 15), however as more vehicles become available in the coming years, this market share is expected to drop significantly.

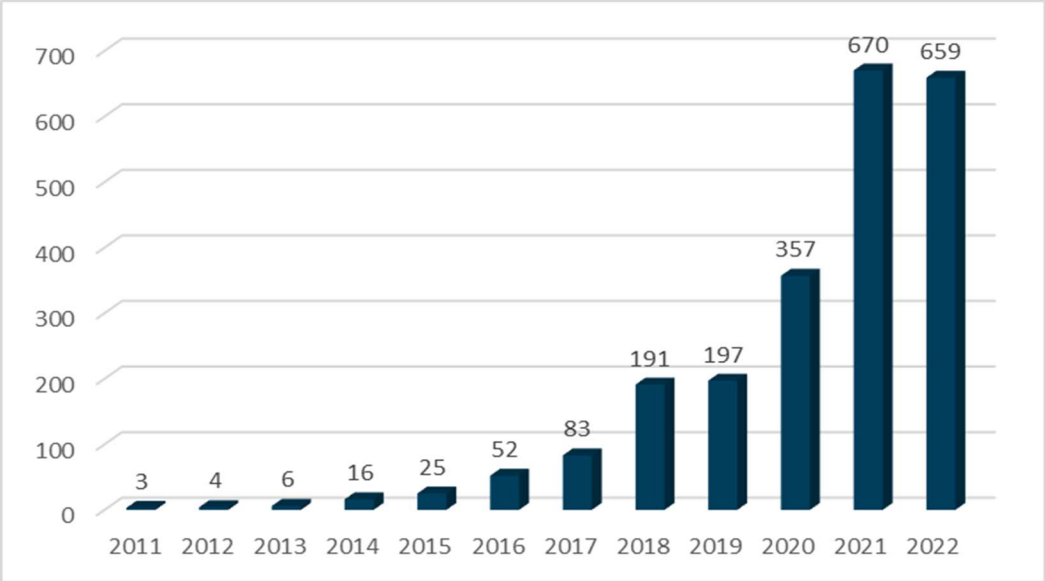


Figure 15. EV Registrations in Virginia Beach by Year

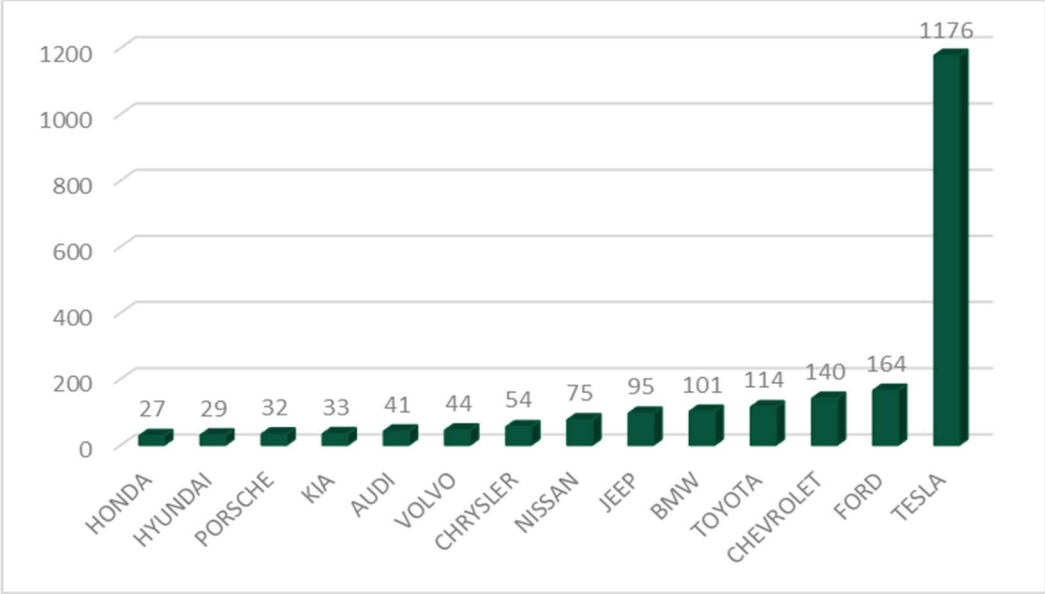


Figure 15.Total EV Registrations in Virginia Beach by Manufacturer

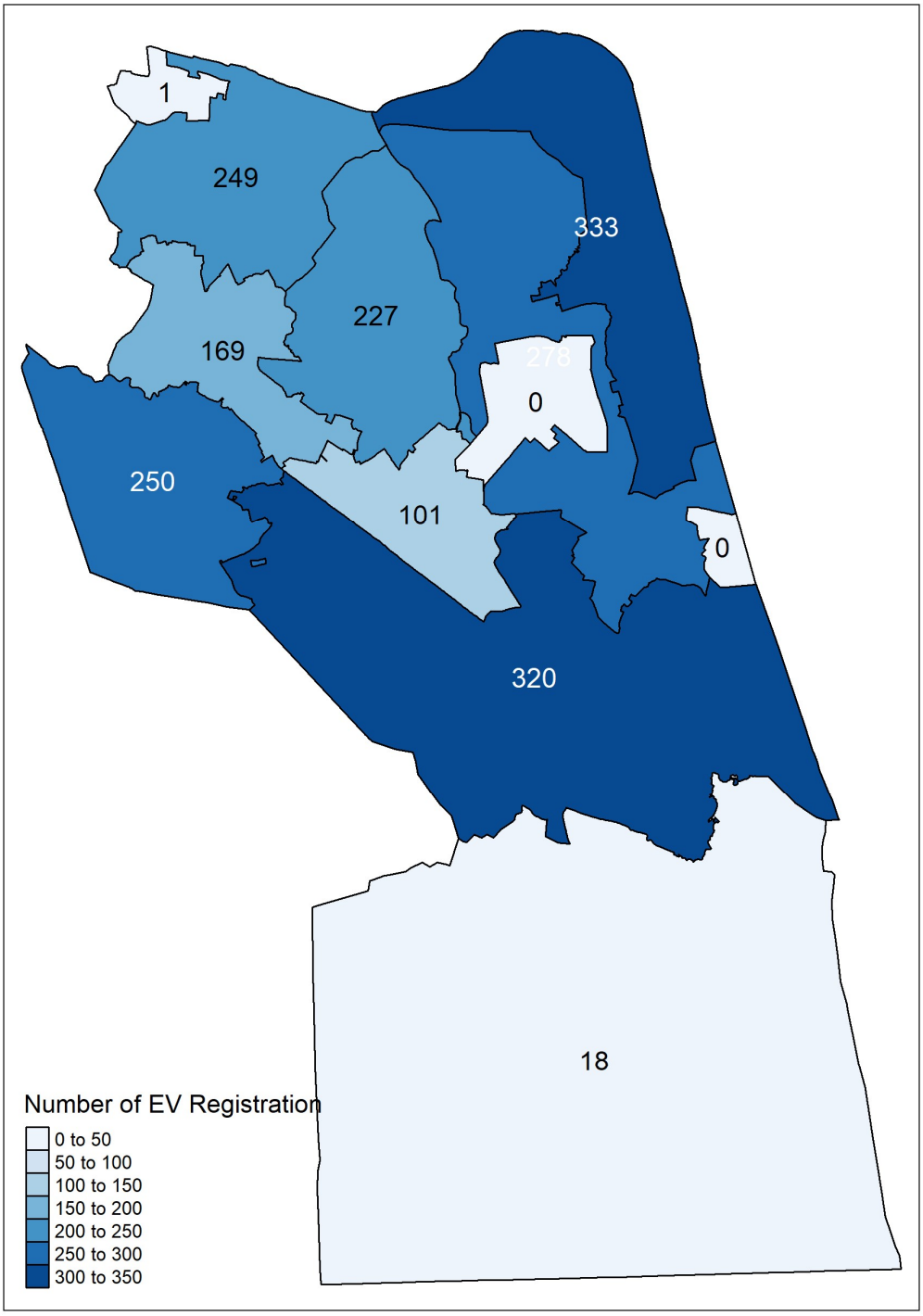


Figure 16. Total EV Registrations in Virginia Beach by Zip Code

The distribution of EVs currently registered in Virginia Beach by zip code is displayed in Figure 16, with darker coloration representing more total registrations. As shown, adoption is higher within some specific zip codes, though distribution of vehicles on a per capita basis is similar across the city. Areas with higher rates of adoption to date may be an indicator of where increased adoption of EVs will be highest in the near term.

Charger Deployment in Virginia Beach

As of 2022, there are a total of 137 plugs at 57 public charging plazas in Virginia Beach. More than half of these charging plazas are at restricted access locations, such as hotels or apartment complexes. Level 2 chargers account for about 90% of the 137 plugs, while DCFC account for the other 10%.

Figure 17 shows the locations of existing charging stations in the city, with blue dots representing Level 2 chargers and red dots representing DCFC charging stations. As shown in, Virginia Beach has an estimated 120 Level 2 charging ports and 17 DCFC charge ports.[xxxi] However, when excluding ports that

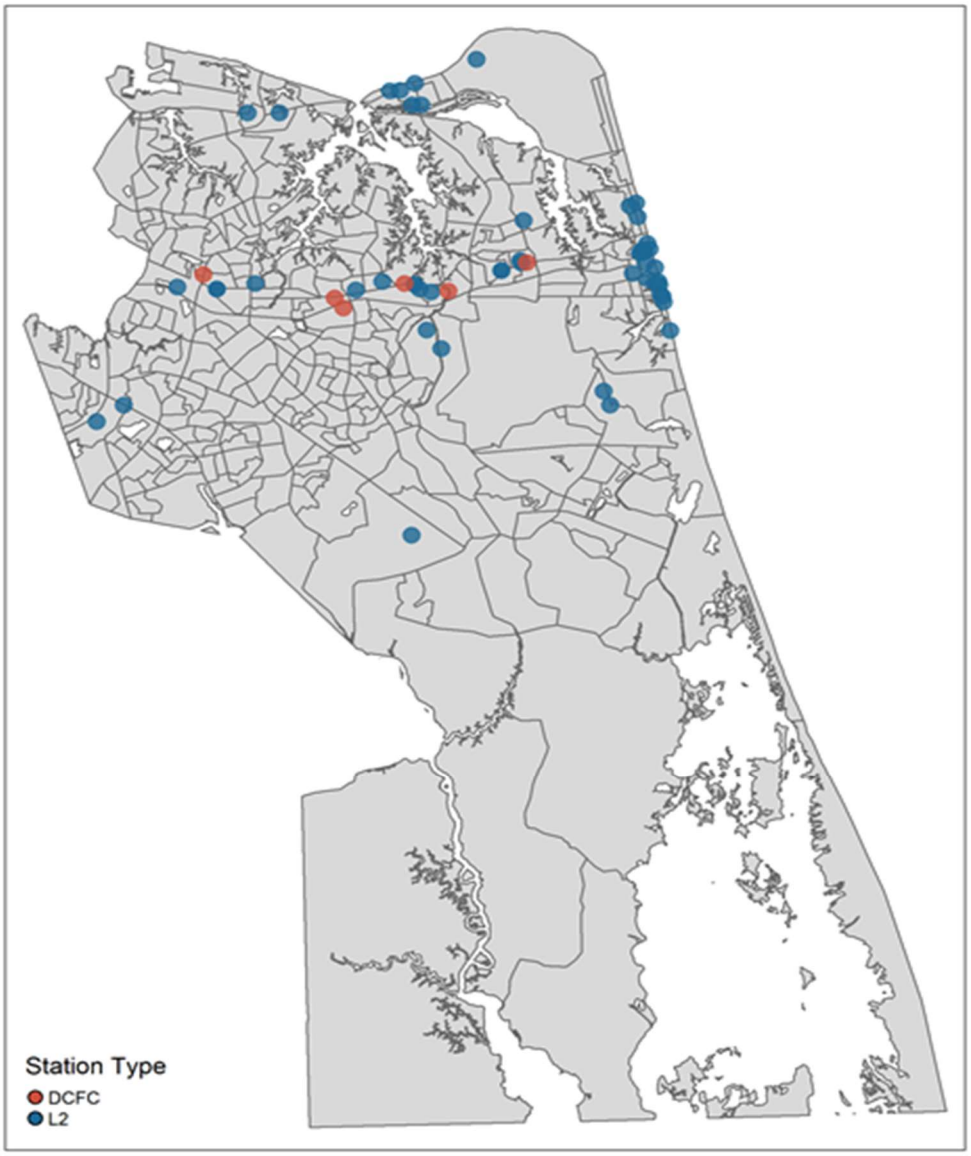


Figure 17. Level 2 (Blue) and DCFC (Red) Charging Stations in Virginia Beach

Note: Includes publicly available and restricted access plugs

are restricted—such as multi-unit dwellings, hotels, and auto dealerships—there are only 47 Level 2 charging ports and 10 DCFC ports. The most common location for ports is at retail locations followed by

hotels. The majority of charging ports installed in the city were constructed in 2018 and 2021 (Figure 18). A detailed assessment of current charging infrastructure and future EV charging needs in Virginia Beach can be found in Chapter 4.

VBCPS Student Survey

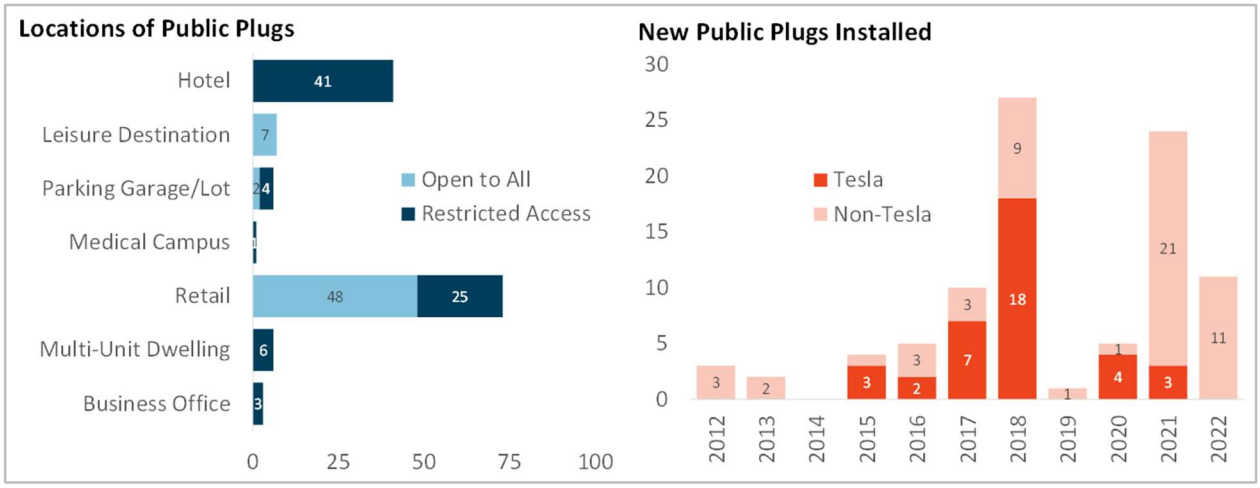


Figure 18. Location of Public Ports (Left), New Public Plugs by Year (Right)

In development of this plan, students from the VBCPS Environmental Studies Program completed a survey and inventory of all publicly available charging stations listed in the DOE AFDC and plugshare.com. Importantly, the students found that many of the stations listed in the national inventories were either not functional or were not easily found and reported as non-existent. This identifies the need more for more accurate data collection for public access, proper maintenance standards and for ordinance which requires proper signage. Actions to address these issues are identified in Chapter 6.

Greenhouse Gas Emissions from EVs

EVs serve as a critical solution towards decarbonization of the transportation sector, as a part of overall state strategies to reduce emissions across industries. EVs already provide significant reductions in GHG emissions when charged using today's conventional generation mix (Figure 19). According to the Union of Concerned Scientists, EVs charged in Dominion Energy Virginia's service territory have an equivalent greenhouse gas emissions per mile of a gasoline car that obtains an 85 miles-per-gallon (mpg) fuel economy.[xxxii] In 2020 Dominion Energy, the majority electric utility in Virginia, set a goal of Net Zero Emissions by 2050. As Dominion Energy and other utilities continue to shift their generation towards renewables in the coming years, the environmental benefits of EVs in comparison to ICE vehicles will significantly increase.

Manufacturing of an EV can be thought of as the production of the necessary raw materials, manufacturing of component parts, and the vehicle assembly process. EV production can be more

emissions-intensive than an ICE vehicle due primarily to the lithium, cobalt, and copper requirements for battery manufacturing.[xxxiii]

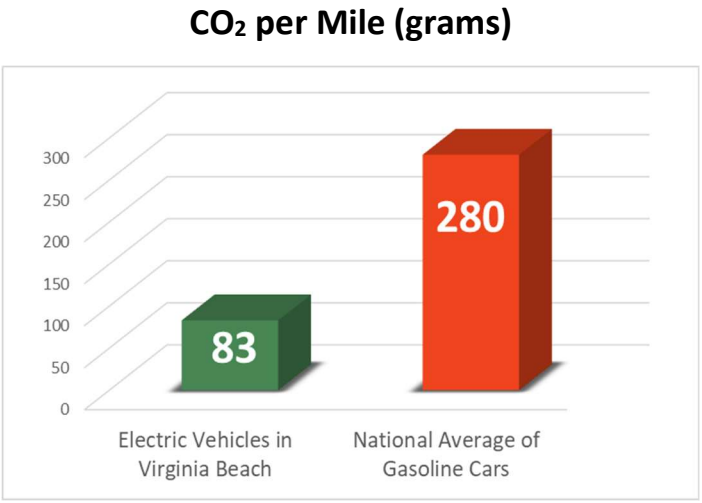


Figure 19. BEV Emissions vs. ICEV in Virginia Beach today in grams of CO_2 per mile traveled

Though EV production can be higher-emitting, total well-to-wheel emissions, or emissions over the entire lifecycle of the vehicle, are lower for EVs than gasoline vehicles. The overall lower emissions impact of EVs can be attributed to much lower impact from operational use and maintenance over the lifetime of the vehicle. In addition, as the source of electricity becomes increasingly powered by renewable energy generation, the environmental impact of EV operation decreases over time.[xxxiv] Acknowledging the environmental impact of EV production, the EV supply chain is innovating to ensure well-to-wheel EV emissions continue to decline. Improvements in manufacturing are underway to ensure that the impacts from the battery production and the end of life, including the collection, recycling, energy recovery, and disposal of the vehicle and batteries, are less emissions intensive. For example, EV battery manufacturers are pursuing new technologies, such as sodium-ion and solid-state batteries, to improve energy density, reduce costs, and rely less on limited critical materials.[xxxv] As the EV market continues to grow, the market for these innovations also matures.

EV Planning in Virginia Beach

Planning and implementation of EVs and charging infrastructure programs is still in early stages in Virginia Beach. The text below highlights these key efforts at the time of this writing.

City of Virginia Beach Comprehensive Plan

In 2018, the City of Virginia Beach published the *City of Virginia Beach Comprehensive Plan – It's Our Future: A Choice,* that outlined a vision for City planning and development, including a Master Transportation Plan and Environmental Stewardship Framework. The Master Transportation Plan identifies numerous opportunities to improve public and multi-modal transportation infrastructure and reduce vehicle miles traveled (VMT), however there was no explicit description of any actions related to EV deployment. The Environmental Stewardship Framework provides recommendations for improvements in surface and groundwater management, land conservation, expansion of green spaces and coastal management strategies – including sea level rise, flooding, and hazard mitigation practices. Transportation nor GHG reduction strategies are described in this plan.

Resort Area Mobility Plan

In June 2022, the City of Virginia Beach launched a micro-mobility project, partnering with FreeBee to provide residents and visitors to the oceanfront a new free public transportation option. As part of the City's Resort Area Mobility Plan (RAMP), the City is funding a one-year pilot project that will provide five

Tesla Model X EVs, which will operate seven days a week, from 11:00 a.m. to 11:00 p.m. The $550,000 project is funded through the Parking Enterprise Fund.

Virginia Beach is also a registrant to the Climate Mayors Electric Vehicle Purchasing Collaborative, which helps to leverage the buying power of Climate Mayors cities to reduce the costs of EVs and charging infrastructure for all U.S. cities, counties, courts, school districts, state governments, and public universities, thereby accelerating fleet transitions. However, at this time Virginia Beach has not made any commitments to participating in fleet electrification through this program, nor is it a member of the City Mayors Network.[xxxvi]

Hampton Roads Transportation Planning Organization

Virginia Beach is a voting member of the Hampton Roads Transportation (HRT) Planning Organization, which oversees the development of both the short- and long-term transportation planning of the region. (Figure 20). HRTPO plans and approves projects, strategies, and services to support economic development, increase safety and security, improve accessibility and connectivity, protect the environment, promote efficient systems management and operation, and increase the resiliency and reliability of the transportation system.

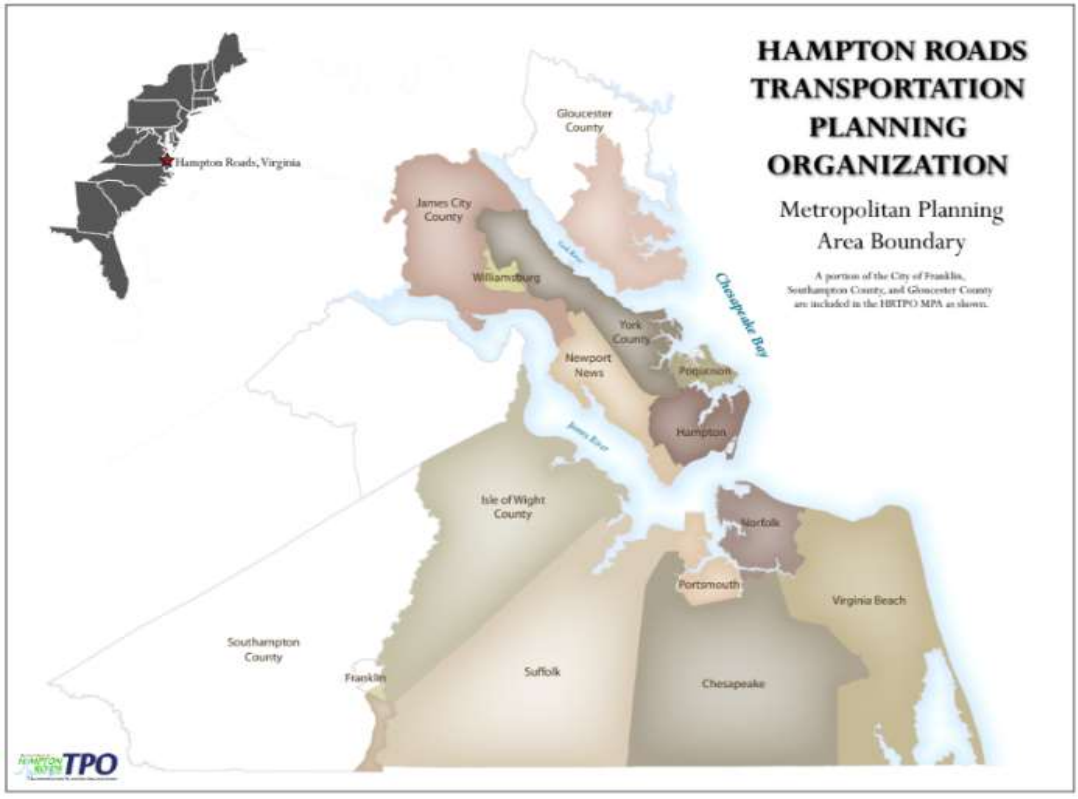


Figure 20. Hampton Roads Transportation Planning Organization Jurisdictions

In response to the announcement of the CFI community charging grant program, HRTPO has begun to develop a strategy for where electric vehicle charging infrastructure may be deployed in the region.[xxxvii] This has included a partial mapping of public DC Fast Chargers in the HRTPO planning area, and identification of disadvantaged communities.

Hampton Roads Transit

Hampton Roads Transit (HRT) provides public transit service in Virginia Beach, including bus, light rail, ferry, ridesharing and paratransit service. In addition to Virginia Beach, HRT also serves Chesapeake, Hampton, Newport News and Portsmouth. In 2021, HRT announced that it would be deploying six all-electric transit buses to service Route 20, which is a 22-block stretch that connects downtown Norfolk with the Virginia Beach Oceanfront. The buses are charged at the HRT 18th St Maintenance shop, located in Norfolk. This project was funded by the Hampton Roads Regional Transportation Program and Hampton Roads Regional Transportation Fund, which were created in 2020 through HB 1726, providing $20 million per year to develop, maintain, and improve a core regional network of transit routes in the HRTPO region, including Virginia Beach.

Military Fleet Electrification

Virginia Beach is also home to extensive military installations, including Naval Air Station (NAS) Oceana, and Joint Expeditionary Base-Little Creek (JEB-LC), employing 30,000 active personnel.[xxxviii] In 2022, the U.S. Navy and Marine Corps announced that it planned to acquire 100% zero-emission vehicles by 2035, including 100% zero-emission light-duty vehicle acquisitions by 2027.[xxxix] The Department of the Navy (DON) will also pursue electrification of tactical vehicles used in combat, in addition to its non-tactical vehicle goals. The U.S. military operates approximately 174,000 non-tactical vehicles across its five service branches. Electrification of non-tactical military vehicles in Virginia Beach will require significant charging infrastructure, which may present opportunities for collaboration between the City and local military operators for strategic deployment of charging station infrastructure.

Virginia Beach Public Schools

As of 2019, Virginia Beach City Public Schools (VBCPS) had 735 active school buses and 314 vehicles in its fleet. The VBCPS bus fleet is comprised of buses with model years from 1996 through 2013 (note that although the replacement cycle for buses is 15 years, VBCPS does have buses in service that are at 17 years old). In 2019 VBCPS published a GHG inventory, which included progress towards the introduction of EV charging stations at all schools within 15 years.

VBCPS has already made significant progress regarding electrification of school buses. There are currently eight Proterra electric school buses operating in Virginia Beach, which were funded in partnership with Dominion Energy. Dominion provided all required charging infrastructure to enable bus operation and long-term agreements for charging station operation and maintenance were established. These buses have been in operation for one full school year and VBCPS intends to replace six internal combustion engine school buses with electric busses annually moving forward. In addition, there are currently seven BEV and PHEV light-duty vehicles operating in the school vehicle fleet.

There are currently four charging locations consisting of 7 charging ports to support the electric bus fleet. The school system is currently undertaking a feasibility study of installation of additional charging infrastructure at six facilities to support electric bus deployment, and seven sites to support deployment of other electric fleet vehicles.

CHAPTER 3. COMMUNITY PERSPECTIVES ON CHARGING

This chapter summarizes results of a public engagement survey distributed through SpeakUpVB.com to gauge community perspectives on electric vehicles and charging infrastructure.

Methodology

A public engagement survey was administered to community members in Virginia Beach in January 2023. The survey was distributed in two forms, one targeted to community residents and one targeted to local businesses and was offered translated into 10 different languages. For both surveys, an invitation to participate in the survey was sent to a stakeholder email list and posted on the City's website. In total, 1,340 individuals responded to the resident survey and 40 individuals responded to the business survey. Questions in both surveys were a mix of multiple choice and open text format. Survey respondents were able to remain anonymous or could provide contact information if desired. Survey responses included in this assessment did not include any personal identifying information.

The survey was distributed through multiple channels throughout January and February 2023, including traditional media, social media and online communications. An overview of methods can be found in Figure 21.

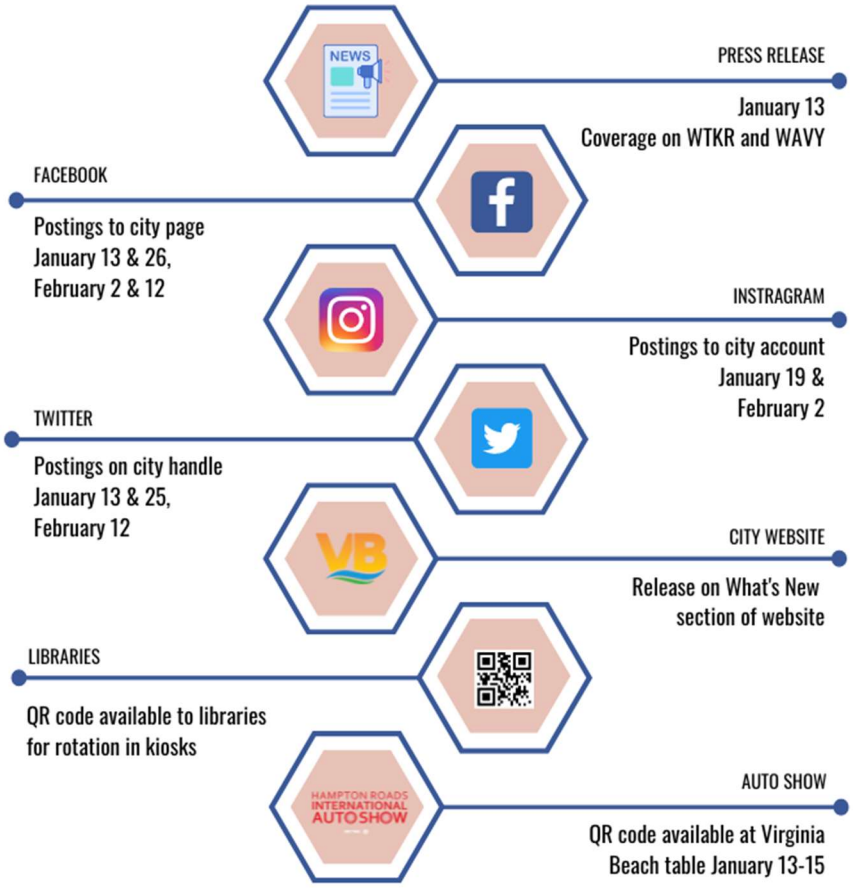


Figure 21. Survey Outreach Methods

Key questions of interest from the resident survey and the business survey are shown in the tables below (Table 8 and Table 9). The full survey questions and responses, including demographics, for the resident and business surveys are in Appendix F.

Table 8. Key Survey Questions in Resident Survey

Abridged Questions
How many miles do you drive on a typical weekday (ONE day between Monday and Friday)?
How familiar are you with EVs?
What is the PRIMARY obstacle stopping you from buying an EV?
If you owned an EV, where would you prefer to charge it (aside from your place of residence and/or workplace)?
Are you aware of incentives to help reduce the cost of purchasing an EV and/or installing EV charging equipment at your home?

Table 9. Key Survey Questions in Business Survey

Abridged Questions
Does your business have parking for employees and/or customers?
On average, how many miles does a single business vehicle travel per day?
How familiar are you with EVs?
Does your business currently have an EV charger available for employees, customers, and/or the general public?
Would your business be interested in installing an EV charger for employees and/or customers?
What is the primary barrier to converting your fleet to EVs?
Are you aware of incentives to help reduce the cost of purchasing an EV and/or installing EV charging equipment at your business?

Survey Results

The surveys (resident and business) were used to understand how residents and businesses currently operate their vehicles, knowledge of and interest in EVs, and preferences as to where charging stations might be installed in the future. Note the resident survey was not a representative sample of the Virginia Beach population. For example, 99% of respondents own a car, while 30% currently own an EV.

Resident Survey

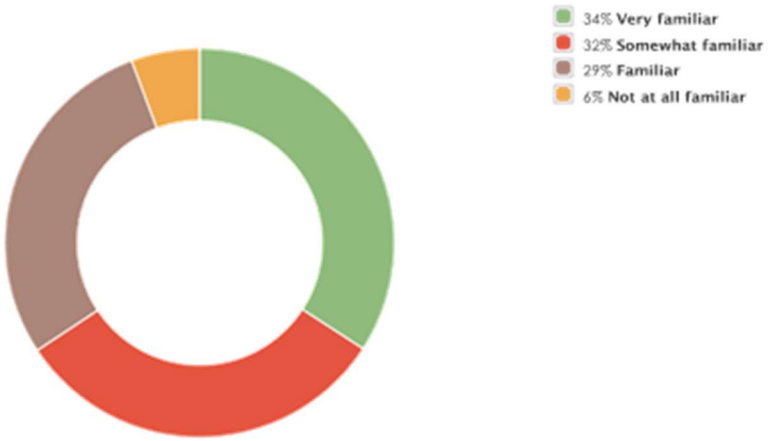
For the resident survey, responses were disaggregated by several categorical variables**.** Table 10 provides summary statistics of survey respondents. As shown, survey respondents were not a representative sample of residents in Virginia Beach. For example, 99% of respondents currently own a car. These descriptive qualities are used below to segment responses and generate useful insights.

Table 10. Results of Descriptive Questions

Category	Summary
Neighborhood location	93% of respondents live in Virginia Beach.
Type of home	82% live in a single-family home and 15% live in an apartment or condominium. 3% of respondents selected "other", with majority of the write in's being "townhomes".
Home ownership	84% own and 16% rent.
Parking type	44% have a private garage at a single-family home, 40% have a driveway at a single-family home, 9% park in a community parking area detached from residence, 4% park in a community parking area in or under their building.
Current electric vehicle ownership	30% currently own an electric vehicle and 70% do not.
Future electric vehicle ownership	52% plan to own an electric vehicle in the next five years and 48% do not.
Car ownership	99% own a car and 1% does not.
Typical miles driven per weekday	20% drive less than 10 miles per day and 80% drive more than 10 miles per day. *See Appendix F for a breakdown of responses.*
Primary workplace location	71% work in Virginia Beach and 29% work outside the city limits. 59% of respondents drive to work every day while 18% do not at all. *See Appendix F for a breakdown of responses.*

Respondents were asked how familiar they are with electric vehicles. As shown in Figure 22, most respondents are very to somewhat familiar (66%) with electric vehicles. There were few respondents who felt not at all familiar (6%) with electric vehicles.

Figure 22. Survey Question: How familiar are you with EVs?



Similarly, most of the respondents are aware of incentives related to reducing the costs of electric vehicles and charging infrastructure. Figure 23 showcases that 70% of respondents are aware of incentives to help reduce the cost of an electric vehicle. There are fewer respondents that are aware of incentives to help reduce the costs of charging equipment (57%), as shown in Figure 24.

Figure 23. Survey Question: Are you aware of incentives to help reduce the cost of purchasing an EV?

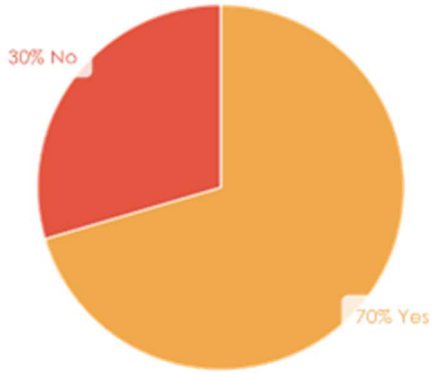
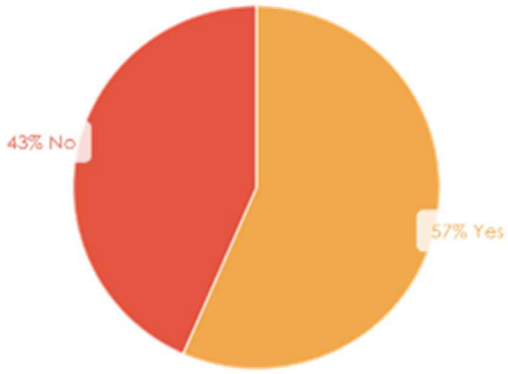
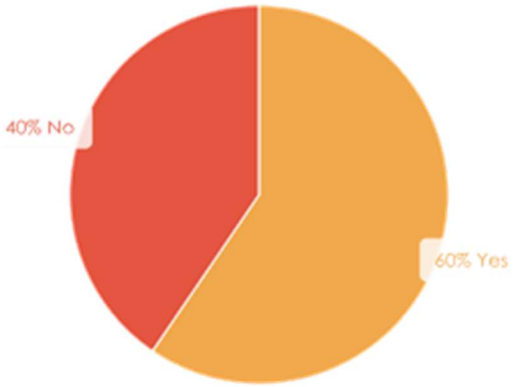


Figure 24. Survey Question: Are you aware of incentives to help reduce the cost of purchasing and/or installing EV charging equipment at your home?



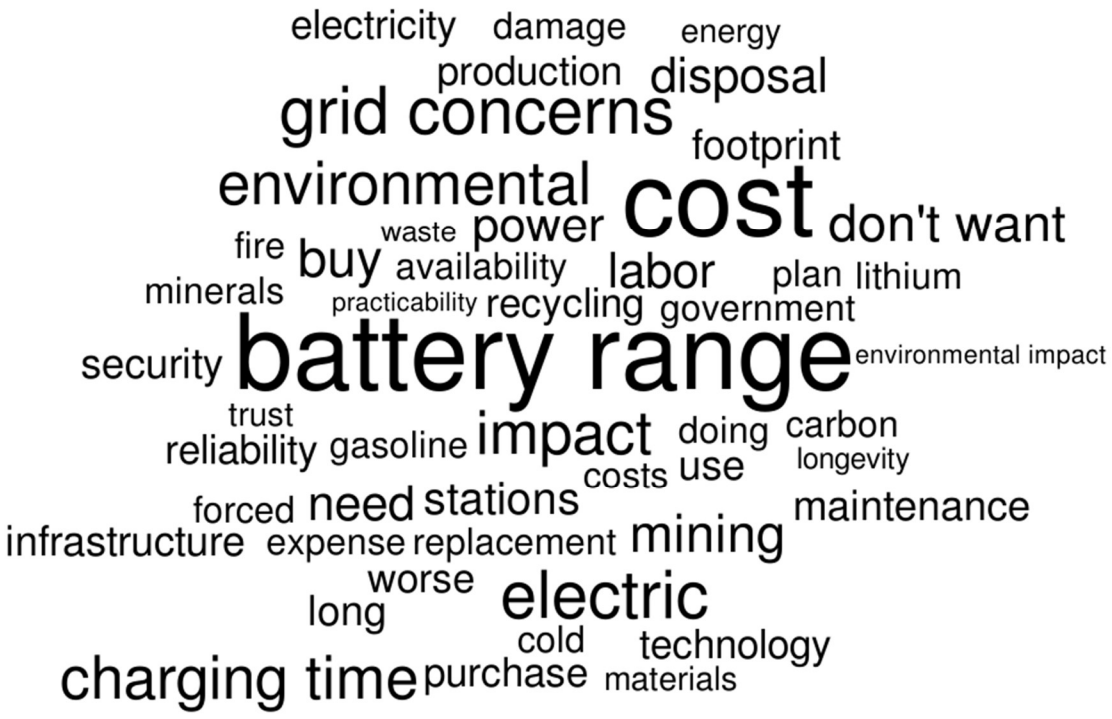
When respondents were asked if they would buy an electric vehicle if it were the same price as a gasoline vehicle, 60% would, while 40% would not. These results are demonstrated in Figure 25. Respondents were then asked what the PRIMARY obstacle is stopping them from buying an electric vehicle. The top answers included lack of access to charging stations (24%), concerns about vehicle range (20%), cost of an EV (20%), and other (21%). Few respondents selected vehicle maintenance (5%), do not like available vehicles (5%), and vehicle safety (4%). None of the respondents were unsure of where to buy an electric vehicle.

Figure 25. Survey Question: Would you buy an EV if it were the same price as a gasoline vehicle?



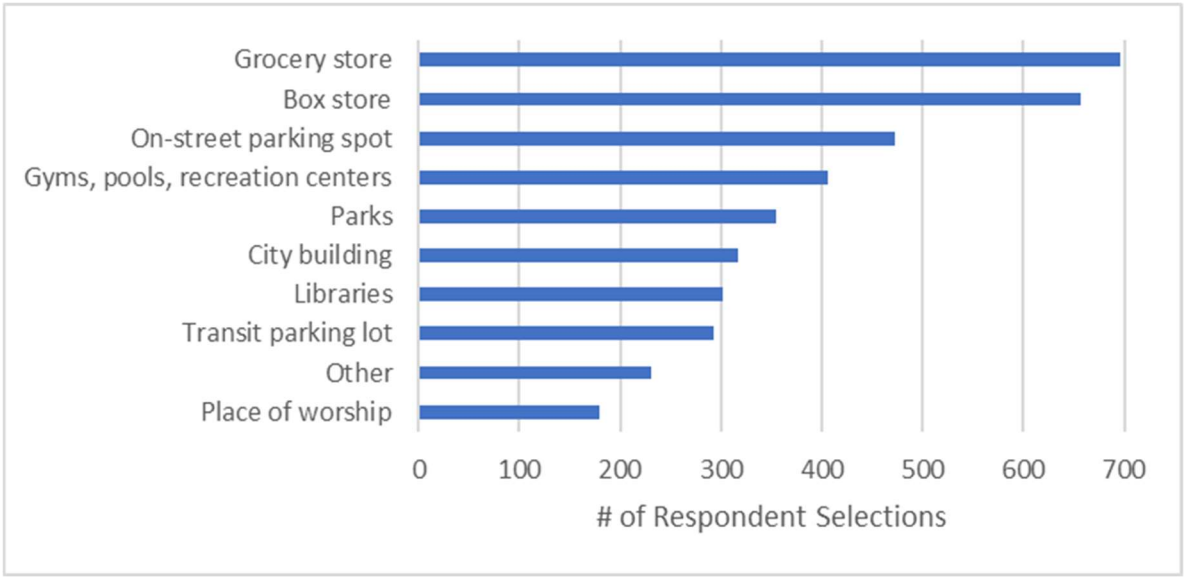
A summary of the "other" responses is depicted in the word cloud below (Figure 26). Responses included concerns about the impacts to the grid, availability of electric vehicles, battery cost, the impact on the environment, recycling of parts, towing capacity, battery fires, and the security of electric vehicles. Some respondents already have an electric vehicle or simply do not want one because they prefer gasoline or are not in need of a new car at the moment.

Figure 26. Primary obstacles to buying an electric vehicle.



Finally, respondents were asked to select the top three places they would prefer to charge their electric vehicle at, aside from their residence and/or their workplace. As shown in Figure 27, the top three places selected by respondents, listed by most preferred to least preferred, include 1) the grocery store, 2) box stores (Walmart, Best Buy, Target, etc.), and 3) on-street parking spot. Place of worship was ranked the least preferrable.

Figure 27. Survey Question: If you owned an EV, where would you prefer to charge it (aside from your place of residence and/or workplace)?



Business Survey

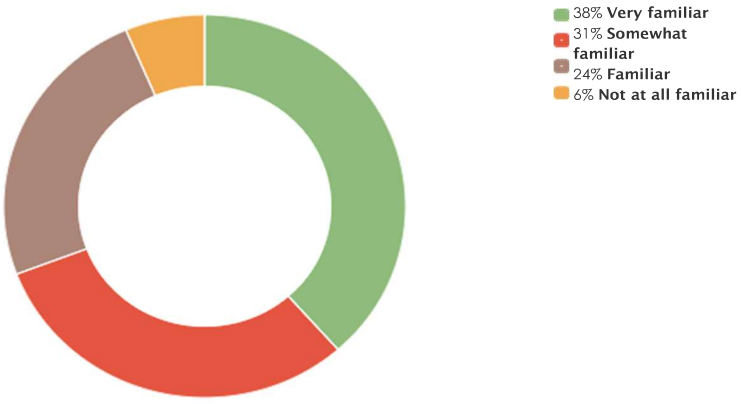
For the business survey, responses were disaggregated by other categorical variables.
Table 11 provides summary statistics of survey respondents. These descriptive qualities are used below to segment responses and generate useful insights.

Table 11. Results of Descriptive Question Response Summary

Category	Summary
Business location	66% of respondents' businesses are located in Virginia Beach, 34% are not.
Employment	48% of respondents employ less than 10 employees and 17% employ more than 250 employees. *See Appendix F for a breakdown of responses.*
Dedicated parking	79% of respondents have dedicated parking for employees and 21% do not. 61% of businesses have dedicated parking for customers and 39% do not. 43% of respondents have customers who utilize parking for 30-90 minutes. *See Appendix F for a breakdown of responses.*
Vehicle fleet operation	81% of respondents do not operate a vehicle fleet and 19% do. 69% of respondents with a vehicle fleet operate more than 30 vehicles.
Current electric vehicles	87% of respondents do not own or operate electric vehicles. 13% of respondents do.
Typical miles driven per day	56% of the business vehicles drive more than 40 miles per day and 6% less than 30 miles per day. *See Appendix F for a breakdown of responses.*
Current EV charger availability	28% of respondents have employees who drive an EV, yet only 7% have EV chargers available for employee use. Majority (>92%) of respondents do not have EV chargers available for customer or the general public's use.
Future electric vehicle ownership	24% would be interested in converting their fleet to electric vehicles and 76% are not.
Future electric vehicle charging infrastructure	32% of respondents would be interested in installing an electric vehicle charger for public use, including customers, employees, and other electric vehicle drivers.

Respondents of the business survey were also asked how familiar they are with electric vehicles. The responses are near evenly split between very familiar (38%), somewhat familiar (31%), and familiar (24%). Only 6% of respondents are not at all familiar with electric vehicles. The responses are shown in Figure 28.

Figure 28. How familiar are you with EVs?



As shown in Figure 29 and Figure 30, when asked if the respondent is aware of incentives for purchasing EVs for their business, 60% answered yes. 51% of the respondents are aware of incentives for purchasing and/or installing EV charging equipment at their business, shown below in Figure 30.

Figure 29. Survey Question: Are you aware of incentives for purchasing an EV for your business?

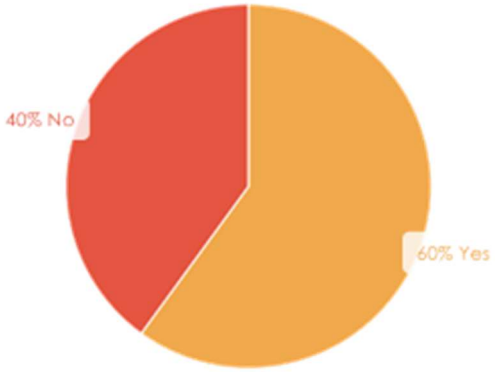
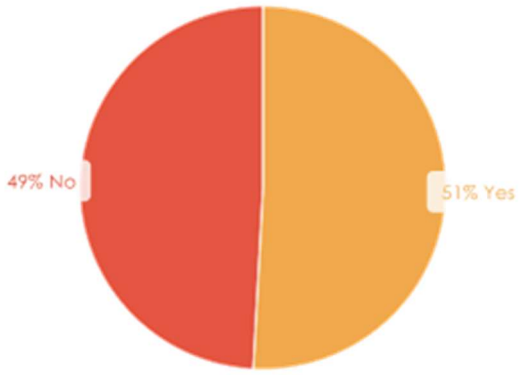


Figure 30. Survey Question: Are you aware of incentives for purchasing and/or installing EV charging equipment at your place of business?



As noted in Table 11, majority of respondents are not interested in converting their fleet to electric vehicles (76%) or installing an electric vehicle charger for public use (68%). When asked, the PRIMARY barrier to converting their fleet was identified to be electric vehicles are too expensive (35%). 27% of respondents selected other, including concerns about charging time, range, and costly repairs. 18% are unsure that an EV can meet operational requirements, 12% are concerned about the access to chargers, 5% are concerned about vehicle maintenance, and 3% feel that employees would be hesitant to use an electric vehicle. Similarly, 35% of respondents also selected too expensive when asked to identify the PRIMARY barrier to installing a charging station at their place of business. Other was the next most selected by 29% of respondents, which included concerns about the space required. 10% are concerned about equipment maintenance, 10% don't know how to get one installed, 10% said that it is a decision of the property manager, and 6% of respondents feel that customers and/or employees will not use the charging station.

At the end of both surveys, respondents were presented with the opportunity to expand on any other information in regard to electric vehicles and/or charging stations to assist with City planning efforts. Listed below are some of the key themes that emerged from responses.

- There is a need for a better selection and pricing of EVs as well as a mix of charging options.
- Investment in electric vehicles and charging infrastructure should not come from taxpayer dollars.
- There is concern that government subsidies will lead to higher taxes and utility bills.
- Charging stations should be paid for by private companies, similar to gas stations, not the City.
- Installing charging stations require permission from the landlord.
- There are concerns about how charging will impact electric bills and the reliability of the grid.
- Charging stations need to be accessible to all. Locations mentioned included:
    - A. Near tourist spots
    - B. Attractions
    - C. Close to the highway
    - D. Schools
    - E. City parking garages

CHAPTER 4. CURRENT AND FUTURE CHARGING NEEDS

This chapter describes the current and future of charging needs for residents of Virginia Beach, including additional requirements of tourist populations. Key Assessment Findings includes:

- **Insufficient DCFC plugs today**. NREL's EVI-Pro Lite tool suggests a need for 38 public Level 2, 18 public DCFC, and 44 workplace plugs to meet the demand of today's electric vehicle population. After removing restricted access plugs (e.g., plugs restricted to hotel patrons), Virginia Beach has sufficient Level 2 plugs (47 today) but insufficient DCFC plugs (only 10 unrestricted plugs today). No data exist on the number of workplace plugs currently in the city.
- **Gap in 2025**. By 2025, in the Current Pathway Virginia Beach needs an additional 38 Level 2 plugs and 28 DCFC plugs beyond what exists city today.
- **Gap in 2040.** By 2040, Virginia Beach needs up to 4,300 Level 2 plugs and 1,800 DCFC plugs based on the Current Pathway.

Current Charging Infrastructure

Virginia Beach has a total of 137 plugs at 57 public charging plazas. More than half of these charging plazas are at restricted access locations, such as hotels or apartment complexes. Level 2 chargers account for about 90% of the 137 plugs, while DCFC account for the other 10%.

This level of charging is slightly below recommended charging deployment. For Virginia Beach, a city with an electric vehicle population of 2,267 vehicles, the Department of Energy recommends a total of 154 public L2 plugs and 34 DCFC plugs.[3] Note these recommended values do not include the sizeable tourism population (see Influence of Tourist Population section below). The U.S. averages 305 chargers per million population, while Virginia Beach is at 300 chargers per million.[xl]

As shown in Figure 17 (Chapter 2), public charging stations are concentrated in a few key locations of the city – namely along I-264 and in the Oceanfront Resort Area. Of the 57 charging plazas in Virginia Beach, 28 are networked chargers—meaning they connect to the cloud and transmit data to a centralized server. The other 29 are "dumb" chargers, many of which are restricted to residents of a multifamily dwellings (MUDs), customers of a store, or guests of hotels. Tesla is the most common electric vehicle service provider (EVSP) for public chargers, accounting for 16 sites and 46 plugs.

Figure 31 summarizes information about public stations in Virginia Beach as of 2023. The chargers are distributed across location types, including retail, automotive dealerships, convenience stores and hotels (top left panel). Charging deployment grew between 2012 and 2018 but declined during the COVID-19 pandemic (top right panel). The majority of charging plazas have one or two plugs (bottom panel). Appendix B provides further details about Virginia Beach's charging stations.

[3] According to DOE's EVI-Pro Lite tool: https://afdc.energy.gov/evi-pro-lite

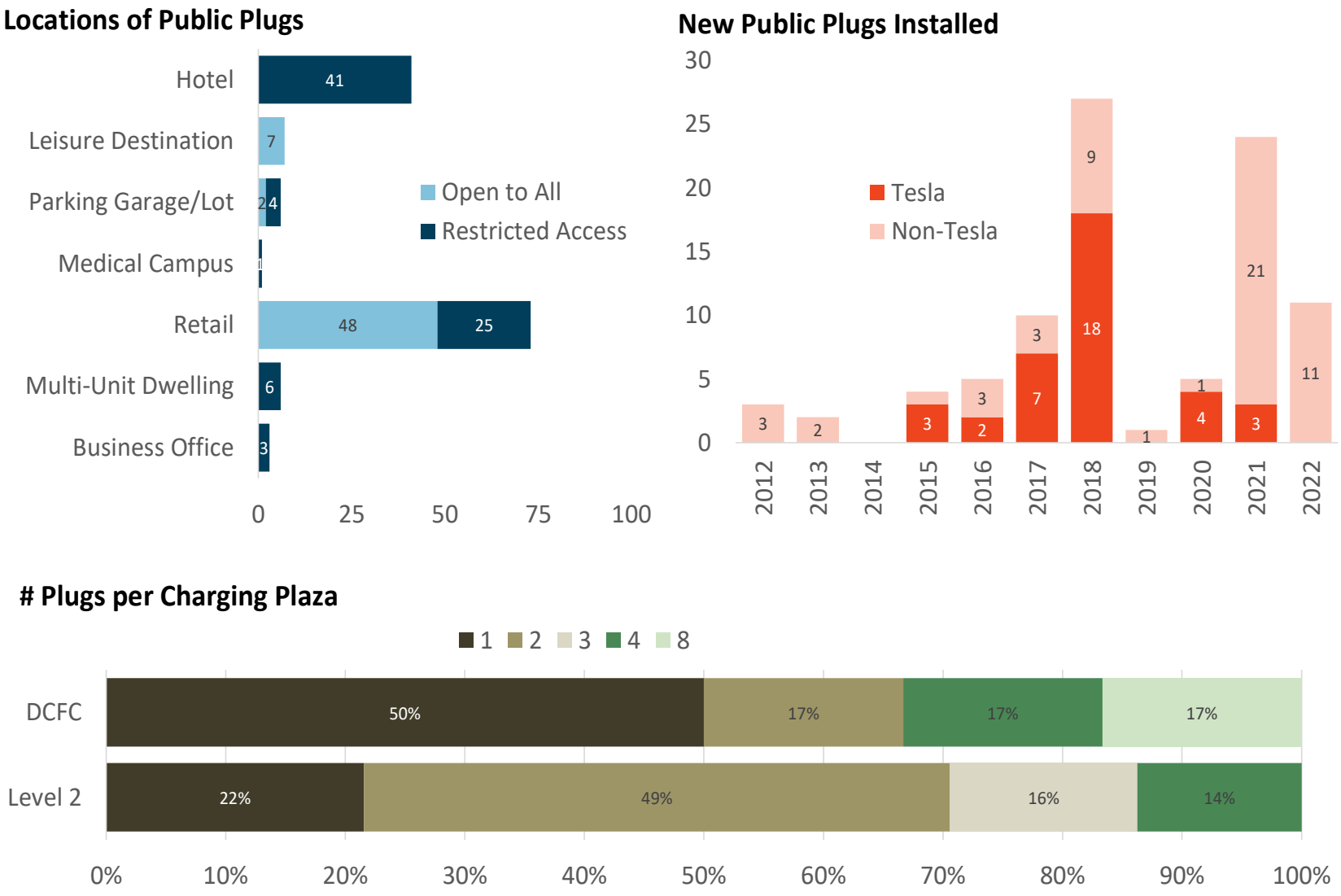


Figure 31. Location of Public Ports (Top, Left), New Public Plugs by Year (Top, Right), # Plugs per Charging Plaza (Bottom)

Role of Charger Utilization

Table 12 shows utilization statistics for chargers based on national averages from over 30,000 networked chargers tracked through the DOE EV Watts initiative.[1] This dataset is the largest publicly available dataset in the county on charger utilization. The table provides several insights relevant to Virginia Beach's charging deployment:

- **Session per Day.** Today, both Level 2 and DCFC chargers tend to be used less than once per day, on average. Charging utilization directly corresponds to the financial viability of a charging station. As electric vehicle populations rise, charging utilization typically increases.
- **Energy use per Plug per Session.** Fleet chargers have the highest energy use per plug per session. These chargers include transit buses which have mostly high-powered charging.
- **Charging Time.** The charging time for vehicles ranges from 1.1 to 4.7 hours, on average, with the longest charge time being at mobility hubs.
- **Plugged in Time.** Plugged in time—the hours a vehicle is connected to a charger— is 2 to 5 times the charging time, suggesting vehicles are commonly plugged in but not charging.

Table 12. National Statistics on Charging Station Utilization

Plug Type	Virginia Beach Plugs (# Plugs)	National Statistics					
		Sample Size (# Plugs)	Sessions/ Port/Day	Energy (kWh)/ Plug / Session	Charging Time (Hr)/ Plug / Session	Plugged-In Time (Hr)/ Plug /Session	Charging Time / Plugged-in Time
By Type of Venue							
Single Family Residential	Unknown	9,052	0.25	12.6	2.4	11.7	21%
Business Office	3	5,780	0.21	15.7	2.1	4.3	50%
Multi-Unit Dwelling	6	5,143	0.19	19.0	3.7	9.8	37%
Retail	73	2,966	0.28	15.3	1.1	2.0	55%
Medical Campus	1	1,999	0.28	12.4	2.5	4.7	53%
Parking Lot	6	1,783	0.27	15.5	2.5	8.1	31%
Fleet	Unknown	1,522	0.23	40.1	2.9	15.2	19%
Leisure Destination	7	968	0.24	12.2	2.0	3.3	59%
Hotel	41	630	0.17	16.4	2.4	4.1	58%
By Power Level							
L2 Port	120	29,246	0.22	13.2	2.7	9.1	30%
DCFC Port	17	3,269	0.34	25.9	0.9	1.7	56%

Influence of Housing Stock

The ability to charge a vehicle overnight at home increases the convenience and lowers the cost of ownership for most electric vehicles relative to gasoline vehicles. To charge at home, a driver needs access to an onsite garage and/or driveway with a nearby outlet. Survey data of early electric vehicle drivers show the majority (about 85%) live in detached, single family homes. Additionally, about 80% of electric vehicle drivers own their residence.[xli]

Renters and Charging

In 2020, Virginia passed right-to-charge legislation, requiring that homeowner associations must allow a resident to install electric vehicle chargers on property owned by the resident, if certain conditions are met. As of 2021, 35% of homes in Virginia Beach are renter occupied.

How conducive is Virginia Beach's housing stock to electric vehicle ownership? Table 13 summarizes the fraction of residents by building type in Virginia Beach and the United States.[xlii] The table highlights that residents of Virginia Beach are slightly more likely than the national average to live in MUDs and attached homes – 45% compared to 39%. Additionally, the prevalence of 1-unit, attached homes is 19% in Virginia Beach compared to only 6% nationally. The large number of attached homes and multi-unit dwellings in Virginia Beach is high, in part, due to the significant military population in the city.

Table 13. Housing Distribution Nationally and in Virginia Beach

Type of Housing	U.S.	Virginia Beach
Total housing units	138,432,751	185,735
1-unit, detached	61.6%	54.6%
1-unit, attached	6.0%	19.2%
MUD, 2 units	3.5%	1.4%
MUD, 3 or 4 units	4.3%	4.8%
MUD, 5 to 9 units	4.6%	7.4%
MUD, 10 to 19 units	4.3%	4.1%
MUD, 20 or more units	9.7%	7.3%
Mobile Home	5.9%	1.1%
Total MUDs and 1-unit, attached	**39.3%**	**45.4%**

As electric vehicles become mainstream, greater fractions of electric vehicle owners will live in MUDs. This suggests a need to build out charging solutions tailored to this sizeable segment of the population. A variety of tools are now available to help renters, building managers, home-owner associations, and local government staff with finding the right solutions for MUD dwellers.[4]

[4] For example, see https://vci-mud.org/

Pathways of Future Electric Vehicle Ownership

This report uses two Pathways, outlined in Table 14, to describe potential trajectories of future electric vehicle growth in Virginia Beach. The objective in developing these Pathways is to bound potential electric vehicle adoption within Virginia Beach to enable subsequent analysis and planning of charging infrastructure needs, costs, and deployment schedule.

Figure 32 shows the growth of electric, light-duty vehicle adoption in Virginia Beach in the Current and Alternative Pathways. The figures use a stock turnover model to capture vehicle replacements and assumes a 0.5% annual growth in total new vehicle sales. More information on assumptions are available in Appendix C.

The figure demonstrates the relationship between vehicle sales (Left) and vehicle stock (Center and Right). Even in the Current Pathway in which 100% of new light-duty sales are electric by 2035 (Left), the stock of electric vehicles stays below 50% through 2040, since vehicle stock lags new vehicle sales. In the Alternative Pathway, electric vehicle stock reaches 11% of the vehicle stock by 2035 and 20% by 2040.

Clean Cars Virginia

Clean Cars Virginia requires automakers to deliver increasing fractions of light-duty, zero emissions vehicles to Virginia—starting at 20% to 30% in Model Year 2026, hitting 49% to 70% in 2030, and reaching 100% by 2035. Flexibilities within the program allow automakers to adjust vehicle deliveries within these bands. While the Commonwealth adopted Clean Cars Virginia in 2021, there is uncertainty whether the Virginia Legislature will repeal the program prior to 2026. However, all efforts in 2022 and 2023 to repeal the legislation failed. More information on Clean Cars Virginia is available through the Virginia Department of Environmental Quality (VDEQ).

Table 14. Description of Electric Vehicle Trajectory Pathways

Scenario	Description	Why Pathway is Feasible
Current Pathway	Virginia continues to implement Clean Cars Virginia regulation adopted in 2021, putting Virginia Beach on a path to no new internal combustion engine vehicle sales by 2035. This analysis assumes Virginia Beach exactly follows the Commonwealth's trajectory of electric vehicle ownership.	HB 1965 signed into law March 2021, establishing Clean Cars Virginia. The law must be repealed by the legislature to impact forecast.
Alternative Pathway	Virginia repeals Clean Cars Virginia and state level electric vehicle adoption follows national forecasts, reaching 35% of new vehicle sales by 2035 and 46% by 2040.	The current governor does not support Clean Cars Virginia. Based on recent investments by the auto industry, even in the absence of Clean Cars Virginia, battery costs will continue to decline and electric vehicle availability will increase.

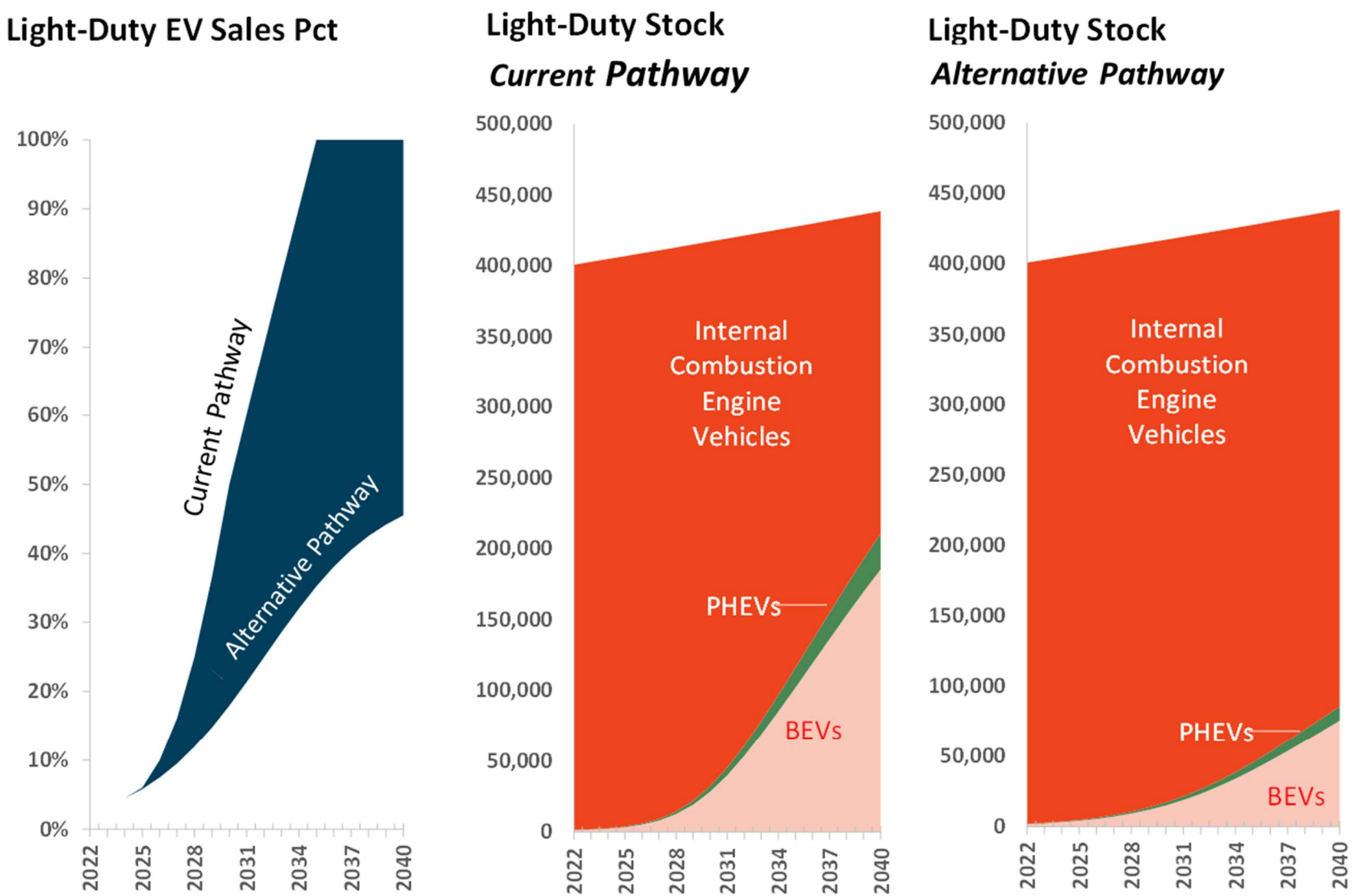


Figure 32. Projected Light-Duty Sales (Left) and Stock (Center, Right)

Future Charging Needs

This analysis estimates the number of public and workplace chargers needed in Virginia Beach through 2040 to support the vehicle populations in the Current (expected) and Alternative Pathways shown above. Inputs and assumptions in the EVI-Pro Lite tool are in Appendix C and detailed charger projections can be found in Appendix D.

Number of Plugs

Figure 33 shows the estimated charging needs in Virginia Beach for the Current and Alternative Pathways from today until 2040. Workplace Level 2 chargers have the highest need across the two Pathways, followed by public Level 2 then DCFC.

This analysis provides several insights:

- **Insufficient DCFC plugs today**. NREL's EVI-Pro Lite tool suggests a need for 38 public Level 2, 18 public DCFC, and 44 workplace plugs to meet the demand of today's electric vehicle population. After removing restricted access plugs (e.g., plugs restricted to hotel patrons), Virginia Beach has sufficient Level 2 plugs (47 today) but insufficient DCFC plugs (only 10 unrestricted plugs today). No data exist on the number of workplace plugs currently in the city.
- **Gap in 2025**. By 2025, in the Current Pathway Virginia Beach needs an additional 38 Level 2 plugs and 28 DCFC plugs beyond what exists in the city today. This equates to roughly 10-15 new charging plazas.
- **Gap in 2040.** By 2040, Virginia Beach needs 4,300 Level 2 plugs and 1,800 DCFC plugs, in the Current Pathway

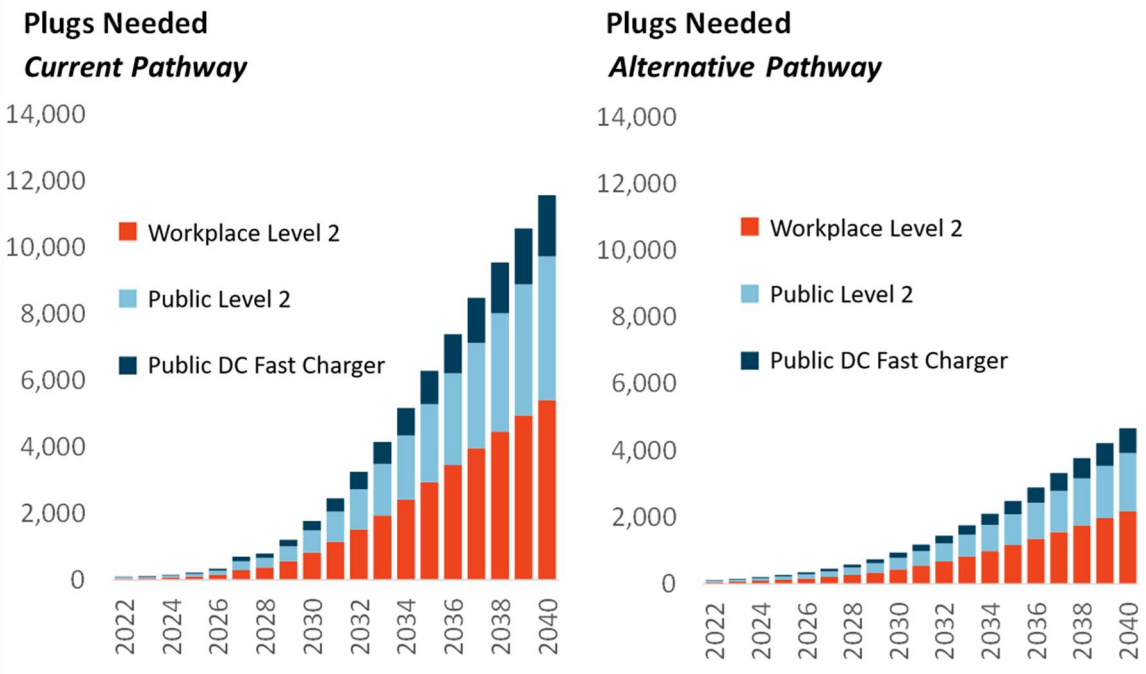


Figure 33. Needed Number of Plugs to Support Electric Vehicles in Two Pathways

Influence of Tourist Population

Tourism and recreation are primary drivers of the economy of Virginia Beach, employing over 30,000 residents and contributing more than $2 billion to the local economy in 2021.[xliii] There were an estimated 3.7 million total adult tourist trips taken to Virginia Beach in 2021 for both business and leisure, and the city had over 11.5 million total visitors. The majority of visitors traveled by car, averaging a distance of 221.8 miles; approximately 50% of visitors travel to the city from a distance between 100-250 miles.

In the future, the number of tourists who drive personal electric vehicles or who rent electric vehicles upon arrival will likely rise at a rate commensurate with the rest of Virginia Beach. This will require the installation of additional charging infrastructure at tourist destinations, like hotels and oceanfront parking lots, as well as increased deployment of residential chargers at rental homes and other vacation properties.

The number of tourists in Virginia Beach varies greatly throughout the year, with the majority of adult visitors traveling to the city in June and July. The peak average daily tourist population in Virginia Beach is in July, with an average of 20,359 visitors per day. There are 146 hotel properties in Virginia Beach, accounting for 11,079 available hotel rooms. The trend in hotel occupancy follows a similar pattern to

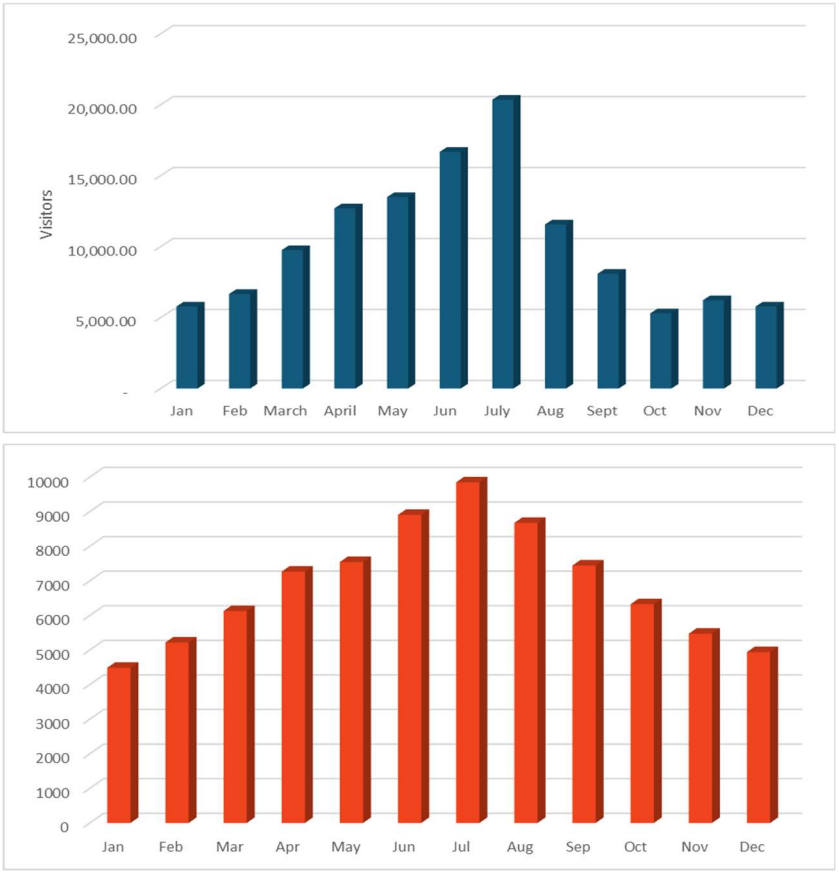


Figure 34. Estimated Daily Visitors (top) and Total Hotel Occupancy (bottom) by Month, 2021

that of overall tourism, with peak occupancy peaking in July, with at occupancy rate of 88.9%, or 9,849 rooms (Figure 34).

Upper Bound Projections for Tourists

The following projections provide an upper bound of potential charging requirements to support tourist populations in Virginia Beach. Actual charging demand of the tourist population in Virginia Beach will likely be lower than the scenarios presented below given that infrastructure is typically built for average (not peak) demand.

Figure 35 shows the upper bound of additional EV chargers that will be required at hotels in Virginia Beach through 2040, assuming tourist electrification mimics the Current Pathway trajectory presented in Figure 32 above. This estimate uses the aggressive assumption that all tourists who drive electric vehicles have access to a dedicated parking space with a Level 2 charger. This is in line with the national average of 1.24 parking spaces per hotel room.[xliv] This estimate is an upper bound since not all tourists will require Level 2 charging of their vehicle; many visitors may require only Level 1 charging, will utilize public charging sites, or may not require vehicle charging at all during their visit. For comparison, hotels in Virginia Beach have 41 Level 2 charging ports today; the upper bound of Level 2 EV chargers required at hotels in Virginia Beach in 2040 is 1,193.

The geographic distribution of hotels in Virginia Beach is shown in Figure 36. Hotels are primarily concentrated in the resort area. While many of the chargers deployed at these hotels in the future may be reserved for hotel guests and staff, it can also be expected that hotels providing parking to non-hotel guests will also have public-facing chargers available.

Taking into account the hotel patrons that are projected to be provided with EV charging at hotel parking facilities, this leaves an estimated total adult visitor population of 10,510 that will require publicly accessible charging or will require residential charging capabilities at rental properties.

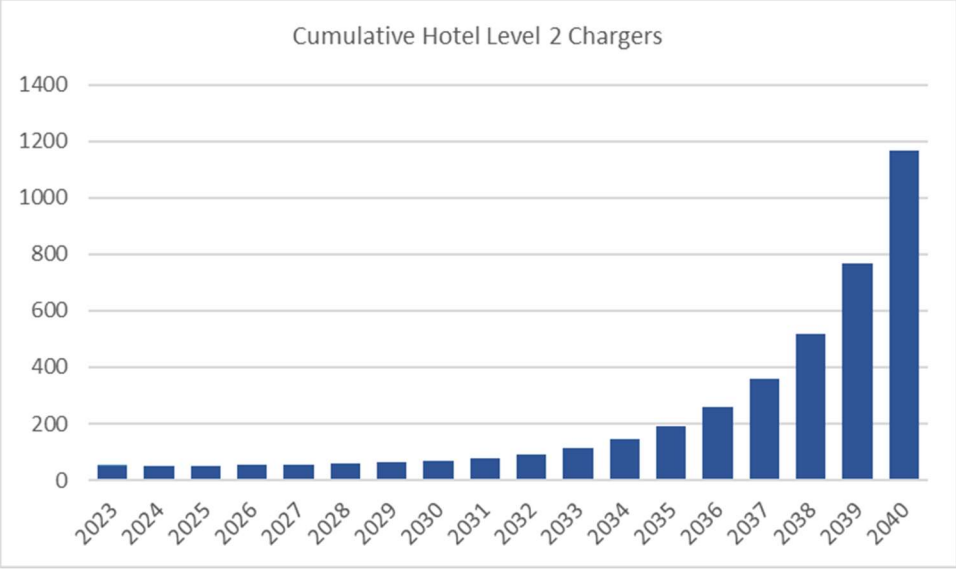


Figure 35. Upper Bound Cumulative Level 2 Chargers at Hotels in Virginia Beach though 2040

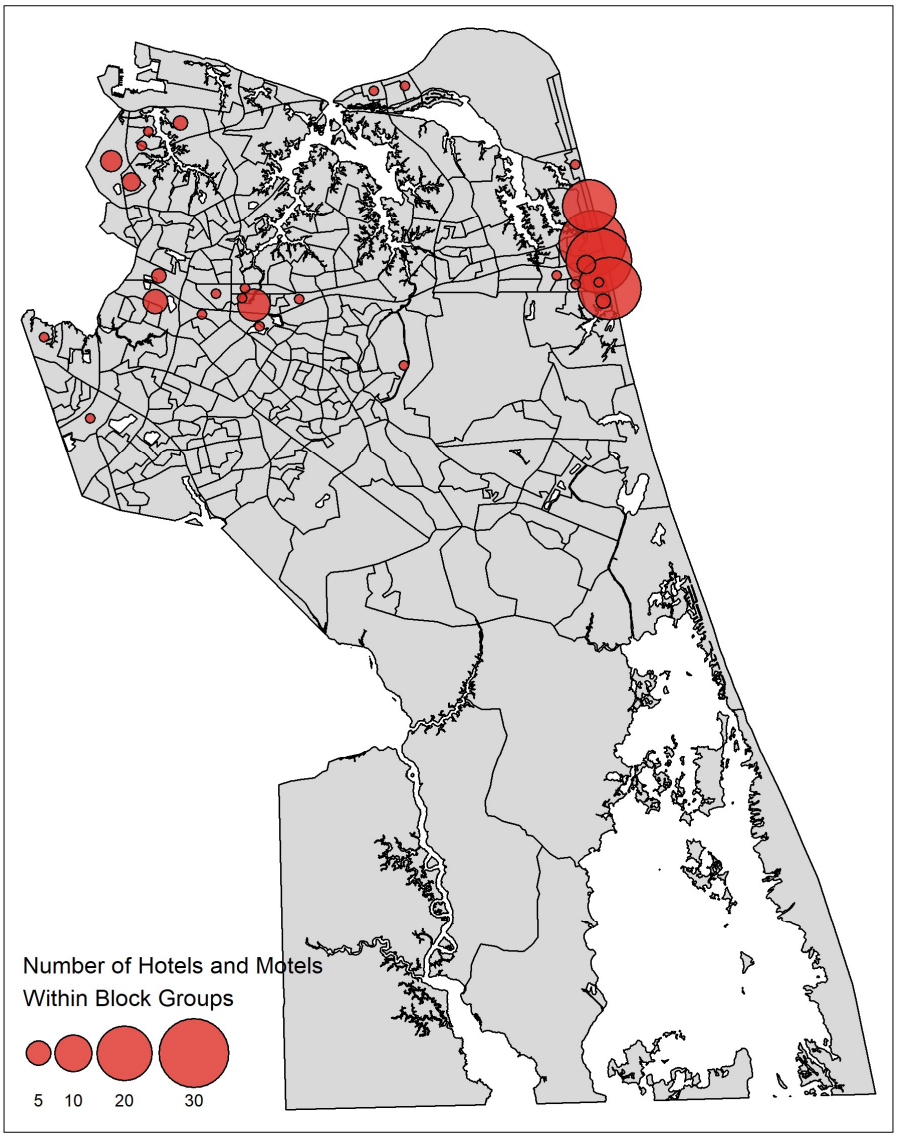


Figure 36. Distribution of Hotels in Virginia Beach

Publicly accessible charging for these visitors is expected to be primarily located along highways and major arterials, as well as at central tourist destinations, such as the convention center and resort area parking facilities. Using a similar aggressive projection, the upper bound of EV charging need assumes that all adult visitors will drive a personal vehicle.

It is assumed that EV deployment for visitors will correlate to the Current Pathway for Virginia Beach in Figure 31 in the prior section above. This would equate to an additional 5,550 electric vehicles in Virginia Beach attributed to visitors by 2040.

It is estimated that by 2040, the city would require 161 additional public Level 2 charging plugs and 44 additional DCFC plugs – beyond those today – to support remaining tourism needs in the city. Cumulative new public level 2 and DCFC chargers for tourists are shown in Figure 37.

It should be noted that these figures represent the upper bound of required additional EV charging in Virginia Beach to support tourist populations beyond the projections of EV charger deployment required to support the resident population of Virginia Beach. Strategic placement of EV charging infrastructure in high volume traffic areas and tourist destinations that can also serve the residents in Virginia Beach, is expected to reduce the volume of additional chargers needed in the city in future years.

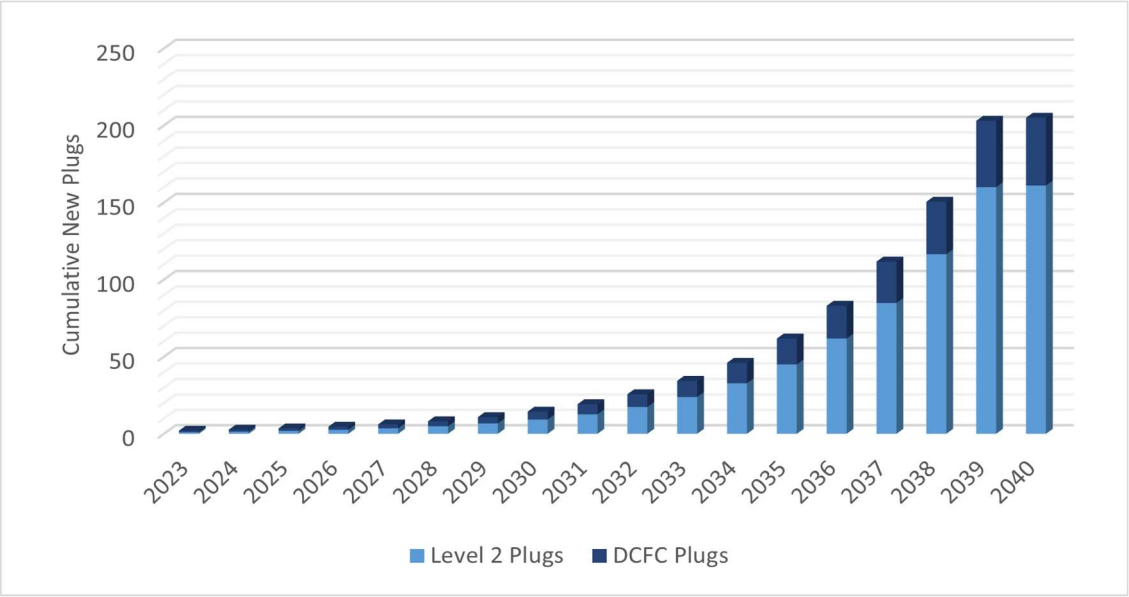


Figure 37. Total New Level 2 and DCFC Plugs: Non-Hotel Tourism

Alternative Scenario

An alternative scenario is presented below in which all tourist populations in Virginia Beach utilize publicly available Level 2 and DCFC charging stations, rather than utilizing chargers located at hotels or

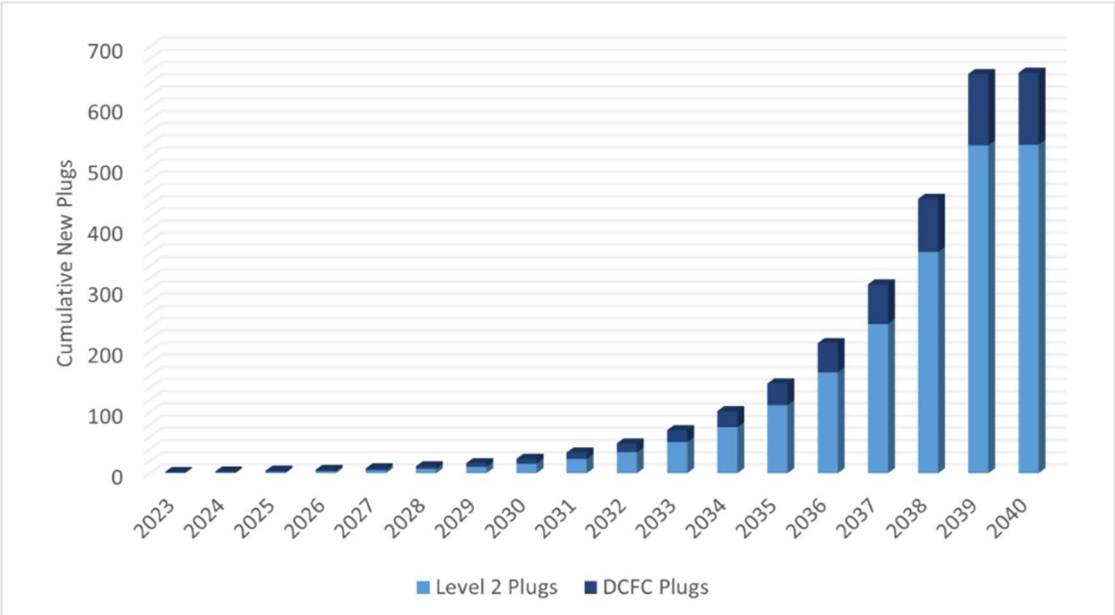


Figure 38. Cumulative New Public Chargers – No Hotel Scenario

vacation properties. In this scenario, 50% of the visitors are not expected to require EV charging during their visit, representing those travelers who travel less than 100 miles to Virginia Beach, day-trip visitors who do not stay overnight, and travelers who utilize a rental car during their stay in the city. In this scenario it is estimated that by 2040, the city would require 539 additional public Level 2 charging plugs and 118 additional DCFC plugs. Cumulative new public level 2 and DCFC chargers are shown in Figure 38.

Distribution of publicly available chargers to support tourist populations are expected to be concentrated in those areas that are designated as short-term rental districts in the City, which includes the Resort Area District and Sandbridge, in addition to along major roadways, primarily I-264. Figure 39 provides a map of short-term rental districts located in Virginia Beach.

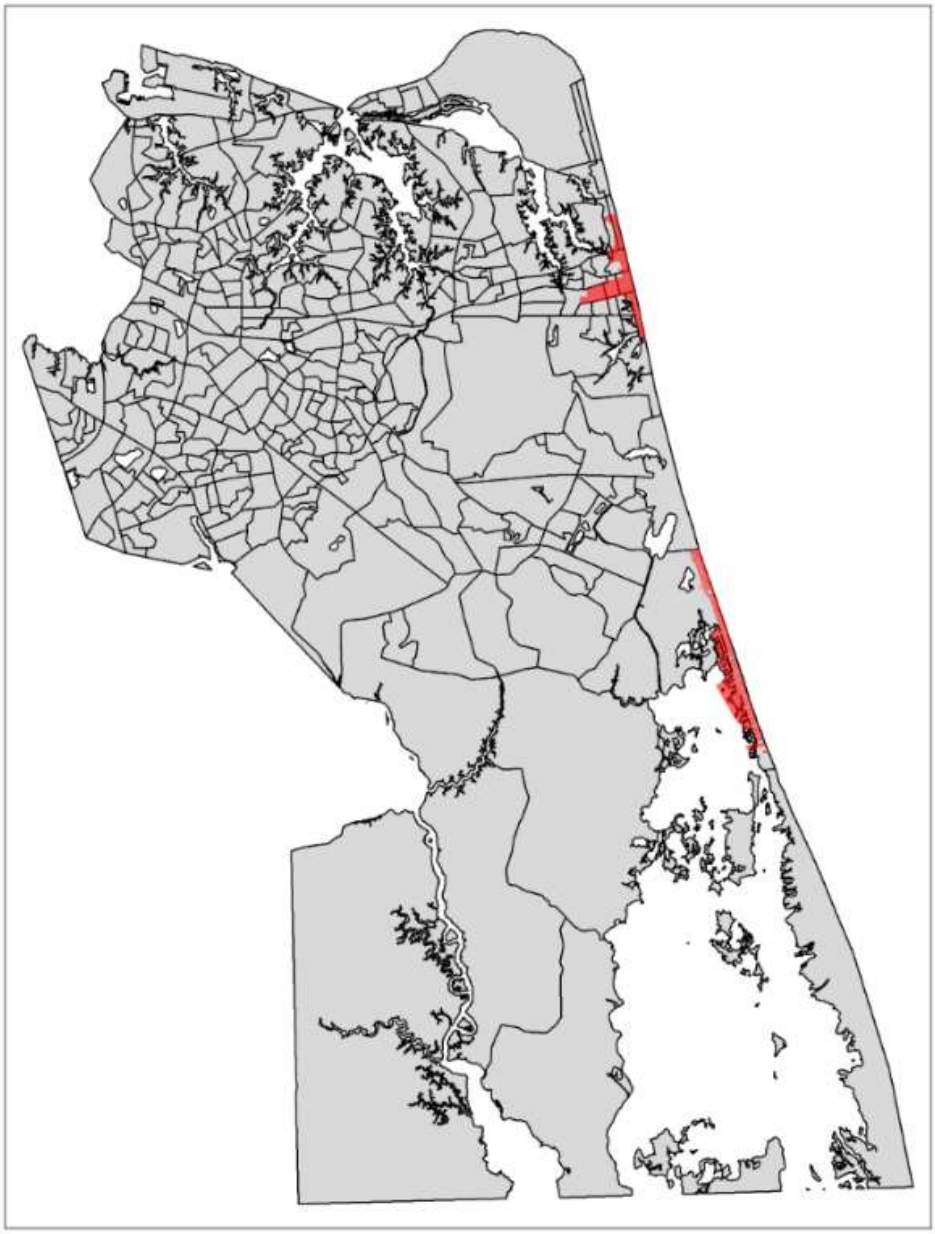


Figure 39. Short Term Rental Districts in Virginia Beach

CHAPTER 5. PRIORITY CHARGING LOCATIONS

To better understand areas of Virginia Beach with the highest need for publicly accessible chargers, this chapter uses a spatial analysis, which combines several factors into two single, weighted scores. When paired with the public engagement results expressed in earlier chapters, this analysis help identify priority charging locations.

Methodology

This study identified the need for two single, weighted scores to determine the need for public electric vehicle charging: a score to locate optimal placement of Level 2 chargers and a score to locate optimal placement of Level 3 chargers. These scores identify census block groups in Virginia Beach of high priority for charging infrastructure and can be aligned with other criteria such as economic development regions to select block groups for early installation of electric vehicle charging stations. As indicated in the call-out box to the right, similar methodologies were used to locate electric vehicle charging infrastructure in other jurisdictions.

CITIES THAT USED A SIMILAR EV SCORING PROCESS

- San Antonio, TX
- Contra Costa County, CA
- Somerville, MA
- Berkeley, CA
- Alexandria, VA

In addition to the Level 2 and DCFC block group scoring, this study identified municipal properties located within priority block groups. These sites are presented subsequent to the Level 2 and DCFC Index scoring sections below and identify sites that may be prioritized for construction of public Level 2 charging infrastructure. The sites are shown by location type.

Level 2 Charging Index

This index identifies census block groups in Virginia Beach where charging infrastructure placement can aid individuals who need to park their cars for longer periods of time. The index is comprised of: (1) number of multi-unit dwellings, (2) number of renters, (3) length of commutes made by cars, (4) population with income under $75,000, (5) existing Level 2 EV charger access, (6) number of long dwell time locations. Several of the factors which have been integrated into this assessment correlate with criteria which prioritize LMI populations, including number of MUDs, number of renters, and household income.

As annotated in Table 15 block group-level data on each factor was collected from U.S. Census data, data provided by Virginia Beach, vehicle registrations provided by the Virginia Department of Motor Vehicles, and the U.S. DOE's Alternative Fuel Data Center.

Table 15. Weights and Rationales to Develop Four Level 2 Composite Score Maps

Indicator	Rationale for Factor	Factor Weighting
Multi-Unit Dwellings [a]	Residents of multi-unit dwellings (MUD) have less access to at-home charging. These "garage orphans" are a relatively large segment of potential electric vehicle adopters who are locked out of the market.	16.7%
Renters [a]	As with residents of MUDs, renters are less likely to have access to at-home charging than owners.	16.7%
Total Commuter Travel Time (Minutes) [a]	Areas with longer commute times have a higher need for charging than areas with a lower density of car commuters.	16.7%
Household Income [a]	Lower income residents will have lower access to at home-charging and should be prioritized for infrastructure deployment to ensure equal access.	16.7%
Existing EV Charger Access [b] **(Level 2)**	Areas with low publicly-accessible charging access should be higher scoring than areas with high charging access.	16.7%
Density of Long-Dwell Time Locations [c]	Areas where residents are likely to park their cars for over two hours should be prioritized for Level 2 charging access.	16.7%

[a] U.S. Census Bureau 2022

[b] U.S. DOE Station Locator and Plugshare.com

[c] Data provided by Virginia Beach Department of Planning

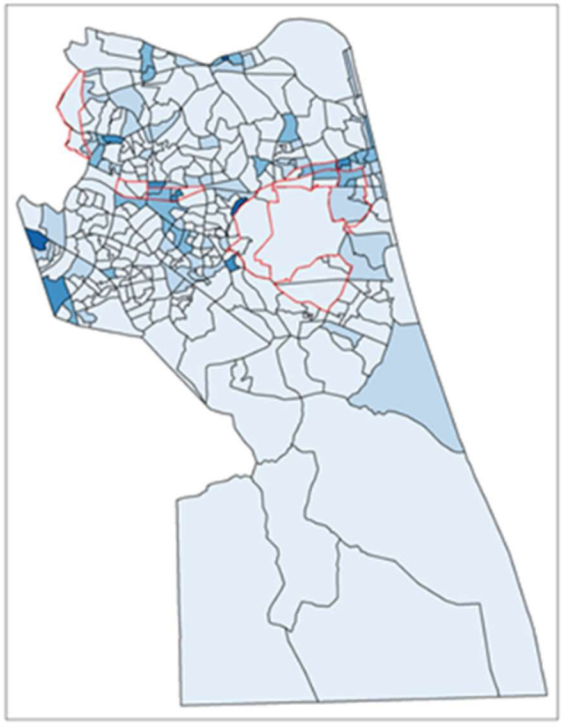
Next, this data was weighted using a weighted mean methodology and compiled into scoring maps. The composite scoring system results in a unique score for each block group that represents the charging need, as shown in the score map in Figure 41.

Weighted Mean description: To calculate the two indices, L2 and DCFC, a weighted mean value for each block group of all the indicators listed was calculated. Each indicator is assigned a weight factor. Then for each block group each indicator value is multiplied by that weight factor and then added together to produce an output weighted mean.

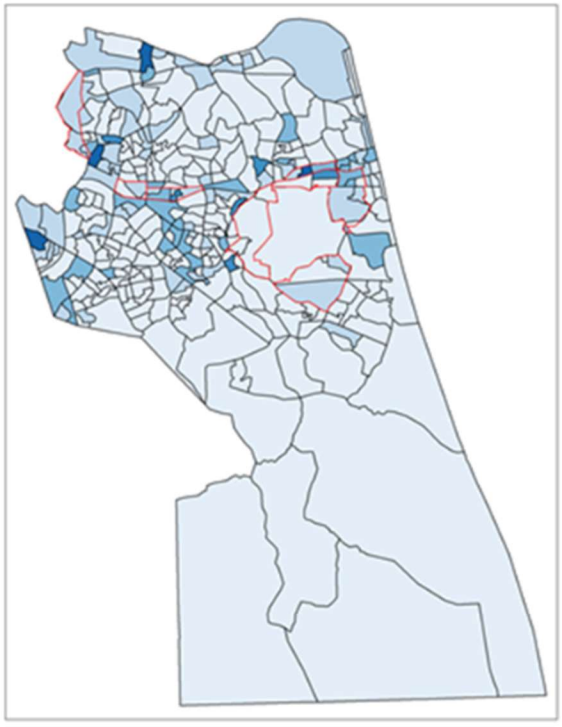
Level 2 Results

Figure 40 shows six maps that display each individual factor. Colors are grouped into five shades using the Jenks natural breaks classification method (ESRI 2020), with the highest scoring 20% of block groups shown as the darkest shade and the lowest scoring 20% of block groups shown as the lightest shade. To

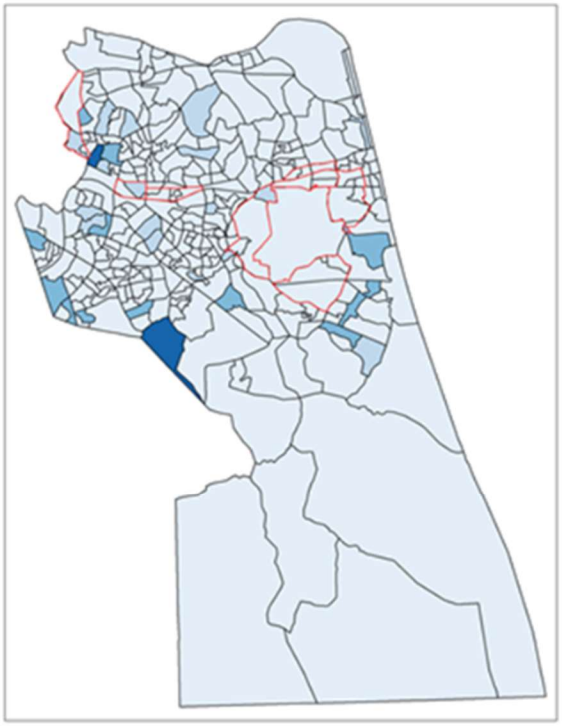
help identify disadvantaged communities in the city, block groups outlined in red represent those block groups that have been designated as Opportunity Zones.



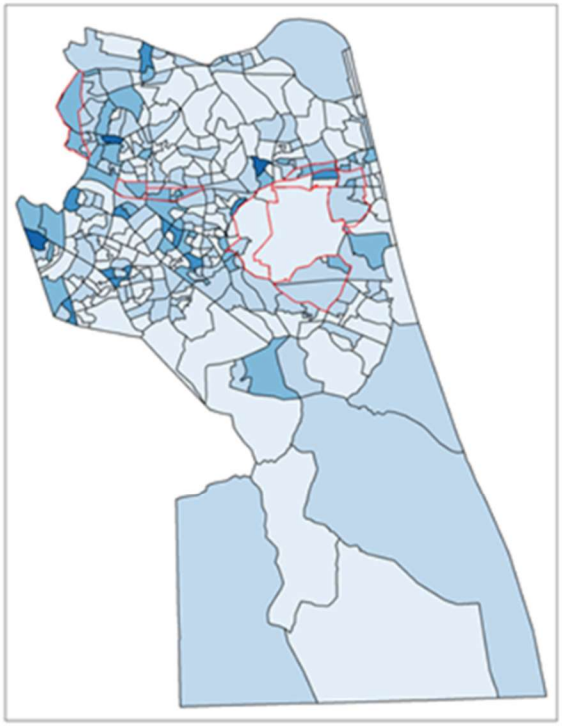
Number of MUDs



Number of Rental Households



Total Average Commuter Time



Number of Households with Income Under $75,000

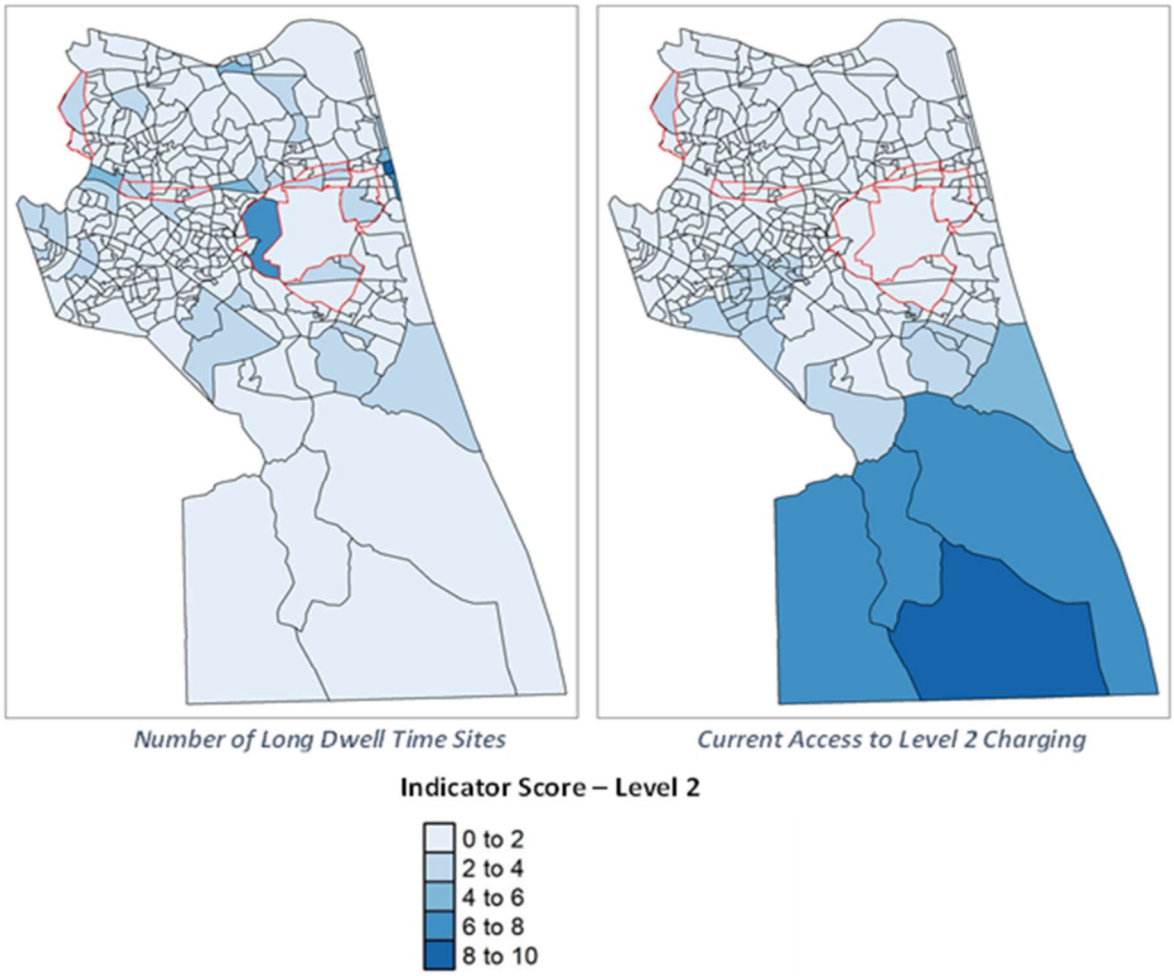


Figure 40. Maps Showing Individual Factors that Build Up to Composite Score Map

Figure 41 shows the composite score Level 2 charging map, developed for each block group after summing the six factors. These block groups are good candidates for identifying Virginia Beach's greatest electric vehicle charging infrastructure needs.

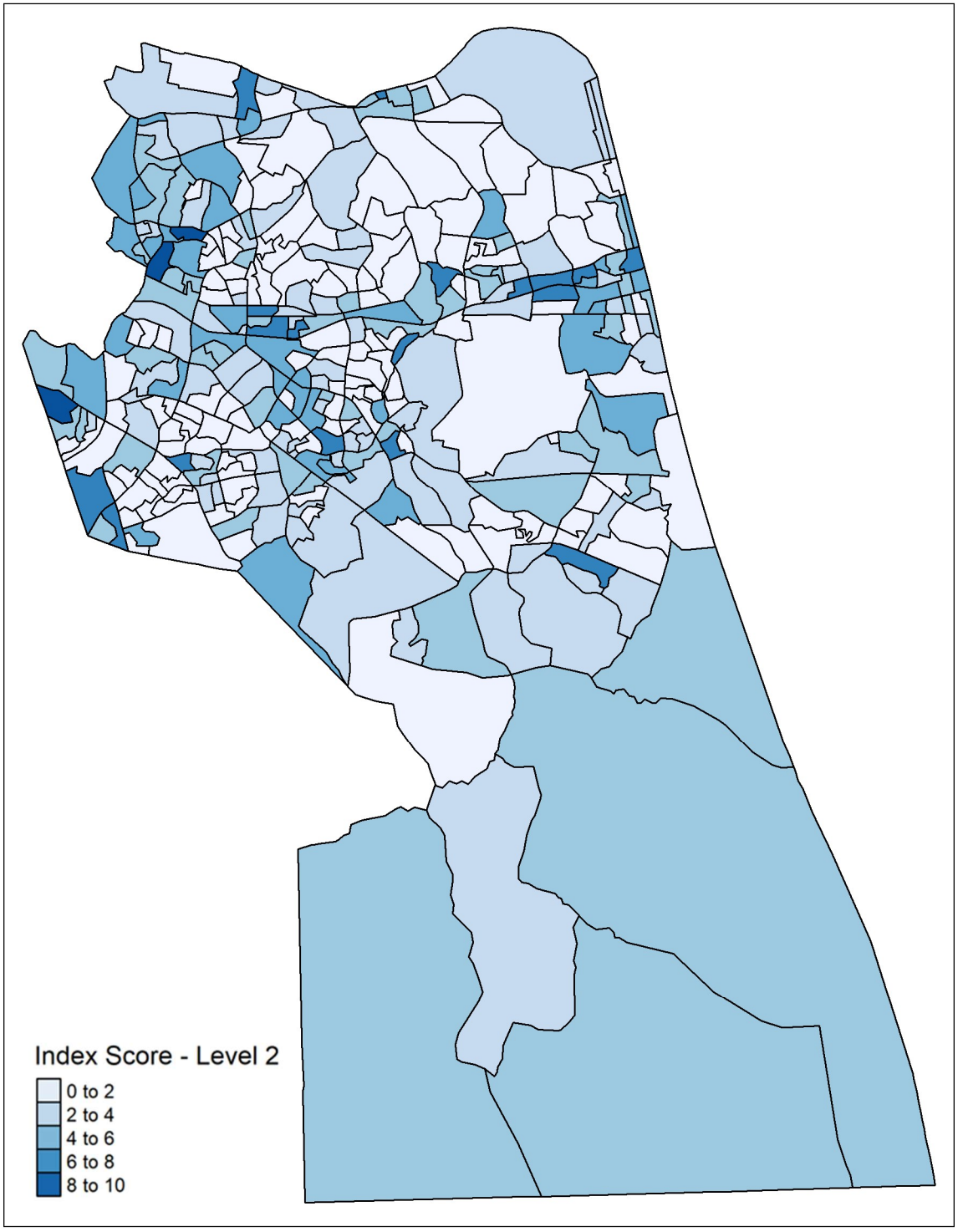


Figure 41. Composite Level 2 Electric Vehicle Charging Prioritization for Virginia Beach

Notes: This map depicts six composite scores. All factors were normalized to 0 and 1 and multiplied by the weights in Table 15.

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Highest Scoring Block Groups: Level 2

Figure 42 shows those block groups that ranked most highly in this analysis. These block groups should be prioritized for Level 2 charging infrastructure on municipal properties in Virginia Beach.

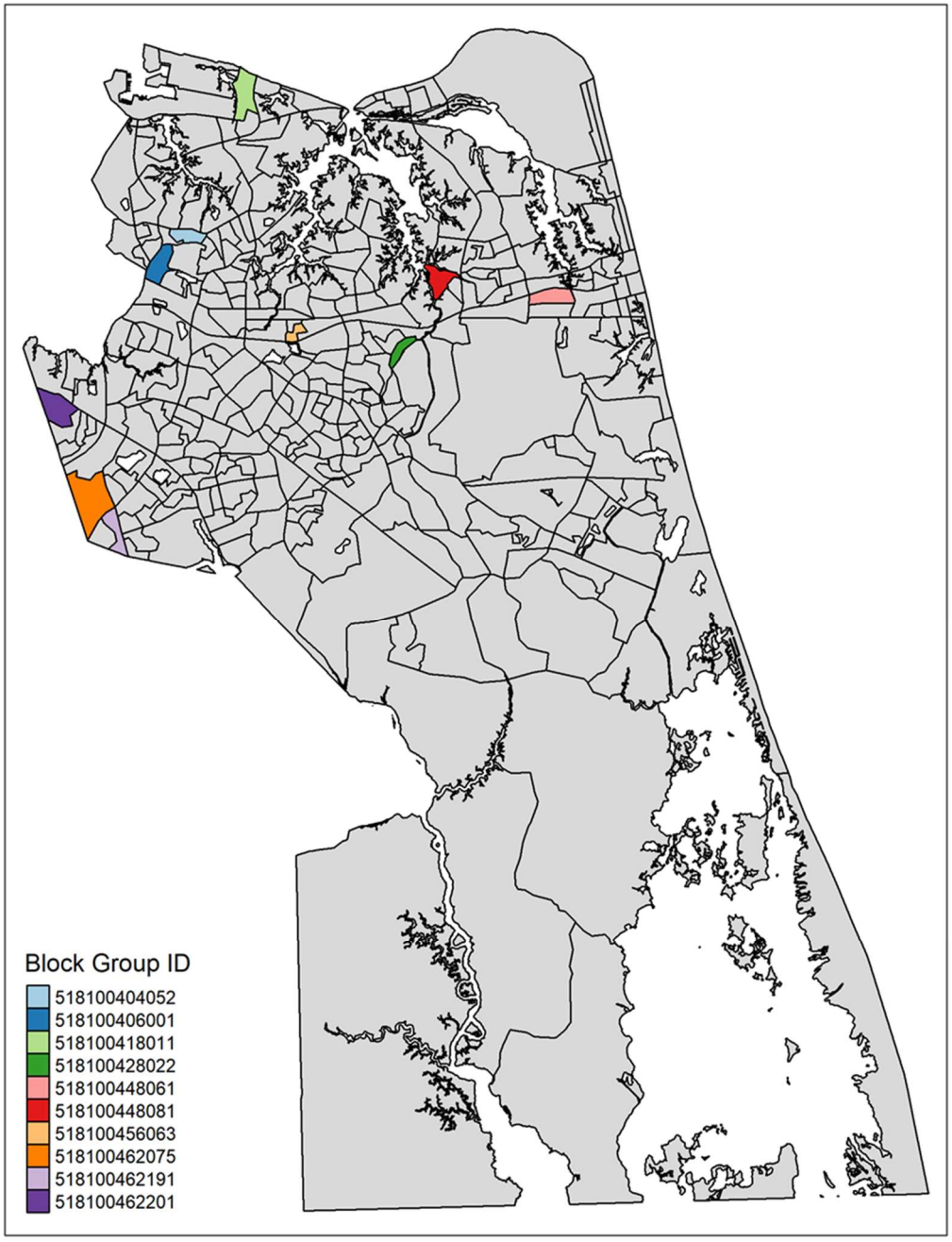


Figure 42. Ten Highest-Ranking Block Groups in Virginia Beach for Level 2 charging

These block groups emerged as the highest ranking using equal weight scoring. Note that these ten block groups are among several block groups that could be good candidates for electric vehicle charging infrastructure selection.

DCFC Charging Index

This index identifies census block groups in Virginia Beach where charging infrastructure placement can aid individuals who need to park their cars for shorter periods of time (e.g., to refuel along a commute, or long-distance drivers on a road trip). The index is comprised of: (1) number of multi-unit dwellings, (2) numbers of renters, (3) distance to highway and major arterials, (4) average daily traffic, (5) density of existing electric vehicle DCFC chargers, (6) density of locations where car drivers would be likely to park their cars for less than two hours, and (7) population density.

As annotated in Table 16 block group-level data on each factor was collected from U.S. Census data and land use data provided by Virginia Beach staff.

Table 16. Weights and Rationales to Develop Four DCFC Composite Score Maps

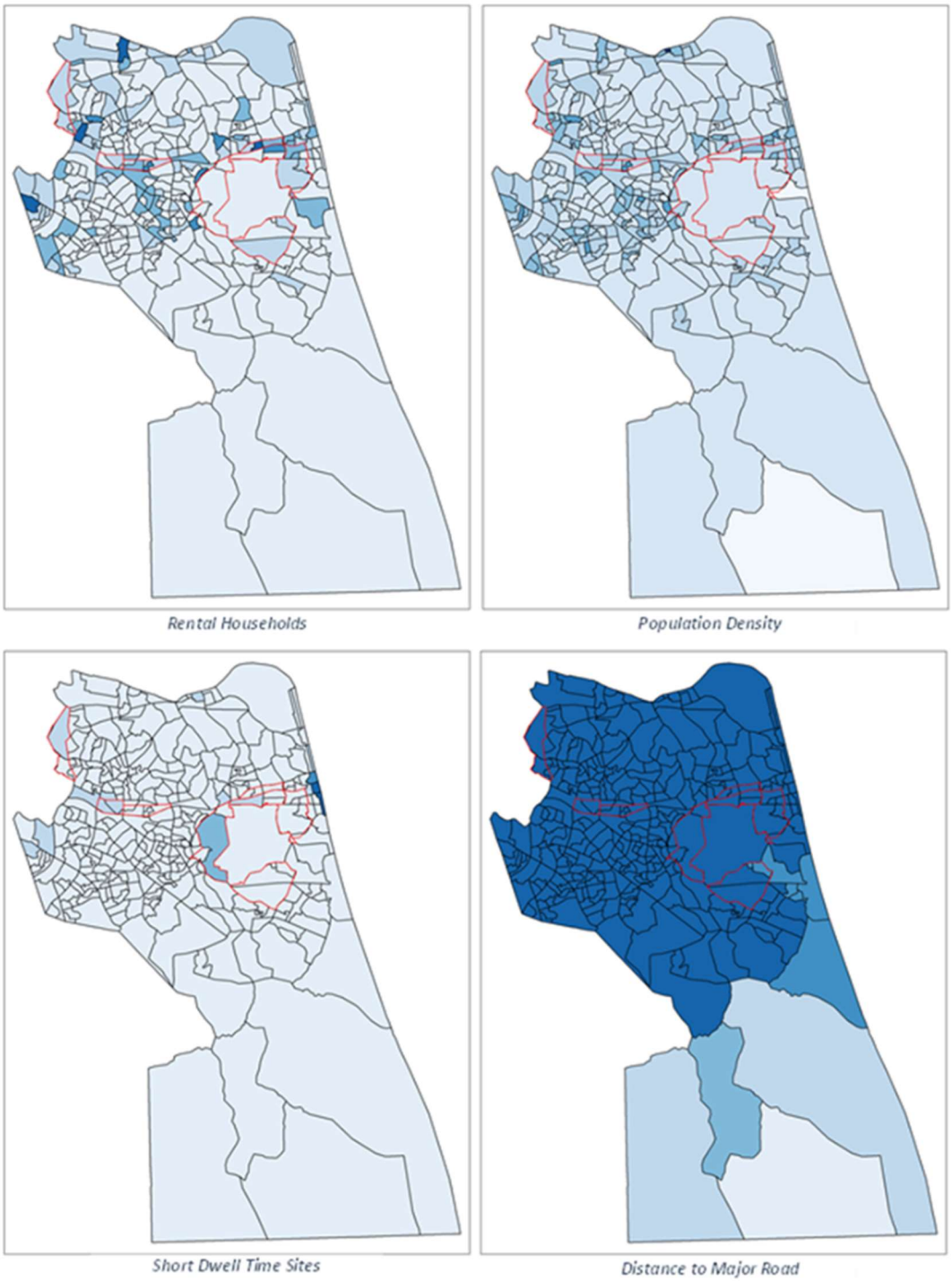
Indicator	Rationale for Factor	Equal Weight
Multi-Unit Dwellings [a]	Residents of multifamily dwellings have less access to at-home charging. These "garage orphans" are a relatively large segment of potential electric vehicle adopters who are locked out of the market.	14.3%
Renters [a]	As with garage orphans, renters are less likely to have access to at-home charging than owners.	14.3%
Distance to Major Road [a]	DCFC stations should be deployed along major traffic corridors to increase access and station visibility.	14.3%
Average Daily Traffic [c]	DCFC stations should be deployed where traffic flows are highest to increase utilization rates.	14.3%
Existing Electric Vehicle Charger Access [b]	Areas with low publicly-accessible charging access should be higher scoring than areas with high charging access.	14.3%
Density of Short-Dwell Time Locations	Areas where residents are likely to park their cars for short periods should be prioritized for DCFC charging access.	14.3%
Population Density [a]	Areas with dense populations will require higher access to DCFC charging due to lower access to residential charging and higher utilization of public charging.	14.3%

[a] U.S. Census Bureau 2022
[b] U.S. DOE Station Locator and Plugshare.com
[c] Virginia Department of Transportation

Next, this data was weighted using a weighted mean methodology and compiled into scoring maps. The composite scoring system results in a unique score for each block group that represents the charging need, as shown in the score maps in Figure 43. It should be noted that it is not expected that any public DCFC stations will be operated by the City in the near term. There are key municipal sites that have been identified that may be suitable for installation of DCFC charging infrastructure at specific municipal sites in Virginia Beach to serve City fleet operations, which can be found in Chapter 6.

DCFC Results

Figure 43 shows seven maps that display each individual factor. Colors are grouped into five shades using the Jenks natural breaks classification method (ESRI 2020), with the highest scoring 20% of block groups shown as the darkest shade and the lowest scoring 20% of block groups shown as the lightest shade. To help identify disadvantaged communities in the city, block groups outlined in red represent those block groups that have been designated as Opportunity Zones.



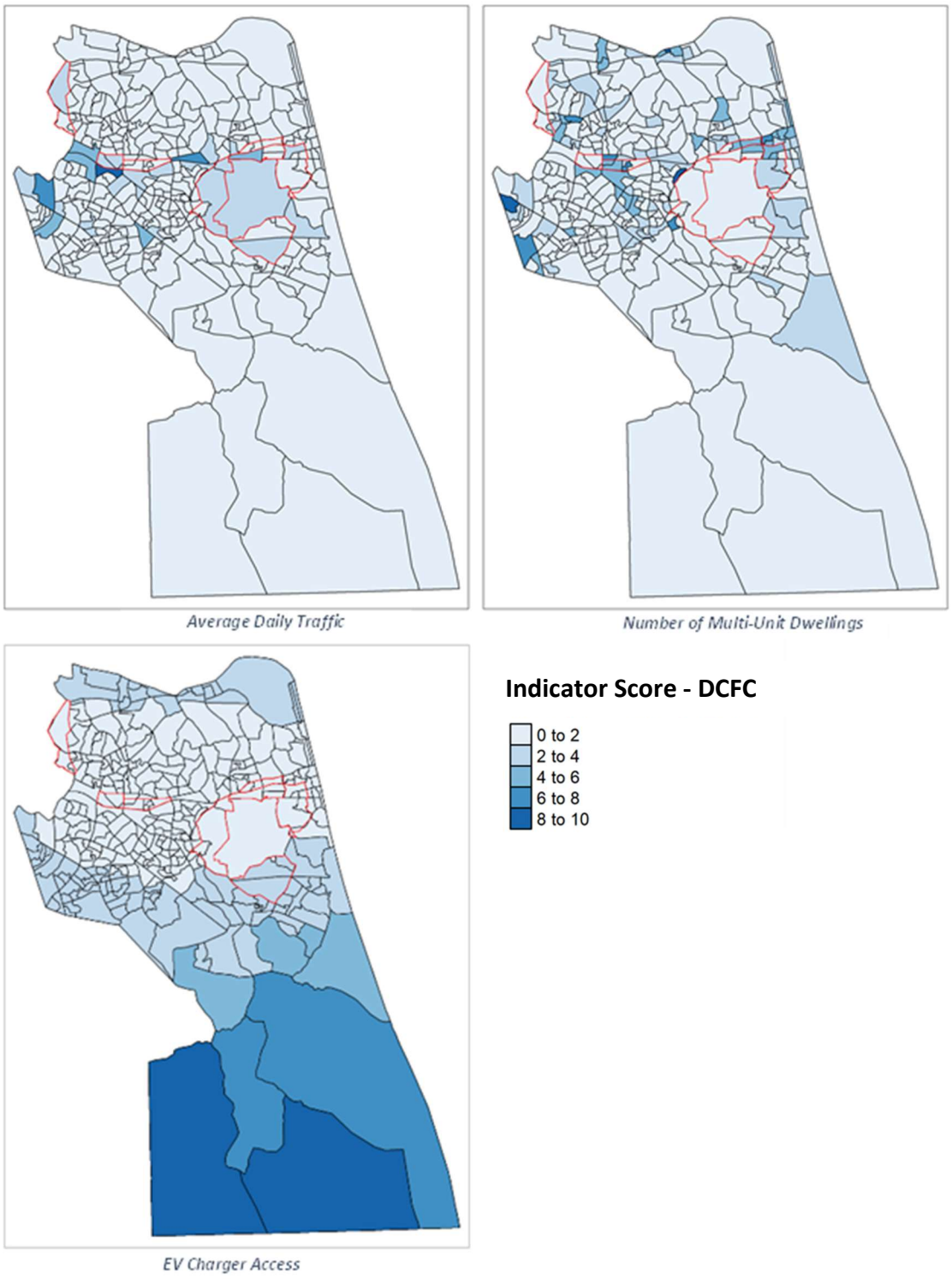


Figure 43. Maps Showing Individual Factors that Build Up to Composite Score Map

shows the composite score DCFC charging map, developed for each block group after summing the six factors. These block groups are good candidates for identifying Virginia Beach's greatest electric vehicle charging infrastructure needs.

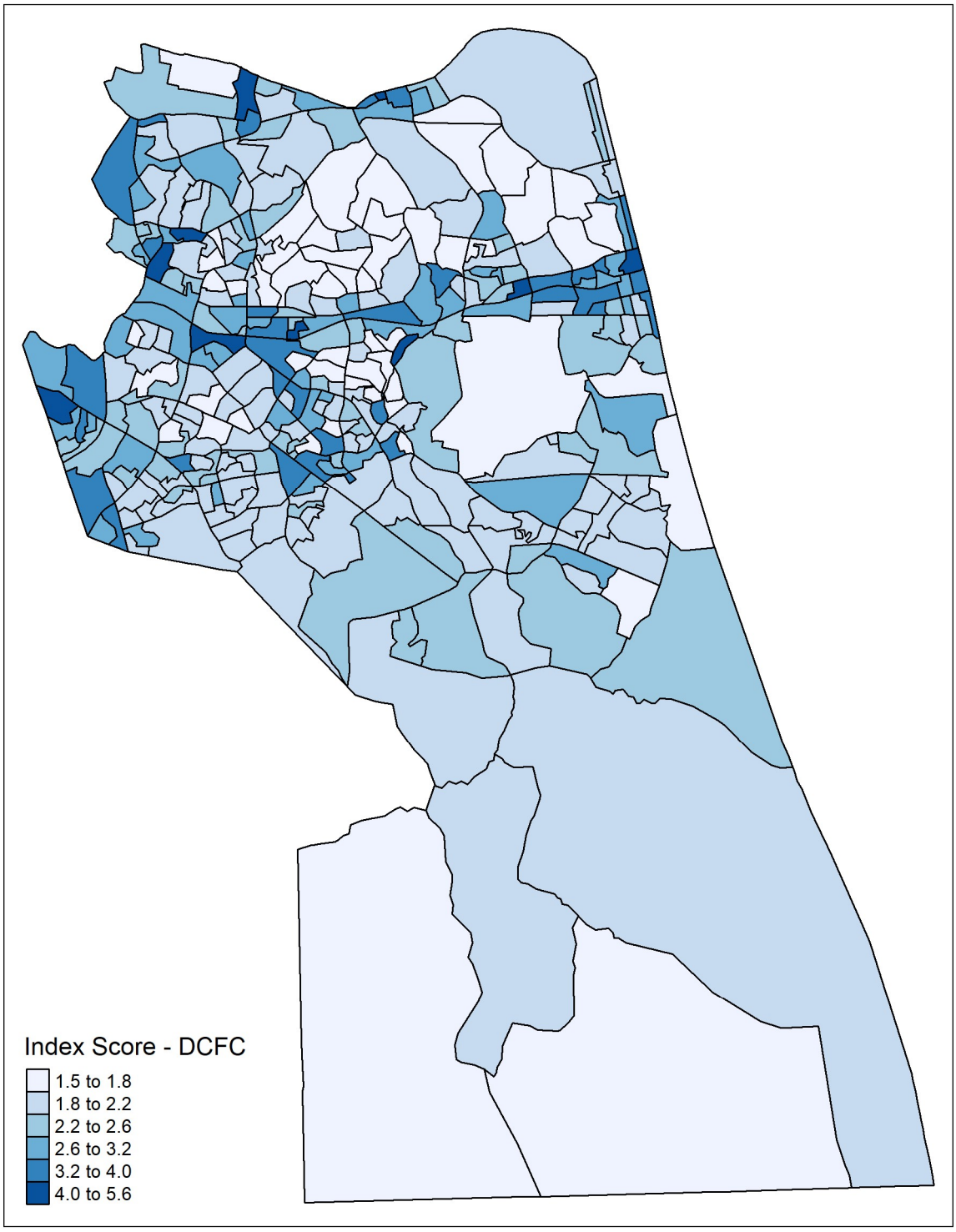


Figure 44. Composite DCFC Electric Vehicle Charging Prioritization for Virginia Beach

Notes: This map depicts seven composite scores. All factors were normalized to 0 and 1 and multiplied by the weights in Table 16.

Highest Scoring Block Groups: DCFC

Figure 45 shows those block groups that ranked most highly using an equal weighting analysis. These block groups should be prioritized for DCFC charging infrastructure on municipal properties in Virginia Beach in the future if required.

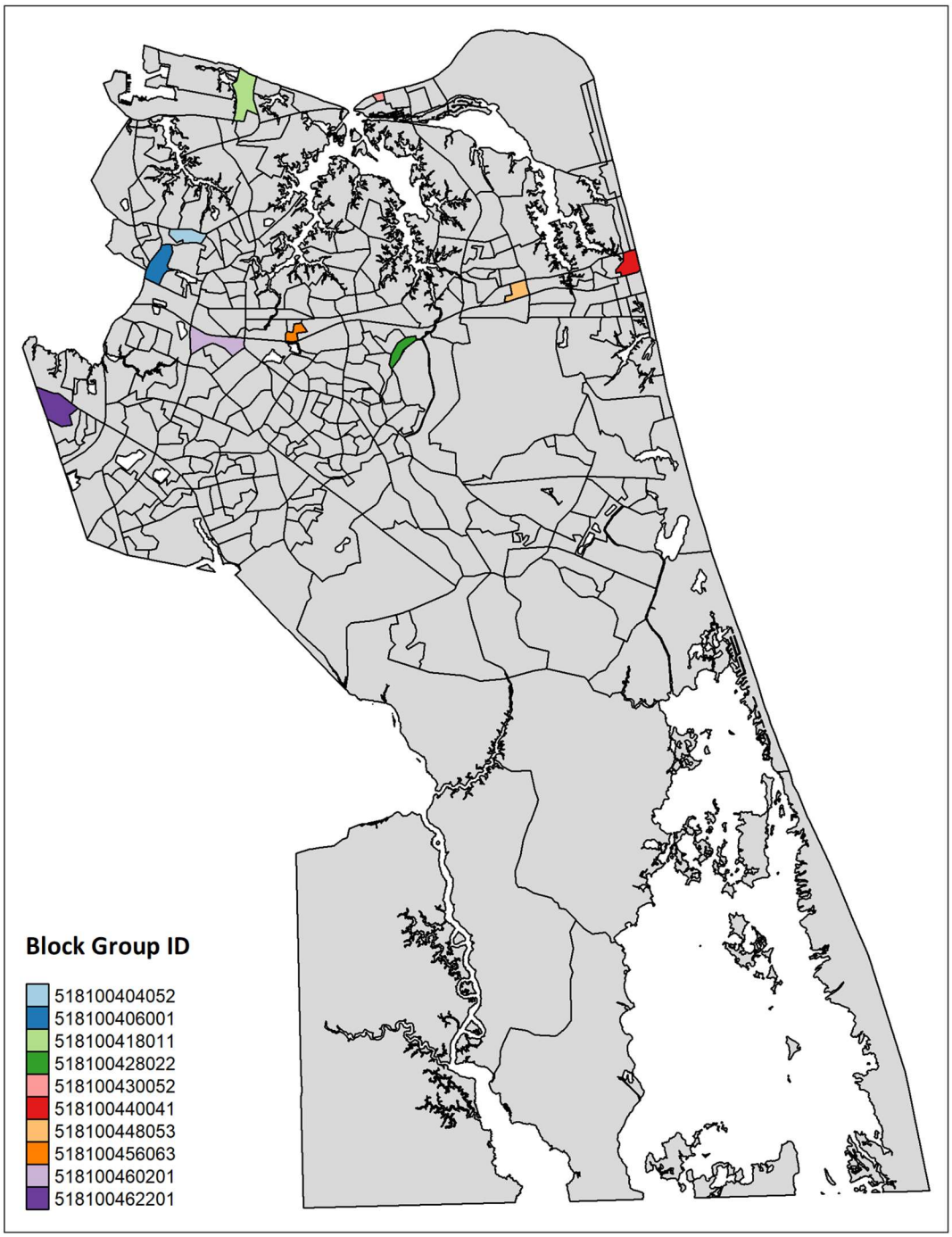


Figure 45. Ten Highest-Ranking Block Groups in Virginia Beach for DCFC

These block groups emerged as the highest ranking using equal weight scoring. Note that these ten block groups are among several block groups that could be good candidates for electric vehicle charging.

Priority Municipal Properties for Level 2 Charging

This study identified over 300 specific locations (with addresses) in Virginia Beach that could potentially be considered for Level 2 public EV charging infrastructure at municipal sites in Virginia Beach, which can be found in Appendix G. From this list, a priority list of locations for potential siting of Level 2 charging infrastructure was developed, presented in Table 17 below. These locations are prioritized based upon the spatial analysis conducted above, in addition to identification of high-visibility locations, sites with significant known utilization by the public, equity and environmental justice considerations and other criteria. The list includes recreation centers, parks, municipal buildings, tourist attractions, landmarks, libraries, and parking garages. Those locations highlighted in green are located in a low-income community or community of color as identified by VDEQ, or in an environmental justice community by a federal agency. An aggregate map of the locations has been provided in Figure 46 below.

Table 17. Priority Municipal Sites Across Block Groups

Property Name	Property Type	Block Group ID
25th Street Garage	Parking	518100440041
31st Street Garage	Parking	518100440041
9th Street Parking Garage	Parking	518100440082
Blue Garage	Parking	518100456032
Green Garage	Parking	518100456032
Maroon Garage	Parking	518100410021
New Parking Garage 19th Street	Parking	518100440043
Orange Garage	Parking	518100456032
Red Garage	Parking	518100456032
Virginia Aquarium - South Building	Attraction	518100452001
Virginia Aquarium and Marine Science Center - Main Building	Attraction	518100452001
Virginia Beach Convention Center Lot	Attraction	518100442023
Virginia Beach Sports Center	Attraction	518100442023
Visitor Information Center	Attraction	518100442023
Little Island Park & Parking Lots	Park	518100454121
MOCA - Contemporary Art Center of Virginia	Attraction	518100440061
Princess Anne Athletic Complex	Attraction/Park	518100454082
Virginia Beach Amphitheater	Attraction	518100460151
Bayside Library/Special Services Library	Library	518100416003
Bayside Recreation Center	Recreation	518100418041
Great Neck Area Library	Library	518100444021
Great Neck Recreation Center	Recreation Center	518100430021
Kempsville Area Library	Library	518100460064
Kempsville Recreation Center	Recreation Center	518100460063
MEO Central Library	Library	518100456012

Mount Trashmore Park	Park	518100458032
Oceanfront Area Library	Library	518100440042
Princess Anne Area Library	Library	518100454322
Princess Anne Recreation Center	Recreation Center	518100454322
Seatack Recreation Center	Recreation Center	518100442011
Soccer Complex & Virginia Beach Field House	Attraction	518100454332
Virginia Beach Farmers Market	Attraction	518100454291
Williams Farm Recreation Center	Recreation Center	518100408023
Amphitheater Pre-Game Lot	Attraction	518100460151
Bayville Park	Park	518100418041
Beach Garden Park	Park	518100440062
City View Park	Park	518100462075
Croatan Parking Lot	Parking Lot	518100440081
Francis Land House	Attraction	518100426002
Great Neck Park	Park	518100430021
Hampton Roads Soccer Complex	Attraction	518100460151
Lake Lawson / Lake Smith Natural Area & Ramp	Park	518100404033
Level Green Park	Park	518100462212
Lynnhaven Boat Ramp	Park	518100418032
Lynnhaven House	Attraction	518100416003
Lynnhaven Park	Park	518100444021
Marshview Park	Park	518100442011
Munden Point Park & Boat Ramp	Park	518100464002
Pleasure House Point Natural Area	Park	518100418032
Princess Anne Park	Park	518100454082
Providence Park & KPB Ball Fields	Park	518100462041
Pungo Blackwater Library & Senior Resource Center Area	Library & Center	518100464003
Red Mill Farms Park	Park	518100454202
Red Wing Park	Park	518100454281
Salem Woods Park	Park	518100462141
Stumpy Lake Natural Area	Park	518100462173
Williams Farm Park	Park	518100408023
Woodstock Park	Park	518100462064

Red points indicate highest scoring and prioritize municipal sites of interest in Virginia Beach for Level 2 EV charging infrastructure. This does not imply that one area of the city will receive closer consideration for electric vehicle infrastructure than any other. Virginia Beach should work to ensure the distribution of electric vehicle charging infrastructure is as equitable as possible throughout the city, including to prioritize equity and access for LMI and underserved residents. These maps can be updated using indices that further prioritize equity considerations, such as the Climate Vulnerability Index or Social

Vulnerability Index. See Appendix G for the full list of sites of interest in Virginia Beach. Note that each row of the table in Appendix G represents one site, so there may be multiple rows of sites for a specific block group.

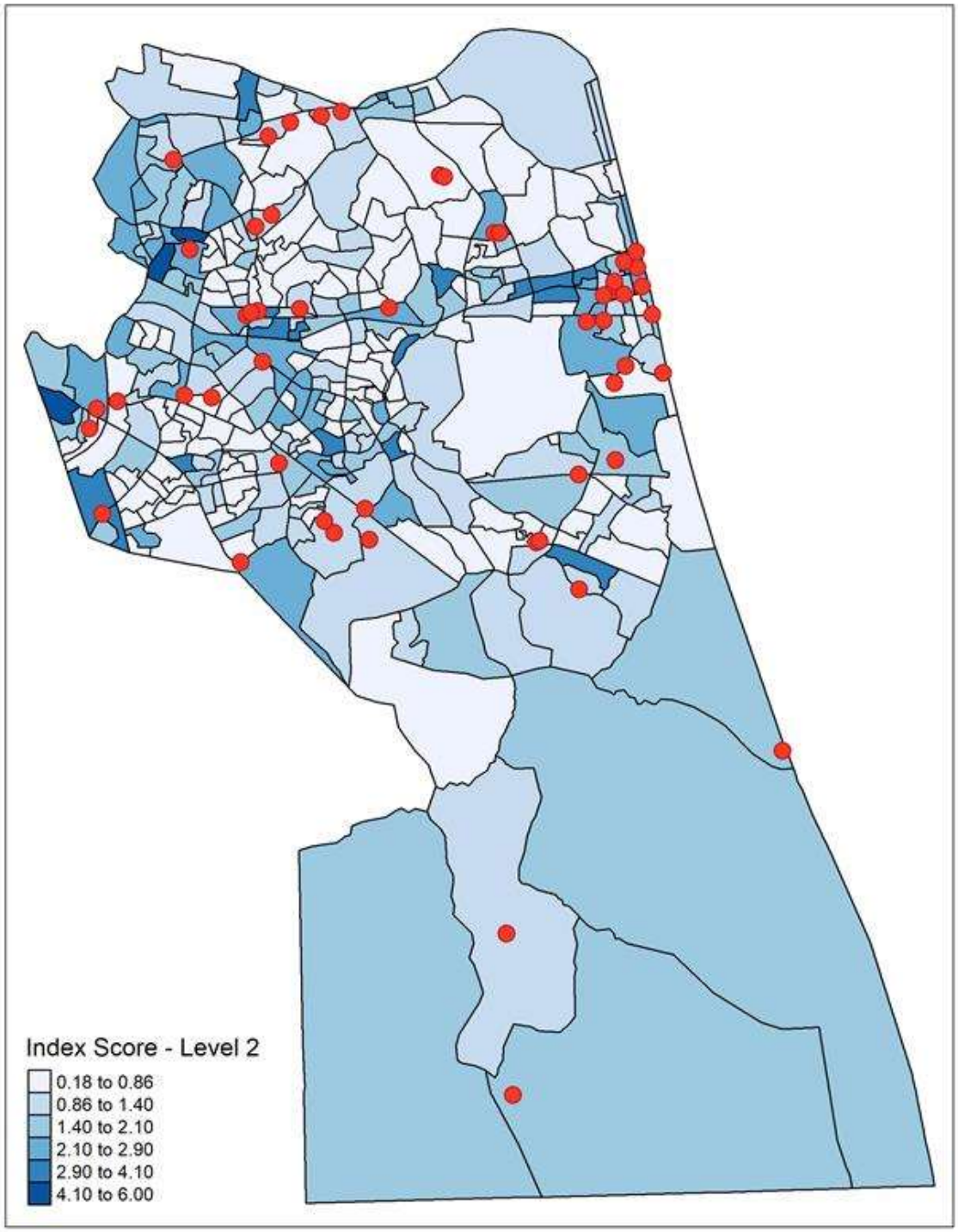


Figure 47. Level 2 Charging Sites of Interest on Municipal Properties

CHAPTER 6. ACTIONS FOR VIRGINIA BEACH

This chapter presents a set of goals, recommendations, and actions for the short, medium, and long term in Virginia Beach (Figure 48). The six goals provide an aspirational vision of what the City wants to achieve regarding electric vehicles and infrastructure. The 34 recommendations are broad categories of measures to achieve those goals. Finally, the 70 actions are discrete, proactive activities that support the recommendations.

Figure 48. Progression from Goals to Actions

The role of the City is primarily to act as a facilitator. The City can remove barriers to deployment of charging infrastructure, engage with stakeholders, identify and pursue funding opportunities, establish programs that improve accessibility, and ensure economic development associated with this new sector. While charging will be provided primarily by the private sector, the City should establish partnerships and utilize funding programs to deploy charging infrastructure at municipal sites, filling infrastructure gaps to ensure equitable charger access, supporting tourism and enhancing resiliency.

Implementing recommendations and actions in Chapter 6 requires City leadership but leverages expertise and investment from a wide set of stakeholders, including private citizens, community groups, small businesses, homeowner associations, Dominion Energy, EVSPs, ridesharing firms, small businesses, and others. As the Plan recommendations are implemented, the city should track progress on achievement of these goals and update the Plan to adapt to a rapidly changing transportation sector.

Goal 1: Ensure Charging is Available and Convenient

How do we make charging easier?

Goal 1 focuses on reducing or removing common barriers to constructing, owning, and operating new charging infrastructure. The City should use zoning, building codes, and permitting to enable the equitable build-out of charging infrastructure for residents and businesses.

Figure 49. Example of ADA-accessible charging spot (left) and MUD chargers (right).

Recommendation 1.A: Streamline Permitting

Short Term

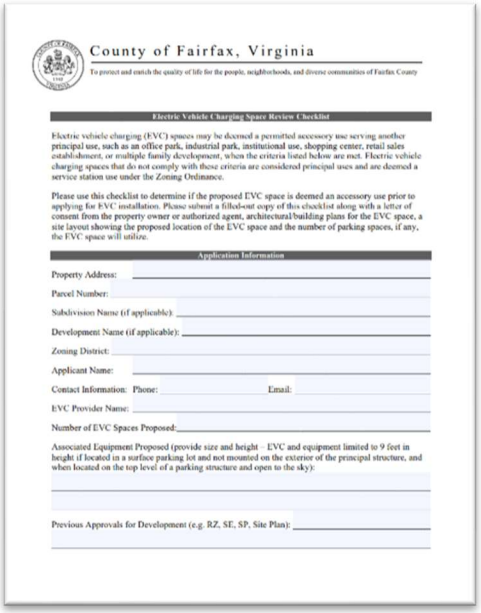
As EV adoption grows, the number of residents and business requiring electrical upgrades to accommodate charging will grow significantly. There is currently no guidance on the City website for individuals and businesses seeking to install chargers, nor is there a mechanism for the City to track the number of EV charger permits. To expedite the permitting process, the City should develop an easy-to-follow permitting application for both residential and public EV charging installations.

➢ Action 1.A.1. Conduct mapping exercise and develop permitting checklist

The City should undertake a mapping exercise to establish each step in the permitting process and identify the information required for residents, businesses, and government facility managers who seek to install EV charging infrastructure. This step-by-step mapping will result in a decision tree that demonstrates how each different type of chargers is permitted (e.g., by charger location, zoning district,

EVSE type and quantity, site and architectural plans, proof of property ownership, license exemptions or other information). This information can be translated into an EV charger permit checklist and application posted to the City's website. This application can be integrated into the City of Virginia Beach Citizen Access System, which allows for the application and issuing of permits electronically.

To support development of this effort, the City can borrow content and layout from another municipal government. In Fairfax County, VA (Figure 50) an Electric Vehicle Charging Station permit checklist is provided on the County Website along with step-by-step instructions regarding the types of permits and documents required along with a description of the approval process.



County of Fairfax, Virginia

To protect and enrich the quality of life for the people, neighborhoods, and diverse communities of Fairfax County

Electric Vehicle Charging Space Review Checklist

Electric vehicle charging (EVC) spaces may be deemed a permitted accessory use serving another principal use, such as an office park, industrial park, institutional use, shopping center, retail sales establishment, or multiple family development, when the criteria listed below are met. Electric vehicle charging spaces that do not comply with these criteria are considered principal uses and are deemed a service station use under the Zoning Ordinance.

Please use this checklist to determine if the proposed EVC space is deemed an accessory use prior to applying for EVC installation. Please submit a filled-out copy of this checklist along with a letter of consent from the property owner or authorized agent, architectural/building plans for the EVC space, a site layout showing the proposed location of the EVC space and the number of parking spaces, if any, the EVC space will utilize.

Application Information

Property Address: _____

Parcel Number: _____

Subdivision Name (if applicable): _____

Development Name (if applicable): _____

Zoning District: _____

Applicant Name: _____

Contact Information: Phone: _____ Email: _____

EVC Provider Name: _____

Number of EVC Spaces Proposed: _____

Associated Equipment Proposed (provide size and height – EVC and equipment limited to 9 feet in height if located in a surface parking lot and not mounted on the exterior of the principal structure, and when located on the top level of a parking structure and open to the sky):

_____

_____

Previous Approvals for Development (e.g. RZ, SE, SP, Site Plan): _____

_____

Figure 50. Example EVSE Permitting Checklist

➢ Action 1.A.2. Track permit applications

The development of a specific permit application for installation of EV chargers in residential, business, and government applications will enable the City to understand the quantity, location, and type of chargers being deployed in Virginia Beach. The information is especially important since public charger websites like PlugShare and AFDC Station Locator lack locational information on some public and most residential and government chargers. This information can help the City better identify where EVs are being deployed in greater numbers and identify locations where infrastructure gaps exist. This information can also be used to understand the number of chargers being deployed in MUDs and LMI communities.

➢ Action 1.A.3. Expedite permitting and reduce permitting fees for EV charging

Ordinance should be adopted that would enable an expedited adminstrative review process for EV charging stations. The City should also consider enacting reduced or waived fees associated with electrical, building, or sign permits for EV charging installations to reduce costs for residents and local businesses, as is being done in other jurisdictions in Virginia. The State of California maintains a comprehensive list of examples of municipal EV permitting rules and a supplemental guidebook on EV permitting.

Recommendation 1.B: Adopt EVSE Design Standards

Short Term

A common barrier for charging EVs is the lack of standardization of charging equipment, including plug type, payment type, and protocols for communicating with the vehicle. To improve charger accessibility

and customer utilization, the City can establish criteria for publicly supported EVSE (e.g., those sponsored by the City at public sites or on municipal properties).

➢ Action 1.B.1. Integrate federal and state guidance on charging station design

Best practice for charging station design integrates the following:

- **Open Charge Point Protocol (OCPP).** For all charging stations, ensure chargers comply with the OPCC, a communication system between the charger and a central server (i.e., "network") that facilitates troubleshooting, maintenance, software updates, and charger utilization tracking. This flexibility is important as charging technology quickly evolves.
- **V2G certified.** For bidirectional charging, ensure chargers are certified to UL 1741 standard.
- **Payment types.** Charging stations should enable multiple forms of payment (ideally at least two forms), including credit card, smart phone applications, keyless fobs, and toll-free number payment support. As much as possible, stations should be open access and prohibit network subscription-based services.
- **ADA accessible.** Charging station outlets and connector devices should be mounted to comply with state code and must comply with all relevant Americans with Disabilities Act (ADA) requirements (see Recommendation 1.D).
- **Charge cord design.** Installation of dual-port pedestals with long retractable charge cords, when possible, to maximize charging capacity and provide access to greatest number of parking spaces and allowing both front-facing and rear-facing parking. Cords should be retractable or have a place to hang the connector and cord sufficiently above the pedestrian surface. Any cords connecting the charger to a vehicle shall be configured so that they do not cross a driveway, sidewalk, or passenger unloading area.
- **Damage protection.** Charging station equipment should be protected by wheel stops or concrete filled bollards.
- **Charging spacing.** Charging station equipment should not reduce the size of the parking space and should be placed in between parking spots (so that one station can reach multiple spots).
- **Pedestrian safety.** Equipment mounted on pedestals, lighting posts, bollards, or other devices for on-street charging station should be designed and located as to not impede pedestrian travel or create trip hazards within the right-of-way.
- **Station availability.** As site locations allow, public charging equipment should be available for use 24 hours a day, 7 days a week, 365 days a year.
- **Protection from extreme weather.** Installation of NEMA-4 rated EV charging equipment in outdoor applications to ensure ruggedness and operation in extreme weather conditions. Charging pedestals should be elevated using a pad or legs.
- **Lighting.** Site lighting to be provided where a charging station is installed.
- **Signage.** Each charging station should have signage indicating the space is only for electric vehicle charging purposes. The following information should be posted at all EV charging stations: 1. Voltage and amperage levels; 2. Hours of operations if time limits or towaway

provisions are to be enforced by the property owner; 3. Usage fees; 4. Safety information; 5. Contact information for reporting when the equipment is not operating or other problems.

- **Charge management.** Charging stations should use managed charging solutions—including networked and smart charging capabilities—to support flexible and responsive electrical load management to better align charging needs with electrical system requirements. Such managed charging may also offer local electrical distribution grid integration opportunities in the future.
- **National Electrical Code.** In 2021 Virginia adopted the 2017 National Electrical Code, which includes NFPA 70 Article 625, which provides criteria for Electric Vehicle Charging System installation. The City should ensure compliance with this standard for any charging installations in Virginia Beach. This document can also be used for development of definitions of terms for Virginia Beach codes (Action 1.C.1).

The City should adopt standards that integrate federal guidance outlined in the federal rulemaking for National Electric Vehicle Infrastructure Standards and Requirements, in conjunction with using accepted standards that have been implemented in other jurisdictions. Projects funded through NEVI will require these minimum standards for operation, and additional guidance is expected for minimum standards for the CFI Community Charging grant program and other federal opportunities in 2023. Federal requirements include that all chargers must be ENERGY STAR certified. As new standards are developed at the federal, state and local level, the City should adopt amended ordinance to ensure compliance and advancement of EV charging technologies locally.

➢ Action 1.B.2. Coordinate charging station design standards

The City should work with state regulators, HRTPO, and other municipalities across Virginia to coordinate charging station design standards to facilitate ease of implementation for private sector operators. Common operational and design criteria can also improve accessibility for all users by ensuring that chargers in different locations will operate in a simple, common format.

This effort may be undertaken in conjunction with participation in the HRTPO 2050 Long-Range Transportation Plan process, which is currently under development. This effort may also help to establish equity needs and priority projects related to transportation electrification that can be implemented in Virginia Beach. Additionally, coordination on charging station design standards may occur in conjunction with a regional proposal to the CFI Community Charging Grant program, which will require federal standards to be incorporated into all stations constructed utilizing these funds.

Recommendation 1.C: Adopt Zoning and Land Use provisions for Electric Vehicle Supply Equipment (EVSE)

Short Term

Public charging stations are accessory use in most instances. Explicit directives regarding where different types of charging stations (Level 1, Level 2, DCFC) are permitted can increase the efficiency by which new EV charging infrastructure can be installed. Providing this information to the public can not only

clarify whether a type of charger can be installed but can also show that the City supports the deployment of public EV chargers by actively addressing the subject matter.

➢ Action 1.C.1. Adopt definition of EVSE terms for City code

The City does not have any existing language in the municipal code in relation to electric vehicles. EV charging should be clearly classified and defined in all zoning regulations. The City should develop clear definitions of terms related to EV charging infrastructure to enable the development of ordinance related to EV charging. Table 18 below provides examples of language that should be adopted by the City.

Table 18. EV Charging Ordinance Definition Examples

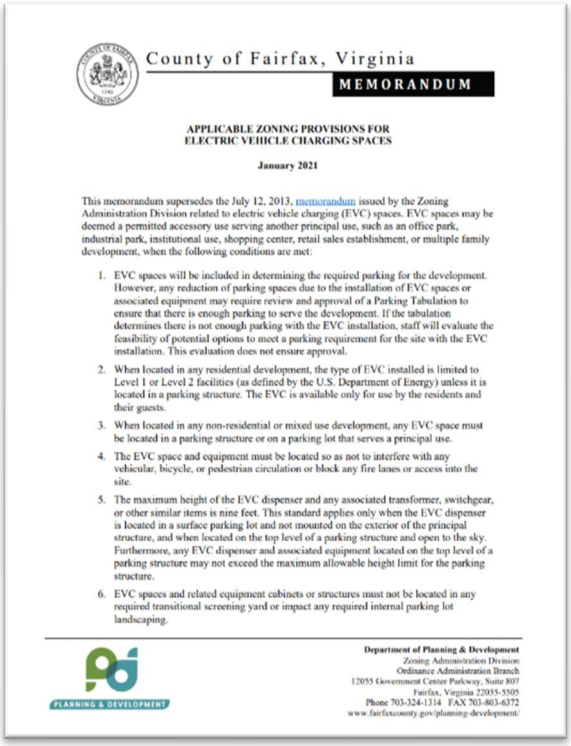
Term	Example Language
Electric Vehicle	Any vehicle that operates, either partially or exclusively, on electrical energy from the grid, or an off-board source, which is stored on-board for motive purpose. "Electric vehicle" includes: (1) a battery EV; (2) a plug-in hybrid EV; (3) a neighborhood EV; and (4) a medium-speed EV.
Electric Vehicle Charging Space	A vehicle parking space served by an electrical component assembly or cluster of component assemblies designed and intended to transfer electric energy by conductive or inductive means from the electric grid or other off-board electrical source to a battery or other energy storage device within a vehicle that operates, partially or exclusively, on electric energy.
Charging Levels	The standardized indicators of electrical force, or voltage, at which an EV's battery is recharged. The terms 1, 2, and DCFC are the most common EV charging levels, and include the following specifications: Level 1 is considered slow charging; Level 2 is considered medium charging; DCFC is considered fast or rapid charging.
Electric Vehicle Infrastructure	Structures, machinery, and equipment necessary and integral to support an EV.
Electric Vehicle Charging Station — Restricted	An EV charging space that is (1) privately owned and restricted access (e.g., single-family home, designated employee parking) or (2) publicly owned and restricted (e.g., fleet parking with no access to the general public).
Electric Vehicle Charging Space — Public	An EV charging space that is (1) publicly owned and publicly available (e.g., park, public library parking lot, on-street parking) or (2) privately owned and publicly available (e.g., shopping center parking, non-reserved parking in multi-family parking lots).
Electric Vehicle Parking Space	Any marked parking space that identifies the use to be exclusively for the parking of an EV.

➢ Action 1.C.2. Adopt zoning and land use provisions for EVSE

The City should amend the Virginia Beach Code by adopting ordinance for application to Appendix A. Article 2. – General Requirements and Procedures for all Districts, to establish requirements for the use of EV charging systems in residential and commercial applications for Level 1 and Level 2 charging. For

DCFC installations, the City may wish to adopt specific provisions specific to each zoning district. EV charging in City historic districts will require specific attention to ensure that infrastructure additions, landscaping and related elements will be in harmony with their setting and environs. The City should explicitly detail when EV charging is considered a primary use. EV chargers that are considered accessory use should be permitted in all non-residential zoning districts to facilitate deployment.

In 2021, Fairfax County, VA the Department of Planning & Urban Development published zoning provisions for electric vehicle charging spaces which can serve as guidance for application in Virginia Beach (Figure 51). The zoning ordinance provides specific guidelines for when an EV charging station is permitted as an accessory use, establishes limitations on the types of chargers that can be installed in residential and commercial applications, and the types of locations (retail, office parks, shopping centers, etc.) that can serve as a site host for those chargers. Those spaces that do not meet the criteria of accessory use are considered principal use, and therefore deemed to be a service station.



County of Fairfax, Virginia

MEMORANDUM

APPLICABLE ZONING PROVISIONS FOR ELECTRIC VEHICLE CHARGING SPACES

January 2021

This memorandum supersedes the July 12, 2013, memorandum issued by the Zoning Administration Division related to electric vehicle charging (EVC) spaces. EVC spaces may be deemed a permitted accessory use serving another principal use, such as an office park, industrial park, institutional use, shopping center, retail sales establishment, or multiple family development, when the following conditions are met:

1. EVC spaces will be included in determining the required parking for the development. However, any reduction of parking spaces due to the installation of EVC spaces or associated equipment may require review and approval of a Parking Tabulation to ensure that there is enough parking to serve the development. If the tabulation determines there is not enough parking with the EVC installation, staff will evaluate the feasibility of potential options to meet a parking requirement for the site with the EVC installation. This evaluation does not ensure approval.
2. When located in any residential development, the type of EVC installed is limited to Level 1 or Level 2 facilities (as defined by the U.S. Department of Energy) unless it is located in a parking structure. The EVC is available only for use by the residents and their guests.
3. When located in any non-residential or mixed use development, any EVC space must be located in a parking structure or on a parking lot that serves a principal use.
4. The EVC space and equipment must be located so as not to interfere with any vehicular, bicycle, or pedestrian circulation or block any fire lanes or access into the site.
5. The maximum height of the EVC dispenser and any associated transformer, switchgear, or other similar items is nine feet. This standard applies only when the EVC dispenser is located in a surface parking lot and not mounted on the exterior of the principal structure, and when located on the top level of a parking structure and open to the sky. Furthermore, any EVC dispenser and associated equipment located on the top level of a parking structure may not exceed the maximum allowable height limit for the parking structure.
6. EVC spaces and related equipment cabinets or structures must not be located in any required transitional screening yard or impact any required internal parking lot landscaping.

PLANNING & DEVELOPMENT

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Zoning Administration Division
Ordinance Administration Branch
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Fairfax, Virginia 22035-5505
Phone 703-324-1314 FAX 703-803-6372
www.fairfaxcounty.gov/planning-development/

Figure 51. Fairfax County Zoning Provisions for EV Charging

Recommendation 1.D: Adopt EV Parking and Signage Requirements

Short Term

Adopting requirements for wayfinding signage, charger availability signage, operational procedures, regulations, and restrictions for charger accessibility ensure that EV owners can utilize existing charging stations at a higher rate. Parking regulations can prevent non-EV drivers from occupying EV parking spaces and can also prevent EV owners from occupying EV spaces for longer than required to charge their vehicle.

➢ Action 1.D.1. Adopt state EV parking space ordinance

In 2022, Virginia adopted Code § 46.2-1219.3. Parking of vehicles in parking spaces reserved for charging electric vehicles, "prohibits a person from parking a vehicle not capable of receiving an electric charge or not in the process of charging in a space clearly marked as reserved for charging EVs. A violation is subject to a civil penalty of no more than $25." It also requires signage be posted that denotes parking requirements and associated fines. The code enables local governments in Virginia to adopt ordinance enforcing the rule. The City should amend ordinance code Chapter 21. Article III. Division 1.Sec. 21-303

to that enforce EV charging parking restrictions in accordance with Virginia state regulations and make these criteria publicly available on the City website.

➢ Action 1.D.2. Adopt EV signage ordinance

In 2013, FHWA published "Regulatory Signs for Electric Vehicle Charging and Parking Facilities" in its Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) that sets signage standards to be used nationally on all public and private roads. These standards have been adopted in Virginia and have been incorporated into federal regulations for federally funded EV charging projects.

Highway and directional signage for EV charging/Alternative Fuels on state-maintained roads must be certified by the VDOT. However, the City maintains flexibility regarding the implementation of how wayfinding and parking restriction signage is displayed. Establishing minimum criteria for how EV chargers should be designated can assist residents in accessing these sites locally. The City should amend ordinance code Appendix A. Article 2. Section B to establish minimum criteria for EV signage on both municipal and private property in Virginia Beach using the MUTCD as a guide or can develop its own signage requirements in accordance with local codes.

Signage is particularly important for new EV owners who may be unfamiliar with charging practices. As part of this Plan, a group of VBPCS students conducted an inventory and review of all publicly listed EV chargers located in Virginia Beach. A number of the chargers that were listed in the inventory were not able to be found by the student team, which may have resulted from lack of adequate wayfinding signage for users.

➢ Action 1.D.3. Support parking minimum standards for new building construction

To meet expanding EV charging demand, the City should encourage the state to adopt 2021 International Energy Conservation Code (IECC), which establishes the minimum number of parking spaces that must be equipped with EV chargers or must be constructed as EV Ready or EV Capable (Table 19). As outlined in Recommendation 3.D, the Virginia State legislature adopted minimum requirements for the number of EV chargers that must be available at for any new construction or major renovations of municipal buildings to service the municipal fleet. The City can also consider the adoption of more stringent parking minimum requirements at these sites.

Table 19. EV Parking Readiness Levels

EV-Ready	Full circuit installations include 208/240 V, 40-amp panel capacity, raceway, wiring, receptacle, and overprotection devices similar to a dryer circuit.
EV-Capable	Panel capacity and the conduit (raceway) are installed to accommodate the future build-out of EV charging with 208/240 V, 40-amp circuits
EV-Installed	EV charging must be installed in new buildings that are constructed.

The 2021 International Energy Conservation Code (IECC) has published requirements for construction of new MUD and commercial developments, as outlined in Table 20. The Commonwealth of Virginia will need to adopt these new IECC code provisions into the Uniform Statewide Building Code (USBC) in future years; however, anticipating these requirements in the future may serve to support actions in Virginia Beach. The Virginia USBC (IECC 2018) currently only requires a single 120 V outlet to be installed in a garage which may offer sufficient charging capability for some EV drivers who may only need passive, longer-duration charging ("Level 1"). It is expected that the 2024 IECC will have further requirements for parking minimums, though proposed amendments are still under review.

Table 20. EVSE Installed, EV-Ready Space and EV-Capable Space Requirements for New Commercial Buildings and Multi-Unit Dwellings – IECC 2021

Total Number of Parking Spaces	Minimum number of Spaces with EVSE Installed[a]	Minimum Number of EV-Ready Spaces	Minimum Number of EV-Capable Spaces
1	1	1	-
2 – 10	1	2	-
11 – 15	1	2	**1**
16 – 19	1	2	**2**
21 – 25	2	3	**2**
26+	**5% of total parking spaces**	**10% of total parking spaces**	**10% of total parking spaces**

(a). Spaces that terminate with a Level 2 EVSE are considered *EV-Ready Spaces* and count toward the minimum number of *EV-Ready Spaces*.

➢ Action 1.D.4. Ensure ADA compliance for charging station design

To ensure that EV chargers are accessible to all residents of Virginia Beach, City-sponsored chargers should meet accessibility criteria for individuals with disabilities. There are currently no established federal Americans with Disabilities Act (ADA) standards with specific application to EV charging installations, however design recommendations have been developed by the U.S. Access Board. In addition, many of the existing ABA accessibility standards are applicable to EV charging stations even in absence of specific provisions. While not formally adopted at the federal level, FHWA has identified these guidelines as a reference for station design for projects funded through the NEVI program.

For existing parking facilities, it is not recommended that ADA compliant parking spaces be converted to EV charging spaces, as this will reduce access to both accessible parking and EV charging spaces. In addition, EV charging spaces have accessible communication requirements for charger operation, as well as requirements for connector and receptacle height, in addition to mobility requirements.

As the City seeks partners for the installation of public charging infrastructure on municipal properties, projects must be required to meet all existing federal accessibility standards. RFP distribution should explicitly state that proposers must comply with all ADA and ABA requirements. As new standards are published, the City will need to update and adopt these requirements for municipal charging to ensure equitable access to charging infrastructure for all residents.

Requirements in the State of California for ADA accessible vehicles are shown in Table 21.

Table 21. Requirements for ADA accessibility in California, per CBC 11B-228.3[xlv]

Total Number of EVSE at Parking Facility[1]	Minimum Required Number of EVSE by Type		
	Van Accessible	Standard Accessible	**Ambulatory**
1 – 4	1	0	**0**
5 – 25	1	1	**0**
26 – 50	1	1	**1**
51 – 75	1	2	**2**
76 – 100	1	3	**3**
101 and over	**1, plus 1 for each 300, or fraction thereof, over 100**	**3, plus 1 for each 60 or fraction thereof, over 100**	**3, plus 1 for each 50, or fraction thereof, over 100**

(a) Where an EV charger can simultaneously charge more than one vehicle, the number of EVSE provided shall be considered equivalent to the number of EVs that can be simultaneously charged.

➢ Action 1.D.5. Adopt ordinance for EV chargers in floodplains

EVSE should always be elevated above potential flood waters if possible. This means that critical surface connection points to above ground or buried lines, transformers, and ideally all electrical equipment should be elevated above base flood elevation (BFE). The City should ensure that updated codes related to EV charging installations have construction requirements as outlined in Virginia Beach Code Appendix K. Article IV. Floodplain District Provisions, so that all chargers located in flood zones are installed above design flood elevation (BFE plus freeboard). In other national jurisdictions, electrical equipment (cabinets, switchgear, and transformer) has been installed one foot above BFE.

Consideration should also be given to installation of chargers that are waterproofed to include personnel protection so that it complies with codes for electrical equipment which may become submerged.

Recommendation 1.E: Empower Residents and Owners of Multi-Unit Dwellings (MUDs)

Medium Term

Residents of MUDs face barriers significant barriers to the adoption of EVs. These residents often do not have an assigned parking space at which a charger can be installed, and the vast majority of MUDs do not have any shared EV chargers installed, leaving these residents fully dependent on public charging. Installation in underground parking facilities also presents specific challenges to building owners, as installation cost may be far higher than in typical applications. LMI and DAC residents are also far more likely to reside in MUDs, exacerbating challenges associated with EV ownership for these groups.

Figure 52 shows the density of MUDs in Virginia Beach by block group. There are approximately 60,935 households in Virginia Beach that are occupied by renters (34% of total households). It is far less likely that renters will have access to residential charging, even when the property may have attached parking facilities. Renters may be prevented from installing Level 2 home charging due to electrical infrastructure upgrades and cosmetic changes that may need to be made by the property owner.

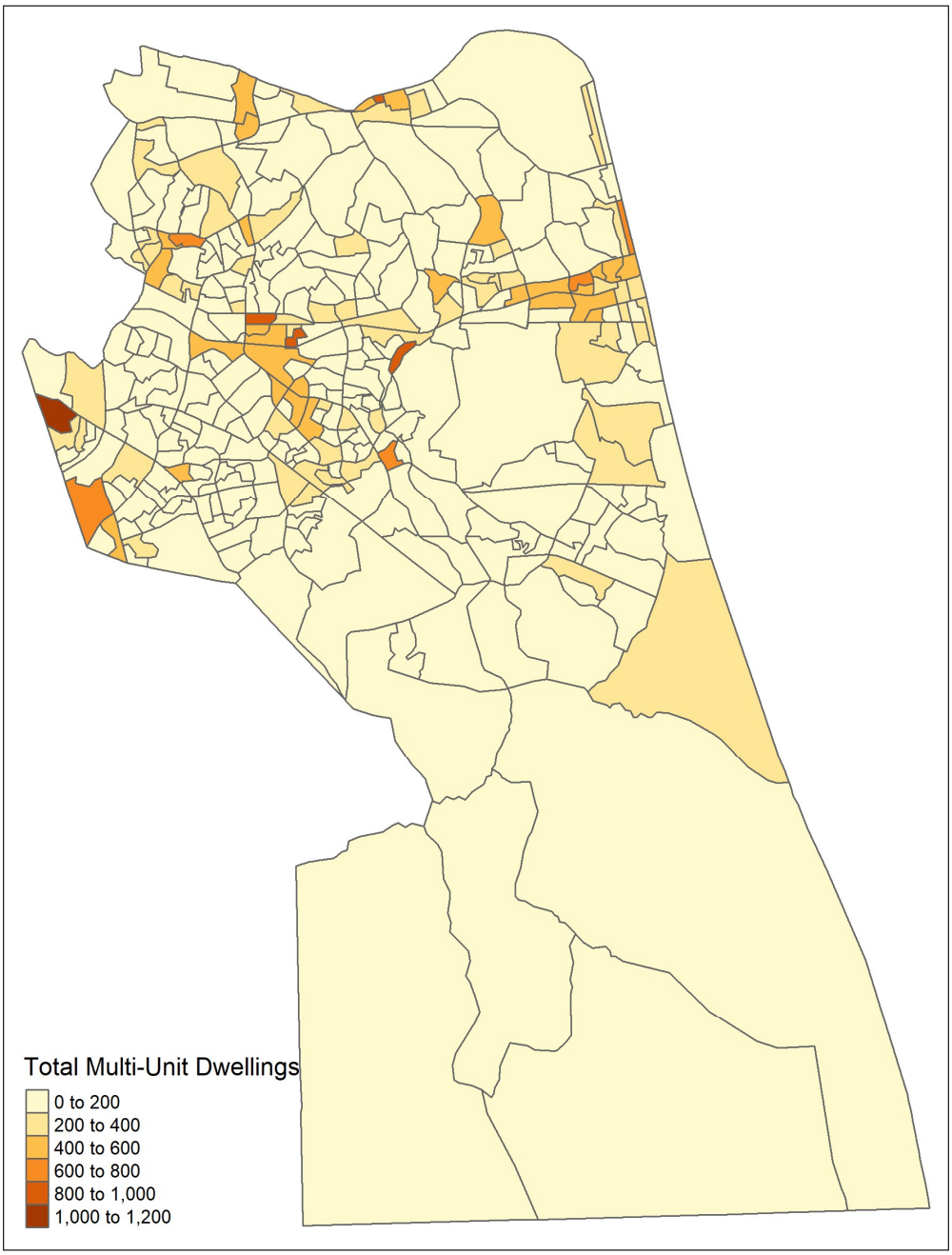


Figure 52. Distribution of MUDs in Virginia Beach by Block Group

Development of policies and programs that address these challenges can both facilitate greater charger access and address equity issues. As described in Goal 5, the City should leverage federal funding sources to facilitate the creation of specific incentives or technical assistance programs for residents and managers of MUDs, particularly in areas that improve charger access to LMI and DAC residents. Adoption of IECC 2021 Commercial Building Codes at the state level (Action 1.C.3) can also help address

charging at MUDs by requiring the installation of EV chargers and EV ready parking spaces in new construction.

➢ Action 1.E.1. Communicate Virginia Code § 55.1-1962.1 to residents and HOAs

In 2020 Virginia passed right-to-charge legislation, which ensures that homeowner and condominium associations cannot prohibit a resident from installing electric vehicle charging station on property owned by the resident, including residents of cooperatives. Information about this law should be communicated to residents, property owners and HOAs through the City website (Recommendation 2.A) to ensure that they are not prevented from installing charging infrastructure at their residence. The City should also provide informational resources to residents regarding installation of chargers at MUDs. City staff should also ensure that this law is properly enforced locally to reduce problems for residents wishing to install charging.

➢ Action 1.E.2. Consider incentive programs for MUDs

There are significant barriers for installation of EV charging infrastructure at MUDs, including high building electrical infrastructure upgrade costs, particularly for older buildings, and accessibility for all residents who are using shared spaces, often leading to underutilization of chargers. For larger deployments, distribution system upgrades can create project delays, further increasing costs, and may trigger building code updates. Building managers and owners may also lack information about the installation process and thereby simply do not pursue installation.

The City should consider the development of an incentive program for the deployment of EV infrastructure at MUDs, with a focus on LMI and DAC residents. Fairfax County, VA is currently in development of the Charge Up Fairfax program, which is being designed to offer HOAs assistance in conducting charging infrastructure feasibility assessments and provide reimbursement grants of up to $5,000 for installation of charging equipment. The pilot program is expected to be implemented in early 2023.[xlvi] A similar program could be implemented in Virginia Beach, potentially utilizing federal funding sources including the CFI Community Charging grant program, Equity Grants or EECBG funds (Goal 4).

Recommendation 1.F: Establish Residential ROW and Curbside Charging Guidance

Medium Term

In addition to residents in MUDs, numerous residents in Virginia Beach rely on street parking for their vehicle, particularly in urban and suburban environments. Across Virginia, only 40% of residents have access to electricity within 20 feet of where they park at home.[xlvii] Commonly referred to as “garage orphans,” these residents face the challenge of how to charge their vehicle when it is parked curbside and lack electrical access. This can result in residents running charging cables from their home across the public ROW, creating significant fire and safety hazards (Figure 53). Actively addressing this issue can help alleviate future problems for residents.

Figure 53. Example of problematic curbside charging in Washington, DC
Credit: EV Advisors

➢ Action 1.F.1. Create pilot program for ROW charging

No state regulations have been adopted regarding ROW charging, however other jurisdictions in Virginia have begun to address this issue by establishing permitting and guidance for residential curbside charging. Requests for curbside charging are expected to increase significantly in Virginia Beach due to the high number of rental properties and residents without driveways or garages. Proactively addressing this issue will reduce the number of residents requesting assistance in the future and reduce labor required for the City to handle these requests. In the near term, the City should establish a pilot program that enables residents to run Level 1 connectors across the ROW using a covered ramp. This strategy has been adopted in Washington, DC and is currently under consideration by other jurisdictions in Virginia. This pilot program would enable the City to gauge the number of requests that can be expected in the future and interest in program participation.

➢ Action 1.F.2. Adopt ordinance enabling residents to install ROW curbside charging

Following an ROW pilot program, the City can consider adopting ordinance and establishing permitting to enable the construction of curbside EV chargers. It is expected that these chargers may be limited to Level 1 charging for residential installations but could also be expanded to Level 2 charging in the future. Several municipalities in the US have already established ROW permitting and design criteria (Figure 54, including Washington, DC and Montgomery County, MD. In addition, Montgomery County also

established a simplified residential EV charging permit process and guidebook which can be used as a model for implementation in Virginia Beach (Recommendation 1.A).

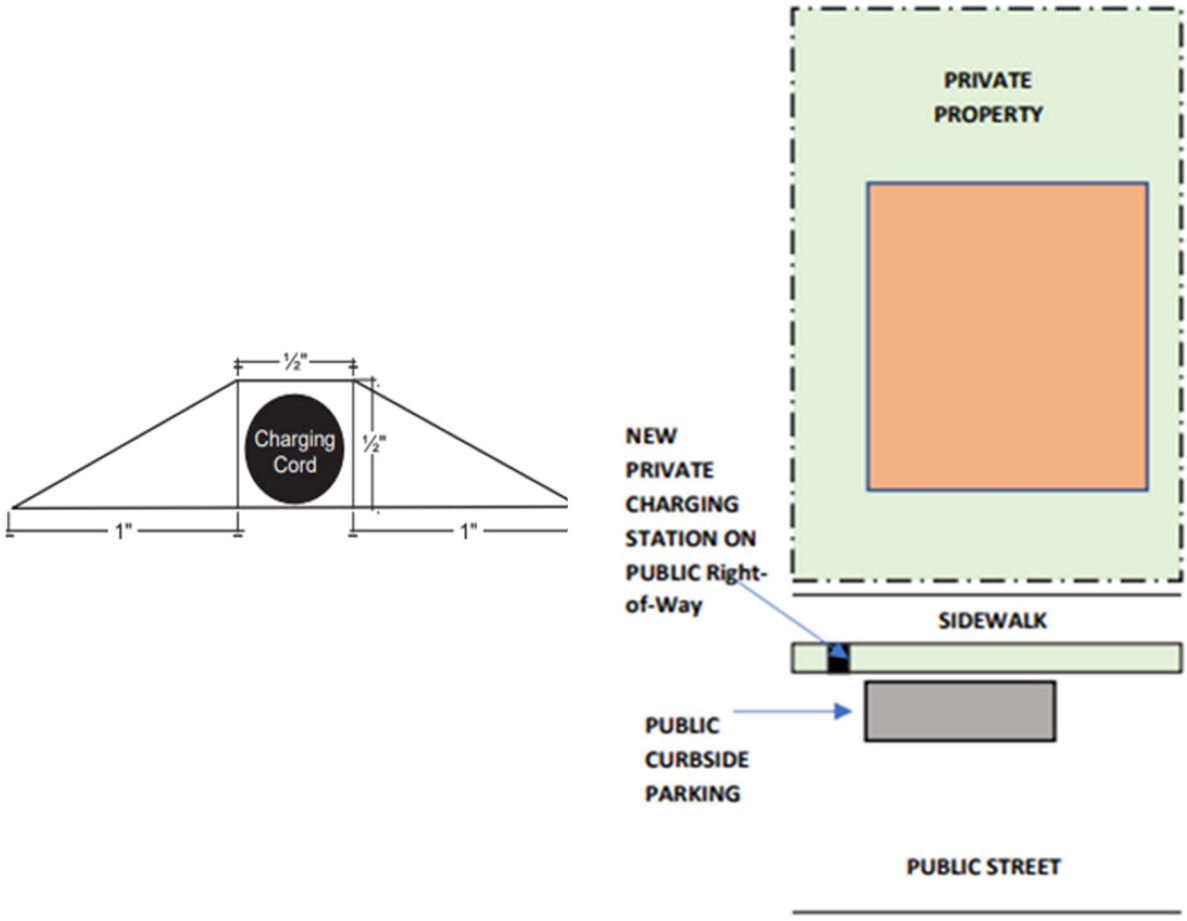


Figure 54. ROW Charging Cord Cover (left) and Residential ROW Charging Guidance, Montgomery County, MD
Credit: DDOT (L) and MCDOT (R)

Recommendation 1.G: Promote Incentives and Policies for Residential Charging
Short Term

As EV adoption grows, it is expected that most of charging will take place overnight at residential locations. The Department of Energy (DOE) estimates that 80% of EV charging currently takes place home[xlviii] because of the convenience and low cost of residential charging in comparison to public charging sites. In the future it is estimated that 61% of Virginia Beach residents will have access to a garage or driveway to enable Level 1 or Level 2 charging installations at home.

➢ Action 1.G.1. Communicate federal and state incentives

As identified in detail in Goal 4, there are several federal and utility incentive programs available to residents of Virginia Beach to reduce costs for the purchase of EVs and charging infrastructure. The City should utilize the City EV information hub (Recommendation 2.A) to provide residents with access to

this information, along with guidance for how to successfully apply to programs. In responses to the public survey conducted as part of this Plan, 30% of residents reported that they were unaware of incentives for the purchase of an EV, while 43% were unaware of incentives for residential EV chargers. To improve access to charging and reduce costs for residents, this information should be made readily available on the City website.

➢ Action 1.G.2. Facilitate residential electrical upgrades

To install Level 2 EV chargers, many residents will need to upgrade to higher capacity electrical service panels, which distributes electricity from a utility grid connected main breaker to other smaller circuits or appliances throughout the home. Electric panel size is determined by the current rating of the main breaker and typically ranges between 100–400A. The more electric loads there are in a home, the larger its electric service panel must be. Older homes, and homes built with natural gas systems for cooking and/or heating will often have an electric panel below 200A. As households electrify or add loads like EV chargers, they will likely need to upgrade their electric panel to 400 A to accommodate Level 2 charging installations.

To complete necessary upgrades, residents will need to engage with an experienced contractor for installation and will require necessary permits for upgrading electrical equipment. The City can provide a streamlined online permitting process and facilitate communication between residents and contractors for installation of charging equipment (Recommendation 2.A).

➢ Action 1.G.3. Consider incentive programs for residential upgrades

The City should consider the development of an incentive program to help reduce the cost of electrical upgrades required for residential charger installations, with a focus on LMI, DAC and rural communities in the form of tax incentives, rebates, or through waiving of permitting fees. This program could be established utilizing federal funding sources including the CFI Community Charging grant program, Equity Grants or EECBG formula funds (Goal 4).

Recommendation 1.H: Promote Incentives and Policies for Workplace Charging

Short Term

After residential charging, the most common location that EV owners are expected to charge their vehicles in the future is at work. The analysis presented in Chapter 4 of this Plan estimates that Virginia Beach will require over 800 workplace charging ports by 2030 and nearly 3,000 by 2035. It is also expected that lower-income communities will be more reliant upon workplace chargers due to lower access to home charging. However, business owners can face challenges for establishing workplace charging programs, including financing charger installation and information about how to appropriately size and operate chargers.

➢ Action 1.H.1. Communicate federal and state incentives

As identified in detail in Goal 4, there are several federal and utility incentive programs available to business operators in Virginia Beach to reduce costs for the purchase of EVs and charging infrastructure. The City should utilize the City EV information hub (Recommendation 2.A) to provide businesses with access to this information, along with guidance for how to successfully apply to programs. The public information survey distributed as part of this plan found that 50% of respondents were unaware of incentives for installation of charging infrastructure at their business and only a third of respondents were interested in installing a charger for its employees or customers. Provision of relevant information to these operators make increase adoption of charging infrastructure in the coming years.

➢ Action 1.H.2. Communicate workplace charging program guidance

The City can prioritize outreach and communication with local businesses to ensure that they have information available regarding the benefits of installing chargers at their place of business. Resources have previously been made available through the Department of Energy, NYSERDA and other organizations that provide information about the costs, benefits and processes associated with workplace charging, which can be shared with businesses in Virginia Beach with the EV hub.

Examples of information required for businesses includes:

- Expected employee demand and time of use
- Number of charging ports to install, electricity demand and required infrastructure upgrades
- Setting of fees for employees and/or the public
- If chargers should be made available for public use
- Revenue models for working with EVSPs
- Availability of federal, state, and local incentives to facilitate implementation

Goal 2: Catalyze Public Engagement Around EV Charging

How do we increase awareness and participation?

Recommendations in this section focus on actions that will facilitate increased awareness of EV technologies for residents, including online and in-person education and outreach activities, training and workforce development programs, and types of information can be provided to local stakeholders to facilitate EV charging. These recommendations will also emphasize the role that public awareness and engagement campaigns can have to help address equity and environmental justice concerns and increase transportation access for all local residents.

Figure 55. Freebee On Demand EV Ride-hailing Program Vehicle in Virginia Beach

Recommendation 2.A*:* Create EV Information Hub on City Website for Residents and Businesses

Medium Term

The City's leadership role in educating the public, providing information and championing transportation electrification is one of its most important and valuable opportunities to support EV adoption and deployment of charging infrastructure in Virginia Beach. Providing easy to understand, accessible materials can help residents to understand the changes involved with transportation electrification in the coming years, how to adequately prepare for this transition, and how to take advantage of programs that may reduce living expenses or increase opportunities for economic improvement.

➢ Action 2.A.1. Develop and publish online EV information hub on the City website

The City should consider the development of EV information hub on the City website that can be made available to residents of Virginia Beach. This can serve a mechanism for residents to find local EV dealers and charger installation professionals, access online permitting resources, view maps of existing EV

chargers operating in the City, and other tools. The goal of such a portal would be to equip residents with the information needed to procure, operate, and maintain an EV and access vehicle charging as easily as possible.

In the near term, the City should integrate publicly available resources provided at the state and federal level to educate residents. The City should work with other regional partners—such as MWCOG, Virginia Clean Cities, Dominion Energy, and universities—to develop a landing page with resources, tools, information on incentives, and other educational material. The City of Boston's website offers a user-friendly and easy-to-navigate interface that can serve as an example (Figure 56).

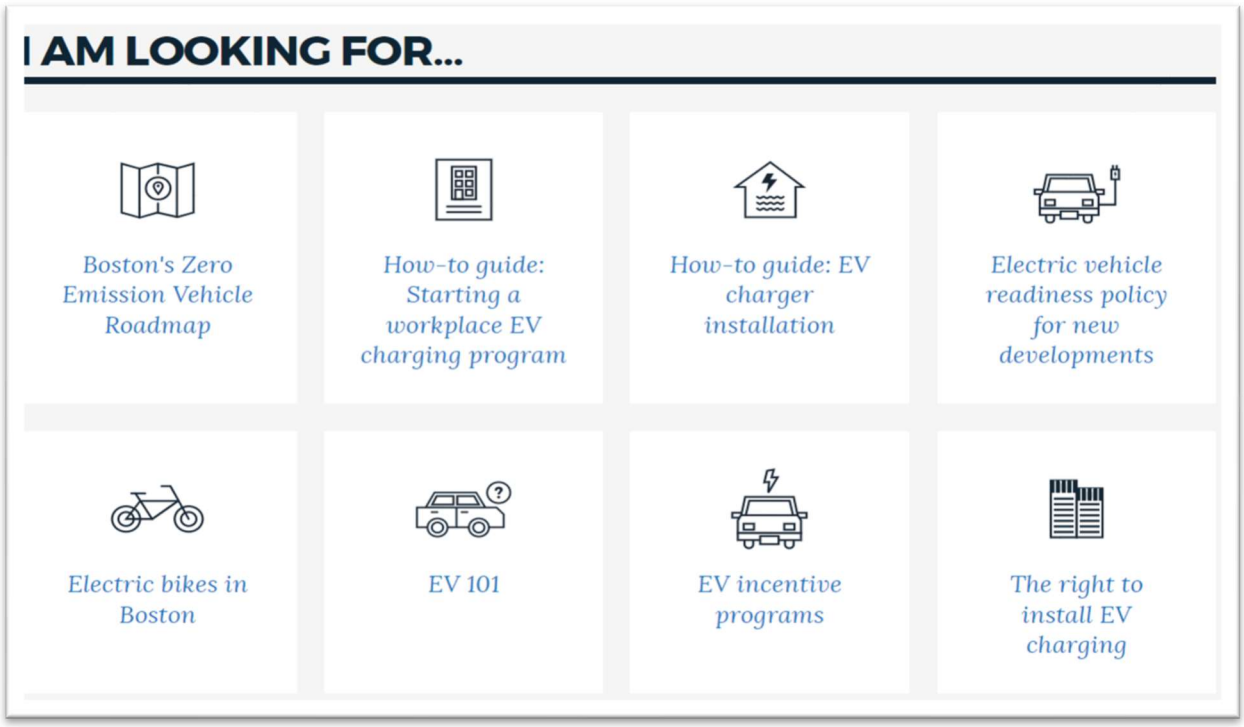


Figure 56. Recharge Boston EV Program Landing Page

In addition to providing resources about EVs, the City can also promote electric scooter and electric bike programs, the City's use of EVs in its fleet (see Goal 4), the City's support of the HRT transit system's electric bus program, and Virginia Beach City Public Schools (VBCPS) electric school buses to provide a comprehensive demonstration of the City's leadership to support EVs.

The core elements of such an EV resource portal should include:

- Roadmaps, strategy documents, and plans related to EVs and charging in the City.
- EV guidance documents, information about vehicle models, costs, and charging technologies.
- Resources connecting local service providers, such as certified electricians and EVSPs.
- Links to City ordinance, codes and online permitting processes related to EVs and charging infrastructure.
- Decision-making tools, vehicle comparison charts, EV checklists.

- Fact sheets describing past or current pilot programs.
- Installation guide for installing home, work, and/or publicly accessible charging stations.
- Maps showing existing or planned EV charging stations.
- Information on workforce training and economic development opportunities.
- Links to federal, state, local and utility incentives and grant programs.
- Links to presentations, workshops, webinars, and training materials.
- A frequently asked question sheet.

This information hub would support many of the recommendations in this Plan focused on the dissemination of information and can help establish the City as a leader in transportation electrification.

Recommendation 2.B. Implement Equity and Environmental Justice Community Outreach and Engagement Strategy

Short Term

Disadvantaged communities, communities of color, LMI and individuals with disabilities have historically lacked quality access to transportation and energy systems. Therefore, these groups have not realized equitable benefits from these systems and should be prioritized in transportation planning activities.[xlix] Ensuring equitable access for EV charging infrastructure requires a comprehensive community outreach and engagement approach that aims to serve all residents. Without a comprehensive and equitable approach, the deployment of EV charging infrastructure may lack affordability, accessibility, and reliability, location convenience, safety, and employment and economic opportunities for the surrounding community.[l]

➢ Action 2.B.1. Establish stakeholder engagement goals

Meaningful engagement with community members helps build support for programs and projects, as well as informs the City about where EV charging infrastructure may be most useful to the community. In turn, an equitable distribution of EV charging infrastructure can improve overall access to transportation, increase access to workforce development and job opportunities, and promote the use of energy efficient technologies. It may also lead to reduced exposures to transportation emissions in these communities.[li] In developing a stakeholder engagement strategy, the City should first establish clear goals and processes that will facilitate implementation (Table 22).

Table 22. Stakeholder Engagement Planning

Define clear purpose and goals of community engagement and outreach.
When designing the engagement plan, clearly identify the desired outcome of outreach, and establish criteria to monitor success.

Establish a community advisory panel. Establish an advisory panel representative of both government and community voices to ensure diverse representation and points of view. This advisory panel can identify stakeholder groups for outreach, oversee implementation, and track program success.

Build ongoing relationships with priority communities. Focus on developing and maintaining relationships with community members to facilitate future engagement and refine strategies for future outreach.

➢ Action 2.B.2. Establish stakeholder engagement strategies and methods

Examples of stakeholder engagement strategies can be found in Table 23. The City should utilize multiple methods of engagement to ensure diverse views are heard and considered throughout the planning process and that the program achieves the equitable and fair distribution of benefits and services of the deployment, installation, operation, and use of EV charging infrastructure.[lii] In addition, the City should set realistic expectations with community members around the types of types of decisions they can inform, prioritize transparency, and be responsive to the concerns and needs of the

Table 23. Stakeholder Engagement Strategies

Conduct a stakeholder mapping exercise to identify priority communities for outreach. Identify community groups such as homeowners' associations, school boards, local housing organizations, equity groups, and small businesses to target for outreach.

Host public information sessions. Provide updates to community members regarding program implementation, opportunities for training and workforce development, or provision of resources available for community use.

Host Public Listening Sessions. Provide a forum for the public to provide feedback, express concerns or address other issues regarding program implementation. To maximize participation, meeting locations and times should be selected that ensure geographic coverage and accessibility.

Conduct surveys. Utilize online and in-person surveys to identify needs, opportunities, and priorities, provided in multiple languages to improve accessibility. Surveys can be targeted to specific communities and can be distributed through program partners, in addition to directly by the City.

Engage with the community using a combination of media outreach. Community outreach should utilize multiple methods for outreach, including in-person, print, online, and social media to ensure information access and feedback.

community throughout the planning and decision-making process.[liii] It is important to evaluate all engagement approaches to understand what groups or community members may not be represented, which can inform where changes may need to be made to better reach those groups.[liv,lv]

➢ Action 2.B.3. Implement continuous stakeholder engagement program

As the City identifies municipal sites for installation of public charging infrastructure, it will be important for the City to have developed a replicable process for ongoing engagement with community members to ensure that the process is both efficient and effective. As EV infrastructure is deployed in Virginia Beach in the coming decade and beyond, the City will need to continually engage with community members to refine program goals, prioritize additional sites, understand stakeholder needs and develop new strategies to help meet those needs. In particular, ongoing engagement can help to assess the overall accessibility of charging infrastructure, barriers to adoption of EVs and charger utilization and the distribution of economic benefits being achieved across priority communities.

Recommendation 2.C. Promote Virginia Beach as an EV Capital City and EV Friendly Tourist Destination

Medium Term

Virginia Beach is the largest city in Virginia and is a significant tourist destination, as highlighted in Chapter 4. As EV adoption rates continue to rise in the coming years, tourist populations will be increasingly concerned with their ability to charge as a prerequisite for selecting a travel destination. Virginia Beach can gain recognition both regionally and nationally by leveraging its actions regarding electric transportation in by branding itself as an Electric Vehicle Tourist Destination. As public EV chargers are deployed in the city, communicating to potential visitors EV owners that there is available charging infrastructure at key tourism destinations in Virginia Beach can alleviate concerns about the ability to fuel their vehicle and could generate additional revenue.

➢ Action 2.C.1. Develop EV branding

Through the Convention and Visitors Bureau, Virginia Beach should consider the development of a brand that communicates the City's commitment to EVs. In other cities, specific EV tourism and branding initiatives have been undertaken to highlight City efforts and commitment (Figure 57). The Drive Electric Orlando Program was established in 2015 through a partnership of the Florida Energy Office and the Electrification Coalition, conducting direct marketing campaigns throughout 2016 to 2018

Figure 57. City EV Initiative Branding

to key populations along the East Coast and offering access to electric rental cars, free valet parking, free charging, and other incentives for tourists who registered through the program. San Antonio developed the EV-SA Initiative to promote City efforts on sustainable and electric transportation, and was done similarly through the Sac-to-Zero program in Sacramento, CA.

Virginia and other states have also created specific branding regarding to enhance awareness around their commitment to vehicle electrification. Similar branding can be adopted by Virginia Beach to be used in communications and public relations campaigns, and utilize resources developed under the Drive Electric USA to enhance public awareness.

Figure 58. State EV Initiative Branding

➢ Action 2.C.2. Publicize EV efforts

Other methods to strengthen the EV ecosystem in Virginia Beach and send strong market signals to investors include using public statements, events, or policies to support and encourage entrepreneurs to become active in the EV market, sending encouraging signals to government employees to find creative solutions to overcome EV barriers, and rewarding and incentivizing EV driving. Investing in EV signage to enhance wayfinding of EV infrastructure is another important way to increase public awareness of charging infrastructure availability. Such efforts may also increase opportunities for strategic public-private partnerships to support investments in Virginia Beach's transportation electrification initiatives.

To the extent possible, public-facing documents and City press releases should reference the need for an electric mobility future and highlight Virginia Beach's cumulative number of EVs on the road, availability of chargers, the policies that have led to sustained adoption success, and emphasize increases in recent EV adoption.

➢ Action 2.C.3. Engage with local businesses

Through the Department of Economic Development, the City should outreach to local industry organizations including the Virginia Beach Hotel Association, the Virginia Beach Restaurant Association, Central Business District Association and Atlantic Avenue Association to provide information and resources to local businesses about EVs. Providing these entities with guidance for installation and operation of charging stations, charging station revenue models and other benefits to business owners in attracting patrons can help to support the deployment of charging infrastructure in tourist areas in the City.

Recommendation 2.D Establish Workforce Development and Training Programs

Medium Term

Deployment of EVs and charging infrastructure brings with it significant opportunities and challenges related to economic development. Numerous new jobs will be created through installation, operation and maintenance of EV chargers and vehicles, manufacturing of EV and charging station components, expansion of local energy generation, and electrical system upgrades. However, this opportunity also requires education and training programs to be implemented that enable local populations to access new employment opportunities in an equitable manner. Standardized education, training, certification, and apprenticeship programs should be implemented within Virginia Beach to expand the capacities of residents to take advantage of the economic benefits associated with EV and charging infrastructure deployment.

➢ Action 2.D.1. Identify training programs

There are several specific programs related to EV infrastructure that should be leveraged or adopted in Virginia Beach to help provide training programs to its residents, as well as to municipal staff. Integration of high-quality national certifications like the Electric Vehicle Infrastructure Training Program (EVITP) have been developed to support training programs related to EVs nationally. Table 24 provides a summary of national and local programs that can be integrated into local efforts.

Table 24. National EV, EV Infrastructure and EV Safety Training Programs

Charger Installation and Maintenance	
Electric Vehicle Infrastructure Training Program (EVITP)	• The program was designed to provide qualified electricians with comprehensive training in the proper installation of EVSE (residential, commercial, public, and fleet). • Participant must be a state licensed or certified electrician. • If the participant works in a state that does not license or certify electricians, they must provide documentation of a minimum of 8,000 hands-on electrical construction experience.
Emergency Response	
National Fire Protection Association (NFPA)	• Alternative Fuel Vehicles Training Program for Emergency Responders: Online • Introduction to alternative fuel vehicle concepts including, electric, hybrid, fuel cell, biodiesel, and gaseous fuels such as CNG (Compressed Natural Gas), LNG (Liquefied Natural Gas), and Propane. • The program also covers identification techniques, immobilization and power-down procedures, extrication challenges, recommended practices for dealing with hazards such as fires and submersion, incidents involving charging/refueling stations, and more.
Electric Vehicle Maintenance	
Reynolds Community College: Hybrid and Electric Vehicle Technology CSC	• Curriculum is designed to meet the need for automotive technicians with education in the advanced technologies used on current vehicles. Such advanced technologies include electric, plug-in hybrid, and fuel cell EVs, as well as the advanced control systems used on these and other advanced vehicles. The

	program provides instruction on the theory of operation, application, and diagnosis of the systems used in these vehicles. • 22 Credits to Receive Certificate.
Clean Tech Institute- Certified Electric Vehicle Technician (CEVT) Training Program	• Offered only in CA currently but could be used as a model training program • 16-week training program covers comprehensive topics through lectures and hands-on workshops in advanced electric car theory and practice. 12 hours per week.

There are also registered apprenticeship programs that should be utilized by the City to facilitate the establishment of a workforce training program. Virginia Clean Cities is currently working on the development of an online resource that will provide information to municipalities regarding EV training programs available in the state, which should be utilized by the City upon publication. Other organizations in Virginia which are currently in development of training and apprenticeship programs related to EVs and EV charging infrastructure that the City should coordinate with includes:

- BlueGreen Alliance
- International Brotherhood of Electrical Workers (IBEW)
- Capital Commitment of Virginia

➢ Action 2.D.2. Establish workforce training partners

Through the Department of Economic Development, the City should leverage existing experience with workforce training initiatives for application to the EV sector. The City should also work with the Hampton Roads Workforce Council and state agencies regarding economic development opportunities, identifying training resources and participating in available programs. Workforce training programs should be established conjunction with environmental justice outreach (Action 2.B.1) to ensure ensuring that education assistance programs are made available specifically for LMI and DAC residents.

➢ Action 2.D.3. Pursue funding for workforce training

As identified in Goal 5, there are numerous federal funding programs that are available to establish workforce training and development programs at the state and local level related to EV technologies. In order to fully capture the economic benefits of federal funding, the City should prioritize those programs and projects which not only provide economic benefit in the short term but will also enable long term economic development for workers in the region by building local capacities and stimulating new sector growth. Workforce training actions should be incorporated into any request for federal funding, with a focus on equitable access to economic development opportunities.

Goal 3 Establish Municipal EV Programs

How do we expand charger deployment at municipally-owned sites?

Figure 59. Municipal EV Fleet in Columbus, OH

Goal 3 focuses on those direct actions that should be taken by the City to prepare for the transition to electrified transportation. This includes the development of leadership programs, establishing deployment goals and targets, coordination with partners and deployment of EV charging at municipal properties.

Recommendation 3.A. Establish an EV Implementation Working Group

Short Term

Formalizing City leadership regarding electric vehicles is an effective mechanism to communicate to both internal and external stakeholders the City's commitment to transportation electrification and provides a mechanism to bring diverse stakeholders into the decision-making process.

➢ Action 3.A.1. Establish purpose and membership

This implementation working group should be developed to help implement the recommendations in this Plan and can evaluate and prioritize recommendations for benefits, impacts, and costs and resource requirements. Participants would collectively prioritize recommendations, identify lead and supporting departments for each recommendation, develop resourcing and implementation plans, and monitor and

report on implementation progress. Moreover, the group should develop a longer-term EV planning guidance to meet city EV charging infrastructure needs in the future. This working group should meet on a regular basis (monthly, quarterly) to ensure that information is effectively communicated across relevant offices and for the development of strategies to increase deployment of charging infrastructure.

This implementation working group may include representatives across City offices to ensure that EV infrastructure training, planning and implementation is conducted in a cohesive manner, and ensure both input and coordination across offices. This working group could include representatives from:

- Public Works
- Planning
- Information Technology
- City Manager
- Public Schools
- Communications Office
- Convention and Visitors Bureau
- Economic Development
- Fire
- Public Utilities
- Parks and Recreation
- Emergency Management
- Police
- Housing and Neighborhood Preservation

Recommendation 3.B: Set Deployment Targets

Short term

Setting targets for EV charger deployment is important for several reasons: communicating the City's priorities to a wide group of stakeholders; ensuring consistency of planning efforts over time and across City departments; tracking progress; and ultimately for ensuring the City direct appropriate resources to charging infrastructure.

➢ Action 3.B.1. Adopt EV Charger Deployment Targets

The City should establish near-term (five-year) and medium-term (10-year) targets for the total number of publicly accessible charging plugs in Virginia Beach. Potential targets are given in Table 25, which are based on the Current EV Pathway presented in Chapter 4. Given the rapidly evolving nature of vehicle and charging technology, the City should periodically—as frequent as every two years—reassess its charging deployment targets. This reassessment should consider actions and targets by other cities (see Recommendation 3.C on benchmarking). This data can be compiled from publicly available resources such as PlugShare or DOE AFDC, or could utilize permitting data to track progress subsequent to implementation of Recommendation 1.A.

Table 25. Potential targets for publicly accessible plugs in Virginia Beach

Scenario	Year	Total Publicly Accessible Level 2 Plugs Needed[b]	Total Publicly Accessible DCFC Plugs Needed[b]
Current	2022	154 needed (120 currently exist)	34 needed (17 currently exist)
Future	2025	188	38
	2030	1,487	284

[a] Electric vehicle population projection based on the Current Pathway discussed in Chapter 4.

[b] The number of needed plugs is based on the plugs to EV ratio from the National Renewable Energy Laboratory's (NREL's) EVI-Pro Lite Tool.

➢ Action 3.B.2. Set fleet conversion targets

The City should also establish targets for the number of EVs that are deployed in the municipal fleet. As outlined in Recommendation 4-D, the City maintains a light duty fleet of over 2,000 vehicles, and a total fleet of over 4,000 vehicles. Establishing a target for the number of EVs deployed in the City fleet on a yearly basis can ensure that the City meets or exceeds deployment of EVs across Virginia as a result of ACCII, resulting in 100% new procurements for the non-emergency LDV fleet being electric by 2035. The results of this fleet assessment are presented in an accompanying report.

Recommendation 3.C: Benchmark Against State and Local Charger Deployment

Short Term

To establish itself in a leadership position, the City should benchmark metrics of EV and EV charger deployments in the City against other jurisdictions and nationally.

➢ Action 3.C.1. Establish benchmarking metrics and conduct annual review

The City should formalize a process for annual review of total chargers deployed in Virginia Beach to be undertaken by the working group identified in Recommendation 4-A. The City should consider benchmarking itself with other MWCOG-member cities or cities in Virginia. As warranted, the City should publicize leadership in the total number of chargers deployed and integrate these achievements into public facing documents.

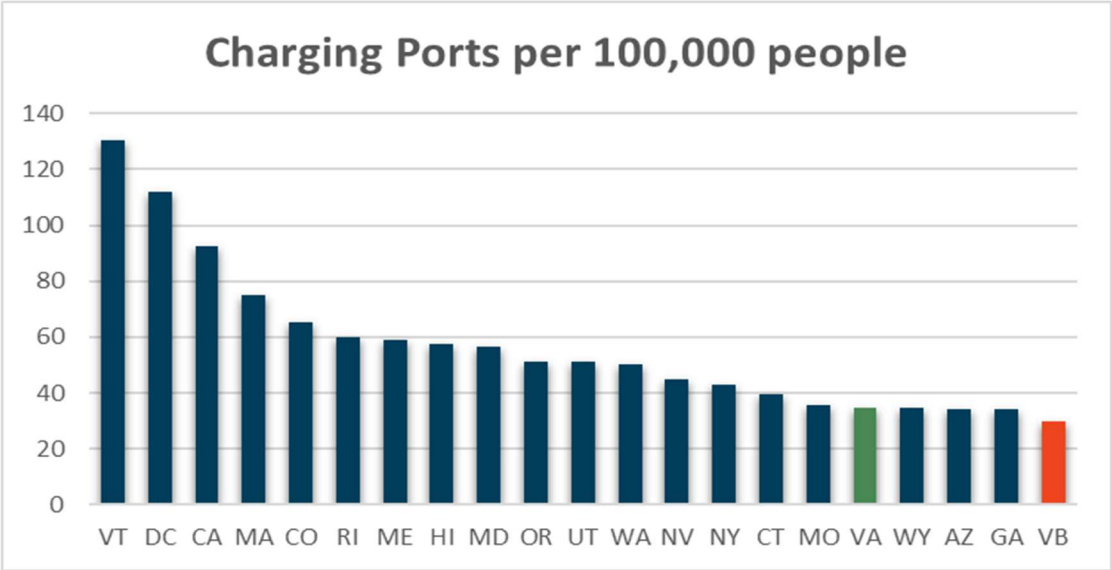


Figure 60. 20 States and Virginia Beach: EV Chargers per 100,000 people

A commonly published metric is the number of chargers and vehicles per 100,000 people (Figure 60). According to the DOE AFDC, across the state of Virginia, there are currently 34.9 EV chargers per

100,000 people and 10 charging ports per registered EV.[lvi] In Virginia Beach, there are currently 29.9 EV chargers, which is below the state average.

Recommendation 3.D: Ensure Implementation of Virginia Code 15.2-1804.1

Short Term

In 2021, Virginia adopted Code 15.2-1804.1, which establishes requirements installation of EV infrastructure at all new construction and major renovations at municipal buildings in the state (Table 26). Under this regulation, the City is required to ensure that for any new construction of at least 5,000 square feet, or a renovation that costs more than 50% of the value of the building, infrastructure "including EV-ready charging electrical capacity and pre-wiring, (i) sufficient to support every passenger-type vehicle owned by the locality and available for use by the locality that will be located at such building upon full occupancy, meet projected demand for such infrastructure during the first 10 years following building occupancy, or (ii) that achieves the current ZEV or EV charging credit for a high performance building certification program."

Table 26. Virginia Municipal Construction Requirements for EV Charging

Subject	Description	Code
Zero Emission Vehicle (ZEV) Infrastructure New Building Requirement for Localities	Any locality designing new building construction of more than 5,000 square feet, or a renovation that costs more than 50% of the value of the building, must include sufficient ZEV charging and fueling infrastructure. The building must be capable of supporting projected ZEV charging and fueling demand over the first 10 years following building occupancy.	15.2-1804.1

➢ Action 3.D 1. Adopt Virginia Code 15.2-1804.1

As identified in Recommendation 3.E, the City maintains a light duty fleet of over 1,600 light duty vehicles that are suitable for electrification. The City is currently planning major construction and renovation projects at several key municipal sites that include significant municipal fleets. For those sites which entered the design phase starting January 1, 2021, and in the future, consideration of this requirement is necessary. While this regulation does not require the installation of EV charging equipment at municipal sites, it does require that the parking facilities be constructed "EV ready"—meaning that all critical wiring and electrical capacity must be installed that would enable the installation of charging ports to support a fully electrified municipal fleet located at that building.

➢ Action 3.D.2. Co-location of public and workplace charging

Integration of this standard may also facilitate the installation of charging stations at municipal properties, both for the public and for municipal employees. When planning new construction or renovations, the City should conduct site assessments to understand the feasibility of installing charging capacity beyond what is needed for the municipal fleet. Co-locating public chargers for use by City

employees or residents with new construction of chargers for fleet operations can reduce overall infrastructure costs. Site design that includes electrical infrastructure for additional chargers can reduce costly retrofits in future years as penetrations of EVs continues to increase.

Policies should also be developed regarding vehicle charging for municipal employees. While some workplace programs provide free charging services to employees as a benefit, it is not recommended that the City provide free charging to municipal employees. While in the short-term EV charging may only apply to a small number of staff, as EV deployment grows this offering may become a large cost to the City. EVs have been shown to reduce TCO for light duty vehicles across vehicle classes, and when combined with existing incentives at the federal and state level it would be unnecessary for employees to be further incentivized to purchase an EV through further reduced fueling costs.

Recommendation 3.E: Implement Plan for Electrification of City Fleet

Short Term

In conjunction with development of this Plan, the City has undertaken an analysis to understand the composition and operational requirements of the light duty fleet operated by the municipality. There are 1,611 light duty vehicles operated by the City which may be available to electrification in the coming years. This analysis provides recommendations on vehicles that are suitable for electrification in the near term, with assessment of available EV replacements by vehicle class, along with infrastructure requirements to support these vehicles. The City should implement a plan to begin electrifying the City fleet, prioritizing high use vehicles such as those operated by DPW and in the motor pool, which will give City operators exposure to EV technologies. A detailed assessment of this analysis can be found in the Fleet Assessment Report accompanying this plan.

➢ Action 3.E.1. Procure vehicles this year

The City should prioritize purchasing or leasing at least one vehicle of each major type this year to give City fleet operators the opportunity to familiarize themselves with the operation of EVs and understand changes to daily operations that result from different fueling practices. Gaining familiarity with EVs in the short term is critical to enabling the pragmatic rollout of EVs across the City fleet in the coming years.

Using the list of priority vehicles provided in the fleet assessment, fleet electrification should be given to those sites that (a) have high concentrations of vehicles co-located for overnight charging to increase efficiency for charger installation, (b) facilities that have planned construction or renovations which will require installation of make ready charging infrastructure (Recommendation 3.D), (c) those sites which will enable greatest employee access to utilize EVs (such as motor pool), and (d) those sites which may be co-located with public charging infrastructure to provide synergy with transformer upgrades, installation of conduit, and other construction activities that will need to be undertaken.

➢ Action 3.E.2. Adopt state DGS TCO calculator into fleet planning

Virginia Code § 2.2-1176.2 mandates that beginning on January 1, 2023, all state agencies in Virginia must use a Total Cost of Ownership (TCO) calculator to assess their light duty fleet. agencies must purchase or lease EVs instead of ICE vehicles if the calculator indicates that an EV will offer a lower TCO than an ICE vehicle.

Virginia Beach should adopt this tool for its own vehicle electrification program to align its efforts with state level planning and to understand the costs and benefits of fleet electrification as technologies advance in future years. As prices for EVs continue to drop in the coming years and vehicle options expand to medium and heavy-duty applications, it will be important for the City to revisit TCO scoring of vehicles to expand the scope of priority vehicles suitable for electrification beyond the scope of the Fleet Assessment accompanying this Plan.

➢ Action 3.E.3. Adopt alternative fuel policy

The City should adopt an Alternative Fuel Policy to guide fleet purchasing and operations, and can develop internal standards and guidelines for implementation of charging infrastructure for City use. Such planning process should include site coordination, vendor and technology standards, charging infrastructure management and governance policies and practices, access policies, funding coordination, and business model approaches. Such planning and governance process will also be critical to opportunities where the City may consider offering publicly accessible charging infrastructure as outlined in Goal 1.

➢ Action 3.E.4. Consideration of PHEVs

For some fleet applications, such as emergency response vehicles, full electrification may not be suitable in the near term. PHEVs may be more suitable for those vehicles that require the flexibility of dual fueling to ensure that vehicles are operational during extended grid failures or to enable rapid refueling times based on used case.

To maximize cost efficiency and reduce emissions, PHEV vehicles should be charged similarly to BEVs to maximize daily travel using the battery system. The majority of the LDV fleet in Virginia Beach has a daily range of <40 miles, using electricity for as the primary power source for most operational needs. Fleet PHEVs can be plugged in for overnight charging as done with BEVs as infrastructure allows.

Recommendation 3.F: Increase Coordination with Dominion Energy
Short Term

A critical component of the charging infrastructure development process is close coordination of local utilities. While the City may have identified priority sites of installation of charging infrastructure or developed strategies for phased rollouts of EVs in the municipal fleet, the utility must assess capacity for the grid to integrate proposed charging infrastructure, particularly for DCFC charging installations. Dominion Energy can also provide specific guidance regarding constraints, development timelines and costs associated with the development of make-ready infrastructure at the project site.

➢ Action 3.F.1. Review priority sites

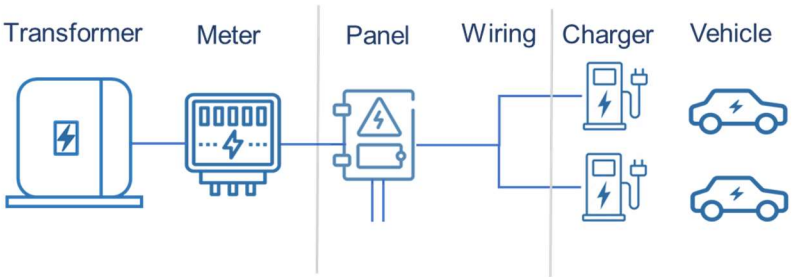
Using the list of priority municipal sites for public charging infrastructure provided in Chapter 5 of this Plan, the City should engage with Dominion to understand which locations are most suitable for installation of charging infrastructure in the near term, and which sites may require significant distribution system upgrades in order to accommodate additional load.

It is expected that in the future the City will be site host to hundreds of chargers to serve both residents and the City fleet. It is critical that the City engage with Dominion in the near term to identify priority locations that may provide the most efficient process towards implementation, and to identify those locations which may require significant upgrades, particularly in rural areas.

The City should also coordinate with Dominion regarding proposed locations for municipal fleet electrification. Municipal fleet locations will require a significantly greater number chargers to be installed in a single location in the near term than will public charging sites. As such, infrastructure upgrades will require higher costs and longer timelines for make ready construction at the project site. As identified in Goal 5, the City should work with Dominion to perform necessary upgrades to enable electrification of the entire fleet at those sites which contain large concentrations of vehicles. Future-proofing these sites will enable the City to more efficiently install additional charging ports in the future.

➢ Action 3.F.2. Establish partnership approaches

The City could partner with Dominion Energy to provide services in multiple partnership arrangements (Figure 61). Dominion can serve a under a traditional model, providing utility service up to the point of the meter. There is also the capacity for the City to work with Dominion to provide "make ready" construction services, whereby the utility supply the panel, conduit and additional infrastructure required up to the point of the EVSE. Lastly, Dominion can serve as the owner-operator of the EVSE, supplying charging services to the City, including ownership of the infrastructure.



Utility Make Ready	Electric Utility	City/EVSP
Customer Make Ready	Electric Utility	City/EVSP
Utility Owner-Operator	Electric Utility	

Figure 61. Utility Partnership Approaches for Municipal Sites

In 2022 Dominion Energy established specific tariff rate structures for commercial Level 2 and DCFC charging for those projects in which Dominion acts as the owner-operator (Table 27). However, site hosts are limited to selection between two charging network providers and charging hardware suppliers as provided by Dominion. Rates have been set as:

Table 27. EV Charging Tariffs for EV Charging Owned by Dominion

Commercial Level 2	$.28/kWh
Commercial DCFC	$.42/kWh

In the near term, the City could explore partnership opportunities with Dominion Energy to act as the owner operator of charging stations on municipal sites, though it is expected that this service will be provided instead by an EVSP.

Recommendation 3.G: Select Ownership Model for Public Charging on Municipal Properties

Medium Term

As outlined in Chapter 1, there is a diverse set of groups that are involved in the construction and operation of EV charging infrastructure. Table 28 provides a summary of the EV charging ownership models that can be utilized by the City in deployment of infrastructure in the future.

Table 28. Public EV Charging Ownership Models

Ownership Model	Costs to City	Revenue Potential
Third-party owned and operated	Low; program management	Low
City-owned, third-party operated	Medium; hardware and management costs	Medium
City-owned and operated	High; hardware, operation, and management costs	High (but may generate losses)
Charging as a Service (CaaS)	Medium; subscription fee	Medium, potential shared revenue
Advertising-supported free charging	Low; program management	Low, small site host payment

➢ Action 3.G.1. Select EVSP partnership approach

To minimize risk and cost to the City, it is not recommended that Virginia Beach act as the owner/operator of public EV charging infrastructure. Most cities do not operate City-owned charging stations for public use, instead opting for grants, incentives, and partnerships with utilities and EVSPs to install, operate and maintain EVSE on municipal properties. While site hosts in the private sector, such

as retail locations, may wish to own and operate EV charging to generate revenue though electricity sales, this also increases the up-front investment necessary for EVSE procurement.

Instead, Virginia Beach should partner with a third-party EVSP to install, operate, and maintain charging equipment on municipal properties as a turnkey service provider at little to no cost to the City. Alternatively, the City may wish to partner with Dominion Energy to provide services whereby the utility provides electricity, make-ready and electrical infrastructure, along with EVSE equipment to streamline the installation process. While third-party owner-operator models offer low revenue potential for the City, it also drastically reduces investment and operational costs.

The selected partnership arrangement should minimize any costs incurred to the City for installation of infrastructure and ensure that EV charger maintenance services are supplied by the EVSP, rather than be overseen by City staff.

➢ Action 3.G.2. Distribute Request for Proposals

Virginia Beach should develop a Request for Proposals (RFP) which enables a third part (such as an EVSP) to install and operate EV charging infrastructure on municipal property with low-to-no cost to the City. The results of the survey conducted in development with this Plan showed that many residents feel that City funds should not be used for construction of public charging infrastructure. Minimizing cost to the City through RFP structuring can support this directive.

This RFP should offer specific guidance regarding the type of infrastructure requested, network and communications protocols, maintenance requirements, and other criteria as outlined in Goal 1. US DOT has developed a checklist for EVSE project planning that the City should use as a guide to understand the project development and scoping, utility planning, and installation planning for specific municipal sites at which it wants to install both public facing and municipal fleet chargers.

The City should use other recent RFPs as a blueprint to inform new RFP design. Virginia municipalities including Harrisonburg, VA, and Fairfax County, VA, have recently issued EV charging station RFPs that can be used to guide development of RFPs in Virginia Beach. The City should also leverge cooperative purchasing programs, such as those offered by Sourcewell, to enable the City to more rapidly deploy EV chargers through a streamlined procurement method.

While the City has failed to gain qualified responses to EV Charging RFPs that were distributed in 2015 and 2019, the EV marketplace has transformed significantly in recent years. The number of chargers nationally has grown from 78,000 total Level 2 and Level 3 charging ports in 2019[lvii] to over 140,000 in 2022 and a includes a far more diverse set of service providers and technologies.

The City should also leverage its existing participation in the DOE Clean Energy to Communities (C2C) technical assistance program to gain strategic guidance on the development of successful RFPs in light of federal funding opportunities in the future. In addition to direct technical assistance from DOE, this program will also enable the City to solicit feedback from other program participants on lessons learned

during RFP distribution, as well as in EV charging installation and operation that will provide valuable in development of RFPs in Virginia Beach.

Recommendation 3.H: Municipal Capacity Building/Training

Medium Term

Education and training are necessary across City government to prepare for transportation electrification. This can range from technical training for fleet management professionals to development of workplace charging policies for City employees. Proactive support for municipal staff can build confidence to EV technologies and enable the City to more seamlessly integrate EV charging into all operations.

➢ Action 3.H.1. Training resources for municipal staff

To help develop and enforce new codes and standards, increase adoption of EVs by municipal employees, and improve the understanding of emergency responders for EV assistance, the City should offer training to local officials to increase their understanding of the EV charging infrastructure technology and safe installation and operation. These trainings can be held as a series of workshops held either in person or online on a wide variety of topics, including EV operations and maintenance, EVSE installation, operations and maintenance, best practices for permitting processes, and other topics.

Priority audiences for training should include the City's planning and zoning staff, historic preservation staff, code administration plan reviewers and inspectors, fire marshals, and first responders, including fire and police departments who may encounter EV charging infrastructure while responding to community emergency needs). Primer materials and videos provided by DOE, the National League of State Legislators, the Electrification Coalition and other should be made available to City employees to introduce them to EVs and charging technology.

➢ Action 3.H.2. Training for technicians

The City should implement a technical training program for City staff that ensure that fleet vehicles and EV chargers are able to be adequately maintained. While it is expected that both maintenance services EVs and chargers is expected to be provided by a third party in the near term, building internal capacities to resolve issues will enable the City to respond to issues more effectively and also increasing staff comfortability with vehicle operations.

The City should enable a training program utilizing the resources presented in Action 2.1.D to be made available to City engineers, automotive services and maintenance staff, facilities managers and other employees that may be responsible for operation and maintenance of EVs and charging infrastructure. As new training resources are developed by Virginia Clean Cities, VDOT and other groups, the City should incorporate these programs into employee education programs.

➢ Action 3.H.3. Training for first responders

EVs present specific challenges to emergency responders, particularly as it relates to battery fires. EVs are far less likely to catch fire than ICE vehicles; only 337 EV fires have been reported globally since 2010.[lviii] However, the fires can be long-lasting and severe, and require specific fire suppression techniques. EV battery fires can be very time- and resource-intensive for responders. There are safety risks for responders related to the emission of toxic and flammable gases from damaged batteries, and the unpredictability of thermal runaway and re-ignition.

Flooding, particularly from saltwater, presents specific challenges for operation of EVs. Residual salt within the battery or battery components can form conductive "bridges" that can lead to short circuit and self-heating of the battery, resulting in fires. The time frame in which a damaged battery can ignite has been observed to vary widely, from days to weeks.

On March 10, 2023, Virginia passed HB 2451, which requires all firefighters, including volunteers, to enroll in a training program on the risks of fires in electric vehicles and how to safely and effectively manage such fires. This program will be developed by the state Department of Fire Programs by July 1, 2024, and all firefighters in Virginia Beach will need to complete the program by December 1, 2025.

The National Highway Traffic Safety Administration (NHTSA) has published guidance related to flooding and fires for first responders and second responders, developed in collaboration with the U.S. Fire Administration, National Fire Protection Association (NFPA) and others. Other guidance materials have been developed for first responders, which should be circulated within Virginia Beach to ensure that appropriate protocols are followed for incident response:

- NFPA training for responders on alternative fuel vehicles.
- Fire Department Response to Electrical Vehicle Fires from the IAFC. The bulletin includes guidance for responders pre-, during and post-incident.

In February 2023, City staff held an initial training with NFPA on issues related to EVs, including fires resulting from flood events. The City should ensure that all first responders are given effective training on how to respond to EV battery fires and required fire suppression equipment should be made available for use by all departments.

Goal 4: Enhance Charger Access at Municipal Sites

How do we expand charger deployment at municipally-owned sites?

Figure 62. Electrify America DCFC Charging Plaza in Santa Clara, CA

Recommendations in this section address how the City can deploy charging infrastructure on municipal properties to best serve its residents and visitors. The majority of EV charging is expected to be located at residential and commercial locations in Virginia Beach, with the City acting as a facilitator by removing barriers to deployment (Goal 1) and through providing residents and businesses with information and resources (Goal 2). However, the City can also work to fill charging infrastructure gaps to ensure equitable charger access, support economic development and achieve community charging goals.

The public engagement survey conducted as part of this Plan (Chapter 5) demonstrates that the preferred sites for publicly accessible charging stations are grocery stores and large retail locations with accessible parking, followed by parking facilities, recreation centers and parks. Municipally owned properties of these types provide the opportunity to deploy charging infrastructure in areas that may not otherwise be served. To increase charger access, the City should first establish priorities for how and where EV infrastructure should be deployed to fill gaps and increase equitable access for all residents.

Chapter 5 presents a methodology for selection of priority locations for Level 2 and DCFC charging infrastructure. The recommendations in this section are complementary to that analysis and can be used for long term planning for infrastructure development in Virginia Beach and orientation of electrification goals for the City.

In prioritizing locations for charging infrastructure on municipal properties, the City should focus on several key areas to support residents and businesses in Virginia Beach:

Equity and Environmental Justice. The City should identify gaps in charging infrastructure that can be filled through installation on municipal properties to ensure equal access to all residents, focusing on geographically distributed locations such as parks, libraries, and community centers. Community engagement and programs for LMI residents and DACs can help ensure that proposed locations match the needs of community members.

Transportation Centers. In the near term, the City can prioritize municipal properties that are expected to have high utilization, including along highways and major arterials, high use parking lots and garages, and locations for destination charging such tourism sites, event spaces, and municipal buildings.

Municipal Fleet and City Employees. The City will require significant charging infrastructure to support electrification of municipal fleet vehicles in the coming decade, as well as providing charger access to City employees. Charging infrastructure supporting the City fleet can be sited in conjunction with public charging to reduce infrastructure development timelines, improve long-term site planning and reduce operational costs.

Emergency Planning. To enhance local response to emergency situations, such as mass evacuations, chargers can be located along key evacuation routes and backup power installed as possible to enhance resiliency. The City should follow best practices for development of charging infrastructure in flood prone areas and the City can consider energy storage and mobile charging technologies to ensure adequate support of mission-critical vehicles and support evacuation operations during grid failures and extreme weather events.

Tourism and Destination Charging. The City can ensure that visitors have access to charging infrastructure by siting municipal chargers in proximity tourist destinations and close to hotels and rental areas. Placing chargers in high-visibility sites will communicate City commitment to vehicle electrification to internal and external stakeholders, while also meeting overall community needs.

Rural Communities. Deployment of charging infrastructure requires specific planning with local utilities and government support to ensure that chargers are deployed where utilization may remain low in the short term due to population density and grid capacity restraints. Chargers can be placed at community centers, libraries, parks, and other municipal properties where private sector installations may lag, and the City develop specific incentive programs to facilitate rural electrification through federal programs.

Chapter 5 presents an inventory of municipal sites that have been identified as potential priority locations based upon the priorities above, in addition to other criteria. Installation of charging

infrastructure at these sites can increase access for both residents and visitors to the city. The City can work directly with EVSPs and other partners through the dissemination of a request for proposals (RFP) for construction and operation of Level 2 and/or DCFC stations on municipal properties with low cost and risk to the City (Recommendation 3.G). Chapter 5 of this Plan and appendices also provide details regarding distribution of LMI, DACs and historically marginalized populations in the city and mechanisms to support development within those communities.

Recommendation 4.A. Ensure Equitable Charger Access

Medium Term

Publicly accessible locations for charging infrastructure are critical for ensuring equitable access to charging infrastructure for DACs and LMI residents, as well as in rural communities. If distribution of charging infrastructure is focused only on where early adopters of EVs are located or travel and driven by historic consumer demand, it can create significant disparity in access. Because EVs can have higher up-front costs and LMI households are less likely to purchase an EV; early adopters tend to be higher income individuals. EVSPs may be less likely to install charging infrastructure in LMI communities with low rates of EV adoption. In turn, lack of charger access can prevent LMI residents from purchasing an EV in the future due to an inability to conveniently charge their vehicle. Identifying those communities which have low rates of existing publicly available charging (charging deserts), high concentrations of MUDs or renters, higher percentages of LMI populations, high exposure to transportation pollution, and other considerations can help establish locations that should be prioritized for EV charging infrastructure deployment by the City.

➢ Action 4.A.1. Adopt EJ criteria for prioritization of charging

There are multiple resources that should be utilized by the City to ensure that chargers are equitably deployed within Virginia Beach. The Joint Office of Energy and Transportation published the Justice40 EV Charging Map, supporting the federal Justice40 initiative, which directs that at least 40% of the overall benefits of certain Federal investments flow to disadvantaged communities (DACs). This map incorporates numerous criteria related to equity, using publicly available data sets related to vulnerable populations, health, transportation access and burden, energy burden, fossil dependence, resilience, and environmental and climate hazards. Using this guidance is of particular importance when positioning the City to access federal grant funding through the Corridor and Community Charging Discretionary Grant program and other federal sources to determine if project locations are located within a priority DAC. The

Table 29 below provides a summary of additional mapping tools that have been made available through federal agencies and through the Virginia Department of Environmental Quality, with applicability of tools for different funding types. These resources should be utilized by the City for specific applications for federal assistance for EV charging infrastructure, using mapping tools correlating with the appropriate agency. As federal standards for equity and environmental justice are further developed, the City will need to reassess the applicability of these maps.

Table 29. Federal and State Disdavantaged Communtiy Tools

Title	Agency	Topic
Energy Justice Mapping Tool	DOE	• Energy
Transportation Disadvantaged Census Tracts	DOT	• Transportation
Electric Vehicle (EV) Charging Justice40 Map Tool	Joint Office of Transportation and Energy	• Electric Vehicle Charging Infrastructure
Climate and Economic Justice Screening Tool	White House Council on Environmental Quality	• Climate change • Clean energy and energy efficiency • Clean transit • Affordable and sustainable housing • Reduction and remediation of legacy pollution • Critical clean water and wastewater infrastructure • Health burdens • Training and workforce development
VA EJScreen+	Virginia DEQ – Virginia Environmental Justice Collaborative	• Identification of Low-Income Communities, Communities of Color and Environmentally Burdened Populations

Figure 63 shows the distribution of priority municipal properties presented in Chapter 5 which are located within low-income, communities of color and overburdened communities identified using the resources in Table 29. Over 50% of the properties identified in the priority property list in Chapter 5 are located in designated communities. Over 200 other municipal properties in Virginia Beach are located within these communities, which should be reviewed for deployment of charging infrastructure in the future. An inventory of these properties can be found in Appendix G.

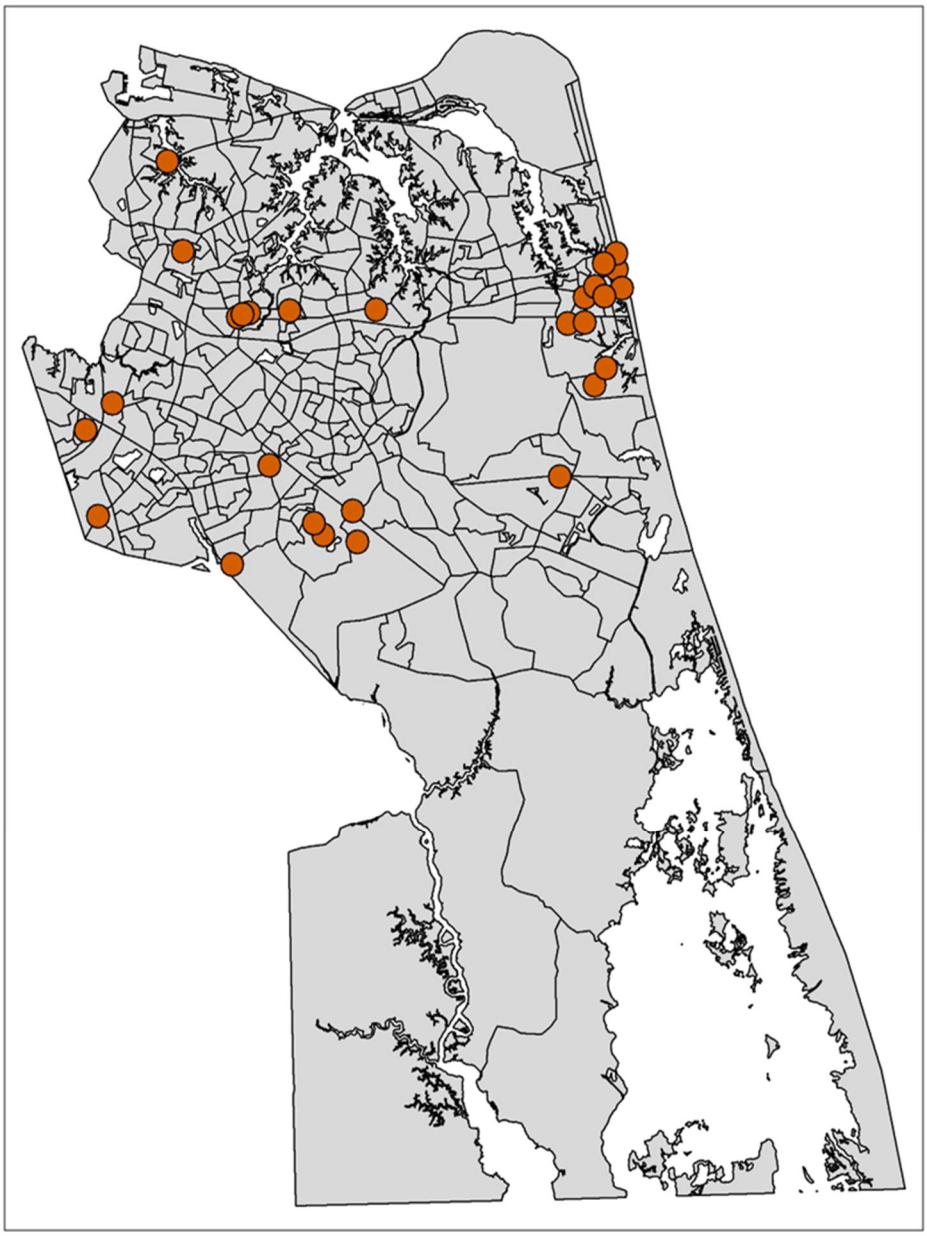


Figure 63. Priority Municipal Properties Located in EJ Communities

➢ Action 4.A.2. Formalize annual review of public charging infrastructure to identify gaps

As EV infrastructure is deployed across Virginia Beach, the City should regularly review the geographic distribution of publicly available charging infrastructure to ensure that all communities in the City have access. Using the screening tools provided in Table 29, the City should conduct an annual review of this distribution and identify where gaps in charging infrastructure may begin to emerge over time. Using this information, the City should prioritize new charging infrastructure deployed on municipal properties to increase access for underserved environmental justice and rural communities, as well as other geographies that are not receiving adequate deployment. The City should leverage federal and state

funding sources to install stations in these areas or establish partnership arrangements which incentivize EVSPs to provide charging infrastructure in those communities.

This review should be completed in conjunction with setting of targets as identified in Recommendation 3.B. The City should also set targets specific to charger deployments in environmental justice, LMI, rural communities or other criteria as a percentage of total charging ports or total charging stations on municipal properties in Virginia Beach.

Recommendation 4.B. Support Rural Electrification

Medium Term

A significant portion of the southern part of Virginia Beach is rural and zoned as agricultural lands. Rural areas present significant challenges for vehicle electrification and as a result, significant barriers to regional EV charging infrastructure. Vehicle and infrastructure costs, reduced grid capacity, geographic isolation, low charger utilization and limited technology exposure to EVs means that rural communities face substantial barriers in the initial construction and long-term viability of public charging stations. Older rural homes are also more likely to require panel upgrades to enable residential Level 2 charging installations, presenting further challenges for adoption of EVs in these areas.

➢ Action 4.B.1. Enact rural electrification strategy

Virginia Beach should work to develop a comprehensive plan of how they want to address charging capabilities in rural areas. As outlined in Recommendation 2.B, this should involve engaging directly with stakeholders to understand how transportation functions locally and what specific community needs are. This could include driving patterns, common occupations, home-charging access, and any other considerations that would impact where and how chargers are built. Virginia Beach should implement for a process that engages with all critical partners in rural communities prior to identification of funding sources to minimize downtime and ensure quick infrastructure rollout. Advocating with Dominion Energy to ensure that grid expansion serves all residents of Virginia Beach, particularly in rural areas, will be critical to ensure greater deployment of EV charging in the future.

Figure 64 provides a map of municipal properties in rural areas that may be suitable for deployment of charging infrastructre overlayed on the Level 2 priority block group map presened in Chapter 5. Three of these properties have been included in the priority locations list presented in Chatper 6. A full inventory

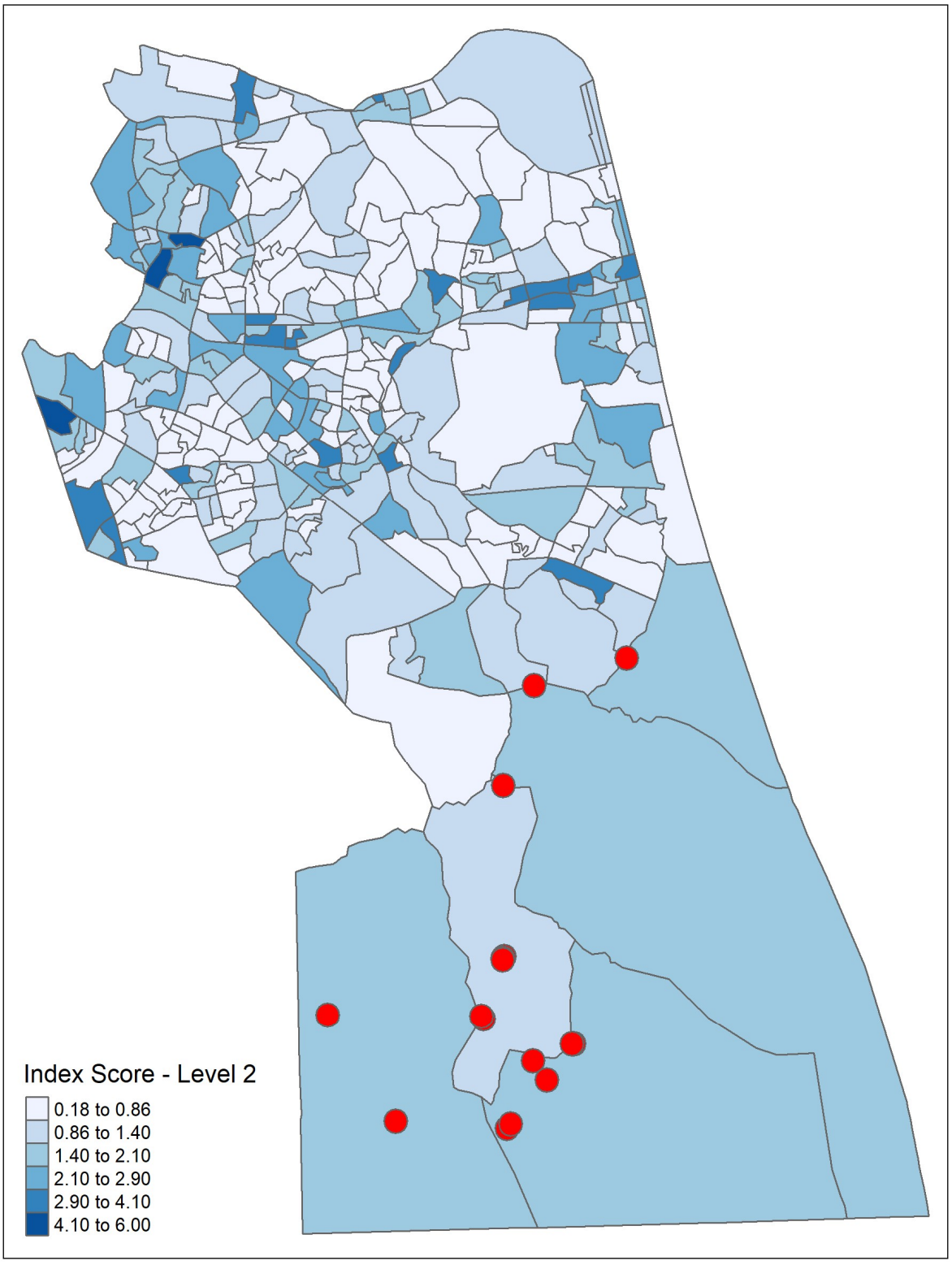


Figure 64. Municipal Properties in Rural Areas in Virginia Beach

Recommendation 4.C. Accelerate Charging at Tourist and Municipal Sites

Medium Term

As discussed in Recommendation 2 and in greater detail in Chapter 4, tourism is a primary driver of economic development in Virginia Beach. While hotels, retail sites, restaurants and service stations will be expected to host charging for visitors and residents of the city traveling to tourist areas, the City can accelerate charging infrastructure to serve growing charging demand by deploying charging at municipal parking facilities. These sites are expected to have higher utilization in the near term in comparison to other areas of Virginia Beach due to their central locations and high turnover rate of users.

➢ Action 4.C.1. Deploy charging at municipal parking facilities

There are a significant number of parking garages and surface lots owned and operated by the City, which are concentrated in the Resort Area and Sandbridge Beach (Figure 65). However, only one charging port is installed at two individual sites, one of which is currently not operational. These sites are expected to have high utilization by both residents and tourist populations and can be prioritized for installation of charging infrastructure in the near term and may provide a source of revenue to the City. Of note are the municipal locations in Sandbridge, as there are currently no known publicly available EV charging sites in this area of Virginia Beach.

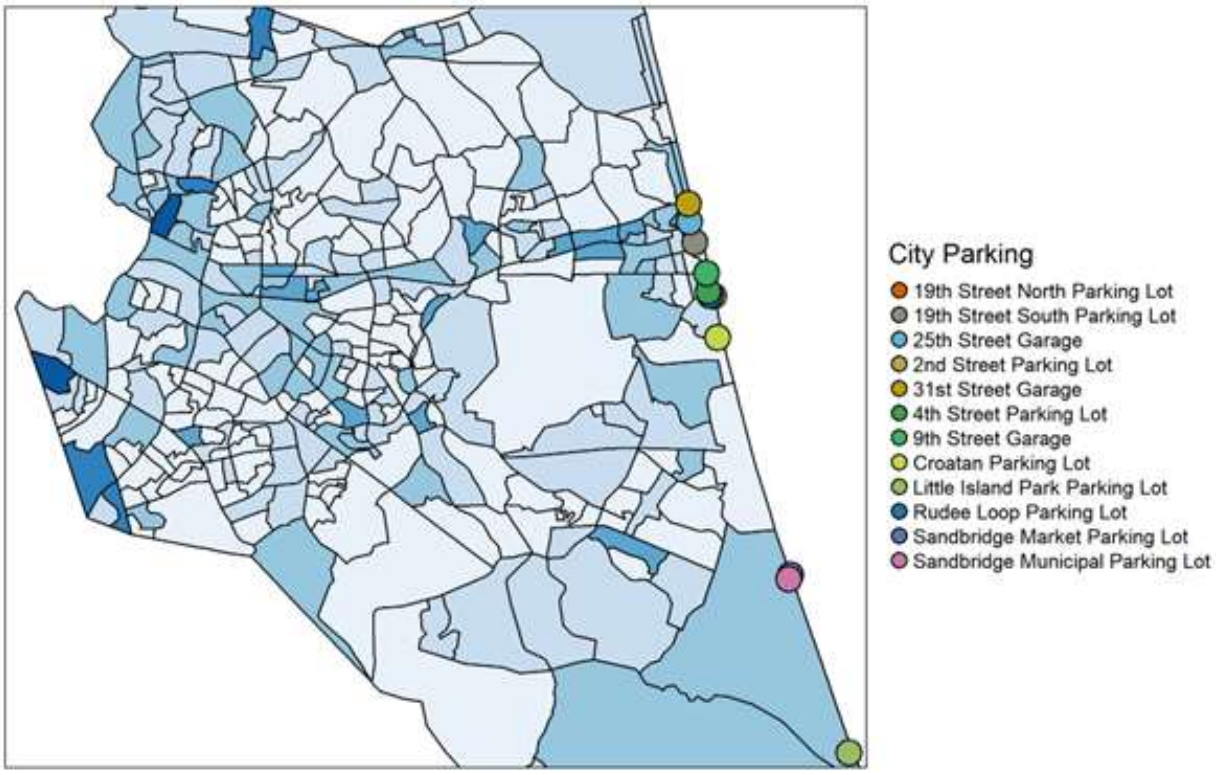


Figure 65. Municipal Parking Facilities in Virginia Beach on Level 2 Charging Priority Map

Table 30 provides as inventory of municipal parking lots in Virginia Beach, as well the Convention Center parking lot which is operated by the City. There are over 5,200 parking spaces distributed across these properties, offering a significant opportunity for deployment of EV charging in the near term. The City should adopt goals for a percentage of parking spaces that have EV chargers installed at these facilities or ensuring that any planned renovations or new construction of parking facilities includes the installation infrastructure with adequate capacity and conduit to enable EV chargers to be installed in the future.

Table 30. Primary Municipal Parking Spaces in Virginia Beach

Garage Name	Total Number of Spaces	EV Chargers Installed (5%)	EV Ready (10%)
19th Street North Parking Lot	334	17	33
19th Street South Parking Lot	204	10	20
25th Street Parking Garage	344	17	34
31st Street Parking Garage	532	27	53
2nd Street Parking Lot	101	5	10
4th Street Parking Lot	65	3	7
9th Street Parking Garage	610	31	61
Croatan Parking Lot	505	25	51
Convention Center Lot	1449	72	145
Rudee Loop Parking Lot	152	8	15
Sandbridge Municipal Parking Lot	136	7	14
Sandbridge Market Parking Lot	75	4	8
Little Island Parking Lot	725	36	73
Total	**5232**	**262**	**523**

The right two columns of Table 30 use International Energy Conservation Code (IECC) 2021 new construction standards as a reference for potential charger deployments at these facilitates (see Recommendation 2-F). In addition to municipal garages, there are over 2,000 parking spaces located on commercial properties in the Oceanfront Resort Area. Proactive communication with property owners regarding the economic benefits of operating charging stations and information regarding process for construction and operation, will help to support the needs for residents and tourists of Virginia Beach in the coming years (Recommendation 2.A).

Recommendation 4.D. Consider DCFC installations on Municipal Properties

Long Term

Due to the high utilization requirements, electricity and investment costs associated with the construction of DCFC charging infrastructure, it is not expected that in the City would serve as site host or own any DCFC stations in the short term. However, as the fleet is electrified in greater numbers, it is likely that the City will need to host DCFC chargers to service the municipal fleet, particularly as medium and heavy-duty vehicle are electrified in the coming years.

➢ Action 4.D.1. Identify municipal sites for DCFC charging

There are eleven existing fueling facilities in Virginia Beach that service the municipal fleet, shown in Figure 66. Existing Municipal Fleet Fueling Sites in Virginia Beach . Given the geographic distribution of these existing sites and proximity to major roadways in the city, including primary evacuation routes (I-264), there may also be opportunity to co-locate both public and municipal fueling at these facilities to increase station utilization rates.

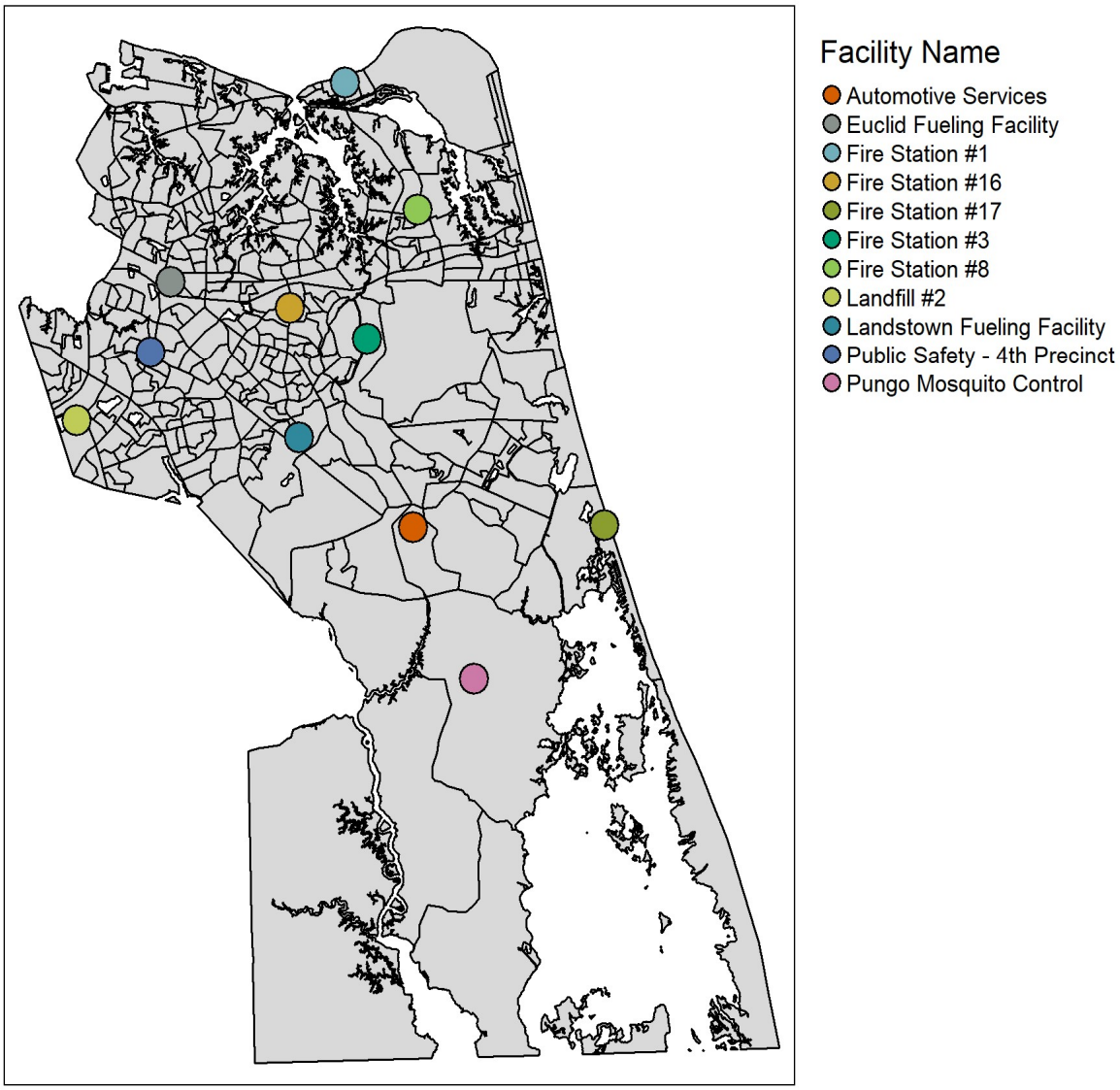


Figure 66. Existing Municipal Fleet Fueling Sites in Virginia Beach

In addition, access to rapid charging to a key mechanism to support emergency planning and resiliency efforts. There is opportunity to have future DCFC chargers which serve the fleet be available for public use during emergency events to facilitate evacuations. These sites can also be reviewed for co-location

of energy storage to ensure charger availability during grid failures for charging of mission critical fleet vehicles.

Recommendation 4.E. Pilot Public Curbside Charging

Long Term

As identified in Recommendation 1.F, curbside charging is critical to supporting residents who are unable to charge the vehicle at home. Development of residential ROW charging policies can facilitate the deployment of EVs in the coming years, but policies can additionally be implemented which facilitate publicly available curbside charging. In these applications, EV chargers can be placed at public street parking sites, potentially conjunction with parking meters, streetlights, or other electrified technologies that operate in the public ROW. Application of these policies can support charging in dense urban areas where surface parking lots may not be available, or in locations that central to where TNCs operate. While curbside charging installations can be costly and can require significant construction in the public ROW, streetlight/pole change can provide a cost effective and easy to implement to solution to some charging infrastructure needs.

Figure 67. Streetlight EV charger in Tacoma, WA

Credit: Tacoma Public Utilities

➢ Action 4.E.1. Pilot streetlight charging project

Streetlights can accommodate Level 1 or Level 2 charging, depending on the existing electrical capacity available at the project site. Because electrical infrastructure is already available, installation costs can be significantly less than typical EVSE site installations. These locations can also be selected to prioritize LMI and DAC communities to support equitable distribution of charging infrastructure across the city. Locally, four Level 1 charging ports were installed at lampposts at the Shenandoah Airport in 2021, and jurisdictions across the united states have installed hundreds of public streetlight chargers.

Virginia Beach has over 1,400 lampposts located on municipal properties across the city (Figure 68), including in rural areas. In partnership with Dominion Energy, the City can explore locations that may be suitable for installation of lamppost Level 1 and Level 2 charging. It would be expected that the majority of these installations would be Level 2, but at those sites in which a resident can park a car overnight or available electrical capacity is not available, Level 1 charging could also help support charging for residents unable to charge at home.

Deployment of this charging technology could also be a project for submission to the CFI-Community Charging Discretionary Grant or other federal programs, particularly for its potential application in LMI, DAC and rural communities and provision of low-cost charging.

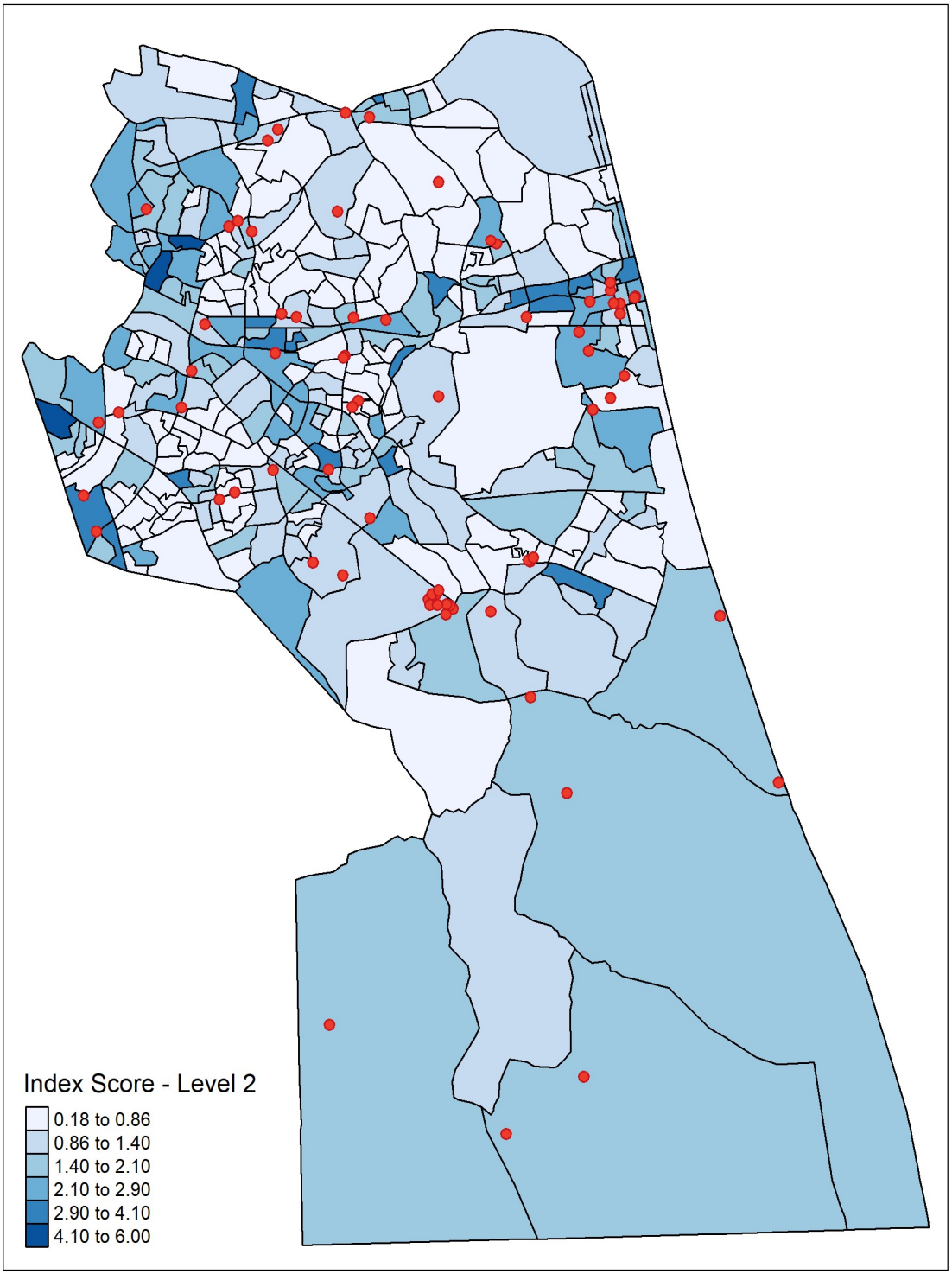


Figure 68. Concentrations of Streetlights on Municipal Properties in Virginia Beach

Goal 5: Identify Sources of Funding for EVs and Charging Infrastructure

What federal, state and local sources can the City utilize?

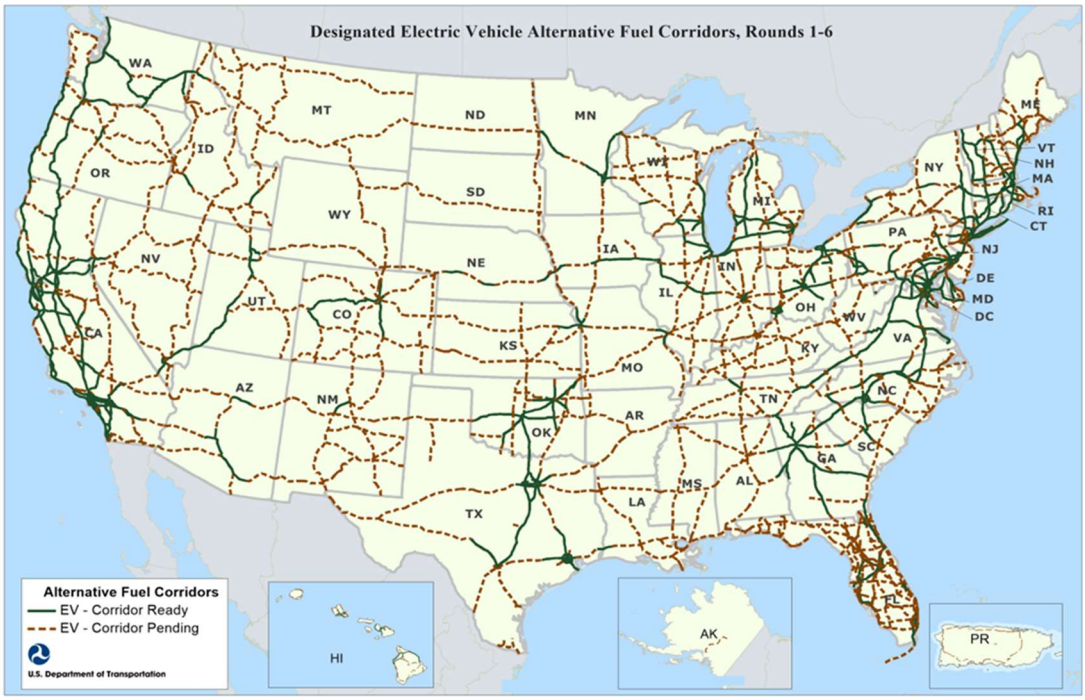


Figure 69. FHWA EV AFC Map

Goal 5 focuses on federal, state and utility-level programs that can be utilized to facilitate EV and charging infrastructure deployment in Virginia Beach. This includes financing strategies, grants, incentives (rebates and tax credits), and vouchers which are used to reduce or eliminate procurement and installation costs. Opportunities to advocate for new policies and programs within state government and with Dominion Energy have also been identified.

Recommendation 5.A. Pursue Federal Formula and Discretionary Grant Opportunities

Short Term

The Bipartisan Infrastructure Law (BIL) includes billions of dollars to fund dozens of new and existing programs for states, cities, towns, and municipalities. As Virginia Beach expands its charging network in the coming years, it will be important for the City to pursue these funding sources the procurement of EVs and construction of EV charging infrastructure, as well as to leverage funding for City planning related to technology adoption, workforce training, economic development, and resiliency.

Table 31 below provides a summary of the key provisions that are outlined in the BIL that may be of interest to Virginia Beach for deployment of charging infrastructure in the future. Each row shows the federal cost share provided by that program; remaining cost-share funding will need to be identified through private sector partners, city and state budgets, revolving loan funds, or other sources. In addition, some programs have 100% federal cost share available for projects in rural or disadvantaged communities. Programs may also have allowable in-kind contributions in the form of third-party contributions of staff time, volunteer services, or other allocation of resources. A searchable inventory of these opportunities can be found through several online resources, including the American Cities Climate Challenge Federal Funding Guide and the Electrification Coalition EV Funding Finder.

Table 31. Key Grant Programs for EV Infrastructure in BIL

Title	Description	Funding Type
Charging Infrastructure		
National Electric Vehicle Infrastructure (NEVI) Program	$5 billion over five years. NEVI Formula Program will provide dedicated funding to states to strategically deploy EV charging infrastructure and establish an interconnected network to facilitate data collection, access, and reliability. Initially, funding under this program is directed to designated Alternative Fuel Corridors for EVs to build out this national network, particularly along the Interstate Highway System. Approximately $106 million allocated to Virginia. **Federal Cost Share:** 80%. *Requires AFC Designation*	Formula
Discretionary Grant Program for Charging and Fueling Infrastructure (CFI) Community Charging	$1.25 billion over five years. Part of the Electric Vehicle Charging and Fueling Infrastructure Program is focused on "Community Charging," where priority is given to projects that expand access to EV charging and alternative fueling infrastructure within rural areas, low- and moderate-income neighborhoods, and communities with a low ratio of private parking spaces. **Federal Cost Share:** 80%	Competitive
Discretionary Grant Program for Charging and Fueling Infrastructure (CFI) - Corridor Charging	$1.25 billion over five years. DOT program to strategically deploy publicly accessible EV charging infrastructure and other alternative fueling infrastructure along designated alternative fuel corridors. *Requires AFC Designation.* **Federal Cost Share:** 80%. *Requires AFC Designation*	Competitive
Clean School Bus Program	$5 billion over the next five years. EPA's Clean School Bus Program provides grants to replace existing school buses with zero-emission and low-emission models. EPA also solicited rebate applications for $500 million through the Clean School Bus Rebates Program in 2022 for zero-emission and low-emission school buses and charging infrastructure. **Federal Cost Share**: 100%	Competitive

Clean Heavy-Duty Vehicle Program	$1 billion EPA program through 2031. $400 million to communities in non-attainment areas. Grants and/or rebates to eligible recipients to replace existing heavy-duty vehicles with clean, zero-emission vehicles, as well as zero-emission infrastructure, workforce development and planning. **Federal Cost Share:** TBD	Competitive
Transportation Infrastructure and Technology		
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	$1.5 billion in funding in 2023. The DOT RAISE program provides investment in road, rail, transit, and port projects that promise to achieve national objectives. Eligible EV activities include LDV charging, infrastructure planning, commercial charging, public transportation charging. **Federal Cost Share:** 80%; up to 100% for projects in rural areas, Historically Disadvantaged Communities (HDC) or an Area of Persistent Poverty (HPP). *Significant projects requiring collaboration with state planning organizations.*	Competitive
Strengthening Mobility and Revolutionizing Transportation (SMART)	$100 million annually for five years. Grants to eligible public sector agencies to conduct demonstration projects focused on advanced smart community technologies and systems in order to improve transportation efficiency and safety. Eligible projects include vehicle-to-grid technologies and improved mobility and infrastructure resiliency. **Federal Cost Share**: 100%	Competitive
Decarbonization, Energy Efficiency and Environmental Justice		
Greenhouse Gas Reduction Fund (GGRF) – Zero Emissions Technologies Program	$7 billion EPA Zero-Emissions Technologies Program of the Greenhouse Gas Reduction Fund will award competitive grants to implement Clean Air Act Section 134 (a)(1), and 2). The Zero-Emissions Technologies Program will prioritize residential and community solar projects, as well as storage technologies and upgrades related to these projects. **Federal Cost Share**: TBD	Competitive
Neighborhood Access and Equity Grants	Provides funding for removing, replacing or retrofitting highways and freeways to improve connectivity. Eligible expenses include: a surface transportation facility which is a source of air pollution, noise, stormwater, or other burden to a disadvantaged or underserved community 'technologies, infrastructure, and activities to reduce surface transportation-related greenhouse gas emissions and other air pollution. **Federal Cost Share**: 80%; up to 100% for projects in a disadvantaged or underserved area.	Competitive
Climate Pollution Reduction Grants (Climate Pollution Plans and Implementation Grants)	$5 billion EPA program to support a technology-neutral approach to planning and implementation of greenhouse gas pollution reduction strategies. Funding available in two phases; Phase I: Planning Grants ($250 million) and Phase II: Implementation Grants ($4.6 billion). Virginia Beach-Norfolk-Newport News region available to receive $1 million in 2023.	Formula and Competitive

	Federal Cost Share: TBD. *Requires state and/or regional collaboration.*	
Environmental and Climate Justice Block Grant	$3 billion EPA program though 2026 to support environmental and climate justice activities that benefit disadvantaged communities. Includes investments in low-and zero-emission and resilient technologies and related infrastructure and workforce development that help reduce greenhouse gas emissions and other air pollutants. **Federal Cost Share:** TBD	Formula

➢ Action 5.A.1. Continue to pursue designation of I-264 as an AFC

As identified in Chapter 2, the largest federal grant program established under BIL is the DOT NEVI program. However, I-264 has not yet be designated as an AFC and therefore is not currently eligible for the program. The City is in ongoing discussions with VDOT and FHWA to garner nomination of I-264 as an AFC and be eligible for funding under this program in future years. Notably, I-264 contains road segments with the highest Average Daily Traffic (ADT) count in the state outside of Northern Virginia, establishing its criticality as part of the national charging network.

The City should continue to advocate with VDOT for nomination in the coming months. As charging infrastructure is installed through this program, the City should continue its coordination with VDOT to ensure that DCFC installations in VA Beach are complementary to other planned or existing deployments. While the City is not currently eligible for NEVI formula funding, there may be opportunities for the City to leverage funding upon designation of I-264 as an AFC, or once all existing AFC in VA have achieved FBO status.

➢ Action 5.A.2. Pursue CFI-Community Charging and other grant programs

In the near term, the City should pursue funding through the CFI Community Charging program. Program information is currently pending, and the Funding Opportunity Announcement (FOA) is expected in early 2023. The City should consider responding to this RFP both as a stand-alone applicant, and as part of a regional collaboration through HRTPO or other lead agency.

For a City-led proposal, the City should prioritize parks, recreation centers and other municipal properties utilizing the spatial analysis presented in Chapter 5. The City should also prioritize workforce development and training programs, or funding to support the deployment of charging infrastructure in MUDs with a focus on historically disadvantaged communities.

The City should consider pursuing projects beyond the scope of deployment of charging infrastructure at municipal sites through NEVI the CFI Community Charging discretionary grant program. In particular, the deployment of EV charging infrastructure with backup storage to enhance transportation system resiliency and emergency preparedness offers opportunities for Virginia Beach to leverage federal funds. The City should also consider the utilization of both formula and competitive grant funding for

decarbonization planning and implementation to support the acquisition of EVs and charging infrastructure in the near term to support larger state level emissions reduction goals.

Examples of projects that could be developed implemented using federal funds includes:

- Utilize federal funds to establish an incentive program for owners and managers of MUDs to construct charging infrastructure, with requirements for funding allocated to MUDs located in disadvantaged and low-income communities.
- Implement workforce development and training programs in conjunction with the Office of Economic Development, partnering with local education and community groups to make resources available to Virginia Beach residents, with a focus on equity.
- Design multi-modal Shared Mobility Hubs in conjunction with HRT and HRTPO to deploy charging infrastructure for passenger vehicles in conjunction with buses, rail and mobility devices such as e-bikes and scooters.
- Deploy energy storage in conjunction with EV charging as a demonstration program for resilient technologies and emergency preparedness.
- Procure mobile charging solutions to serve the City fleet, as well as for emergency responders
- Develop an EV resiliency and emergency preparedness plan.

➢ Action 5.A.3. Establish FOA response plan for federal opportunities

For the City to effectively plan for and response to federal and state level funding opportunities, the City should develop a framework that will streamline the development and application process. There are several key components for development of any application of funding that will facilitate implementation and potential award.

Table 32. Guidelines for FOA Responses

Review Sites. Identify priority site locations using analysis provided in Chapter 5 of this report, in addition to other City requirements. Focus on “shovel ready” projects in the near-term using criteria outlined in Recommendation 1-A, with a focus on equity, geographic distribution, visibility, and potential utilization of chargers.

Coordinate with Utility. Meet with Dominion Energy to discuss proposed project sites and scope of the project(s). Determine potential infrastructure upgrades, timelines, and estimated costs for implementation. Identify “shovel ready” municipal project sites to facilitate rapid implementation.

Communicate Internally. Ensure that relevant City staff are involved in selection of project sites. Generate support within key offices and personnel to facilitate grant application development and project implementation. Begin initial project planning with the City Manager’s Office, Planning Department, Department of Public Works, and other relevant departments and offices.

Develop Partnerships. Engage with partner organizations and potential vendors that may offer support to or be involved in proposed projects. Obtain letters of support from potential contractors, neighborhood associations, community groups, workforce training and equity organizations, City staff, and other relevant stakeholders.

Design Outreach Strategy. Provide structure for public education and outreach strategies, with a focus on equity and environmental justice. Identify communications practices, methods for outreach, and incorporation of stakeholder feedback during project planning post award.

Obtain Approval and Identify City Funding. Obtain approval from City Council or other City leadership as required. Understand cost share requirements of the selected grant program and identify internal or external sources of funding that may be applicable for project implementation.

Draft Proposal. Produce initial draft of the project proposal and distribute to internal and external stakeholders for review. Focus on the ability to implement the project in an efficient manner, highlighting City, community, and partner organization support for proposed project(s). Establish need for grant funding, establish clear goals and metrics to measure success, community benefits, sources of matching funds, and how the proposed project will catalyze future investment. Highlight past performance and experience implementing similar grant funded projects and of stakeholder engagement.

Submit. Incorporate reviewer comments and update proposal. Ensure that the proposal meets all requirements outlined to the grant funding opportunity announcement. Circulate proposal for final review and approval.

Recommendation 5.B. Leverage Federal Tax Incentive Programs

Short Term

The Inflation Reduction Act (IRA) of 2022 is expected to significantly advance the adoption of EVs across the US. Each of the provisions outlined in Table 33 below will be applicable to residents and businesses located in Virginia Beach.

Table 33. IRA Provisions for EV and Charging Infrastructure

Provision	Incentive Value	Details
30D Tax Credit for New EVs	Up to $7,500 per vehicle, based on battery size, battery manuf.	• No limit on tax credits available per OEM (previously there was a 200,000 per vehicle limit per OEM) • Requires final vehicle assembly to occur in U.S. • After 2024, battery manufacturing must be domestic.

	location and critical minerals sourcing	• After 2025, batteries must not have critical minerals sourced from Democratic Republic of Congo (DRC) or adjacent countries, or China and Russia. • Limits tax credit to EVs with Manufacturer Suggested Retail Price of under $80,000 (sport utility vehicles, vans, or pickup trucks), or $55,000 (all other vehicles). • Adds maximum income based, Adjusted Gross Income requirement of $150,000 (individual), $225,000 (head of household) or $300,000 (married joint return).
25E Tax Credit for Used EVs	The lesser of $4,000 per vehicle or 30% of sales price	• Sales price cap of $25,000. • Model year 2+ year less than year of sale. • Taxpayers with modified adjusted gross income of more than $75,000 (individual), $112,500 (head of household) or ($150,000) (married joint return) are ineligible for the credit. • Buyers must purchase the vehicle from a dealership and cannot claim the credit more than once every 3 years. • The credit only applies to the first resale of a used vehicle and includes restrictions on sales between related parties. • The credit may be transferred to the dealer/seller of the vehicle and deducted from the sales price at the time of sale in the same way this is allowed under section 30D.
45W Commercial Fleet EV tax credit	Up to $7,500 for light-duty and up to $40,000 for all other vehicles	• Commercial clean vehicles can claim a credit of 30% of the cost of the vehicle, up to $7,500 in the case of a vehicle that weighs less than 14,000 pounds, and up to $40,000 for all other vehicles. • The tax credit amount also may not exceed the amount by which the EV exceeds the cost of a "comparable" (otherwise comparable in size and use) internal combustion powered vehicle. • Battery size of 15 kWh minimum.
30C Residential EV Charger Tax Credit	30% (up to $1,000 per unit) of the cost of the equipment.	• The maximum credit is $1,000 or 30% of the installation cost, whichever is lower. • If a resident moves to a new home during the year and install recharging equipment at the new residence, both installations can be claimed s up to a maximum of $2,000.
30C Commercial EV Charger Tax Credit	Tax credit covers 6% (up to $100,000 per station) of the cost of the equipment	• Commercial entities can be eligible for a tax credit of up to 30% if the EV charger meeting certain requirements: - Located in population census tract where the poverty rate is >20% - Located in Metropolitan and non-metropolitan area census tract where the median family income is less than 80% of the state medium family income level - Eligible projects must also meet apprenticeships and prevailing wage requirement • This credit cannot be used to cover permitting and inspection fees

➢ Action 5.B.1. Communicate tax credits to residents and business

As identified in Goals 1 and 2, the City can best support the deployment of EVs and charging infrastructure in Virginia Beach by serving as a facilitator. Ensuring that residents and businesses are

aware of these incentive programs and have guidance for how to receive benefits can reduce barriers to EV adoption and charger deployment.

In particular, the commercial EV charging equipment tax credit can cover 30% and up to $100,000 per unit for installations that meet income and prevailing wage requirements. Enabling businesses located within low-income census tracts in Virginia Beach to access this incentive has help support equity and environmental justice goals established by the City.

➢ Action 5.B.2. Utilize tax credits for municipal fleet procurements

Two provisions listed in Table 33 above are relevant to the City for the acquisition of vehicles and charging infrastructure for the City fleet. First, the section 45W Commercial Clean Vehicle Tax Credit. Guidance releases by the Department of Treasury and the Internal Revenue Service in December 2022 details that the 45W tax credit been extended to tax-exempt entities. It is expected, but not yet finalized, that many of the of the sourcing provisions outlined in the 30D tax credit will not be applicable, providing a larger number of available vehicles in the near term. In addition, it is expected that vehicle leasing companies may be eligible to receive the tax credit, which should enable procurements of vehicles for the City fleet at a lower cost. Second is the Commercial EV Charger Tax Credit, which may be applicable to tax exempt entities. Final regulations for all tax credits outlined in Table 33 are pending final publication.

Guidance released by the Department of Treasury and the Internal Revenue Service in December 2022 details that the 45W tax credit been extended to tax-exempt entities. It is expected that many of the of the sourcing provisions outlined in the 30D tax credit will not be applicable, providing a larger number of available vehicles in the near term. Second is the Commercial EV Charger Tax Credit, which may be applicable to tax exempt entities. Final regulations for all tax credits outlined in Table 33 are pending final publication.

This credit is expected to be provided as a direct payment to governments, with compensation received through a tax filing. Additional guidance regarding forms and process for claiming the credit is still pending. The City should ensure that it utilizes the 45W commercial tax credit for all alternative fuel vehicle procurements in the future.

Recommendation 5.C. Capture Opportunities for Funding and Advocacy in State Government
Medium Term

Through BIL, significant allocations of formula funds were made available to state governments with applicability to EV infrastructure. Key programs are highlighted in Table 34, which includes the CMAQ program, which until June 2022 provided funding to local government agency fleets located in Air Quality Non-Attainment areas in Virginia with reimbursement for incremental costs to transition to alternative fuels such as electric, natural gas or propane.

Table 34. Key BIL State Formula Funding Programs Applicable to EV Infrastructure

Title	Description	Funding Type
Congestion Mitigation and Air Quality (CMAQ) Improvement Program	$15.7 billion DOT program which provides a flexible funding source to state and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Types of projects are eligible under the CMAQ program includes EVs and charging stations, diesel engine replacements and retrofits, transit improvements, bicycle and pedestrian facilities, shared and micro mobility projects. In addition to improving air quality and reducing congestion, CMAQ projects can improve equitable access to transportation services, improve safety, and promote application of new and emerging technologies.	Formula
Surface Transportation Block Grant	$72 billion DOT program for projects to preserve and improve the conditions and performance on any federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminal. Includes installation of EV charging infrastructure and vehicle-to-grid infrastructure.	Formula
National Highway Performance Program (NHPP)	$147 billion DOT program to provide support for the condition and performance of the National Highway System (NHS), and to provide support for activities to increase the resiliency of the NHS to mitigate the cost of damages from sea level rise, extreme weather events, flooding, wildfires, or other natural disasters. Eligible activities were expanded under BIL to include installation of EV charging infrastructure, workforce training and public transportation. Projects must be identified in the Statewide Transportation Improvement Program (STIP)/Transportation Improvement Program (TIP) and be consistent with the Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan(s).	Formula
Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT)	$7.3 billion DOT program to help make surface transportation more resilient to natural hazards, including climate change, sea level rise, flooding, extreme weather events, and other natural disasters through support of planning activities, resilience improvements, community resilience and evacuation routes, and at-risk costal infrastructure. Up to 50% of funds can be distributed to other formula programs including NHPP, STBG, CMAQ, and the Carbon Reduction Program.	Formula
Carbon Reduction Program	$6.5 billion DOT program to states and MPOs reduce transportation emissions, defined as carbon dioxide (CO2) emissions from on-road highway sources. Eligible activities include acquisition, installation, or operation of publicly accessible EV charging infrastructure or hydrogen, natural gas, or propane vehicle fueling infrastructure. Purchase or lease of zero-emission construction equipment and	Formula

	vehicles, including the acquisition, construction, or leasing of required supporting facilities.	
State Energy Program	$2.5 billion DOE program. State Energy Program provides funding and technical assistance to states, territories, and the District of Columbia to enhance energy security, advance state-led energy initiatives, and increase energy affordability Funding available to states for implementation LDV charging, infrastructure planning, commercial charging, and public transportation charging.	Formula
Building Resilient Infrastructure and Communities (BRIC)	$2.3 billion Department of Homeland Security Program. BRIC is designed to advance broad, impactful, flexible, and innovative resiliency solutions that enhance the energy system and access to energy during disasters. Priorities to incentivize natural hazard risk reduction activities that mitigate risk to public infrastructure and disadvantaged communities; incorporate nature-based solutions including those designed to reduce carbon emissions; enhance climate resilience and adaptation; and increase funding to applicants that facilitate the adoption and enforcement of the latest published editions of building codes. Federal Cost Share: 75%. Local governments can apply as sub-applicants to states.	Competitive

➢ Action 5.C.1. Monitor and pursue state opportunities

As new programs are established at the state level, it will be important for the City to continue discussion with state agencies included VDOT, VDEQ, and other agencies to pursue funding. The City can also advocate for use of these funding sources to develop specific new programs for EV charging infrastructure. Active engagement at the state level can facilitate partnership approaches that will increase likelihood of award and build relationships to ensure that charging infrastructure is deployed in coordination with neighboring jurisdictions to increase station utilization.

State level opportunities may include direct funding for the procurement of electric vehicles or the deployment of EV charging infrastructure. However, the City should also position itself to utilize funding available for emergency preparedness planning and resiliency for potential deployment of energy storage in conjunction with EV charging technologies.

➢ Action 5.C.2. Advocate for state electric vehicle rebate program

As noted in Chapter 1, in 2021 the Virginia legislature passed HB 1979, which authorized an incentive for the purchase or lease of any new and used EV through the Electric Vehicle Rebate Program. Virginia residents can qualify for a $2,500 rebate; LMI buyer requirements can receive an additional $2,000 rebate for a new EV and $500 for a used EV. However, to date this incentive program remains unfunded.

The City should advocate within the state government for the funding of this program, or for the program to be specifically designed to provide incentives for LMI residents.

➢ Action 5.C.3. Resilient Virginia revolving loan fund

The Resilient Virginia Revolving Loan Fund was established in 2022 to make loans or grants to local governments to finance or refinance the cost of any resilience project. Loans and grants may also be made from the Fund to a local government that has developed a funding program to provide low-interest loans or grants to any persons of the Commonwealth eligible for projects for resilience purposes. Projects under this program includes measured that "enable widespread integration of distributed energy resources, including energy storage and rooftop solar, into the grid to achieve decarbonization and to enhance resilience."

The City should consider pursuing funding through this program for the deployment energy storage to enhance resiliency, which could be sited in conjunction with EV charging to ensure availability of vehicle charging during weather emergencies and grid failure as part of a larger scale resiliency strategy. Energy storage can serve dual purpose at evacuation shelters, providing both vehicle charging during peak load period prior to evacuations, and to provide back-up power to the facility during emergency events.

Recommendation 5.D. Identify Opportunities for Funding and Advocacy with Dominion Energy

Medium Term

Dominion Energy has established several incentive programs for residents and fleets operating EVs in Virginia. A summary of these incentives can be found in Table 35.

Table 35. Dominion Residential Charging Incentives (2023)

Program Name	Description
Residential EV Charger Rewards Program	• Enrollment in EV charger rewards allows Dominion Energy Virginia (DEV) to make remote adjustments to charger's energy use during periods of high demand for electricity. Residents can earn $40 each year for participation. Residents may also qualify for an enrollment bonus of $125 after purchasing charging equipment.
Residential Charger Program	• Enables Dominion Energy Virginia to install EV Charging Stations for up to 1,000 customers • For 100 eligible low-income customers, no costs. • For all other customers, $40.27 per month for 60 months or $1,835.96 upfront
Level 2 Charging Program	• Enables DEV to install, own and maintain make-ready and level 2 charging stations for up to 110 customers • For 10 eligible customers located in low-income community or community of color, no costs. • For all other customers, 50% upfront incentive on EVSE make-ready; customers pay monthly charge for remaining balance for 10 years.

Fleet Charging Program	• Enables DEV to install, own and maintain make-ready and EV charging station for up to 175 fleet customers • For 10 eligible customers located in low-income community or community of color, no costs. • For all other customers, 50% upfront incentive on EVSE make-ready; customers pay monthly charge for remaining balance for 10 years on their bill.

➢ Action 5.D.1. Advocate for EV program expansion

To increase EV charging access for both residents and businesses in Virginia Beach, the City should advocate for the expansion of these programs to gain opportunity for more residents. In particular, while each of the three existing programs have specific incentives for low-income residents, they are extremely limited in scope. Establishing large-scale incentive programs for residents and owners of MUDs and those residing in DACs will help to increase equitable charger access across the City.

Virginia Beach should also advocate for programs that support lower-cost charging for both residential and public charging applications. In 2021, Dominion Energy launched a program for Virginia residents to enroll in an Off-Peak Plan, which enabled consumers to take advantage of time-of-use rates. However, this program was limited to 10,000 participants, and is fully subscribed. Expansion of this plan to include more residents will decrease EV operational costs to consumers, while also improving grid operations by limiting the number of residents that charge vehicles during peak periods (such as early evening).

➢ Action 5.D.2. Advocate for commercial EV charging tariffs

DCFC stations require significantly higher utilization rates than Level 2 charging, due to both the higher cost for installation and infrastructure, as well as demand charges that may be incurred from the local utility because of high peak energy demand. Peak demand charges are applied to rates of all energy consumption through the billing period, which can cause stations to be operationally cost prohibitive. electricity demand charges (or capacity charges) are a common element for utilities to recover system costs throughout their service territory, particularly for commercial and industrial users, charging larger electric consumers for their peak usage each month

In other localities, utilities have begun to create a specific commercial tariff for DCFC stations to avoid prohibitive demand surcharges from being levied against site host. Utilities such as Southern California Edison have established waiver programs whereby demand charges are not applied until year 5 of charger operation in order to allow time for increased utilization. Utilities have also established temporary rate schedules, or rebate programs to offset demand charges in the short term. The City should work with the State Corporation Commission (SCC), Dominion Energy, and other jurisdictions in Virginia to facilitate the implementation of specific tariffs for DCFC chargers in the state.

Recommendation 5.E. Adopt and Promote Utilization of C-PACE

Short Term

C-PACE is a federal program administered by Virginia PACE in Virginia. The program offers 100% financing for a wide variety of energy and resource sustainability and conservation project for commercial properties. Financing covers both hard and soft costs for projects with long term (30-year) fixed rate loans that are paid through property assessments which are tied to the land, not the owner. Program participation is entirely voluntary wherein property owners can opt-in to receive financing for eligible projects.

➢ Action 5.E.1. Adopt revised ordinance to enable use of utilize C-PACE for EV chargers

In 2022, eligible project types were expanded to include EV charging infrastructure, as well as energy storage and microgrids, at the state level. All C-PACE financed projects must be permanent fixtures to the property in question, so charging stations should not utilize mobile charging technology.

For property owners and developers to utilize C-PACE financing, a locality must also opt-in to the program. They do this by passing a local ordinance that enables the program and officially agree to the program in coordination with Virginia PACE. Virginia Beach passed ordinance 3676 in 2021 establishing The City of Virginia Beach Commercial Property Assessed Clean Energy (C-PACE) Financing Program. Eligible C-PACE properties include office, multi-family, industrial, retail, hotel, agriculture and non-profit (i.e., churches). Ordinance to Amend Chapter 35.5 of the City Code for the C-PACE Program was brought before City Council on February 21, 2023.

Information about this program, process and the applicability to EV charging infrastructure should be made available on the City website.

Goal 6: Prepare for the Future

What issues need to be considered now for the long term?

Recommendations in this section focus on specific technologies, practices and applications that can be integrated into City EV charging infrastructure planning in the future. These recommendations may facilitate increased charging accessibility, operation, and overall transportation system resiliency, but will require longer timelines for implementation, or may require more mature technologies to be developed before widespread adoption can be considered.

Figure 70. Shared Mobility Hub Concept
Credit: CoMo UK

Recommendation 6.A. Develop Shared Mobility Hubs
Long Term

A Shared Mobility Hub is an emerging concept in transportation land-use planning where transportation connections, travel information, and community amenities are aggregated into a comfortable, seamless, understandable, and on-demand travel experience. Shared Mobility Hubs are typically located with major transit facilities and in places where frequent services intersect to allow easy transfers between

mobility services. In addition to transit, Shared Mobility Hubs may include connections to car share, transportation network companies (TNCs), taxis, bike share, bike parking, pick-up and drop-off, kiss-and-ride, freight delivery, as well as connections to local bike and pedestrian routes. Hub projects can vary in size and scope, ranging from regional to neighborhood applications providing a variety of different transportation services.

➢ Action 6.A.1. Coordinate with HRTPO and HRT to pursue project development

The City should coordinate with HRTPO, HRT and the Active Transportation Advisory Committee to identify opportunities for the deployment of a shared mobility hub in Virginia Beach. A Shared Mobility Hub in Virginia Beach could include four types of EV chargers:

- Publicly accessible chargers using a mix of different power levels. The goal should be to serve multiple dwell times, from commuters (Level 1 chargers), visitors (likely Level 2 or DCFC), or others.
- Fast chargers aimed solely at taxis and TNCs. Examples of this type of dedicated charger are increasingly prevalent, such as in the District of Columbia, Colorado, and Seattle.
- HRT electric bus charging stations.
- Docks for electric micro-mobility bikes and scooters.

A potential location for a shared mobility hub is the Silverleaf Transit Center. This location is centrally located and near I-264, providing high rates of accessibility for multi-modal transit. The City is currently reviewing the potential deployment of a public bike-sharing program, which could also be incorporated into this project design.

Recommendation 6.B. Technologies and Practices to Enhance Resiliency and Support Evacuations

Long Term

Between 2020 and 2080, flooding of roadways in Virginia will increase by about 200% during a major flood, which means more comprehensive and effective solutions are mitigate the flood risk to charging networks. In the same time period, electricity assets vulnerable to a flooding event are projected to increase around 170%. With increased use of EVs, it is possible that concentrated periods of charging during mass evacuations could overload the grid in the future. Residents may also face challenges in recharging vehicles due to lack of access to public charging stations and due to the longer period of time takes to charge an EV as compared to gasoline vehicles. Beach should implement strategies to facilitate response to emergency events, such as hurricanes, floods, and mass evacuations.

➢ Action 6.B.1. Identify priority sites for EV charging during evacuations

The most direct method available to the City to address vulnerabilities of EV charging networks during extreme weather events and evacuations is to expand the number of chargers available on municipal properties. The City should consider the following:

- Installing more electric charging stations in known evacuation regions and along evacuation routes could allow more evacuees to charge at one time without overloading the charging network. The power grid capacity may need to be upgraded to ensure that there is enough electricity in the case of an evacuation.[3]
- Investing more funding in DCFC chargers could allow more EVs to charge in a smaller amount of time, which will more efficiently meet the demand during a mass evacuation.[3]
- During evacuations, charging networks are often most stressed at geographies just outside of flooded areas. Strategically installing additional chargers outside of flood prone areas may support improved grid stability during emergency situations. This may include coordination with other municipalities in the region to ensure charger distribution.
- Public messaging, such as recommending residents recharge their vehicle before a storm, can help reduce grid strain. Early and consistent communication with energy utilities could help better prepare the City in case of power shortages or outages.[3]

The primary evacuation routes in Virginia Beach are I-264 and I-64, and secondary Highway 58, which runs in parallel to I-264. Figure 71 identifies all municipal properties in Virginia Beach that are located within one mile of evacuation routes; a list of these properties can be found in Appendix G. This includes several properties that have been identified as priority locations for deployment of charging infrastructure in Chapter 5, including the Convention Center and Mount Trashmore Park. These locations should be given consideration by the City as locations for EV resiliency centers in which chargers are deployed in higher numbers and are sited in conjunction with energy storage or other back-

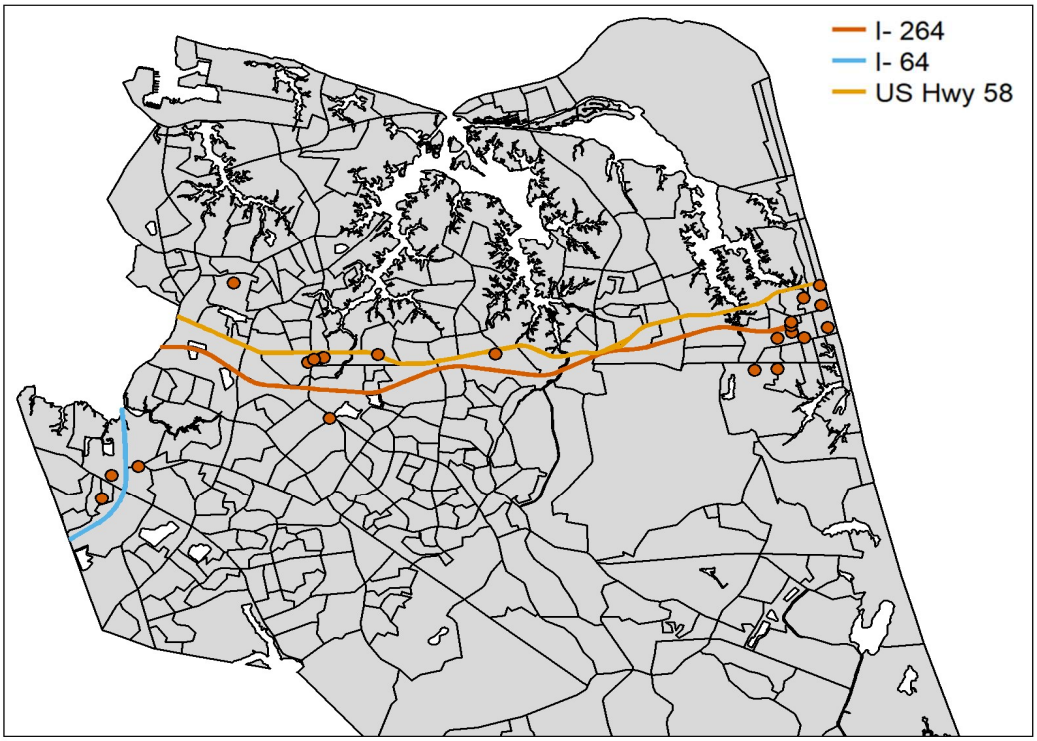


Figure 71. Municipal properties within one mile of evacuation routes

up power system (Action 6.B.2) to ensure operation during grid failures and periods of peak demand.

➢ Action 6.B.2. Deploy resiliency technologies

To further enhance emergency preparedness planning in Virginia Beach, it is recommended that the City consider integration of resiliency technologies for EV charging infrastructure in the future. These technologies extend beyond static, grid-powered stations vulnerable to variances in power generation and natural disasters. EV Resiliency technologies not only ensure reliable transportation when the grid fails but can be utilized to reduce overall power demand and buffer the grid when it is at risk. Deployment of these technologies at emergency shelters, critical infrastructure and along evacuation routes will improve the capacities of residents of Virginia Beach to access charging during emergency situations, as well as enhance municipal operations.

In the near term, the City can connect EV chargers at municipal sites to permanent generators already in operation if capacity is available, or expand existing permanent generators to serve as back-up power for critical vehicles during grid failure events. However, integration of mobile generators and battery storage into municipal plans will provide greater flexibility for responding to emergency situations and can also serve to provide grid services in non-emergency periods. In particular, the deployment of mobile charging technologies can be integrated into municipal operations for use during non-emergency events to serve as a charger for the municipal fleet, or to be dispatched to refuel stranded vehicles that have run out of charge. A summary of available technology applications to enhance resiliency are provided below.

Back-Up Generation

Permanent and mobile back-up power generation is recommended, either diesel or a battery energy storage system. Generators present a common and widely utilized solution for bolstering the resiliency of critical infrastructure when the grid fails. Offering great variety in capacity, mobility, and fuel source, generators can be deployed to sites as needed or permanently installed in areas where grid reliability is of greater concern, or the infrastructure must always be powered. While modern generators can burn cleaner and more widely-sources fuels, they are not an ideal solution for resiliency and sustainability. Not only do generators produce significant emissions, but they rely on fuel supply chains that are vulnerable to disruptions, especially during times of increased stress like grid failure.

Figure 72. Fixed Diesel Generator Powering an EV Charger

Distributed Renewable Generation

There is opportunity to significantly improve the resilience of EV charging infrastructure by integrating renewable power into new and existing stations. EV charging can be paired with on-site renewable energy generation—most commonly by co-locating EVs with on-site solar energy systems, and in some

cases batteries, either with or without managed charging. This offers the opportunity for emissions-free EV operation, and when paired with energy storage, may offer the opportunity for vehicle operation without grid interconnection.

Solar generation offers flexible location and sizing, zero emissions, and grid independence which reduces vulnerability and overall demand on the grid. Solar charging can readily support Level 2 EV charging and adding features like battery storage and grid integration can improve capacity and power delivery. Grid integration also offers the benefit of bolstering overall power generation capability in the area where solar chargers are utilized.

Energy Storage

The ability to store energy is critical to future grid and charging station resilience. Stored energy not only ensures that stations can continue to charge EVs when grid power fails, it can also improve grid stability by providing capacity during peak demand. Integration of energy storage with EV charging is gaining widespread adoption in the US; for example, Electrify America has deployed over battery energy storage systems (BESS) at over 150 EV charging stations across the US, and in 2022 deployed its first MW scale installation in 2022.

Mobile Charging

Mobile charging is a relatively new technology with the ability to serve many of the same functions as traditional charging station with several additionally capabilities. Coming in a variety of sizes, large mobile chargers can service entire vehicle fleets with reduced fixed infrastructure while smaller chargers can provide critical range for long trips or stranded EVs. Mobile chargers have the added benefit of acting as stored energy sources, offering similar grid resilience benefits as traditional storage systems. There are both Level 2 and DCFC mobile stations that are available for procurement on the market today.

Figure 73. Freewire Mobi Mobile Charger

Mobile chargers can range significantly in size, but all are designed to be deployed to sites where charging is needed on demand. The Tesla Megapack Mobile Supercharger is a 3.9 MWh battery that is approximately the size of a shipping container that can provide DCFC charging, while the Freewire Mobi charger is 80kWh and provides Level 2 charging capabilities, which is shown in Figure 73.

➢ Action 6.B.3. Include EVs in Disaster Management Planning

The City should consider developing an EV-focused chapter of its disaster management plan that will ensure that EV charging is available during crisis events and is resilient to natural or man-made shocks.

This should include the installations of EV chargers and backup power at emergency shelters and along evacuation routes in the City, as well as the deployment of mobile charging at geographically distributed points along I-264 and with emergency response units. Protocols for communicating with the public regarding EV charging prior to extreme weather events should also be established. Close coordination with Dominion Energy will be required for the development of any emergency response plan, including proposed sites large EV charging installations to serve evacuation routes, or energy storage and charging deployed in conjunction with emergency shelters.

The City should examine opportunities to leverage federal and state funding programs related to resiliency and disaster preparedness for the acquisition and installation of energy storage and mobile charging applications, as outlined in Recommendation 4.A.

Recommendation 6.C. Consider Opportunities for Bi-Directional Charging and V2G
Long Term

Bi-directional charging refers to the ability for the battery of an electric vehicle to be used as a mobile storage device, delivering energy back to the grid, a building or to another external load. This requires both the charger and the vehicle to be capable of bi-directional charging; most chargers and vehicles do not have this capacity today. In the future this charging technology may provide critical resiliency leveraging the significant storage capacity of EVs to power the grid, buildings, and even other EVs.

➢ Action 6.C.1. Pilot V2G project with Dominion Energy

As identified in Chapter 2, VBCPS is currently engaged in a V2G demonstration project with Dominion through its electric school bus program. Several federal programs identified under Goal 5 have specific applicability for the deployment of V2G technologies and should be assessed for deployment of pilot projects in Virginia Beach. The City can consider the deployment of a pilot V2G project for the municipal fleet in conjunction with Dominion Energy utilizing federal grant funds. As of this writing, on a handful of public schools have V2G demonstration projects, including El Cajon Valley Unified School District in California, Durango School District in Colorado, and White Plains School District in New York.

Recommendation 6.D. Future Proof Charging Installations
Long Term

Futureproofing refers to the process of accommodating the shifting needs of users over time and enabling easy and low-cost expansion of charging and upgrading of equipment at a project site. Futureproofing aims to prevent the costly and labor-intensive process of replacing or performing complex upgrades before equipment has reached the end of its design period without incurring excessive cost and risk. The most cost-effective time to create EV Capable and EV Ready sites is during construction, either when a building is being constructed or undergoing a major retrofit or when an initial electric vehicle charging station project is being installed.

➢ Action 6.D.1. Oversize infrastructure for forecasted EV deployment

As new chargers are installed in Virginia Beach, the City should work to ensure that sites are designed and constructed to accommodate charger expansion, or higher power charging, in the coming years. This can include Installing larger substations and transformers, laying higher capacity conduit, installing additional electrical circuits, or designing the project site to enable future on-site energy storage and/and distributed generation. Critically, it will be important to communicate with Dominion regarding the expected future load at the project site to assist in grid planning and necessary upgrades to the distribution system.

Futureproofing of infrastructure will be most important at locations with large concentrations of municipal fleet vehicles and public parking. Some municipal sites are host to fleets in excess of 100 vehicles that will be electrified in the coming decade. Designing to accommodate rapid expansion of charging infrastructure will greatly reduce future construction costs.

As identified in Recommendation 4.D, it is required that all new buildings and major renovations be constructed with infrastructure that will enable electrification of all municipal vehicles in the next ten years. This requirement should be used as a baseline for how to futureproof charging installations at municipal properties across Virginia Beach.

What Happens Next?

To implement the Recommendations and Actions presented in this chapter, the City can undertake the following as immediate next steps to enhance the capacity of the City to support the deployment of EV charging infrastructure across Virginia Beach.

Figure 74. Short Term Actions to Support EV Infrastructure in Virginia Beach

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REPORT DEVELOPMENT

This report was developed in 2022 and 2023. Regular meetings were held with City staff throughout report development to provide input and feedback. In January 2023, the city sought community input via an online survey to understand community perspectives on electric vehicles, evaluate charging needs and to help evaluate locations for publicly accessible chargers. This report builds on several prior initiatives in Virginia Beach, such as the Comprehensive Plan, Sea Level Wise Adaptation Strategy and the City's Capital Improvement Program.

Special thanks to Chris Freeman of Virginia Beach City Public Schools and students of the Environmental Studies Program, including Curren Lankford, Juliette Deley, Madison Lortscher, and Matthew Stanley.

APPENDIX A. ELECTRIC VEHICLE REGISTRATIONS IN VIRGINIA BEACH

Table 36 contains a list of all Plug-in Hybrid Electric Vehicle (PHEV) and Battery Electric Vehicle (BEV) total registrations by year. Data provided by the Virginia Department of Motor Vehicles.

Table 36. Total EV Registrations by Year

Make	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Audi	0	0	0	0	0	2	1	0	11	5	12	10	0	41
BMW	0	0	0	6	9	8	9	13	9	2	19	21	2	98
Cadillac	0	0	0	1	0	0	2	2	0	0	0	0	0	5
Chevrolet	6	15	15	13	7	9	25	11	9	10	2	11	6	139
Chrysler	0	0	0	0	0	0	2	13	4	12	13	10	0	54
Fiat	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Ford	0	0	18	13	10	22	28	6	6	2	24	37	0	166
Honda	0	0	0	1	0	0	0	24	0	0	2	0	0	27
Hyundai	0	0	0	0	0	0	0	0	1		1	27	0	29
Jaguar	0	0	0	0	0	0	0	0	1	2	0	0	0	3
Jeep	0	0	0	0	0	0	0	0	0	0	48	47	0	95
Karma	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Kia	0	0	0	0	0	2	2	1	2	6	1	20	0	34
Land Rover	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Lexus	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Lincoln	0	0	0	0	0	0	0	0	0	1	2	4	1	8
Lucid	0	0	0	0	0	0	0	0	0	0	0	5	0	5
Mercedes-Benz	0	0	0	0	0	0	0	0	3	1	0	7	0	11
Mini Cooper	0	0	0	0	0	0	0	2			3	2	0	7
Mitsubishi	0	0	0	0	0	0	0	7	1	4	0	0	0	12
Nissan	2	8	10	2	20	4	2	7	11	11	2	11	0	90
Polestar	0	0	0	0	0	0	0	0	0	0	1	2	0	3

Porsche	1	1	1	2	1	2	2	1	1	6	6	8	0	32
Rivian	0	0	0	0	0	0	0	0	0	0	0	9	0	9
Smart	0	0	1	0	0	1	1	1	0	0	0	0	0	4
Subaru	0	0	0	0	0	0	0	0	0	1	0	0	1	2
Tesla	0	3	20	16	22	43	42	156	99	180	317	278	0	1176
Toyota	0	8	8	4	0	0	32	11	3	6	32	10	0	114
Volkswagen	0	0	0	0	0	3	0	0	0	0	15	2	0	20
Volvo	0	0	0	0	0	0	2	1	3	0	15	20	3	44
Total	**9**	**35**	**73**	**59**	**69**	**96**	**150**	**256**	**164**	**252**	**515**	**543**	**13**	**2234**

Table 37 provides an annual total of PHEV and EV registration by drivetrain type.

Table 37. Total EV Registrations by Year - BEV and PHEV

Drivetrain	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
BEV	2	11	33	22	44	58	55	169	133	212	383	425	6	1554
PHEV	7	24	40	37	25	38	95	89	31	40	132	118	7	684
Grand Total	**9**	**35**	**73**	**59**	**69**	**96**	**150**	**256**	**164**	**252**	**515**	**543**	**13**	**2234**

APPENDIX B. INVENTORY OF PUBLIC ELECTRIC VEHICLE CHARGING PLAZAS AND PORT COUNTS

Table 1 provides a summary of the locations of existing EV charging stations in Virginia Beach by address, public accessibility, port count, charging network and property type.

Table 38. Inventory of Current Electric Vehicle Charging Plazas and Port Counts in Virginia Beach

Station Name	Street Address	Publicly Available 24 hours	Level 2 Port Count	DCFC Port Count	EV Network	Property Type
The Pearl at Marina Shores	2110 Marina Shores Dr		4		Non-Networked	Multi-Unit Dwelling
Delta Hotels by Marriott	2800 Shore Dr		2		Non-Networked	Hotel
25th Street Parking Garage	336 25th St	Yes	2		Non-Networked	Multi-Use Parking Garage/Lot
Marriot Virginia Beach Oceanfront	4201 Atlantic Ave		1		Non-Networked	Hotel
Westminster Canterbury	3100 Shore Drive		2		SemaCharge Network	Multi-Unit Dwelling
The Cavalier Virginia Beach	4200 Atlantic Ave		4		Tesla Destination	Hotel
PRESS wine bar	2301 Red Tide Rd	Yes	4		Tesla Destination	Retail
Hyatt House Virginia Beach Oceanfront	2705 Atlantic Ave		3		Tesla Destination	Hotel
First Landing State Park	2500 Shore Dr	Yes	3		Tesla Destination	Leisure Destination
Beach Spa Bed & Breakfast	2420 Arctic Ave		2		Tesla Destination	Hotel
Atrium Resort	315 21st St		2		Tesla Destination	Hotel
CROC'S 19th Street Bistro	620 19th St		2		Tesla Destination	Retail
Il Gardino	2105 W Great Neck Rd	Yes	2		Tesla Destination	Retail
Il Giardino Ristorante	910 Atlantic Ave	Yes	2		Tesla Destination	Retail
Navy Exchange NEXCOM	3280 Virginia Beach Blvd	Yes	2		ChargePoint Network	Retail

Beach Ford	2717 Virginia Beach Blvd		3		Non-Networked	Retail
Hall Nissan - Virginia Beach	3757 Booney Rd		2	1	Non-Networked	Retail
Jaguar Virginia Beach	3033 Virginia Beach Blvd		2	1	Non-Networked	Retail
Audi Virginia Beach	2865 Virginia Beach Blvd		2		Non-Networked	Retail
Checkered Flag Porsche	2865 Virginia Beach Blvd		1		Non-Networked	Retail
Wawa - Tesla Supercharger	2501 Virginia Beach Boulevard	Yes		8	Tesla	Retail
Atlantic Bay Mortgage	596 Lynnhaven Parkway		1		Tesla Destination	Business Office
Hilltop Plaza	1725 Laskin Rd	Yes		2	eVgo Network	Retail
Whole Foods Market	1800 Laskin Rd	Yes	2		Non-Networked	Retail
Captain George's - Tesla	1956 Laskin Rd	Yes	2		Non-Networked	Retail
Wasserhund Brewing Company	1805 Laskin Rd	Yes	3		Tesla Destination	Retail
Captain Georges Seafood Restaurant	1956 Laskin Rd	Yes	2		Tesla Destination	Retail
Mermaid Winery	4401 Shore Dr	Yes	3		Tesla Destination	Leisure Destination
Il Giardino Ristorante	2500 Tournament Dr	Yes	4		Tesla Destination	Retail
Volvo Cars of Virginia Beach	4980 Virginia Beach Blvd		4		ChargePoint Network	Retail
Southside Harley-Davidson	385 N Witchduck Rd			1	ChargePoint Network	Retail
Urology of Virginia	225 Clearfield Ave		4		Non-Networked	Multi-Use Parking Garage/Lot
Pembroke Mall	4554 Virginia Beach Blvd	Yes	3		Tesla Destination	Retail
Anthem Inc, Amerigroup	1300 Amerigroup Way		2		ChargePoint Network	Business Office
Founders Inn and Spa	5641 Indian River Rd		2		Tesla Destination	Hotel
Checkered Flag Hyundai World	3700 Sentara Way			4	EVgo / Tesla	Retail
Barclay Towers / Quality Inn	809 Atlantic Avenue		7		Non-Networked	Hotel
Four Points by Sheraton Virginia Beach Oceanfront	1211 Atlantic Ave		4		Tesla Destination	Hotel

Wawa	4800 Shore Drive	Yes	4		Non-Networked	Retail
Holiday Trav-L-Park	1075 General Booth Boulevard		3		Non-Networked	Hotel
Dunkin Donuts	3701 Pacific Ave	Yes	2		Non-Networked	Retail
iFLY Virginia Beach	300 25th St		2		Non-Networked	Retail
Virginia Beach KOA	1240 General Booth Boulevard		2		Non-Networked	Hotel
RK Chevrolet	2651 Virginia Beach Boulevard		2		Non-Networked	Retail
Hall Honda	3516 Virginia Beach Blvd		2		Non-Networked	Retail
Tesla Service Center	573 Central Dr	Yes	2		Non-Networked	Retail
Sentara Virginia Beach General Hospital	1060 First Colonial Rd		1		Non-Networked	Medical or Ed. Campus
Courtyard Marriot	2501 Atlantic Ave		1		Non-Networked	Hotel
Fairfield Inn	1901 Atlantic Ave		1		Non-Networked	Hotel
Best Western Sandcastle Inn	1307 Atlantic Avenue		1		Non-Networked	Hotel
Beach Carousel	1300 Pacific Ave	Yes	1		Non-Networked	Leisure Destination
Barclay Bed & Breakfast	400 16th St		1		Non-Networked	Hotel
Ramada Inn	615 Atlantic Ave		1		Non-Networked	Hotel
Turtle Cay Resort	600 Atlantic Avenue		1		Non-Networked	Hotel
Atrium Resort	312 25 1/2 St		3		Tesla/Non-Networked	Hotel
Total			**120**	**17**		

APPENDIX C. CURRENT AND ALTERNATIVE PATHWAY VEHICLE PROJECTION ASSUMPTIONS

The following assumptions were used in the Current and Alternative Pathway vehicle projections. Figure 75 is the assumed fraction of light-duty vehicles remaining after a given vehicle gain, using national statistics.[5]

	Value in Model
LDV registrations per Yr in Virginia Beach	20,247
Total LDV registrations in Virginia Beach	397,059
Fraction of EV Population that are BEVs	88%
Annual Population Growth Rate	0.50%

	S-Curve Parameters
Maximum Value (share) (L)	0.5
Steepness (k)	0.29
Crossover Point (x0)	2032
Maximum Value (share) (L)	1
Steepness (k)	0.55
Crossover Point (x0)	2027

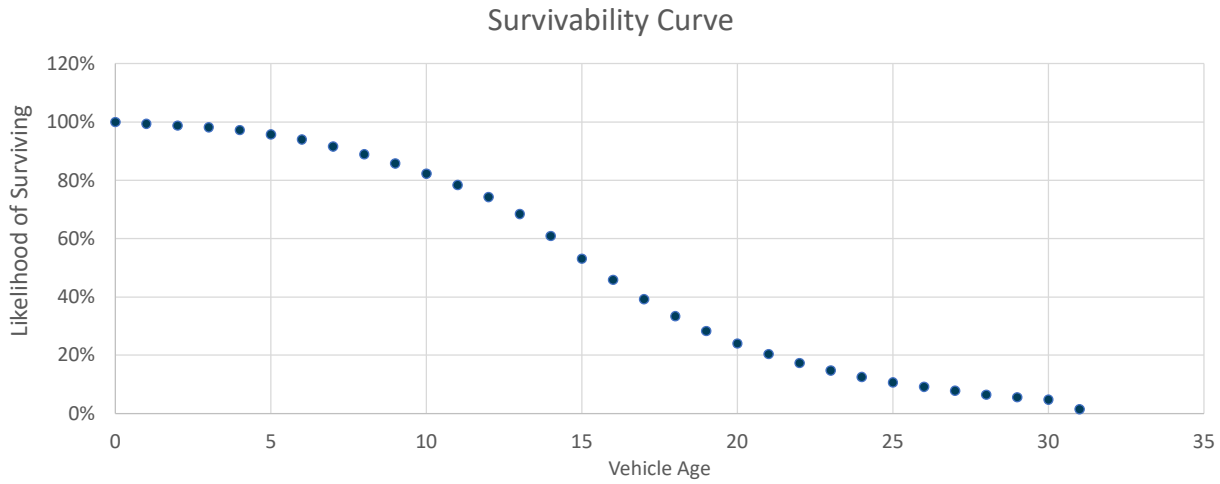


Figure 75. Fraction of Light-Duty Vehicles Surviving After a Given Vehicle Age

[5] Source: U.S. Environmental Protection Agency, Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025, EPA-420-D-16-900, July 2016. (Additional resources: https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas-ghg#TAR)

EVI-Pro Lite Projections

As detailed earlier in this chapter, the EVI-Pro Lite Tool developed by the NREL was utilized to develop projections of required charging infrastructure to support EV deployment in Virginia Beach through 2040. The EVI-Pro Lite tool requires the input of several Pathway assumptions to enable assessment of required infrastructure. To complete this forecast, the following criteria was used:[lix]

Table 39. Input Assumptions for EVI-Pro Lite Analysis for Virginia Beach

Vehicle Mix	Percentage of Electric Vehicles by Type
Plug-in Hybrids 20 mile range	15%
Plug in Hybrids 50-mile range	15%
All Electric Vehicles 100-mile range	10%
All Electric Vehicles 250-mile range	60%
% of hybrid miles from gasoline	50%
% of drivers with access to home charging	60%

APPENDIX D. DETAILED RESULTS OF CHARGING NEEDS ASSESSMENT

Table 40 shows the cumulative total number of plugs needed to support the electric vehicle populations in the Current and Alternative Pathways identified in Chapter 4. Note that these charging needs should be compared to the current number of plugs deployed in the city: 120 publicly accessible Level 2 chargers and 17 DCFC.

Table 40. Forecast of Cumulative Plugs Required by Year

Year	Current Pathway - Total Plugs Needed			Alternative Pathway - Total Plugs Needed		
	Public Level 2	Workplace Level 2	DCFC	Public Level 2	Workplace Level 2	DCFC
2023	46	54	21	57	68	26
2024	60	72	27	75	91	34
2025	**85**	**103**	**38**	**99**	**120**	**44**
2026	126	154	55	129	158	57
2027	263	301	130	168	207	73
2028	297	369	128	217	268	94
2029	451	562	194	277	344	120
2030	**661**	**826**	**284**	**350**	**436**	**151**
2031	929	1,162	399	438	546	189
2032	1,246	1,559	534	540	674	233
2033	1,600	2,003	686	657	820	282
2034	1,977	2,476	847	787	984	338
2035	**2,367**	**2,966**	**1,014**	**929**	**1,162**	**399**
2036	2,763	3,462	1,183	1,082	1,353	464
2037	3,156	3,955	1,352	1,242	1,554	533
2038	3,546	4,444	1,518	1,407	1,761	603
2039	3,928	4,923	1,681	1,576	1,973	676
2040	**4,297**	**5,386**	**1,840**	**1,746**	**2,186**	**748**
2041	4,650	5,829	1,990	1,914	2,397	820
2042	4,983	6,246	2,133	2,080	2,606	891
2043	5,294	6,636	2,266	2,242	2,809	960
2044	5,580	6,996	2,388	2,398	3,004	1,027
2045	**5,842**	**7,324**	**2,500**	**2,547**	**3,192**	**1,091**

APPENDIX E. FORECASTED IMPACT ON ELECTRICITY LOAD

Table 41 presents estimates of the power consumption, by charger type, for the electricity needed to charge light-duty electric vehicles in Virginia Beach between today and 2040. These estimates are in addition to existing community loads for other services such as buildings and industry (not shown). For example, the table shows that by 2030 in the Current Pathway, the load from all light-duty electric vehicles averages to 16 MW and peaks at 35.3 MW.

Table 41. Average and Peak Load for Virginia Beach's Light-Duty Electric Vehicle Population

	Today		2030		2040	
	Current Pathway	Alternative Pathway	Current Pathway	Alternative Pathway	Current Pathway	Alternative Pathway
Light-Duty EV Stock	1,688	1,688	32,327	17,047	211,830	85,593
Average Load (MW)	0.8	0.8	16.0	8.4	104.8	42.3
Peak Load (MW), Unmanaged	1.9	1.9	35.3	18.6	230.9	93.3

Figure 76 is an estimated load growth curve for all light-duty electric vehicle charging in Virginia Beach in 2030 during an average workday, Monday through Friday. The at-home Level 1 and 2 charging (dark blue and light blue) account for the majority of load in most parts of the day, including during the peak, which occurs around 7:00 PM. As expected, workplace Level 1 and 2 (beige and green) peak in the morning of the workday, as drivers arrive to work and plug in. Public Level 2 and DCFC (dark brown and red) rise during the morning and stay relatively constant until the evening.

Figure 76 is only an estimate. In reality, Virginia Beach's load profile could look different for a number of reasons. For example, the curves could shift with the number of vehicles charging (e.g., during high tourism season), the management of charging (e.g., through time of use rates), or changes in the weather (electric vehicles are less efficient in very cold or very hot weather). Additionally, the figure only shows the load curve for light-duty vehicles. Medium- and heavy-duty electric vehicles will add additional load throughout the day. Their impact is not assessed in this plan and is likely a lower magnitude of load.

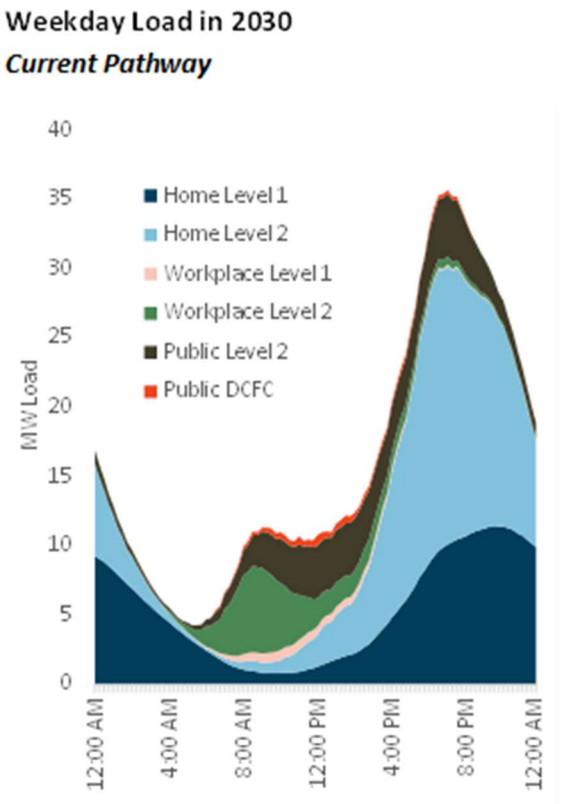


Figure 76. Load Curves for Light-Duty Electric Vehicles in Current Pathway in 2030

APPENDIX F. SUMMARY OF SURVEY RESPONSES

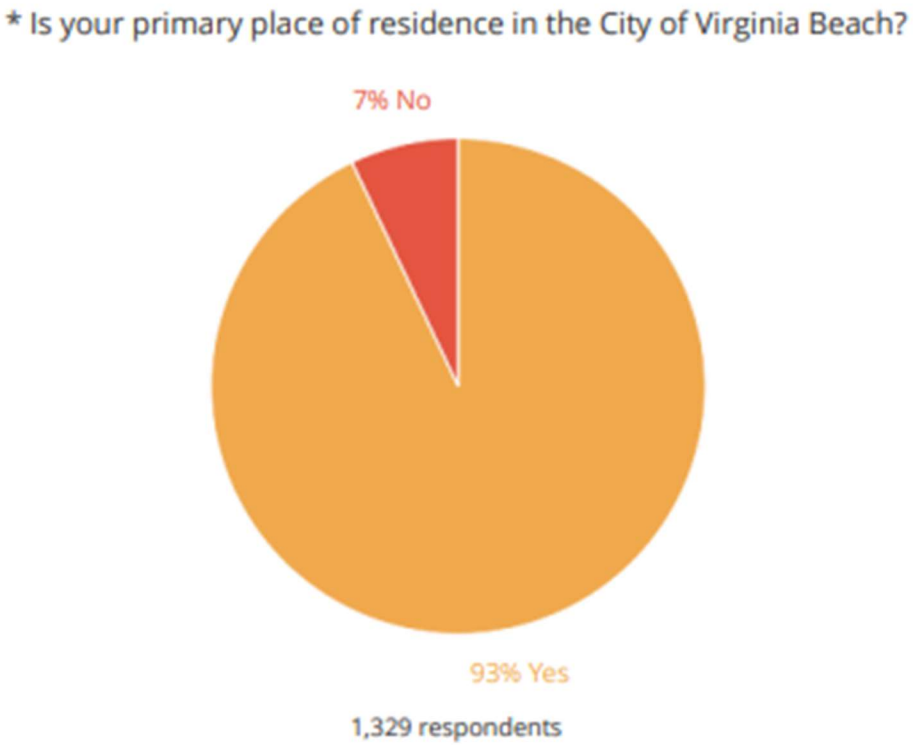
The following sections present a summary of responses to the public engagement survey that was distributed in January 13- February 13, 2023 via SpeakUpVB. Responses containing any personal identifying information have been omitted. Short form narrative responses have also been omitted but are available through the City.

Table 42 provides a summary of the total responses received, followed by a visualization of the aggregated survey responses in chart format.

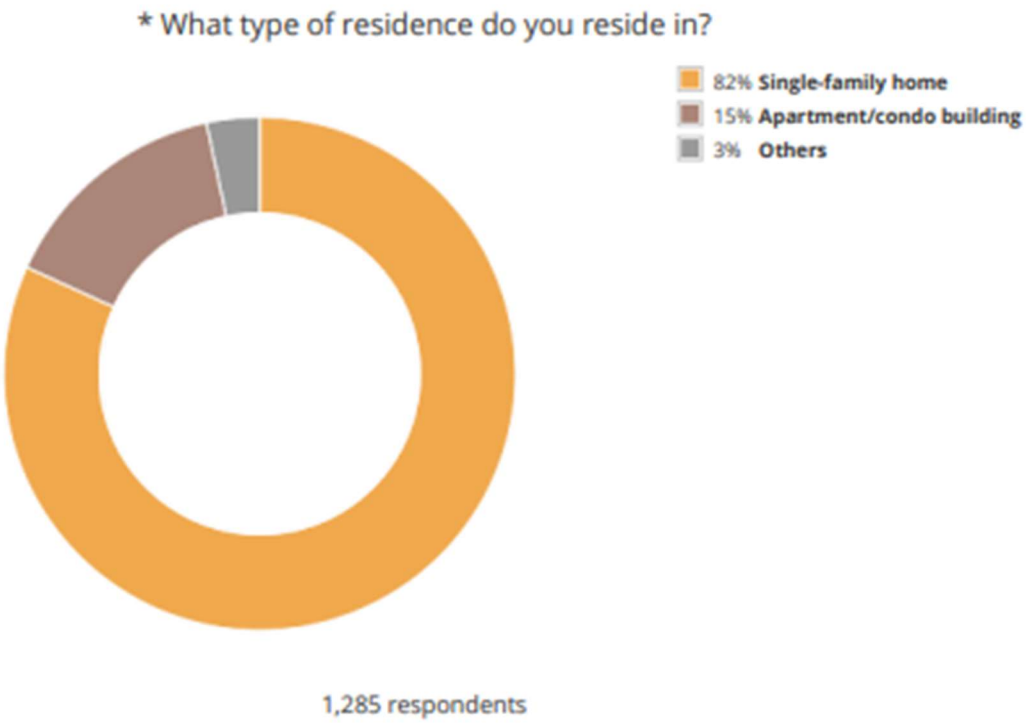
Table 42. Engagement Summary Statistics

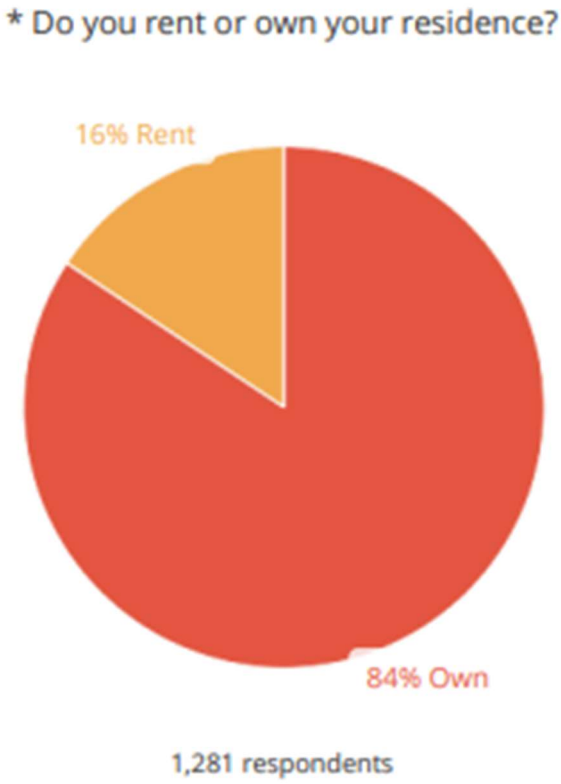
Views	Participants	Total Question Responses	Comments	Subscribers
3,462	1,381	32,529	1,844	840

A. Scoping question directing participants to residential or business survey.

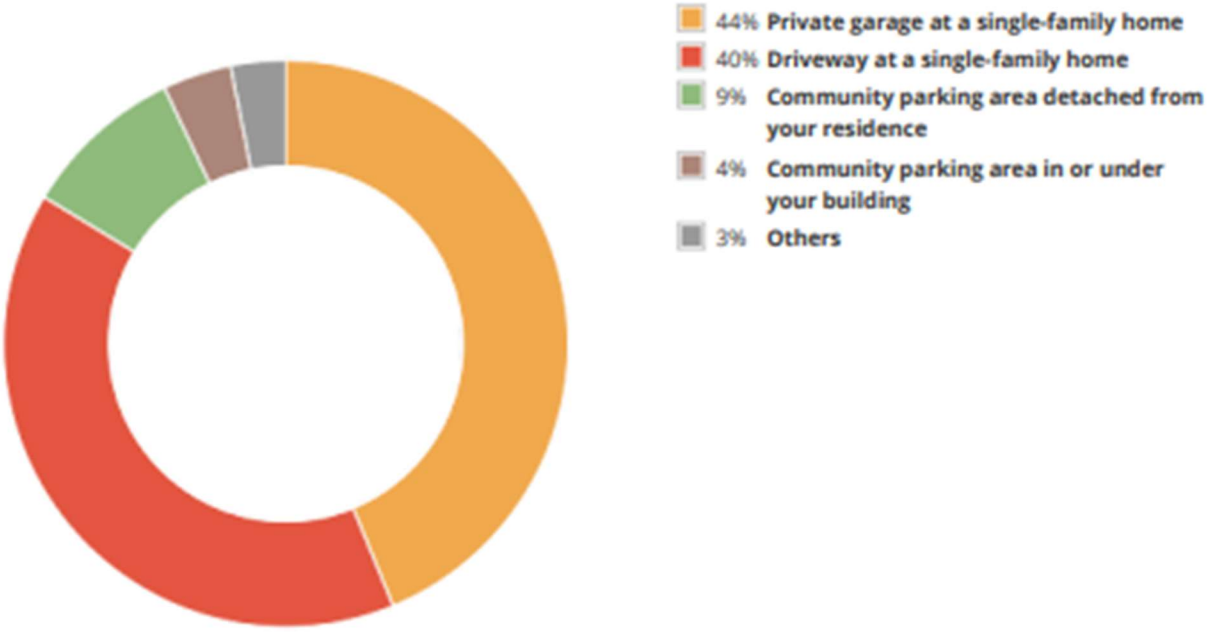


B. Residential Survey Response Summary

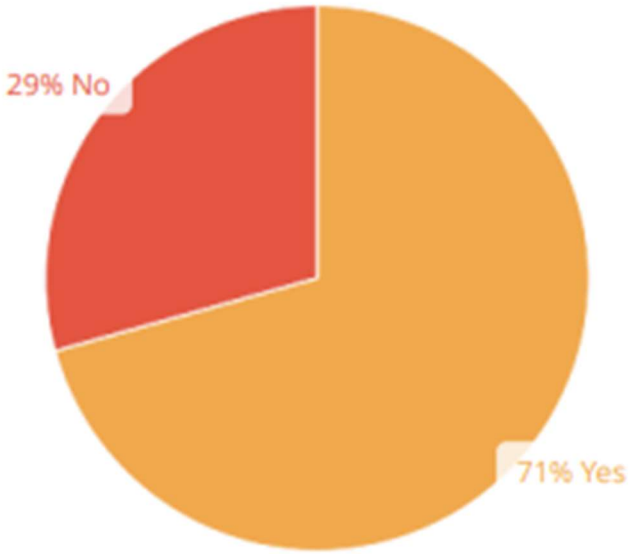




* Which of the following best describes the type of parking available at your residence?



* Is your workplace located in the City of Virginia Beach?

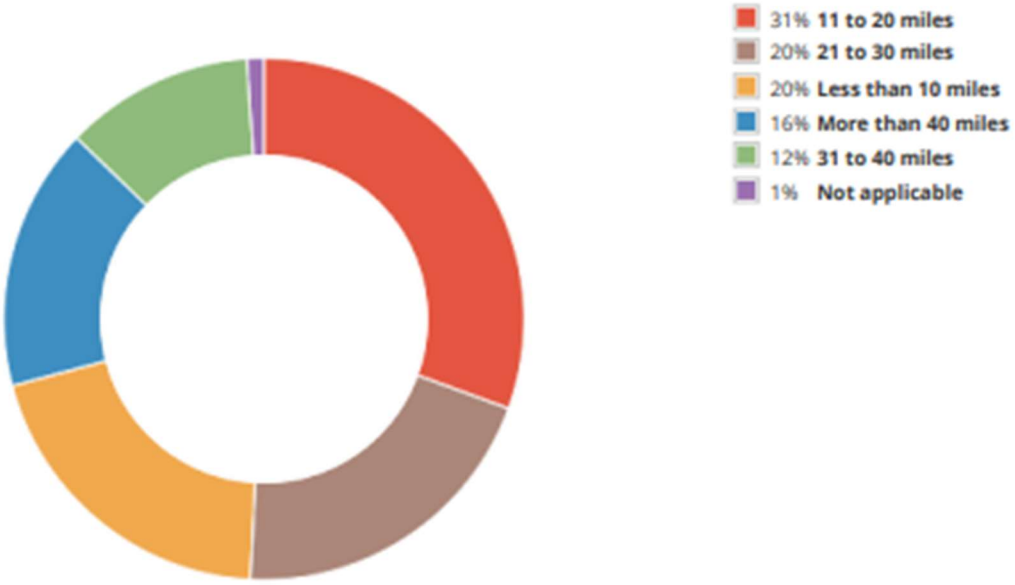


1,266 respondents

* Do you own a car?

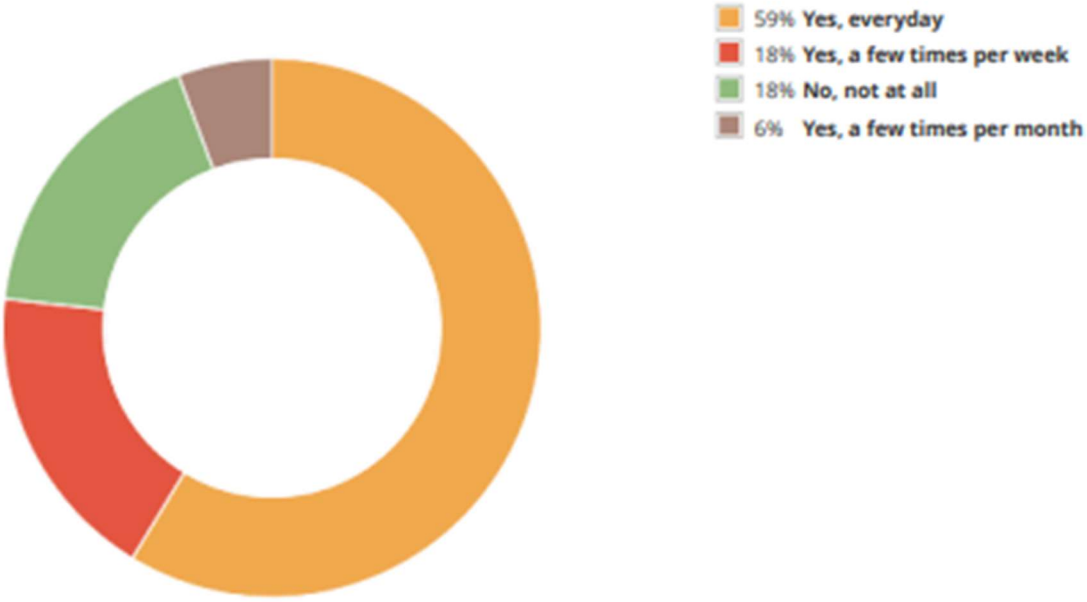
1,266 respondents

* How many miles do you drive on a typical weekday (ONE day between Monday and Friday)? Consider activities such as driving to work, running errands, school drop off, etc. (Select one)



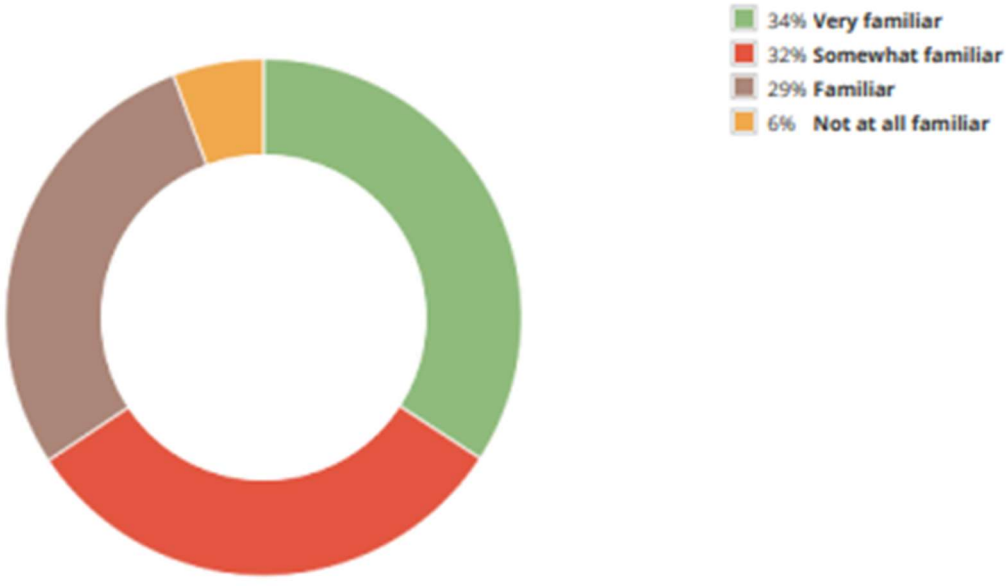
1,243 respondents

* Do you drive to work?



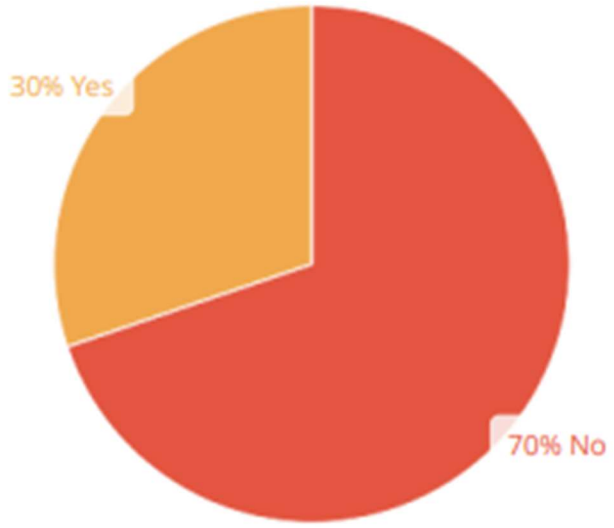
1,237 respondents

* How familiar are you with EVs?



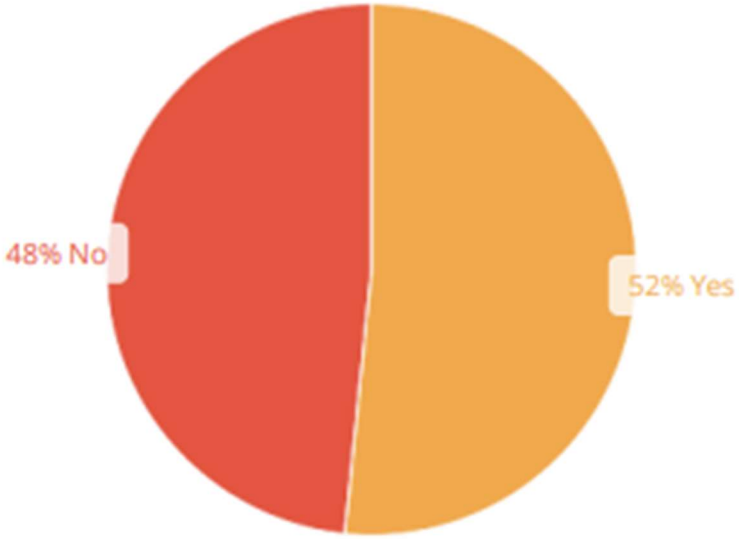
1,247 respondents

* Do you currently own an EV or plan to own an EV within the next year?



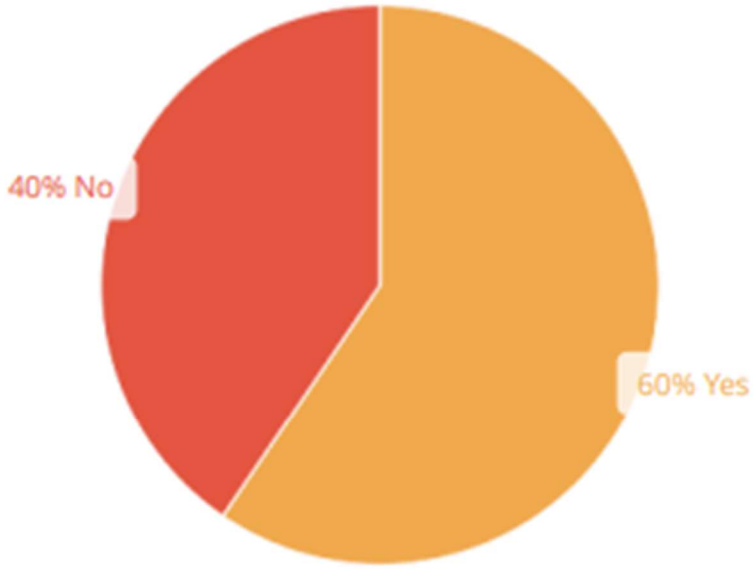
1,246 respondents

* Do you think you will own an EV within the next 5 years?



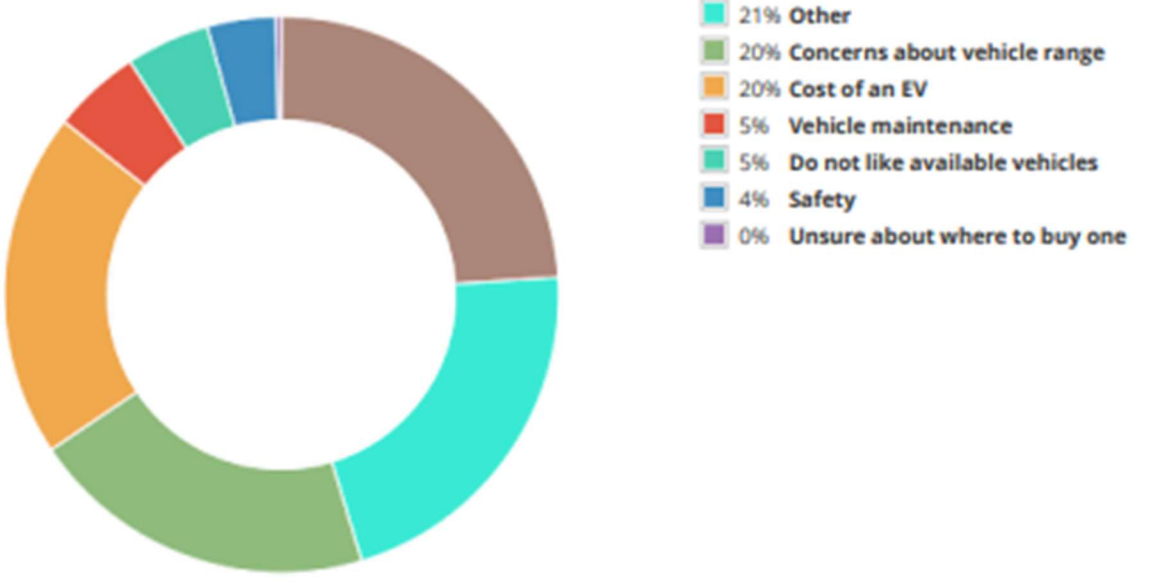
1,246 respondents

* Would you buy an EV if it were the same price as a gasoline vehicle?



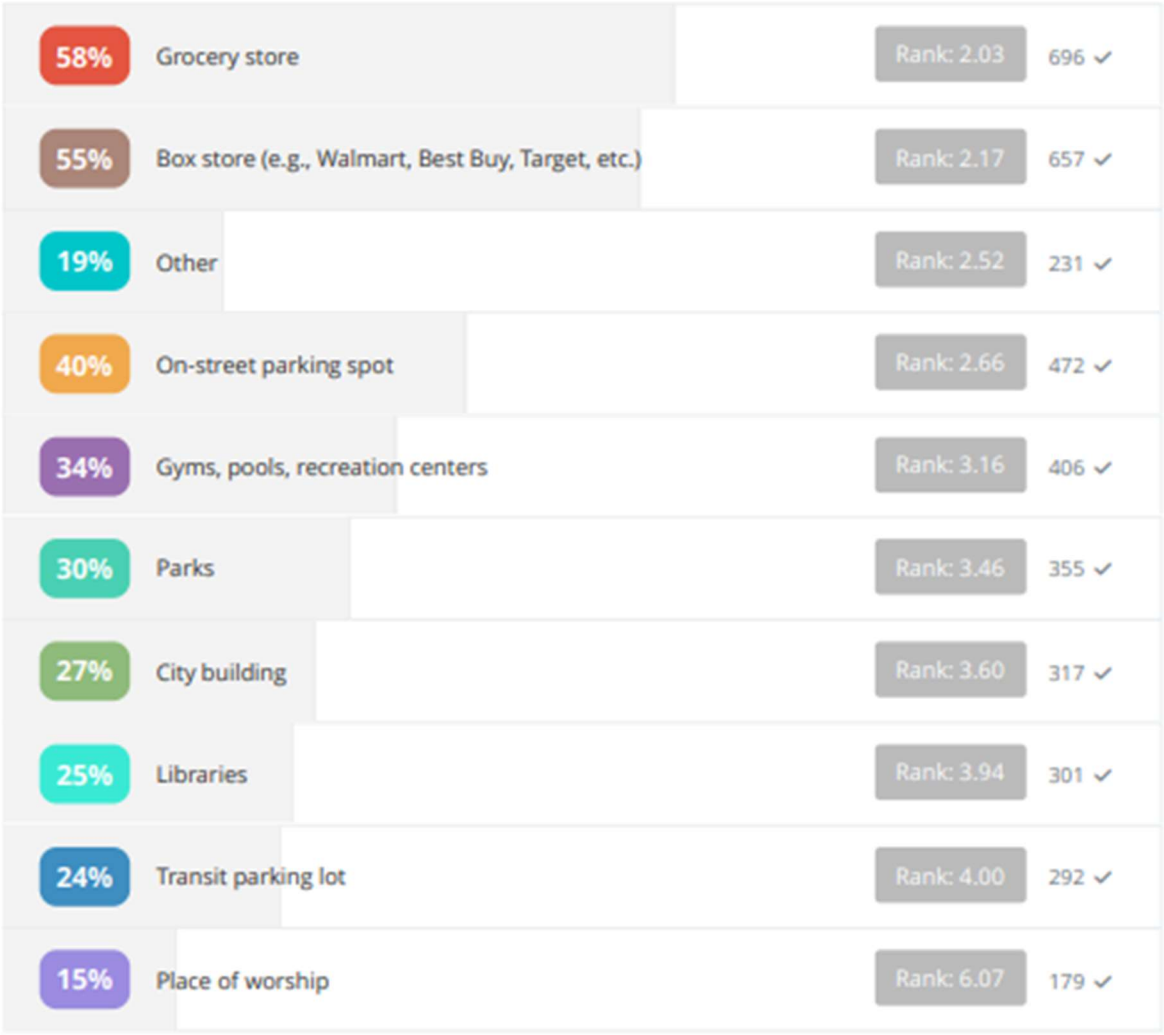
1,244 respondents

* What is the PRIMARY obstacle stopping you from buying an EV? (Select one)



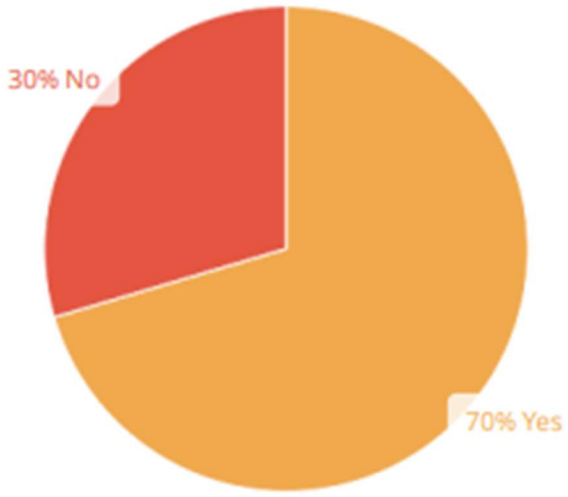
1,229 respondents

* If you owned an EV, where would you prefer to charge it (aside from your place of residence and/or workplace)? (Select top three in order of preference)



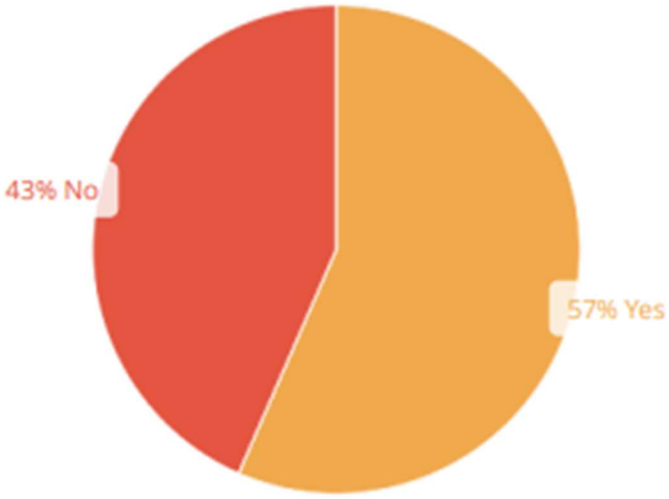
1,193 Respondents

* Are you aware of incentives to help reduce the cost of purchasing an EV?



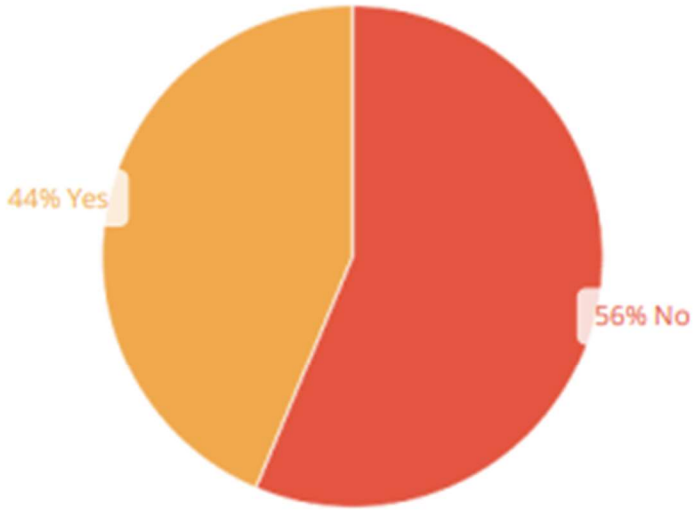
1,191 respondents

* Are you aware of incentives to help reduce the cost of purchasing and/or installing EV charging equipment at your home?



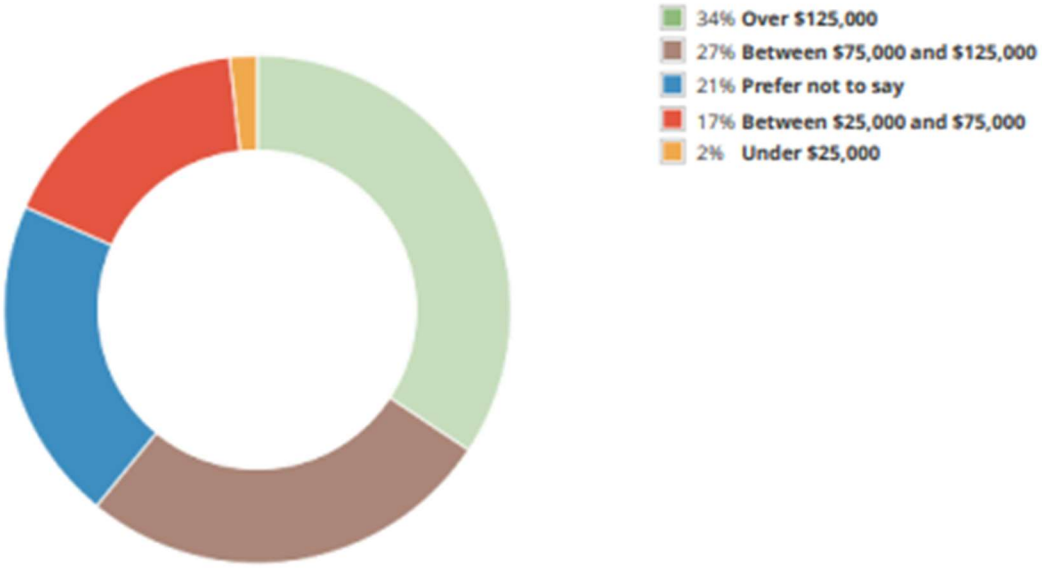
1,188 respondents

* Would you be interested in helping identify charger locations and / or receiving future communications about this program?



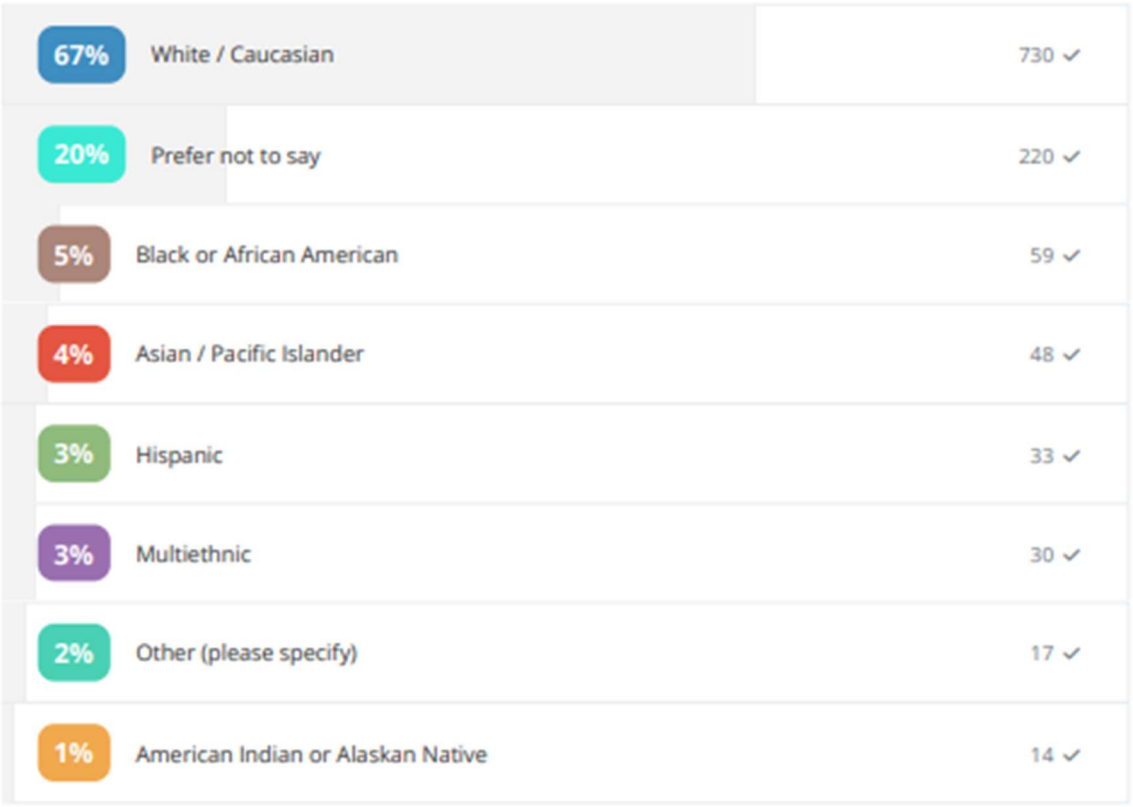
1,165 respondents

* What is your annual household income?



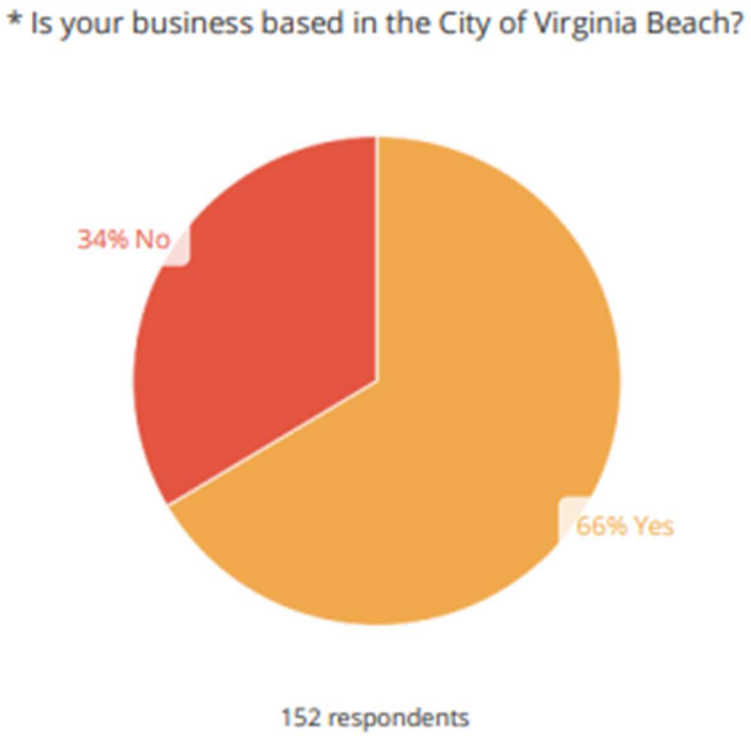
1,093 respondents

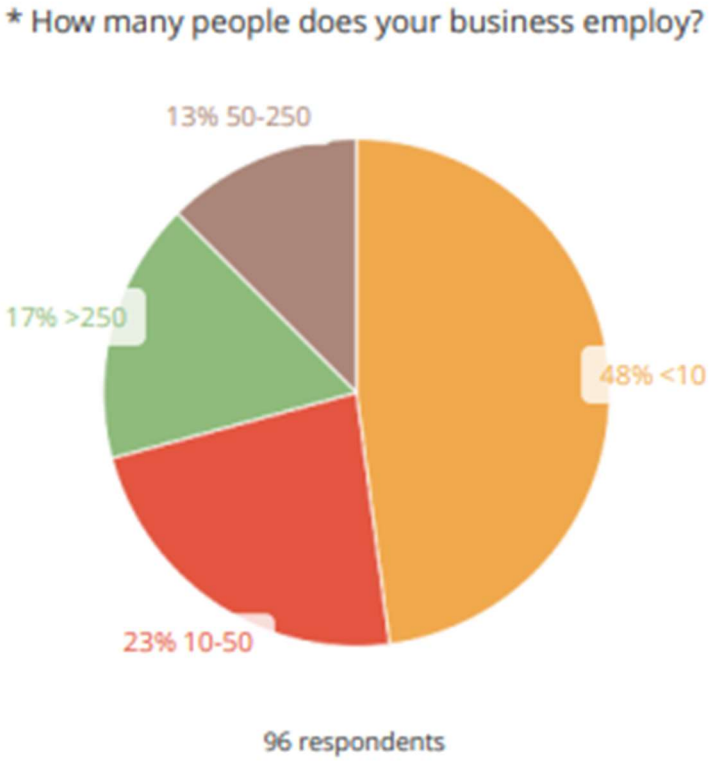
* What ethnicity or race best describes you?



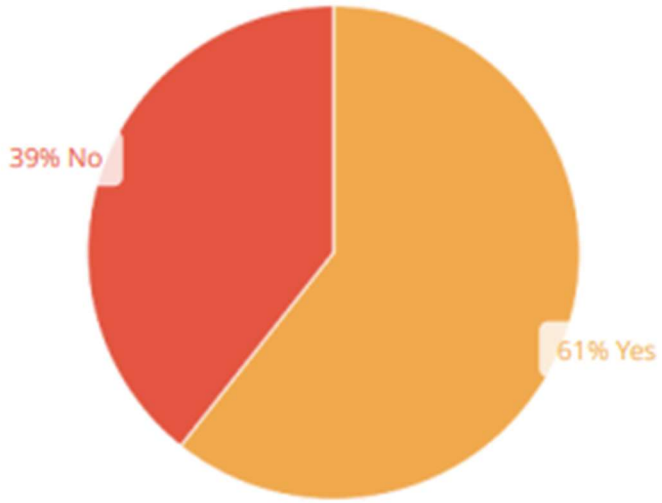
1,088 Respondents

C. Business Survey Responses



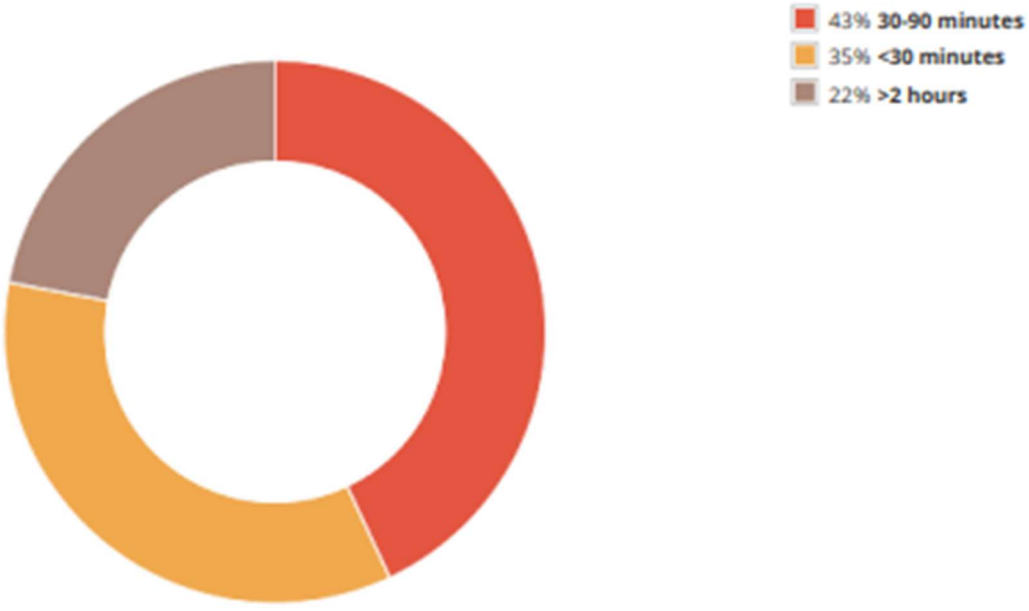


* Does your business have dedicated parking for customers?



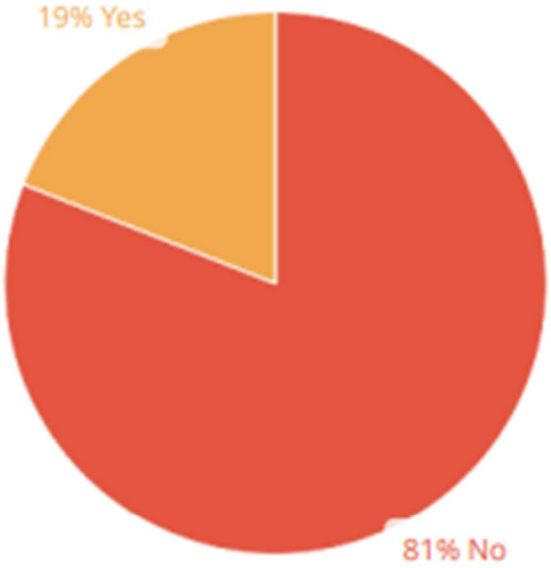
89 respondents

* How long are customers typically parking for?



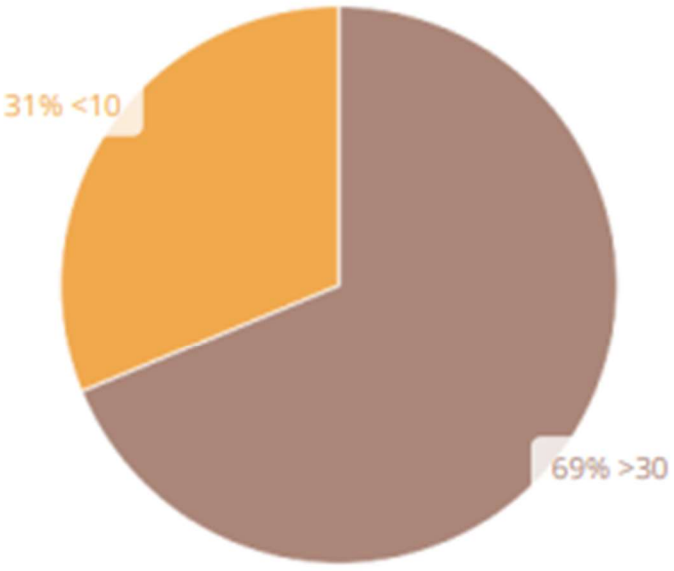
86 respondents

* Does your business operate a vehicle fleet?



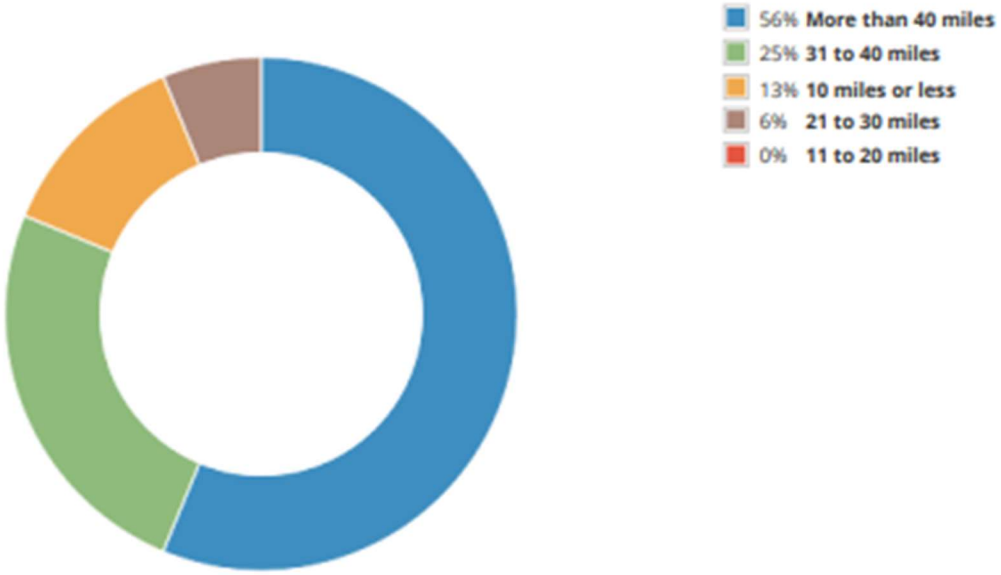
84 respondents

* How many vehicles are in the fleet?



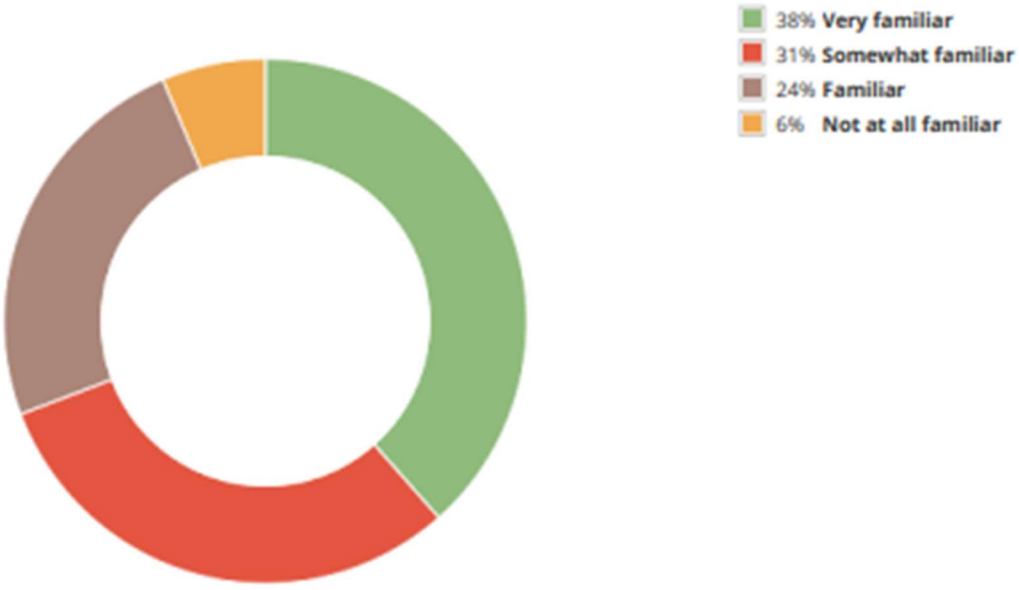
16 respondents

* On average, how many miles does a single business vehicle travel per day?



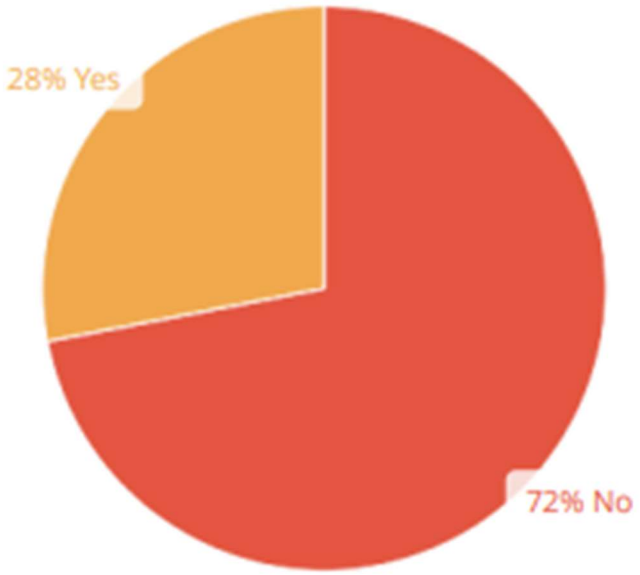
16 respondents

* How familiar are you with EVs?



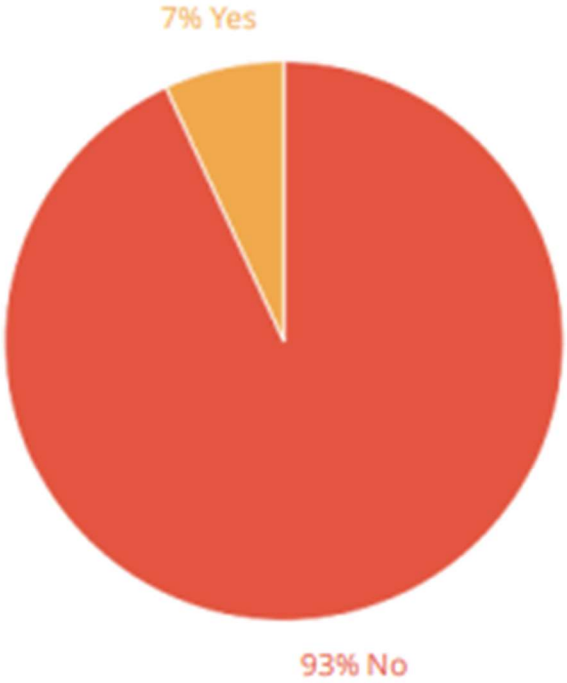
78 respondents

* Do any of your employees drive an EV to work?



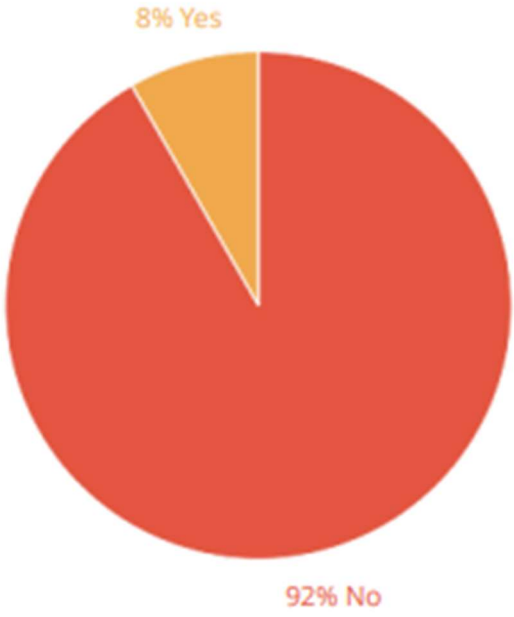
75 respondents

* Does your business currently have an EV charger available for employees?



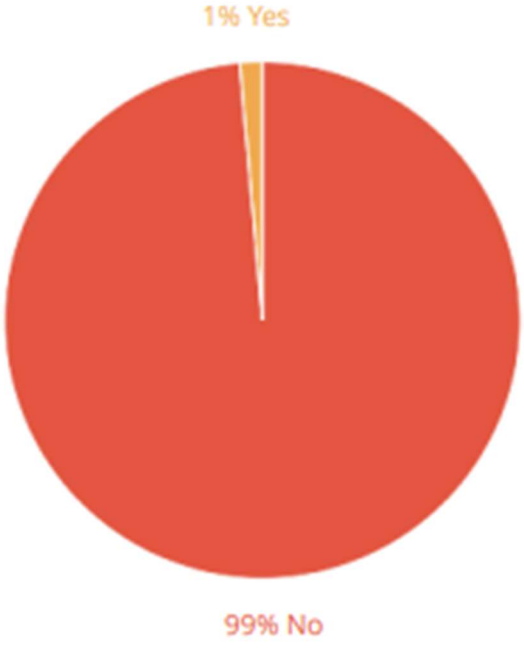
72 respondents

* Does your business currently have an EV charger available for customers?



72 respondents

* Does your business currently have an EV charger available to the general public?

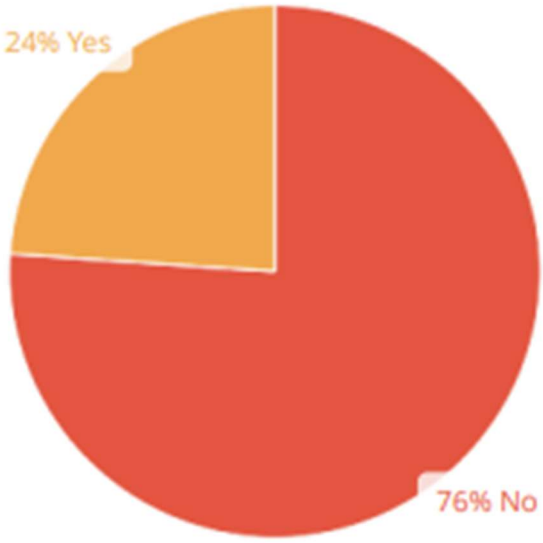


71 respondents

* Does your business currently own or operate any EVs?

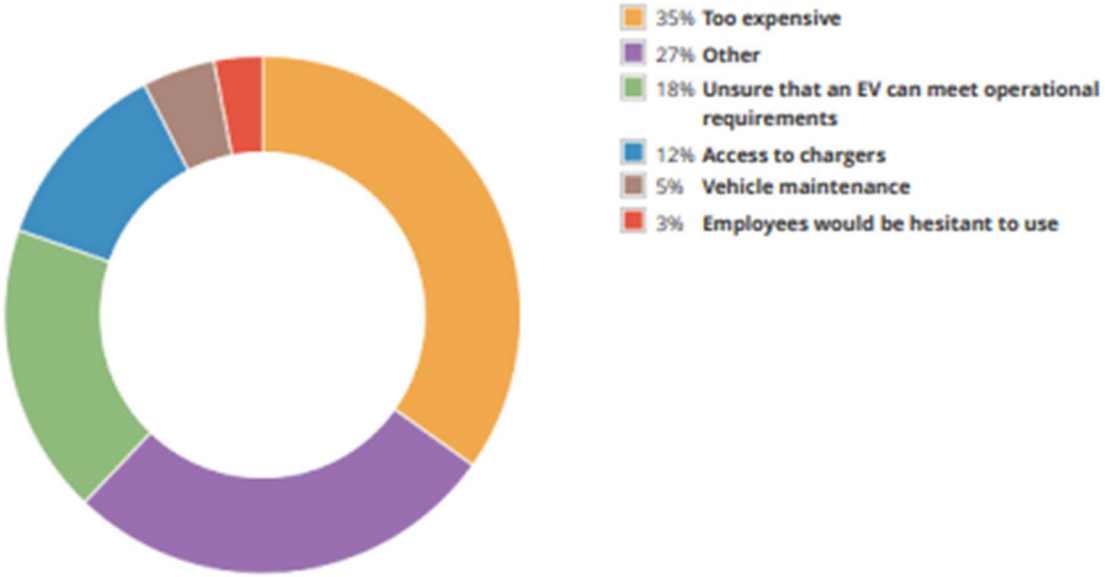
71 respondents

* Would your business be interested in converting some or all of its fleet to EVs?



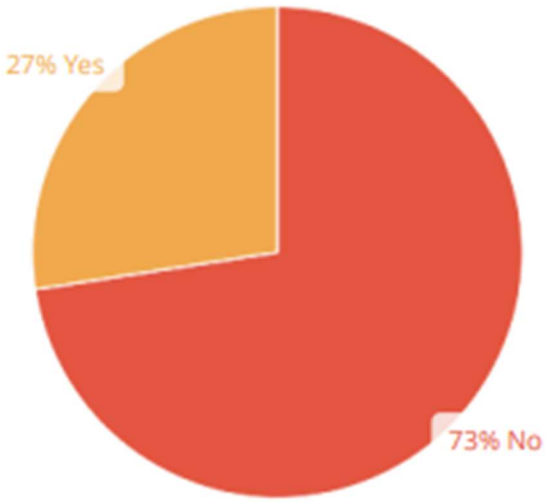
71 respondents

* What is the primary barrier to converting your fleet?



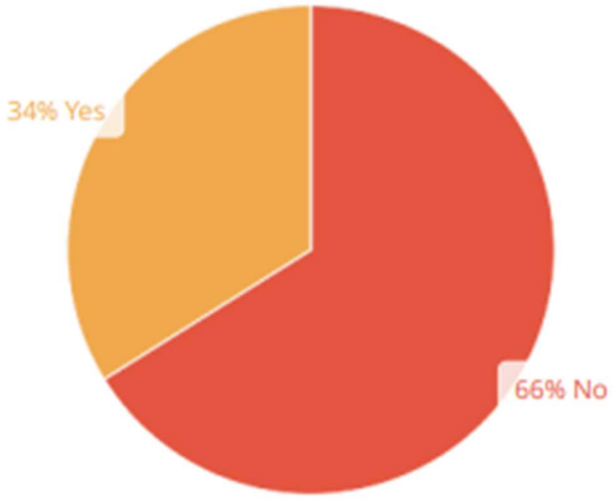
66 respondents

* Would your business be interested in installing an EV charger for use limited to its employees?



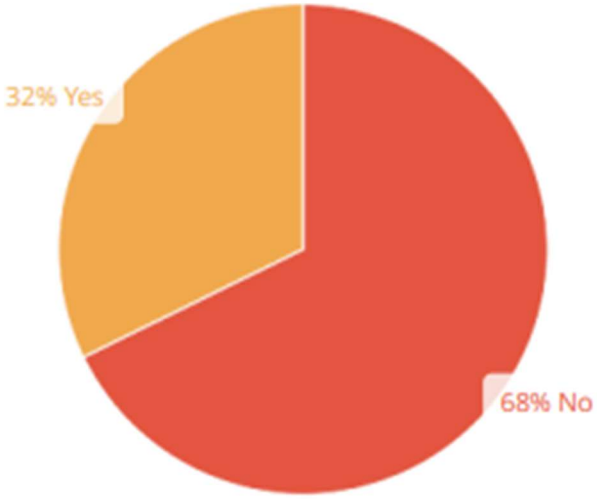
62 respondents

* Would your business be interested in installing an EV charger for use limited to customers?



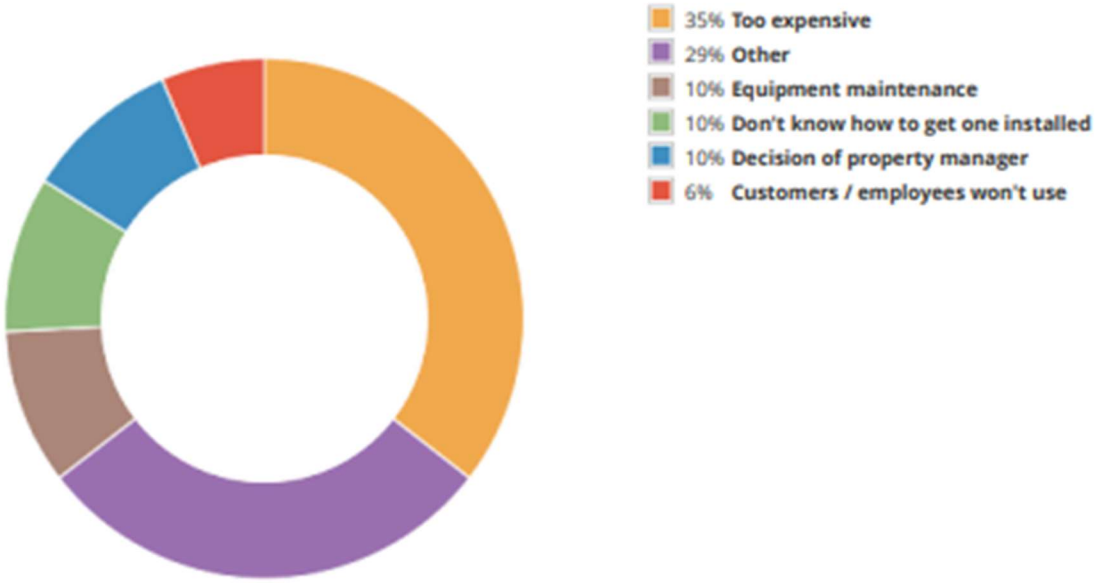
62 respondents

* Would your business be interested in installing an EV charger for public use, including employees, customers and other EV drivers?



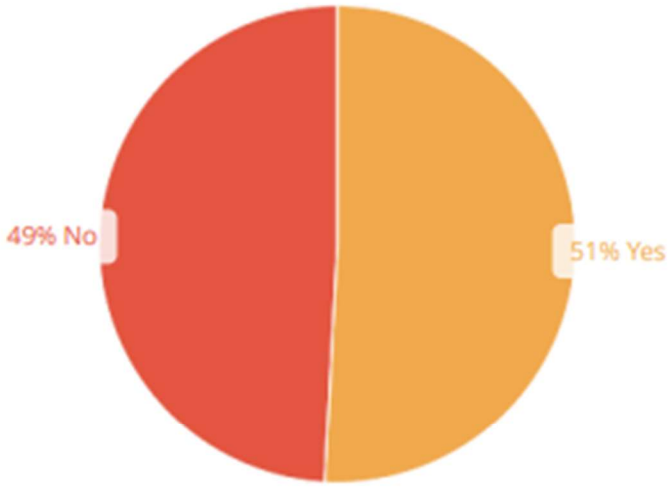
62 respondents

* What is the primary barrier to installing a charging station at your place of business?



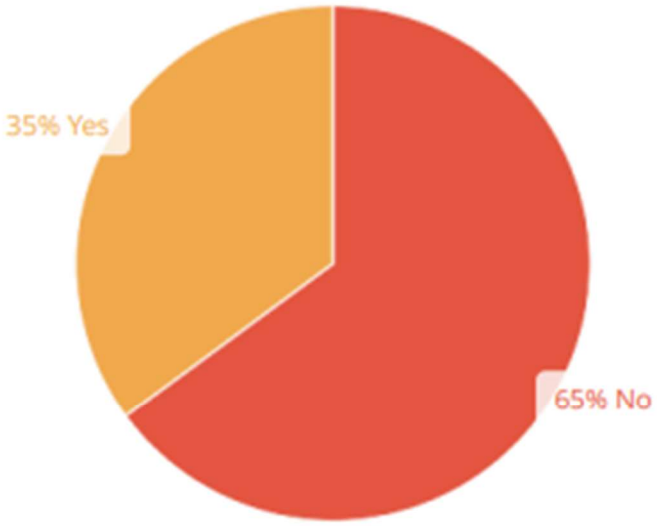
62 respondents

* Are you aware of incentives for purchasing and / or installing EV charging equipment at your place of business?



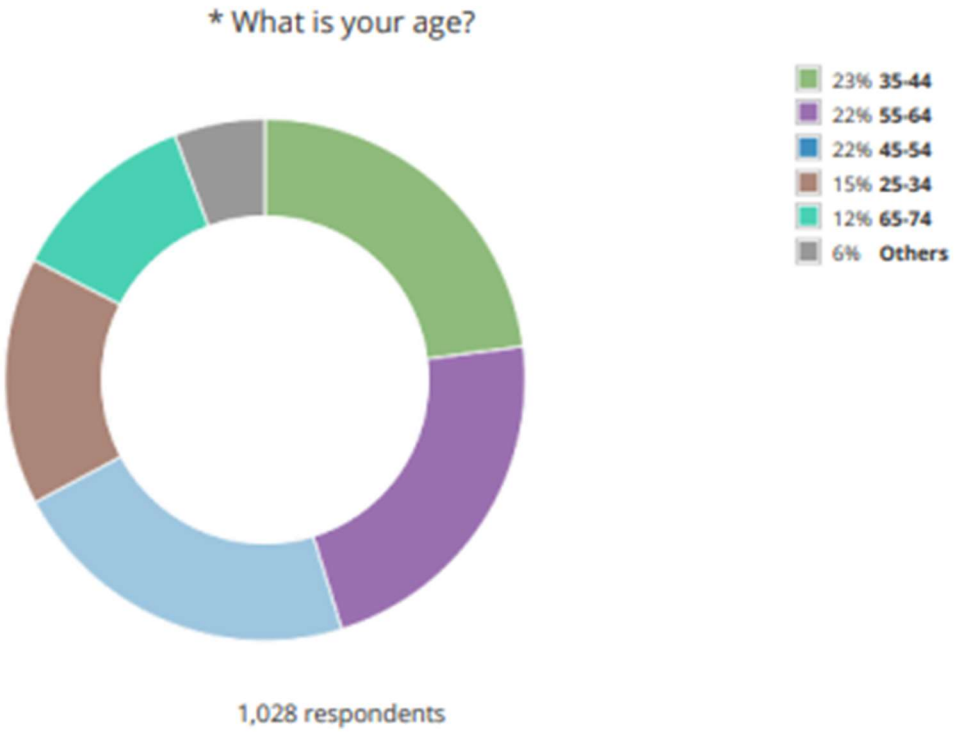
59 respondents

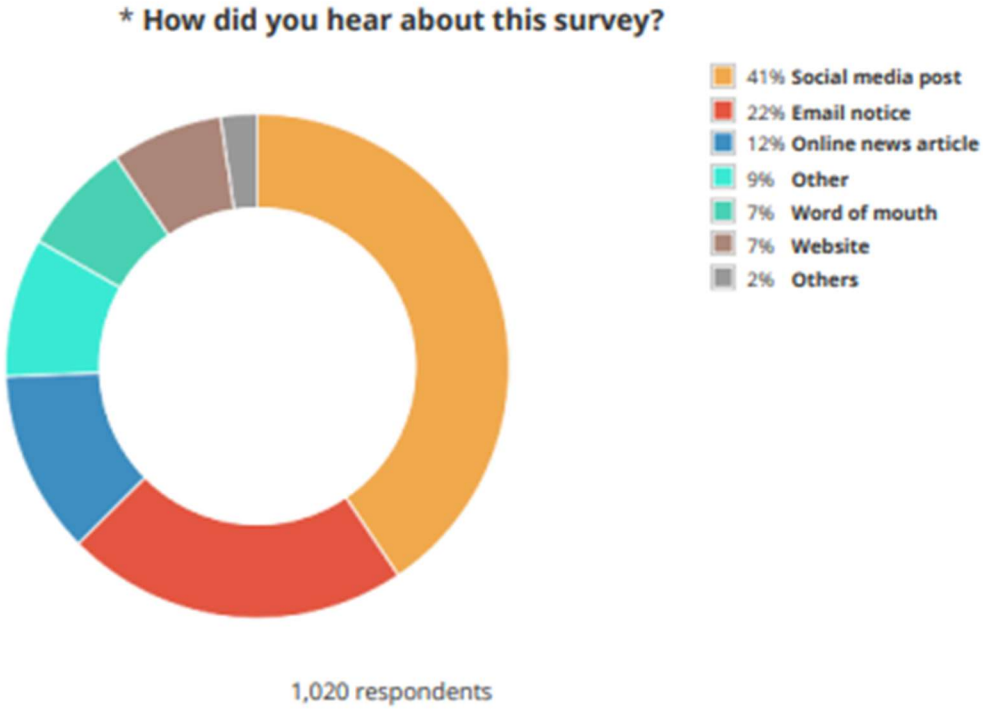
* Would you be interested in helping identify charger locations and / or receiving future communications about this program?



57 respondents

D. Common Summary Questions





E. Distribution of Responses by Zip Code

Note: Not all participants provided affiliated zip code.

Table 43. Survey Responses by Zip Code

Zip Code	Total Responses
23456	225
23454	169
23451	161
23464	148
23452	146
23455	131
23462	109
23453	77
23457	24
23320	13
23322	8
23518	6
23503	5
23435	5
23321	3
23505	3
23323	3
23112	2
23509	2
23517	2
23510	2
23701	2
Other	29
Total	**1275**

APPENDIX G. MUNICIPAL SITE INVENTORY AND INDEX SCORES

The following tables provide a summary of municipal properties in Virginia Beach that may be suitable for installation of charging infrastructure in the future. Table 44 provides an inventory of all properties and Level 2 charging index score; Table 45 provides a summary of municipal properties in rural areas; Table 46 provides a summary of municipal properties located within one mile of evacuation routes; and Table 47 provides a summary of prioritized municipal properties that are located in priority areas as determined by five different disadvantaged and environmental justice community screening criteria, which will be applicable for different federal and state level grant opportunities.

Table 44. Total Inventory of Municipal Properties in Analysis

Property Name	Address	Property Type	Block Group ID	Score
Bayside Middle School	965 Newtown Rd	School - Middle	518100404052	4.5
Centerville Elementary School	2201 Centerville Tpke	School - Elementary	518100462191	4.1
Tallwood Elementary School	2025 Kempsville Rd	School - Elementary	518100462075	4.1
City View Park	1989 Jake Sears Rd	Park - City Metro Park	518100462075	4.1
Centerville Park	1960 John Brown Ln	Park - City Neighborhood	518100462191	4.1
Chesapeake Beach Park		Park - City Neighborhood	518100418011	4
Deerwood Trace Park	2540 Reagan Ave	Park - City Neighborhood	518100448081	3.6
Kenstock Park	2521 Peritan Rd	Park - City Neighborhood	518100448081	3.6
25th Street Garage	336 25th Street 23451	Parking	518100440041	3.4
31st Street Garage	209 30th Street 23451	Parking	518100440041	3.4
31st Street Parking Garage	209 30th Street	Parking	518100440041	3.4
25th Street Parking Garage	336 25th Street	Parking	518100440041	3.4
Scarborough Square East Park	1198 Old Clubhouse Rd	Park - City Neighborhood	518100454303	3.3
Green Garage	225 Town Center Drive	Parking	518100456032	3.2
Orange Garage	4525 Main Street	Parking	518100456032	3.2
Red Garage	4535 Commerce Street	Parking	518100456032	3.2

Blue Garage	4544 Columbus Street	Parking	518100456032	3.2
Rosemont Elementary School	1257 S Rosemont Rd	School - Elementary	518100458101	3.1
Fire 18 / Ems 18 - Green Run	1601 South Lynnhaven Pkwy	Fire And Ems	518100458101	3.1
Birdneck Elementary School	949 S Birdneck Rd	School - Elementary	518100452002	2.9
Fire 12 - Seatack	949 S Birdneck Rd	Fire Station	518100452002	2.9
Red Wing Lake Golf Course	1136 Prosperity Rd	Sports - Golf Course	518100452002	2.9
Joint Use Library	1700 College Cres Ste E	Library	518100460131	2.8
Mount Trashmore Park	310 Edwin Dr	Park - City Signature Park	518100458013	2.8
Francis Land House	3131 Virginia Beach Blvd	Museum / Historic Site	518100426002	2.7
Bellwood Estates Park	2096 Brush Hill Ln	Park - City Neighborhood	518100460161	2.7
Pinewood Gardens Park	2800 Ansol Ln	Park - City Neighborhood	518100426002	2.7
Hillcrest Farms Park	2464 Savannah Trl	Park - City Neighborhood	518100460161	2.7
Highlands Meadows Park	2640 Highland Meadows Way	Park - City Neighborhood	518100460161	2.7
Green Run High School	1700 Dahlia Dr	School - High School	518100458095	2.6
Green Run High School	1700 Dahlia Dr	School - High School	518100458095	2.6
Woodstock Elementary School	6016 Providence Rd	School - Elementary	518100462041	2.6
Old Coast Guard Station	2401 Atlantic Ave	Museum / Historic Site	518100440043	2.6
24th Street Park	2405 Atlantic Ave	Park - City Community Park	518100440043	2.6
Green Run High School (Tennis Courts)	1700 Dahlia Dr	Sports - Tennis Courts	518100458095	2.6
Providence Park	952 Reon Dr	Park - City Community Park	518100462041	2.6
Woodstock Cove Park		Park - City Neighborhood	518100462041	2.6
Hunts Pointe Park	574 Cardamon Dr	Park - City Neighborhood	518100462041	2.6
19th Street North Parking Lot	300 19th Street	Parking	518100440043	2.6
19th Street South Parking Lot	300 19th Street	Parking	518100440043	2.6
Lynnhaven Middle School	1250 Bayne Dr	School - Middle	518100444021	2.5
Arrowhead Elementary School	5549 Susquehanna Dr	School - Elementary	518100460102	2.5
Fire 08 - Oceana	1201 Bayne Dr	Fire Station	518100444021	2.5
Ems 08 - Great Neck	1243 Bayne Dr	Ems	518100444021	2.5

Great Neck Area Library	1251 Bayne Dr	Library	518100444021	2.5
Lynnhaven Park	1246 Bayne Dr	Park - City Community Park	518100444021	2.5
Lynnhaven Park (Tennis Courts)	1246 Bayne Dr	Sports - Tennis Courts	518100444021	2.5
Great Neck Farms Park	1210 Moorefield Ct	Park - City Neighborhood	518100444021	2.5
Lawson Hall Park	5564 Lawson Hall Rd	Park - City Neighborhood	518100404041	2.5
Raleigh Square Park	5508 Shire Reach	Park - City Neighborhood	518100404041	2.5
Wesleyan Park	5525 Shire Reach	Park - City Neighborhood	518100404041	2.5
Maroon Garage	4621 Columbus Street	Parking	518100410021	2.5
Ems	1243 Bayne Dr	Ems	518100444021	2.5
Town Center Fire Station	4817 Columbus St	Fire Station	518100410021	2.5
Diamond Springs Elementary	5225 Learning Cir	School - Elementary	518100408023	2.4
Newtown Elementary School	5277 Learning Cir	School - Elementary	518100408023	2.4
Williams Elementary School	892 Newtown Rd	School - Elementary	518100408023	2.4
Fire 11- Beach Borough	800 Virginia Beach Blvd	Fire Station	518100442023	2.4
Williams Farm Recreation Center	5252 Learning Cir	Recreation Center	518100408023	2.4
Second Precinct Police Station	800 Virginia Beach Blvd	Police Station	518100442023	2.4
Lighthouse Shelter	825 18th St	City Facility - Other	518100442023	2.4
Visitor Information Center	2100 Parks Ave	City Offices	518100442023	2.4
Virginia Beach Convention Center	1064 19th St	Landmark	518100442023	2.4
City Treasurer - Beach	420 Birdneck Cir	City Offices	518100442023	2.4
Williams Farm Park	5269 Learning Cir	Park - City Community Park	518100408023	2.4
Charlestown Athletic Complex Park	5592 Lynnhaven Pkwy	Park - City Neighborhood	518100462172	2.4
Lakeview Shores Park	4712 Mckenzie Dr	Park - City Neighborhood	518100412002	2.4
Lynbrook Landing Park	5390 Lynbrook Lndg	Park - City Neighborhood	518100408023	2.4
Newsome Farms Park	588 Prospect Ln	Park - City Neighborhood	518100408023	2.4
Seatack North Park	1152 Americus Ave	Park - City Neighborhood	518100442023	2.4
Convention Center Lot	1000 19th Street23451	Parking	518100442023	2.4
Visitor Center Lot	2100 Parks Avenue23451	Parking	518100442023	2.4

Convention Center	1000 19th Street		518100442023	2.4
Williams Farm Recreation Center	5252 Learning Circle	Recreation Center	518100408023	2.4
Seatack Recreation Center	141 S Birdneck Rd	Recreation Center	518100442011	2.3
Virginia Beach Animal Care Center	341 S Birdneck Rd	City Offices	518100442011	2.3
City Treasurer - Kempsville	5340 Fairfield Sc	City Offices	518100460021	2.3
Hillier Ignite Fitness Park	100 36th St	Park - City Community Park	518100438001	2.3
Fairfield Park	717 Rosaer Cir	Park - City Neighborhood	518100460021	2.3
Lake Edward North Park		Park - City Neighborhood	518100404061	2.3
Lake Edward Park	704 Hampshire Ln Ste P	Park - City Neighborhood	518100404061	2.3
The Lakes East Park	929 Pocasset Ct	Park - City Neighborhood	518100454142	2.3
Salt Marsh Point Park	141 Marshview Dr Ste P2	Park - City Neighborhood	518100442011	2.3
Seatack Park	340 S Birdneck Rd	Park - City Neighborhood	518100442011	2.3
31st Street Park	3101 Atlantic Ave	Park - City Community Park	518100438001	2.3
Marine Animal Care Center	1008 Bells Rd		518100442011	2.3
Animal Control And Adoption Center, Birdneck	341 South Birdneck Rd		518100442011	2.3
Bayside High School	4960 Haygood Rd	School - High School	518100412003	2.2
Bayside High School	4960 Haygood Rd	School - High School	518100412003	2.2
Luxford Elementary School	4808 Haygood Rd	School - Elementary	518100412003	2.2
Bayside High School (Tennis Courts)	4960 Haygood Rd	Sports - Tennis Courts	518100412003	2.2
Haygood Point Park	4775 Haygood Point Rd	Park - City Neighborhood	518100412003	2.2
Landstown Lakes Park	3180 Monet Dr	Park - City Neighborhood	518100454222	2.2
Landstown Meadows Park	1916 Winter Forest Ct	Park - City Neighborhood	518100454222	2.2
Landstown Meadows West Park	3268 Barberry Ln	Park - City Neighborhood	518100454222	2.2
Brandon Middle School	1700 Pope St	School - Middle	518100462071	2.1
Virginia Beach Middle School	600 25th St	School - Middle	518100440062	2.1
Renaissance Academy	5100 Cleveland St	School - High School	518100406002	2.1
Renaissance Academy	5100 Cleveland St	School - High School	518100406002	2.1

Beach Garden Park	2854 Kilbourne Ct	Park - City Community Park	518100440062	2.1
Virginia Beach Middle School (Tennis Courts)	2520 Cypress Ave	Sports - Tennis Courts	518100440062	2.1
Northridge Park	5210 Condor St	Park - City Neighborhood	518100406002	2.1
Larkspur Greens Park	641 Pinebrook Dr	Park - City Neighborhood	518100460111	2.1
Thalia Trace Park	169 Thalia Trace Dr	Park - City Neighborhood	518100456061	2.1
Old Beach Park	2520 Cypress Ave	Park - City Neighborhood	518100440062	2.1
Bayside Sixth Grade Campus	4722 Jericho Rd	School - Middle	518100410032	2
Pembroke Elementary School	4622 Jericho Rd	School - Elementary	518100410032	2
Fire 06 / Ems 06 - Creeds	595 Princess Anne Rd	Fire And Ems	518100464002	2
Fire 17 / Ems 17 - Sandbridge	305 Sandbridge Rd	Fire And Ems	518100454121	2
Fire 13 / Ems 13 - Blackwater	6009 Blackwater Rd	Fire And Ems	518100464004	2
Fire 09 / Ems 09 - Kempsville	5146 Ruritan Ct	Fire And Ems	518100460192	2
Creeds Athletic Park	1585 Campbells Landing Rd	Sports - Ball Field	518100464002	2
Munden Point Park Boat Ramp		Marina / Boat Ramp	518100464002	2
Lynnhaven Municipal Marina	3211 Lynnhaven Dr	Marina / Boat Ramp	518100430062	2
Little Island Park	3820 Sandpiper Rd	Park - City Signature Park	518100454121	2
Creeds Wayside Park		Park - City Neighborhood	518100464002	2
Munden Point Park		Park - City Metro Park	518100464002	2
Blackwater Park	3390 Head River Rd	Park - City Neighborhood	518100464004	2
Creeds Ath. Airfield Park	1585 Campbells Landing Rd	Park - City Neighborhood	518100464002	2
Grand Lakes Park	421 Indian Summer Ln	Park - City Neighborhood	518100406003	2
Lotus Garden Park	1289 Sandbridge Rd	Park - City Neighborhood	518100454121	2
Lynnhaven Colony Park	3125 Shore Dr	Park - City Neighborhood	518100430062	2
Pine Meadows West Park	1577 Bunsen Dr	Park - City Neighborhood	518100454273	2
Pine Meadows Place Park	1497 Galvani Dr	Park - City Neighborhood	518100454273	2
Sandbridge Beach Park		Park - City Neighborhood	518100454121	2
Sandbridge Market Parking Lot	100 Sandbridge Rd 23456	Parking	518100454121	2

Little Island Park Parking Lot	3820 Sandpiper Road 23456	Parking	518100454121	2
Lynnhaven Elementary School	210 Dillon Dr	School - Elementary	518100428021	1.9
Old Donation School	4633 Honeygrove Rd	School - Middle	518100408011	1.9
Cape Story Park		Park - City Neighborhood	518100430042	1.9
Cypress Point North Park	1100 Fallbrook Bnd	Park - City Neighborhood	518100404045	1.9
Doyle Way Park		Park - City Neighborhood	518100428021	1.9
Lecove Park	3458 Glen Arden Rd	Park - City Neighborhood	518100462042	1.9
Level Green Park	1520 Level Green Blvd	Park - City Neighborhood	518100462213	1.9
Lynnhaven Woods Park	156 Golden Maple Dr	Park - City Neighborhood	518100428021	1.9
Oak Springs Park	832 Northwood Dr	Park - City Neighborhood	518100454051	1.9
Sunstream Park	4052 Rainbow Dr	Park - City Neighborhood	518100460141	1.9
Glenwood Elementary School	2213 Round Hill Dr	School - Elementary	518100462163	1.8
College Park Elementary School	1110 Bennington Rd	School - Elementary	518100462202	1.8
Bayside Elementary School	5649 Bayside Rd	School - Elementary	518100404033	1.8
Fire 01 / Ems 22 - First Landing	2837 Shore Dr	Fire And Ems	518100430061	1.8
Lynnhaven Inlet Fishing Pier	2350 Starfish Rd	Sports - Fishing	518100430061	1.8
Lake Lawson / Lake Smith Natural Area	5381 Shell Rd	Park - City Community Park	518100404033	1.8
Lake Smith Boat Ramp	5381 Shell Rd	Marina / Boat Ramp	518100404033	1.8
Strawbridge East Park	1921 Lewisham Way	Park - City Neighborhood	518100454082	1.8
Strawbridge North Park	2125 Weybridge Dr	Park - City Neighborhood	518100454082	1.8
Buckner Farms Park	1508 Competitor Ct	Park - City Neighborhood	518100454292	1.8
Buffington House (Vacant)	2441 North Landing Rd	Museum / Historic Site	518100454342	1.7
West Neck Creek Natural Area		Park - City Community Park	518100454342	1.7
Carolanne Park	5281 Challedon Dr	Park - City Neighborhood	518100460094	1.7
Salem Village Park	1712 Moonstone Dr	Park - City Neighborhood	518100460142	1.7
Floyd E. Kellam High School	2668 West Neck Rd	School - High School	518100454342	1.7
Floyd E. Kellam High School	2668 West Neck Rd	School - High School	518100454342	1.7
Oceanfront Area Library	700 Virginia Beach Blvd	Library	518100440042	1.6

Ems 14 - Virginia Beach	740 Virginia Beach Blvd	Ems	518100440042	1.6
Convention/Visitor Bureau	716 21st St Ste 117	City Offices	518100440042	1.6
Dewitt Cottage/Atlantic Wildfowl Heritage Museum	1113 Atlantic Ave	Museum / Historic Site	518100440082	1.6
Red Wing Park	1398 Sakura Ln	Park - City Metro Park	518100454281	1.6
9th Street Parking Garage	200 9th Street	Parking	518100440082	1.6
Marshview Park	Marshview Dr	Park - City Community Park	518100442012	1.5
Alexandria Park	5569 Glen View Dr	Park - City Neighborhood	518100462192	1.5
Eureka Park	2600 Southern Blvd	Park - City Neighborhood	518100426001	1.5
Great Neck Meadows Park	781 Old Cutler Rd	Park - City Neighborhood	518100444022	1.5
Scarborough Square Park	1225 Warwick Dr	Park - City Neighborhood	518100454301	1.5
Scarborough Square North Park	1201 Old Clubhouse Rd	Park - City Neighborhood	518100454301	1.5
Larkspur Middle School	4696 Princess Anne Rd	School - Middle	518100458032	1.4
Creeds Elementary School	920 Princess Anne Rd	School - Elementary	518100464003	1.4
Kingston Elementary School	3532 Kings Grant Rd	School - Elementary	518100422011	1.4
Parkway Elementary School	4180 O Hare Dr	School - Elementary	518100460184	1.4
Kempsville Meadows Elementary School	736 Edwin Dr	School - Elementary	518100458032	1.4
Pungo Blackwater Library	920 Princess Anne Rd	Library	518100464003	1.4
Bayside Library/Special Services Library	936 Independence Blvd	Library	518100416003	1.4
Third Precinct Police Station	926 Independence Blvd	Police Station	518100416003	1.4
City Treasurer - Pembroke	281 Independence Blvd Ste 102	City Offices	518100410042	1.4
Chesapeake Bay Center At First Landing State Park	2500 Shore Dr	City Facility - Other	518100432001	1.4
West Neck Marina	3985 West Neck Rd	Marina / Boat Ramp	518100464003	1.4
Senior Resource Center	920 Princess Anne Rd	City Offices	518100464003	1.4
Pungo Ferry Landing Park	2272 Old Pungo Ferry Rd	Park - City Community Park	518100464003	1.4
Pungo Ferry Landing Boat Ramp	2272 Old Pungo Ferry Rd	Marina / Boat Ramp	518100464003	1.4

Box Elder Arch Park	1745 Box Elder Arch	Park - City Neighborhood	518100454262	1.4
Brill Field Park	3500 Kings Grant Rd	Park - City Neighborhood	518100422011	1.4
Ocean Lakes North Park	1916 Upton Dr	Park - City Neighborhood	518100454262	1.4
Fire 03 / Ems 03 - London Bridge	600 Central Dr	Fire And Ems	518100454072	1.4
Fire 20 - Little Neck	885 Little Neck Rd	Fire Station	518100422011	1.4
Lynnhaven House	4401 Wishart Rd		518100416003	1.4
Point O'view Elementary School	5400 Parliament Dr	School - Elementary	518100460091	1.3
Rosemont Forest Elementary School	1716 Grey Friars Chase	School - Elementary	518100462251	1.3
Contemporary Art Center Of Virginia	2200 Parks Ave	Museum / Historic Site	518100440061	1.3
Bellamy Plantation Park	1680 Grey Friars Chase	Park - City Neighborhood	518100462251	1.3
Birchwood South Park	3788 Lampl Ave	Park - City Neighborhood	518100424003	1.3
Kings Grant Park	3797 Kings Grant Rd	Park - City Neighborhood	518100422012	1.3
Liberty Ridge Park	3733 Chancery Ln	Park - City Neighborhood	518100458063	1.3
Corporate Landing Middle School	1597 Corporate Landing Pkwy	School - Middle	518100454081	1.2
Corporate Landing Elementary School	1590 Corporate Landing Pkwy	School - Elementary	518100454081	1.2
Fire 10 / Ems 10 - Woodstock	5644 Providence Rd	Fire And Ems	518100460023	1.2
Kempsville Greens Municipal Golf Course	529 Kempsville Greens Ct	Sports - Golf Course	518100460191	1.2
Diamond Springs Park	5610 Haden Rd	Park - City Neighborhood	518100404032	1.2
Fox Fire East Park	2471 Esplanade Dr	Park - City Neighborhood	518100454241	1.2
Lago Mar Park	2701 Atwoodtown Rd	Park - City Neighborhood	518100454203	1.2
Red Wing On The Park	1213 Eaglewood Dr Ste B	Park - City Neighborhood	518100454081	1.2
Fox Fire Park	2470 Esplanade Dr	Park - City Neighborhood	518100454241	1.2
Seabridge Square Park	1001 Coastaway Dr	Park - City Neighborhood	518100442022	1.2
Stoneybrook Park	5600 New Colony Dr	Park - City Neighborhood	518100460023	1.2
Future Princess Anne Middle School (Under Construction)	2509 Seaboard Rd	School - Middle	518100454241	1.2
Police – New Forensic Store Bldg.	2667 Leroy Rd 23456		518100454241	1.2

Kempsville High School	5194 Chief Trl	School - High School	518100460064	1.1
Kempsville High School	5194 Chief Trl	School - High School	518100460064	1.1
Princess Anne Elementary School	2444 Seaboard Rd	School - Elementary	518100454242	1.1
North Landing Elementary School	2925 North Landing Rd	School - Elementary	518100454341	1.1
Shelton Park Elementary School	1700 Shelton Rd	School - Elementary	518100412001	1.1
Three Oaks Elementary School	2201 Elson Green Ave	School - Elementary	518100454242	1.1
Kempsville Elementary School	570 Kempsville Rd	School - Elementary	518100460064	1.1
Kempsville Area Library	832 Kempsville Rd	Library	518100460064	1.1
Ems 01 - Ocean Park	3769 E Stratford Rd	Ems	518100418032	1.1
Fourth Precinct Police Station	832 Kempsville Rd	Police Station	518100460064	1.1
Lynnhaven Boat Ramp	3576 Piedmont Cir Ste Vl	Marina / Boat Ramp	518100418032	1.1
Kempsville High School (Tennis Courts)	5194 Chief Trl	Sports - Tennis Courts	518100460064	1.1
Technical And Career Education Center	2925 North Landing Rd	School - Technical	518100454341	1.1
Kempes Landing Park	524 Kempsville Rd	Park - City Community Park	518100460064	1.1
Pleasure House Point Natural Area	3957 Marlin Bay Dr	Park - City Community Park	518100418032	1.1
Cedar Hill Park		Park - City Neighborhood	518100462062	1.1
Holland Oaks Park	2962 Sugar Maple Dr	Park - City Neighborhood	518100454212	1.1
Kempsville Park	832 Kempsville Rd	Park - City Neighborhood	518100460064	1.1
Lamplight Manor Park	2933 Augusta Cir	Park - City Neighborhood	518100454073	1.1
Lock Haven Park	3657 E Stratford Rd	Park - City Neighborhood	518100418032	1.1
Newlight Park	1111 Thompkins Ln	Park - City Neighborhood	518100462062	1.1
Whitehurst Grove Park	1098 Taylor Rd	Park - City Neighborhood	518100462062	1.1
Wyndamere Park	4077 Ware Neck Dr	Park - City Neighborhood	518100462161	1.1
Sandbridge Municipal Parking Lot	2524 Sandbridge Rd	Parking	518100454242	1.1
Central Library	4100 Virginia Beach Blvd	Library	518100456012	1
Bayside Recreation Center	4500 First Court Rd	Recreation Center	518100418041	1
Ems Headquarters	4160 Virginia Beach Blvd	City Offices	518100456012	1
Bayville Farms Park	4132 First Court Rd	Park - City Metro Park	518100418041	1

Bayville Park (Tennis Courts)	4132 First Court Rd	Sports - Tennis Courts	518100418041	1
Southgate Park	2281 Huckleberry Trl	Park - City Neighborhood	518100454321	1
Southgate West Park	2400 Lillipond Ln	Park - City Neighborhood	518100454321	1
Thalia Park	420 Thalia Rd	Park - City Neighborhood	518100456012	1
Croatan Parking Lot	920 Vanderbilt Ave 23451	Parking	518100440081	1
Fire 05 - Princess Anne / Ems 05 - Courthouse	2461 Princess Anne Rd	Fire And Ems	518100454332	0.98
Virginia Beach National Golf Course	2400 Tournament Dr	Sports - Golf Course	518100454332	0.98
First Precinct Police Station	2409 Princess Anne Rd	Police Station	518100454332	0.98
Municipal Center	2401 Courthouse Dr	General Location	518100454332	0.98
Agriculture/Voter Reg	2499 Princess Anne Rd	City Offices	518100454332	0.98
Judicial Center	2425 Nimmo Pkwy	City Offices	518100454332	0.98
Virginia Beach Field House	2044 Landstown Centre Way	City Facility - Other	518100454332	0.98
City Hall	2401 Courthouse Dr	City Offices	518100454332	0.98
Sportsplex	2044 Landstown Centre Way	Sports - Field Hockey	518100454332	0.98
Little Neck Park		Park - City Neighborhood	518100420001	0.98
City Hall Parking Lot	2401 Courthouse Drive23456	Parking	518100454332	0.98
Parks And Rec Admin	2154 Landstown Rd	Parks and Rec	518100454332	0.98
Sportsplex	2044 Landstown Centre Way	Parks and Rec	518100454332	0.98
Oceana Athletic Park	229 First Colonial Rd	Park - City Neighborhood	518100448063	0.97
Public Works Highways	3500 Dam Neck Rd	City Operations And Maintenance	518100454291	0.97
Public Utilities Operations	3500 Dam Neck Rd	City Operations And Maintenance	518100454291	0.97
Virginia Beach Farmers Market	3640 Dam Neck Rd	Landmark	518100454291	0.97
Advanced Technology Center	1700 College Cres Ste E	City Offices	518100454291	0.97
Advanced Technology Center	1700 College Cres Ste E	School - Technical	518100454291	0.97
Brigand's Quay Park	1777 Brigands Wy	Park - City Neighborhood	518100454291	0.97

Oceana Village Park	1813 S Streamline Dr	Park - City Neighborhood	518100448063	0.97
Rosemont Forest West Park	1841 Gravenhurst Dr	Park - City Neighborhood	518100462243	0.97
Red Mill Elementary School	1860 Sandbridge Rd	School - Elementary	518100454202	0.94
Fairfield Elementary School	5428 Providence Rd	School - Elementary	518100460022	0.94
Red Mill Farms Park	1900 Sandbridge Rd	Park - City Neighborhood	518100454202	0.94
Fairfield Forest Park	5380 Hargrove Blvd	Park - City Neighborhood	518100460022	0.94
Southall Quarter Park	1625 Southall Dr	Park - City Neighborhood	518100446004	0.93
Green Run Elementary School	1200 Green Garden Cir	School - Elementary	518100454053	0.92
Landstown Middle School	2204 Recreation Dr	School - Middle	518100460151	0.9
Landstown High School	2001 Concert Dr	School - High School	518100460151	0.9
Landstown High School	2001 Concert Dr	School - High School	518100460151	0.9
New Castle Elementary School	4136 Dam Neck Rd	School - Elementary	518100460151	0.9
Landstown Elementary School	2204 Recreation Dr	School - Elementary	518100460151	0.9
Hampton Roads Soccer Complex	2185 Recreation Dr	Sports - Soccer	518100460151	0.9
Princess Anne Park	3740 Dam Neck Rd	Park - City Neighborhood	518100460151	0.9
Virginia Beach Amphitheater	3550 Cellar Door Way	Entertainment	518100460151	0.9
Princess Anne Athletic Complex	4001 Dam Neck Rd Ste Vl1	Sports - Ball Field	518100460151	0.9
Newcastle Park	3805 Middleham Dr	Park - City Neighborhood	518100460151	0.9
Amphitheater Pre-Game Lot	2181 Recreation Dr		518100460151	0.9
Windsor Oaks Elementary School	3800 Van Buren Dr	School - Elementary	518100458061	0.89
Lake Placid Park	2420 Mirror Lake Dr	Park - City Neighborhood	518100454311	0.89
Windsor Oaks West Park	532 Windsor Oaks Blvd	Park - City Neighborhood	518100458061	0.89
Salem Elementary School	3961 Salem Lakes Blvd	School - Elementary	518100460152	0.87
Champion Oaks Park	1909 Stillmeadow Ct	Park - City Neighborhood	518100460152	0.87
Salem Lakes South Park		Park - City Neighborhood	518100460152	0.87
Trantwood Elementary School	2344 Inlynnview Rd	School - Elementary	518100444012	0.85
Windsor Woods Elementary School	233 Presidential Blvd	School - Elementary	518100458011	0.85
Windsor Woods Area Library	3612 S Plaza Trl	Library	518100458011	0.85

Colonial Oaks Park	1254 Parkside Pl	Park - City Neighborhood	518100444012	0.85
Laurel Cove Park	1321 Parkside Pl	Park - City Neighborhood	518100444012	0.85
Fire 16 / Ems 16 - Plaza	3608 Plaza Trl S	Fire And Ems	518100458011	0.85
Stumpy Lake Golf Course	4797 Indian River Rd	Sports - Golf Course	518100462173	0.84
Stumpy Lake Canoe / Kayak Launch		Marina / Boat Ramp	518100462173	0.84
Charlestown Lakes South Park	1052 Kinderly Ln	Park - City Neighborhood	518100462173	0.84
Hunt Club Park	2122 Grey Fox Ln	Park - City Neighborhood	518100454323	0.83
Middle Oaks Plantation Park	2368 Breezy Pines Ln	Park - City Neighborhood	518100454323	0.83
Pine Ridge Park	1901 Piney Woods Ln Ste P2	Park - City Neighborhood	518100454312	0.83
Strawbridge Park	2301 Hunts Neck Trl	Park - City Neighborhood	518100454323	0.83
Parliament Village Park	5324 Leesburg Dr	Park - City Neighborhood	518100460092	0.82
Romney Lane Park	857 Romney Ln	Park - City Neighborhood	518100408014	0.82
Oceana Gardens Park	213 N Oceana Blvd	Park - City Neighborhood	518100448062	0.82
Upton Estates North Park	1136 Crossway Rd	Park - City Neighborhood	518100454261	0.82
Upton Estates Park	1916 Eastborne Dr	Park - City Neighborhood	518100454261	0.82
First Colonial High School	1272 Mill Dam Rd	School - High School	518100446002	0.81
First Colonial High School	1272 Mill Dam Rd	School - High School	518100446002	0.81
Brighton On The Bay/Linkhorn Cove Park	1868 Eden Way	Park - City Neighborhood	518100446002	0.81
Lago Mar North Park	960 Artesia Way	Park - City Neighborhood	518100454263	0.81
Sawyer Lakes Estates Park	916 Gideon Rd	Park - City Neighborhood	518100454263	0.81
Lago Mar At Back Bay Park	817 Artesia Way	Park - City Neighborhood	518100454263	0.81
Tallwood High School	1668 Kempsville Rd	School - High School	518100462221	0.8
Tallwood High School	1668 Kempsville Rd	School - High School	518100462221	0.8
Cooke Elementary School	1501 Mediterranean Ave	School - Elementary	518100440074	0.8
Ferry Plantation House	4136 Cheswick Ln	Museum / Historic Site	518100416001	0.79
Pembroke Meadows Wayside Park	4333 Pembroke Blvd	Park - City Neighborhood	518100416001	0.79
Hermitage Elementary School	1701 Pleasure House Rd	School - Elementary	518100414002	0.78

Thoroughgood Elementary School	1444 Dunstan Ln	School - Elementary	518100414002	0.78
Hermitage Park	4730 Andrew Jackson Ln	Park - City Neighborhood	518100414002	0.78
Independence Middle School	1370 Dunstan Ln	School - Middle	518100414003	0.77
Plaza Northgate Park	3401 Bancroft Dr Ste A	Park - City Community Park	518100454145	0.77
Plaza Northgate Park Ballfields	3401 Bancroft Dr Ste A	Sports - Ball Field	518100454145	0.77
Holly Green Park	3418 Waltham Cir Ste B	Park - City Neighborhood	518100454145	0.77
London Bridge Park	520 Old Great Neck Rd	Park - City Neighborhood	518100448082	0.77
Holland Elementary School	3340 Holland Rd	School - Elementary	518100454143	0.76
The Lakes Park	3296 Boynton Ct	Park - City Neighborhood	518100454143	0.76
King's Grant Elementary School	612 N Lynnhaven Rd	School - Elementary	518100422021	0.75
Bellamy Plantation East Park	1833 Burwillow Dr	Park - City Neighborhood	518100462252	0.75
Middle Plantation/Bishop's Gate Park	3181 Little Haven Rd Ste P1	Park - City Neighborhood	518100422021	0.75
Malbon Acres Park	1952 Rossini Dr	Park - City Neighborhood	518100454251	0.74
Ocean Lakes East Park	1276 Tennyson Rd	Park - City Neighborhood	518100454251	0.74
Salem Middle School	2380 Lynnhaven Pkwy	School - Middle	518100462253	0.73
Salem High School	1993 Sundevil Dr	School - High School	518100462253	0.73
Salem High School	1993 Sundevil Dr	School - High School	518100462253	0.73
Linkhorn Park Elementary School	977 First Colonial Rd	School - Elementary	518100444023	0.73
Fire 19 / Ems 19 - Stumpy Lake	4196 Pleasant Valley Rd	Fire And Ems	518100462253	0.73
Coventry Park	4757 Ardmore Ln	Park - City Neighborhood	518100462253	0.73
Gloucester Park	1910 Long Bridge Ln	Park - City Neighborhood	518100444023	0.73
Rosemont Forest East Park	2300 Lynnhaven Pkwy	Park - City Neighborhood	518100462253	0.73
Great Neck Middle School	1848 N Great Neck Rd	School - Middle	518100430022	0.72
Cox High School	2425 Shorehaven Dr	School - High School	518100430021	0.72
Cox High School	2425 Shorehaven Dr	School - High School	518100430021	0.72
John B Dey Elementary School	1900 N Great Neck Rd	School - Elementary	518100430022	0.72
Great Neck Recreation Center	2521 Shorehaven Dr	Recreation Center	518100430021	0.72
Great Neck Park	2521 Shorehaven Dr	Park - City Metro Park	518100430021	0.72

Chelsea/Greenhill Park	2532 Queens Elm Pl Ste P1	Park - City Neighborhood	518100430022	0.72
Broad Bay Estates Park	2548 Falcon Cres	Park - City Neighborhood	518100430021	0.72
Cardinal Estates Park	1324 Old Clubhouse Rd	Park - City Neighborhood	518100454302	0.7
Rosemont Forest Park	4360 Pleasant Valley Rd	Park - City Neighborhood	518100462144	0.7
Brigadoon Pines Park		Park - City Neighborhood	518100462223	0.68
Pecan Gardens Park		Park - City Neighborhood	518100458062	0.68
Bow Creek Recreation Center	3427 Club House Rd	Recreation Center	518100428014	0.67
Bow Creek Golf Course	512 Barcelona Ln	Sports - Golf Course	518100428014	0.67
Bow Creek Neighborhood Park	3427 Club House Rd	Park - City Neighborhood	518100428014	0.67
Bow Creek Recreation Center	3427 Club House Rd	Recreation Center	518100428014	0.67
Princess Anne High School	4400 Virginia Beach Blvd	School - High School	518100410033	0.66
Princess Anne High School	4400 Virginia Beach Blvd	School - High School	518100410033	0.66
Princess Anne High School (Tennis Courts)	4400 Virginia Beach Blvd	Sports - Tennis Courts	518100410033	0.66
Chatham Hall Park	5364 Chatham Hall Dr	Park - City Neighborhood	518100462063	0.65
Indian Lakes Elementary School	1240 Homestead Dr	School - Elementary	518100462121	0.64
Bellamy Woods Park	4629 Berrywood Rd	Park - City Neighborhood	518100462121	0.64
Brigadoon Woods Park		Park - City Neighborhood	518100462225	0.63
Charlestown East Park	1760 Legare Ln	Park - City Neighborhood	518100462225	0.63
Strawbridge Elementary School	2553 Strawbridge Rd	School - Elementary	518100454322	0.62
Fire 21 / Ems 21 - General Booth	1468 Nimmo Pkwy	Fire And Ems	518100454322	0.62
Princess Anne Area Library	1468 Nimmo Pkwy	Library	518100454322	0.62
Princess Anne Recreation Center	1400 Nimmo Pkwy	Recreation Center	518100454322	0.62
Charlestown Lakes South Park West	1053 Kinderly Ln	Park - City Neighborhood	518100462171	0.62
Hunt Club Forest Park	2440 Hunts Neck Trl	Park - City Neighborhood	518100454322	0.62
Hunters Run Park	2540 Hunters Run Trl	Park - City Neighborhood	518100454322	0.62
White Oaks Elementary School	960 Windsor Oaks Blvd	School - Elementary	518100460181	0.61
Brookwood Elementary School	601 S Lynnhaven Rd	School - Elementary	518100454151	0.61

Dunbarton Park	4468 Paddock Ln	Park - City Neighborhood	518100460061	0.59
Green Run Park	1877 Lynnhaven Pkwy	Park - City Neighborhood	518100460182	0.59
Groveland Park	409 N Lynnhaven Rd	Park - City Neighborhood	518100422023	0.59
Ocean Lakes High School	885 Schumann Dr	School - High School	518100454271	0.58
Ocean Lakes High School	885 Schumann Dr	School - High School	518100454271	0.58
Malibu Elementary School	3632 Edinburgh Dr	School - Elementary	518100424004	0.58
Ocean Lakes High School (Tennis Courts)	885 Schumann Dr	Sports - Tennis Courts	518100454271	0.58
Birchwood - Malibu Park	3632 Royal Palm Arch Ste P2	Park - City Neighborhood	518100424004	0.58
Princess Anne Quarter Park	2360 Fenwick Way	Park - City Neighborhood	518100454211	0.57
Buyrn Farms Park	2609 Buyrn Cir	Park - City Neighborhood	518100454211	0.57
Holland Woods Park		Park - City Neighborhood	518100454211	0.57
Rolling Woods Park	1704 Prodan Ln	Park - City Neighborhood	518100454211	0.57
Litchfield Manor Park	2313 Litchfield Way	Park - City Neighborhood	518100454211	0.57
Woods Of Avalon Park	5720 Normandy Ave	Park - City Neighborhood	518100460024	0.56
Christopher Farms Elementary School	2828 Pleasant Acres Dr	School - Elementary	518100454221	0.55
Plaza Methodist Park	208 S Plaza Trl	Park - City Neighborhood	518100428012	0.55
Princess Anne Crossing Park	2561 Cantwell Rd	Park - City Neighborhood	518100454221	0.55
Wood Of Piney Grove Park	3017 Damascus Trl	Park - City Neighborhood	518100454221	0.55
Princess Anne Middle School	2323 Holland Rd	School - Middle	518100454221	0.55
Pembroke Meadows Elementary School	820 Cathedral Dr	School - Elementary	518100416004	0.54
Saw Pen Point Park	1051 Saw Pen Point Trl Ste P2	Park - City Neighborhood	518100416004	0.54
Pembroke Meadows Park	820 Cathedral Dr	Park - City Neighborhood	518100416004	0.54
Adam Thoroughgood House	1636 Parish Rd	Museum / Historic Site	518100414001	0.53
Red Mill Farms North Park	2049 Upton Dr Ste 1	Park - City Neighborhood	518100454252	0.53
Salem Lakes Park	2080 Centennial Cir	Park - City Neighborhood	518100460154	0.53
Salem Park	1848 Centennial Cir	Park - City Neighborhood	518100460154	0.53

Fire 04 / Ems 04 - Chesapeake Beach	2211 Greenwell Rd	Fire And Ems	518100418043	0.51
Point O'woods Park	2128 Chicken Valley Rd	Park - City Neighborhood	518100448073	0.51
Ocean Lakes Elementary School	1616 Upton Dr	School - Elementary	518100454272	0.5
Woodstock Park	5709 Providence Rd	Park - City Community Park	518100462064	0.49
Fire 02 / Ems 02 - Davis Corner	4672 Haygood Rd	Fire And Ems	518100412004	0.48
Brigadoon Park	5277 Lynnhaven Pkwy	Park - City Neighborhood	518100462232	0.48
Kempsville Middle School	860 Churchill Dr	School - Middle	518100460063	0.47
Providence Elementary School	4968 Providence Rd	School - Elementary	518100460063	0.47
Kempsville Recreation Center	800 Monmouth Ln	Recreation Center	518100460063	0.47
Lark Downs Park	800 Monmouth Ln	Park - City Neighborhood	518100460063	0.47
Kempsville Recreation Center	800 Monmouth Lane	Recreation Center	518100460063	0.47
Thalia Elementary School	421 Thalia Rd	School - Elementary	518100456011	0.42
Ems 15 - Thalia	333 Thalia Rd	Ems	518100456011	0.42
Lineberry Park	3629 Kings Point Rd	Park - City Neighborhood	518100458051	0.42
Wolfsnare Park	2401 Plantation Dr	Park - City Neighborhood	518100444013	0.42
Alanton Elementary School	1441 Stephens Rd	School - Elementary	518100446001	0.41
Bay Colony Park	824 Bay Colony Dr Ste P2	Park - City Neighborhood	518100438004	0.41
Stratford Chase Park	900 Minden Rd	Park - City Neighborhood	518100462111	0.39
Witchduck Landing Park	5071 Holly Farms Dr	Park - City Neighborhood	518100408024	0.39
Plaza Middle School	3080 S Lynnhaven Rd	School - Middle	518100428023	0.28
Plaza Middle School (Tennis Courts)	3080 S Lynnhaven Rd	Sports - Tennis Courts	518100428023	0.28
Seatack Elementary School	912 S Birdneck Rd	School - Elementary	518100452001	0.18
Aquarium - South Building	928 S Birdneck Rd	Aquarium	518100452001	0.18
Virginia Aquarium And Marine Science Center	717 General Booth Blvd	Aquarium	518100452001	0.18
Owl Creek Tennis Center	928 S Birdneck Rd	Sports - Tennis Courts	518100452001	0.18
Owl Creek Boat Ramp	717 General Booth Blvd	Marina / Boat Ramp	518100452001	0.18
Marsh Pavilion At The Aquarium	801 General Booth		518100452001	0.18

Table 45. Municipal Properties Located in Rural Areas

Property Name	Address	Property Type	Block Group ID
Lotus Garden Park	1289 Sandbridge Rd	Park - City Neighborhood	518100454121
Creeds Elementary School	920 Princess Anne Rd	School - Elementary	518100464003
Pungo Blackwater Library	920 Princess Anne Rd	Library	518100464003
West Neck Marina	3985 West Neck Rd	Marina / Boat Ramp	518100464003
Senior Resource Center	920 Princess Anne Rd	City Offices	518100464003
Pungo Ferry Landing Park	2272 Old Pungo Ferry Rd	Park - City Community Park	518100464003
Pungo Ferry Landing Boat Ramp	2272 Old Pungo Ferry Rd	Marina / Boat Ramp	518100464003
FIRE 06 / EMS 06 - Creeds	595 Princess Anne Rd	Fire and EMS	518100464002
Creeds Athletic Park	1585 Campbells Landing Rd	Sports - Ball Field	518100464002
Creeds Wayside Park	540 Princess Anne Rd	Park - City Neighborhood	518100464002
Munden Point Park	2001 Pefley Ln	Park - City Metro Park	518100464002
Creeds Ath. Airfield Park	1585 Campbells Landing Rd	Park - City Neighborhood	518100464002
FIRE 13 / EMS 13 - Blackwater	6009 Blackwater Rd	Fire and EMS	518100464002
Blackwater Park	3390 Head River Rd	Park - City Neighborhood	518100464004
Police Barn for Mounted Patrols	2089 Indian River Rd 23456	Police	518100464004

Table 46. Municipal Properties Located within One Mile of Primary Evacuation Routes

Facility Name	Address	Property Type	Block Group ID
25th Street Garage	336 25th Street 23451	Parking	518100440041
31st Street Garage	209 30th Street 23451	Parking	518100440041
Blue Garage	4544 Columbus Street	Parking	518100456032
Green Garage	225 Town Center Drive	Parking	518100456032
Maroon Garage	4621 Columbus Street	Parking	518100410021
New Parking Garage 19th Street	PENDING	Parking	518100440043
Orange Garage	4525 Main Street	Parking	518100456032
Red Garage	4535 Commerce Street	Parking	518100456032
Virginia Beach Convention Center Lot	1000 19th Street, 23451	Attraction	518100442023
Virginia Beach Sports Center	1045 19th St	Attraction	518100442023
Visitor Information Center	2100 Parks Ave	Attraction	518100442023
MOCA - Contemporary Art Center of Virginia	2200 PARKS AVE	Attraction	518100440061
Meo Central Library	4100 Virginia Beach Blvd	Library	518100456012
Mount Trashmore Park	310 Edwin Dr	Park, Major	518100458032
Oceanfront Area Library	700 Virginia Beach Blvd	Library	518100440042
Seatack Recreation Center	141 S Birdneck Rd	Recreation Center	518100442011
Williams Farm Recreation Center	5252 Learning Circle	Recreation Center	518100408023
Beach Garden Park	2854 Kilbourne Ct	Park	518100440062
Francis Land House	3131 Virginia Beach Blvd	Attraction	518100426002
Level Green Park	1520 Level Green Blvd	Park	518100462212
Marshview Park	120 Marshview Drive	Park	518100442011
Providence Park & KPB Ball Fields	952 Reon Dr	Park	518100462041
Williams Farm Park	5269 Learning Circle	Park	518100408023
Woodstock Park	5709 Providence Road	Park	518100462064

Table 47. Priority Municipal Sites Located in Disadvantaged and Environmental Justice Communities - Multiple Screening Tools

Facility Name	Address	VDEQ - Low Income Communities	VDEQ - Communities of Color	Virginia Opportunity Zones	White House CEJST	DOE/DOT EJ Screen
25th Street Garage	336 25th Street 23451	YES	--	--	--	--
31st Street Garage	209 30th Street 23451	YES	--	--	--	--
9th Street Parking Garage	200 9th Street	--	--	--	--	--
Blue Garage	4544 Columbus Street	--	YES	--	--	--
Green Garage	225 Town Center Drive	--	YES	--	--	--
Maroon Garage	4621 Columbus Street	--	--	YES	YES	--
New Parking Garage 19th Street	Pending	YES	--	--	--	--
Orange Garage	4525 Main Street	--	YES	--	--	--
Red Garage	4535 Commerce Street	--	YES	--	--	--
Virginia Aquarium - South Building	801 General Booth	--	--	--	YES	--
Virginia Aquarium and Marine Science Center	717 General Booth Blvd	--	--	--	YES	--
Virginia Beach Convention Center Lot	1000 19th Street, 23451	YES	YES	YES	--	--
Virginia Beach Sports Center	1045 19th St	YES	YES	YES	--	--
Visitor Information Center	2100 Parks Ave	YES	YES	YES	--	--
Little Island Park & Parking Lots	3820 Sandpiper Road 23456	--	--	--	--	--
MOCA - Contemporary Art Center of Virginia	2200 Parks Ave	--	--	--	--	--
Princess Anne Athletic Complex	4001 Dam Neck Rd	--	YES	--	--	--

Virginia Beach Amphitheater	3550 Cellar Door Way	--	YES	--	--	--
Bayside Library/Special Services Library	936 Independence Blvd	--	--	--	--	--
Bayside Recreation Center	4500 First Court Rd	--	--	--	--	--
Great Neck Area Library	1251 Bayne Dr	--	--	--	--	--
Great Neck Recreation Center	2521 Shorehaven Dr, Virginia 23454	--	--	--	--	--
Kempsville Area Library	832 Kempsville Rd	--	--	--	--	--
Kempsville Recreation Center	800 Monmouth Lane	--	--	--	--	--
MEO Central Library	4100 Virginia Beach Blvd	--	YES	--	--	--
Mount Trashmore Park	310 Edwin Dr	YES	YES	--	--	--
Oceanfront Area Library	700 Virginia Beach Blvd	YES	--	--	--	--
Princess Anne Area Library	1444 Nimmo Pkwy, Virginia 23456	--	--	--	--	--
Princess Anne Recreation Center	1400 Nimmo Pkwy	--	--	--	--	--
Seatack Recreation Center	141 S Birdneck Rd	--	YES	YES	--	--
Soccer Complex & Virginia Beach Field House	2044 Landstown Centre Way	--	YES	--	--	--
Virginia Beach Farmers Market	3640 Dam Neck Rd	--	YES	--	--	--
Williams Farm Recreation Center	5252 Learning Circle	--	YES	--	--	--
Amphitheater Pre-Game Lot	2181 Recreation Dr	--	YES	--	--	--
Bayville Park	4132 First Court Rd	--	--	--	--	--
Beach Garden Park	2854 Kilbourne Ct	YES	--	--	--	--
City View Park	2073 Kempsville Road	YES	YES	--	--	--
Croatan Parking Lot	920 Vanderbilt Ave	--	--	--	--	--
Francis Land House	3131 Virginia Beach Blvd	--	YES	--	--	--

Great Neck Park	2513 Shorehaven Dr	--	--	--	--	--
Hampton Roads Soccer Complex	2185 Recreation Dr	--	YES	--	--	--
Lake Lawson / Lake Smith Natural Area & Ramp	5381 Shell Rd	--	--	--	--	--
Level Green Park	1520 Level Green Blvd	YES	YES	--	YES	--
Lynnhaven Boat Ramp	3576 Piedmont Cir	--	--	--	--	--
Lynnhaven House	4401 Wishart Rd	--	--	--	--	--
Lynnhaven Park	1246 Bayne Dr	--	--	--	--	--
Marshview Park	120 Marshview Drive	YES	--	YES	--	--
Munden Point Park & Boat Ramp	2001 Pefley Ln	--	--	--	--	--
Pleasure House Point Natural Area	3957 Marlin Bay Dr	--	--	--	--	--
Princess Anne Park	3740 Dam Neck Rd	--	YES	--	--	--
Providence Park & KPB Ball Fields (close to VDOT)	952 Reon Dr	--	--	--	--	--
Pungo Blackwater Library & Senior Resource Center Area	920 Princess Anne Rd	--	--	--	--	--
Red Mill Farms Park	1900 Sandbridge Rd	--	--	--	--	--
Red Wing Park	1398 Sakura Ln	--	--	--	--	--
Salem Woods Park	1525 Salem Road	--	YES	--	--	--
Stumpy Lake Natural Area	4327 Indian River Lane	--	YES	--	--	--
Williams Farm Park	5269 Learning Circle	--	YES	--	--	--
Woodstock Park	5709 Providence Road	--	YES	--	--	--

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