

ELECTRIC VEHICLE CHARGING POINT STRATEGY

London Borough of Waltham Forest

2020 – 2025



PROJECT
CENTRE

EXECUTIVE SUMMARY

Vision: *Enable Waltham Forest's residents, businesses and visitors to convert to low emission vehicles to help reduce transport related emissions and to promote more sustainable forms of transport. This is to be achieved by installing a network of charging points that caters for their respective needs and encourages further uptake of low emission vehicles, without impacting any other pavement users or sustainable modes of transport.*

Why EV?

Electric vehicles (EVs) have the potential to offer great benefits to London's residents, businesses and visitors in terms of health, the environment and reduced running costs over the lifetime of the vehicle. Electric vehicles are part of the tool kit for decarbonising transport emissions and are an important component of improving local air quality and reducing premature deaths and health risks associated with exposure to toxic air.

Central, regional and local government are actively pursuing schemes which will facilitate the adoption of electric vehicles, working in partnership with electric vehicle manufacturers, charge point operators, car clubs and private businesses.

Department for Transport data shows that demand for electric vehicles has increased exponentially over the last 5 years and is projected to expand rapidly over the next 30 years. It is important that there is sufficient and accessible charging infrastructure in place to support this transition to low emissions vehicles, whilst keeping abreast of emerging technologies and key developments surrounding charging infrastructure and sustainable transport. This strategy will focus on where Waltham Forest can have the biggest impact which is by providing charging on our streets.

London Borough of Waltham Forest recognise their role in supporting the uptake of electric vehicles and this strategy will provide guidance on identifying the appropriate charging infrastructure, located in the right places, to support electric vehicle uptake by the growing population and meet future demand for charging facilities across the borough. Stress will also be placed upon installing infrastructure in a way that meets the borough's local needs and follows best practice, so that pedestrians and other pavement users are not adversely affected.

Six key objectives of this strategy are to:

- Continue to deliver an electric vehicle charging network that meets the demands of residents, businesses and visitors;
- Designing sites that take into consideration other road users, particularly pedestrians;
- Suitable coverage of the borough by 2025 (our target is for 80% of residents and businesses to be within 250m of a charging point by 2025);
- Ensure the charging network has capacity for further expansion;
- Encourage the uptake of electric vehicles through initiatives and public engagement;
- Identify income opportunities that will lead to the provision and maintenance of charging points becoming cost neutral to the borough

GLOSSARY	4
CHAPTER ONE – Waltham Forest Context	5
CHAPTER TWO – Policy Context	9
CHAPTER THREE – The Charging Network	14
CHAPTER FOUR – Current EV Ownership, Charging Provision and Demand	18
CHAPTER FIVE – Key Targets and Objectives for the Next 3-5 Years	21
CHAPTER SIX – Key Developments and Emerging Technologies	29

GLOSSARY

AQMA; Air Quality Management Area - Local authorities review and assess air quality; where UK pollution objectives are not likely to be achieved, it must declare an Air Quality Management Area and an Air Quality Action Plan must be produced.

CO₂; Carbon Dioxide - Pollution mostly as a result of the burning of fossil fuels

EVCPs; Electric vehicle charging points

EU; European Union

GLA; Greater London Authority

GULCS; Go Ultra Low City Scheme

LEZ; Low Emission Zone

MTS; Mayor's Transport Strategy

NO_x; Nitrogen Oxide - When nitrogen is released during fuel combustion, it combines with oxygen atoms to create nitric oxide (NO). This further combines with oxygen to create nitrogen dioxide (NO₂). Nitrogen dioxide and nitric oxide are referred to together as oxides of nitrogen (NO_x).

NO₂; Nitrogen Dioxide

OLEV; Office for Low Emission Vehicles

PHV; Private Hire Vehicle

PM; Particulate Matter - also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets that get into the air. Once inhaled, these particles can affect the heart and lungs and cause serious health effects

RFID; Radio-Frequency Identification - the use of radio waves to read and capture information stored on a tag attached to an object, such as a contactless payment card

TfL; Transport for London

ULEV; Ultra Low Emission Vehicle

ULEZ; Ultra Low Emission Zone

CHAPTER 1

Waltham Forest Context

The London Borough of Waltham Forest sees air quality improvement as a top priority. Our recently updated Air Quality Action Plan emphasises the council's dedication towards managing the impact of future growth in the borough, supporting healthier lifestyles for residents and reducing the impact of traffic on air quality. Reducing CO₂ emissions and climate change is another top priority.

The borough is meeting all the national Air Quality Strategy objectives, other than for the gas Nitrogen Dioxide (NO₂) in certain areas, which is a problem across London. Particulate Matter (PM) is the other main pollutant of concern. Most of the poorest air quality levels are in areas adjacent to the busiest roads because vehicle emissions continue to be the primary pollution source in Waltham Forest, in particular along the North Circular and A12. Whilst the control of these two roads falls under the remit of TfL and the GLA, Waltham Forest is doing what it can to tackle borough sites where air quality regularly exceeds statutory limits and has identified 13 localised focus areas (see the Action Plan for more information).

Road transport is a key contributor to air pollution and electric vehicles offer a solution to this problem as they operate with no tail pipe emissions. Waltham Forest recognises that although electric vehicles contribute towards reducing emissions, they also emit pollutants into the environment from tyre and brake wear but are overall less polluting than conventional counterparts. The introduction of electric vehicle charging points across the borough will support our aim of improving air quality, in combination with other sustainable and active travel measures. Supporting car clubs in particular will be a priority for Waltham Forest as this should support local and regional aims to reduce car ownership.

Waltham Forest and King's College London published a report in 2018, which models a range of interventions around air quality, exposure and attitudes, and its impact on the public in Waltham Forest. The findings show that recent work to promote walking and cycling has had air quality and health benefits. However, there is always more work to be done, including to deliver on the key objectives of the Mayor's Transport Strategy and reducing private car use.

Waltham Forest intends on placing more focus on specific local areas of high pollution; the Air Quality Action Plan highlights 13 locations within the borough identified as having high levels of pollution and human exposure. The actions proposed in the Air Quality Action Plan to target pollution in these areas fall into six categories:

1. Reducing emissions from developments and buildings
2. Increasing of both public health and air quality awareness
3. Reducing emissions from delivery servicing and freight
4. Reducing emissions from council own vehicles i.e. Borough fleet actions
5. Localised, neighbourhood solutions
6. The use of cleaner transport

Providing an accessible network of electric vehicle charging points will play a vital role in facilitating the uptake of electric vehicles and is a necessity to meet these Air Quality Action Plan targets. It is also necessary to help the borough achieve the Mayor of London's target for a zero-emission transport network by 2050.

In April 2019, the council declared a 'Climate Emergency' and committed to launching a Commission "to help shape our local response to this global challenge and to produce a set of policy 'asks' for our regional and national politicians"; this includes smarter travel and technology. The Commission comprises of experts from across the energy, waste and environmental sectors to bring their knowledge and expertise to help the Council in their next phase of tackling the Climate Emergency.

Waltham Forest is committed to achieving the Mayor's Transport Strategy of 80% modal share of trips by walking, cycling and public transport by 2041. Waltham Forest's electric vehicle strategy will work together with the current 'Enjoy Waltham Forest' initiative. 'Enjoy Waltham Forest' is backed by a £30m funding pot awarded by TfL and the Mayor of London which works towards changing the way streets are used, to promote sustainable transport including walking, cycling and using public transport. The initiative focuses on improving the network within Waltham Forest to encourage more sustainable modes of transport, thus reducing congestion. The borough has set out its priorities in promoting active travel in the Vision 2020 document, which is important for lower emissions and cleaner air.

Waltham Forest is also committed to improving emissions from the commercial sector and has secured funding to launch a Zero Emission Delivery scheme (ZED). The service is available to residents shopping locally and businesses with local delivery needs, with deliveries available at agreed times. It is a zero-emission service, making use of vehicles such as cargo bikes and an electric van, which are benefiting the environment by reducing air and noise pollution, whilst benefiting the local economy. Also, the bikes are able to use the dedicated cycle lanes where possible meaning deliveries could be quicker, more efficient and thus increasing overall productivity.

Population and Growth

According to GLA data, a total of 275,300 people are estimated to have been living in the borough in 2016; this figure is projected to increase by a further 16,200 (6%) from 2016 to 2021.

Over the last decade or so, we have witnessed an ever-increasing emphasis being placed on the need for sustainable transport which has translated into 29% modal share of public transport, 33% walking and 2% cycling in Waltham Forest (Travel Demand Survey and Travel in London 9 and 10). Combined, Waltham Forest is the only Outer London borough where the number of people walking and cycling matches the number using a car. Despite this, in Waltham Forest alone there were 89,000 vehicles registered within the borough in 2017 and car ownership has grown by 7% since 2013 (Department for Transport). There is still a long way to go in ensuring that goods and people flow freely through our capital without exacerbating air quality and its associated impacts.

Land Use

The map to the right displays current land use types within Waltham Forest.

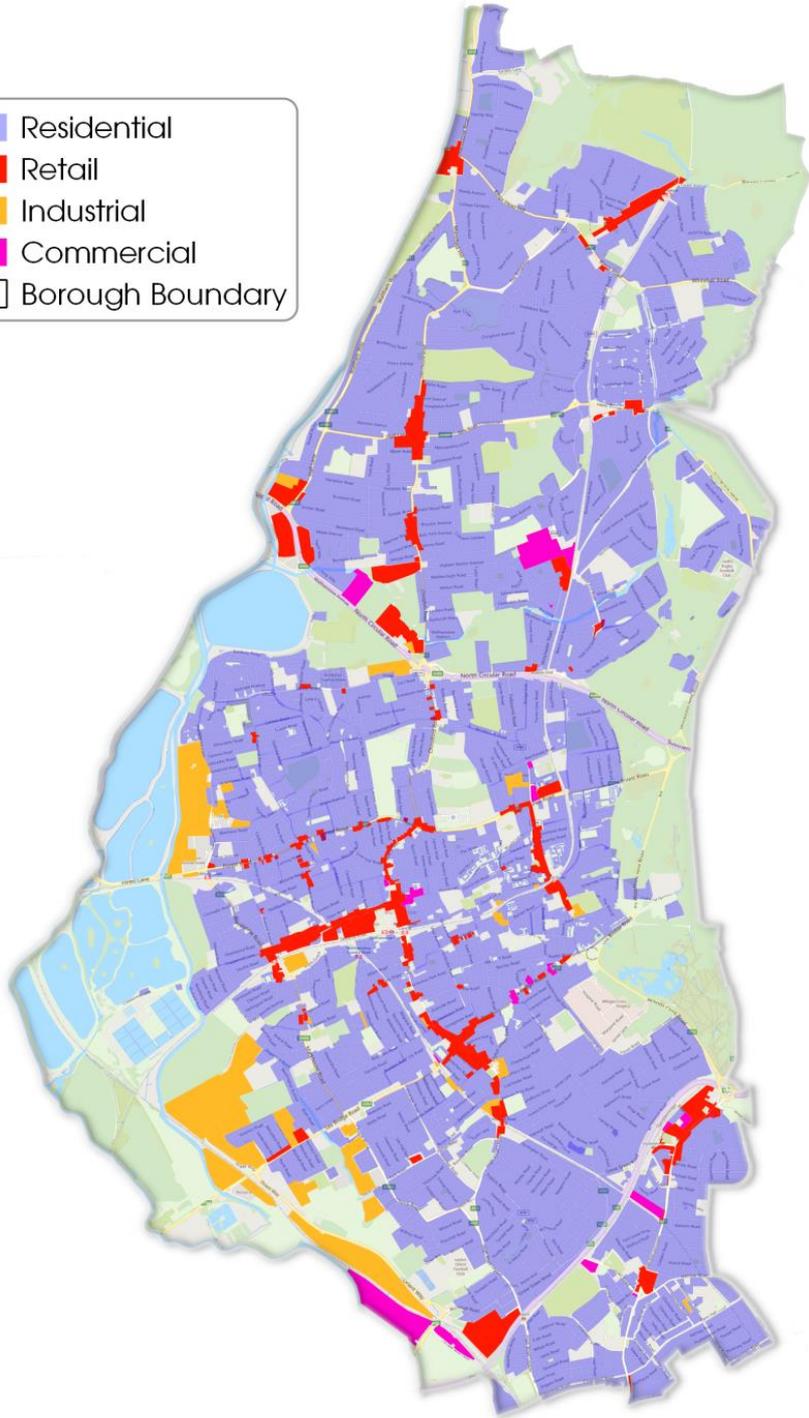
With the estimated increase in population figures in mind, it is already evident that the majority of land is used for residential dwellings. Understanding land use in the borough will enable us to establish which types of charging points to install in particular locations, to meet the needs of the growing number of residents and businesses.

Regeneration

Waltham Forest has many regeneration areas and objectives across the borough, including part of the Lea Valley Opportunity Area. Upper Lea Valley is seen to have a huge range of development potential, with the opportunity areas being spread across Enfield, Hackney, Haringey and Waltham Forest. The Mayor of London has committed to significant improvements to transport infrastructure within the Lea Valley Opportunity Area as part of a vision to increase commercial capacity and opportunity within this area. Waltham Forest is putting this into practice with their proposals for the development of three sites around Lea Bridge Station. These sites are to include housing development, many of which will be affordable housing, a new station entrance and public space, a commercial space to invite business into the area, and a local energy centre.

Redevelopment; Low Hall Depot

The Low Hall Depot site will be undergoing redevelopment. Although the depot already has 2 dual fast charging points, the transformation will include levelling the land and ensuring that the power supply is suitable for electric vehicle charging; including the introduction of sub-stations to facilitate more charging points. The aspirations are for the site to be a charging hub for council fleet servicing vehicles. As of January 2020, Waltham Forest installed 3 dual 7kW fast charging points and 1 rapid charging point at Low Hall Depot to charge eight new electric vehicles, which will be used to service the borough.



The table below highlights targets for charging points for Low Hall Depot and parks land (Leyton Jubilee Park and Jubilee Sports Ground) within Waltham Forest (These figures are included in the overall Targets Summary table in Chapter 5):

Period	Charging points targets		
	Standard charging units (aiming for 2 bays per location)	Lamp column chargers in clusters of 2 or 3	Rapid chargers
2020-2021	4		1
2021-2022			2
2022-2023			
2023-2024	20	2	7
2024-2025			

Leyton Jubilee Park and Jubilee Sports Ground

Waltham Forest also have plans to create a small charging hub in both Leyton Jubilee Park and Jubilee Sports Ground; the target numbers are included in the table above.

Redevelopment; Town Hall Campus

The Town Hall Campus transformation programme (2020-2023) will change the way the Council operates and delivers services to residents.

There are three main reasons for doing this:

- **Opening up the Town Hall Campus** with a new public space and public realm that can be enjoyed by residents, visitors and staff in Chapel End ward and the heart of the borough.
- **To contribute much needed housing**, with 50% affordable, by selling off council offices in other parts of the borough that are expensive to run, not fit for purpose, and confusing for customers who have to travel between sites.
- **Significant investment into our historic buildings** means the Grade II-listed Town Hall and Assembly Hall is protected and preserved for future generations to enjoy.

As part of these renovation plans, the existing number of parking spaces will be reduced, however there will be allocated spaces for charging electric vehicles.

Leisure Centres

Waltham Forest Feel Good Centre car park contains 5 electric vehicle charging points; customers can purchase a token from reception for £2.50 which will provide a 1-hour charge. Electric vehicle users will still need to pay for parking.

CHAPTER 2

Policy Context

Climate Change Policy

The Climate Change Act 2008 – This Act saw the UK tasked with reducing emissions by at least 80% by 2050, with London being set a target to reduce annual emissions of CO₂ by 60% in the same time frame. The responsibility was placed on all sectors; however, the Mayor’s Climate Change Mitigation and Energy Strategy (CCMES) suggested the transport sector should contribute to the wider target by making a 48% reduction in transport CO₂ emissions. Considering that the population is expected to increase within London, these tasks will be particularly challenging.

Health Impacts of Air Quality – London and Waltham Forest Policy

Future Estimates of London’s Air Quality

According to the GLA, London is seeing its position in liveability rankings dropping behind cities like Berlin and Paris, who are taking advanced action to minimise air pollution and congestion. It is estimated that by 2020, air quality will have improved as a consequence of the emphasis being placed on technological advances in vehicle design, together with policies and legislation geared at reducing emissions across London and the EU.

Nitrogen Oxide and Particulate Matter

The London Borough of Waltham Forest is meeting all of the national Air Quality Strategy objectives other than for Nitrogen Dioxide (NO₂) in certain areas. Nitrogen Oxides, or NO_x, are a group of pollutants which can have a significant long-term impact on the environment and on our health, and NO₂ is one of the most common. Waltham Forest is meeting the current objectives for Particulate Matter (PM₁₀ and PM_{2.5}) but as this pollutant is damaging to health at any level this remains a pollutant of concern.

Road transport is responsible for nearly half of both NO_x and PM emissions across greater and central London, with diesel engines causing around 40% of NO_x emission across the whole city (*Driving Away from Diesel*, 2015, London Assembly report). London still does not meet the legal EU limits for NO₂ and it is argued that following the current policy, the legal NO₂ limit may not be reached until at least 2025. These pollutants are released as both tailpipe emissions, for which EVs can make the most significant improvements, and through brake and tyre wear.

Impact on Health

Kings College London (*Understanding the Health Impacts of Air Pollution in London*, 2015, for TfL and GLA) reported that in 2010, short-term exposure to both pollutants in London was associated with 1,990 hospital admissions for respiratory problems resulting from PM_{2.5}, and 420 from NO₂. 740 admissions were for cardiovascular ailments associated with PM_{2.5}. It is estimated that all these health effects imposed an economic cost of between £1.4 billion and £3.7 billion.

The Government's Clean Air Strategy 2019

The Government's Clean Air strategy, which was published in January 2019, sets out plans to meet ambitious legally binding international targets to reduce emissions of the five most damaging air pollutants by 2020 and 2030. This strategy outlines the government's ambitions relating to reducing air pollution, making air healthier to breathe, protecting nature and boosting the economy. The strategy sets out a clear direction for future air quality policies and goals. Emissions from road transport have been in the spotlight because of their impact on local air quality, but the government is committed to cutting air pollution from all forms of transport.

Mayor's Transport Strategy (MTS)

The MTS focuses primarily on reducing car ownership which Waltham Forest supports. With regards to EVs, the MTS aims for all taxis and Private Hire Vehicles (PHVs) to be zero emission capable by 2033, for all buses to be zero emission by 2037, and for London's entire transport system and all new road vehicles driven in London to be zero emission by 2040. By 2041, the Mayor aims for 80% of all Londoners' trips to be made by foot, by cycle, or by public transport.

Three key themes are at the heart of this strategy:

Healthy Streets and Healthy People

Creating streets and street networks that encourage walking, cycling and public transport use will reduce car dependency and the health problems it creates.

A Good Public Transport Experience

Public transport is the most efficient way for people to travel over distances that are too long to walk or cycle, and a shift from private car to public transport could dramatically reduce the number of vehicles on London's streets. The MTS suggests that consideration of the whole journey will improve quality of life and reduce car dependency, by providing attractive and accessible alternatives to car use.

New Homes and Jobs

More people than ever want to live and work in London. Planning the city around walking, cycling and public transport use will unlock growth in new areas and ensure that London grows in a way that benefits everyone.



Expected Outcomes

The strategy outlines 9 expected outcomes, 3 of which are related to increased uptake of EVs:

- London’s streets will be healthy and more Londoners will travel actively
- London’s streets will be clean and green
- Active, efficient and sustainable travel will be the best option in new developments

Healthy Streets Concept

The MTS introduces the concept of healthy streets and suggests that streets make up 80% of the city’s public space.

There are 10 components of the healthy streets agenda, two of which directly relate to electric vehicles; improving air quality and reducing traffic noise. Electric vehicles would contribute to achieving both goals within Waltham Forest and across the city.

The Healthy Streets Approach provides a structure for placing human health and experience at the centre of planning the city and recognises improving air quality benefits everyone and reduces unfair health inequalities.

The London Plan

The current London Plan states that all new developments must provide 20% active provision of parking spaces with electric vehicle charging points and an additional 20% of passive spaces which have the civils prepared so that charging points can be added when demand increases in the future. Installing passive ducts and cabling greatly reduces the time, cost and disruption of installing additional bays in the future. Activation is left to the discretion of the landowner except in the case where a travel plan is in place. In this case, the levels of usage should be monitored, and new electric vehicle charging points installed when the supply is exceeded.

A draft new London Plan was published for consultation in December 2017, with a final London Plan due to be adopted by late 2019. This revised Plan suggests that all residential car parking spaces must provide infrastructure for electric or ultra-low emission vehicles. At least 20% of spaces should have active charging facilities, with passive provision for all remaining spaces.

TfL Electric Vehicle Charging Infrastructure Location Guidance for London

This document was published in 2017 and provides an evidence-based guidance to help boroughs and operators identify where best to locate charging infrastructure, to meet the current and future needs of electric vehicle users across London. The content of the guidance focuses on 4 themes:

- Identification of current demand
- Provision for future uptake
- Installing appropriate charging points in the right locations to ensure the type of charging point installed reflects the needs of the user
- A good geographical spread of charging networks

The guidance focuses on the specific needs of London's key electric vehicle user groups, including residents and visitors without off-street parking, deliveries, local businesses and electric Car Club fleets.

Waltham Forest will continue to work with TfL to ensure electric vehicle charging points within the borough are both located and designed appropriately.

Waltham Forest's Local Implementation Plan (LIP)

Waltham Forest's LIP document outlines goals and objectives for the council to meet. With focus on the Mayor's Transport Strategy, the LIP places importance on promoting 'cleaner, greener transport' and developing a 'sustainable transport network' to tackle transport emissions.

It will be essential now that the Mayor's Transport Strategy 2018 is finalised to develop the LIP3 (period 2019/20 - 2021/22) to reflect the council's priorities. The LIP3 will support the implementation of electric vehicle charging points.

"Climate Local" Action Plan

Electric vehicle technology can mitigate climate change and greenhouse gases from road transport. Waltham Forest's "Climate Local" Action Plan is the Local Government Assessment's (LGA) initiative to capture the opportunities and benefits of action on climate change. The plan works towards the delivery of the Waltham Forest Climate Change Strategy target, adopted in 2009, of an 80% reduction in CO2 emissions by 2050. One of the commitments included in Climate Local is to "promote the installation of infrastructure required for low carbon vehicles".

TfL's Low Emission Zone (LEZ)

The LEZ operates across the whole of Greater London and commenced in January 2012, when a charge was levied on the most polluting vehicles. These vehicles include lorries, buses and coaches below the Euro 4 emissions standard, and vans, minibuses and ambulances below Euro 3 standards.

The charge applies 24 hours a day, all year round. Cameras with number plate recognition allow fines to be issued to eligible vehicles not paying the charge.

TfL's Ultra Low Emission Zone (ULEZ)

The ULEZ policy came into force in 2019 and covers London's current congestion zone area. Vehicles failing to meet the Euro 6 emissions standard for diesel, and Euro 4 for petrol (Euro 3 for motorcycles), will levy a charge.

- £12.50 for cars, vans and motorcycles
- £100 for HGVs, buses and coaches

Fines will be imposed on eligible vehicles not paying the charge. By the end of 2018, all newly registered taxis were required to meet the same standards, with buses complying by 2020. From 2021, the zone will be extended and be bound by the North and South Circular roads; for central London from 8 April 2019, and then for Inner London from 25 October 2021, all vehicles (light and heavy) will be subject to relevant ULEZ standards and charges.

An expansion in the ULEZ area covering light and heavy vehicles to Inner London in October 2021, together with the changes to the LEZ to require Euro 6 London wide for heavy vehicles after October 2020, will result in significant reduction in NOx emissions; this means more Londoners experiencing the health benefits of improved air quality. As a result, in 2020, it is expected there would be a 20% reduction in NOx from road transport London-wide. In 2021, it is expected there would be a 31% reduction in road transport NOx in inner London and 28% in outer London. All roads in London are expected to see a decrease in road transport NOx emissions as a result of the proposals.

Waltham Forest has a key role to play in contributing to these projected figures; the borough will have to plan for the electrification of cars, taxis, buses and freight.

CHAPTER 3

The Charging Network

The charging network should be varied and include different types of charging infrastructure operating at different speeds (residential 5.5kW, trip-destination 7-22kW, and rapid charging 50kW) to provide for a range of needs. Vehicle owners in Waltham Forest are at a relatively early stage in the adoption of electric vehicles and it will be particularly important that a network of public chargers continue to be introduced to help drive uptake. Those considering whether to convert from traditional vehicles to ULEVs are often concerned with ‘range anxiety’ and having public chargers visibly installed on-street helps to dispel this fear.

The following table outlines the technology that is most commonly being used on-street; other emerging technologies are referred to in Chapter 6.

Type	How do they work?	Design Considerations
 <p>Slow (5.5kW) Overnight charging</p> <p>The majority of charging occurs at home, in residential areas. Lamp post chargers are a different approach to the majority of the existing electric vehicle chargers. Primarily, they are intended to address the challenge of charging electric vehicles when owners do not have access to off-street parking. Existing units operate on the Ubitricity network.</p>	<p>Lamp post chargers tap into the existing power network created for street lighting and are either integrated into the lamp column or are attached to it; making them a less expensive alternative to floor-mounted units. As they piggyback on an existing power grid, they are limited in the power they can supply but are sufficient for overnight charging. Integrating these charging units into existing street furniture means that there is no additional street clutter.</p> <p>For lamp posts that are situated at the back of the pavement and where trailing cables would pose a severe risk, Waltham Forest have placed new columns at the front of the pavement to ensure the footway is safe for pedestrians.</p> <p>Users must purchase a smart cable in order to use these charging points, currently at a cost of £200, and the metering technology within it allows the user to be billed for the energy they use.</p>	<ul style="list-style-type: none"> ● Considering whether lamp column infrastructure is appropriate for the chosen location ● Ensuring lamp columns are at the front of the pavement, to avoid trailing cables and liability implications ● If a lamp column is back of footway, allow adequate footway widths for bollard at front of footway ● The optimal use of lamp columns requires two or three lamp column chargers on each street to ensure residents are always able to access a charging point; there needs to be enough suitable lamp columns on each street under consideration to meet this requirement ensuring charging point locations chosen are resident led in areas of existing demand and where there is likely to be future demand ● Ensuring columns are practical for the installation of the infrastructure – columns must adhere to a prescribed standard of earthing, increasing the fuse size to cope with the extra energy usage, and metering an otherwise unmetered energy supply. Also require steel lamp columns, not concrete ones ● Adequate space and no apparent services within 700mm of the lamp column to accommodate earthing mats ● Does not require a fixed/marked dedicated EV only bay - if the lamp column charge point is located within a CPZ without a dedicated EV bay, the local parking controls apply



Standard/Fast
(7-22kW)
3-4 hours

Standard 7kw-22kw chargers are most widely available across London and will be suitable for the vast majority of electric vehicle users. Standard chargers are usually installed in public on-street locations, with high visibility and high footfall, or in off-street locations, such as car parks, where users can leave their vehicle for three to four hours. The first public charging points installed within the borough are on the POLAR network, using Chargemaster units.

Floor-mounted charging points have dedicated EV parking bays, with signing indicating length of stay restrictions. Having marked bays ensures electric vehicle owners can access charging points and emphasise that bays are dedicated. EVs must be plugged in and actively charging in order to use the dedicated bays. Users will need to set up an account and become members of the network they wish to utilise in order to charge their vehicles. Some networks prefer drivers to use an RFID card and others a smart phone app, while some allow access using either. Some charging points are free to use, while others are accessible with set charges which tend to be a connection fee, price per time, price per energy consumed, or a combination of the above; most charging points offer pay as you go.

All units within Waltham Forest will be placed on the public highway, to ensure that the footway is not obstructed for pedestrians and all footway users.

- Ensuring sufficient pavement space and distance from trees and existing electrical street furniture
- Considering which networks to introduce
- Considering the impact that the charging point will have on the street scene
- Considering how publicly accessible charging points are distributed across the borough
- Considering the visibility of charging points is key to increasing public awareness
- Considering the balance of on-street and off-street charging points
- Minimise impact on parking bays – consider flank walls and areas without significant parking stress
- Considering sites that aren't expected to change in the next 5-8 years
- Install infrastructure on public highway to ensure footways are kept clear
- Ensuring adequate power supply
- Ensuring viable access for the installation team



Rapid
(50kW)
80% in 30 mins

Rapid chargers are capable of recharging a vehicle in minutes rather than hours. They are vital to long distance travel and for commercial vehicles such as taxis, which will need to top-up during the day. TfL have publicised their rapid charging framework, offering the scheme to local authorities within London. They are proposing to identify locations across TfL, borough and private land which would be capable of hosting EV rapid charging infrastructure. Under the scheme, chosen locations would be tendered to charge point operators who will bid for a concession contract to install, operate and maintain rapid charging points at their own cost. Rapids are ideal for off-street locations near arterial roads, service stations and car parks, due to their size.

Rapid chargers work in the same way as a standard floor mounted charger but charge at a more accelerated rate.

The standard rapid charging speed is currently 50kW, which can charge a vehicle to 80% full in 30 minutes, although Tesla currently offers an Ultra Fast 120kW with their proprietary 'Super Chargers'. In addition, technology company ABB has introduced the first public 150kW charger in the US.

- Considering the impact that the charging point will have on the street scene, especially due to the size of rapid charging points
- Considering locations based on whether they are in an appropriate position to service fleets and commercial delivery vehicles, for example, close to major road networks bringing traffic in and out of the borough
- Considering whether a rapid charging hub, normally consisting of 5 or more charging points, can be implemented
- Considering whether there is sufficient space for a feeder pillar or substation, if required
- Considering the available power capacity from the local grid and whether it can support a rapid charging point

Connector Types

	Image	Compatible with	Description
1		<ul style="list-style-type: none"> • Slow charging (Type 1 - 3kW) • Standard (Fast) Charging (Type 1 - 7-22kW) 	A five-pin plug with a clip
2		<ul style="list-style-type: none"> • Slow charging (Type 2 - 3kW) • Standard (Fast) Charging (Type 2 - 7-22kW) • Rapid charging (Type 2 – 43kW AC) • Rapid charging (Type 2 – Tesla 120kW DC) 	A seven-pin plug with one flat edge, this connector is typically found on EVs manufactured by European brands
3		<ul style="list-style-type: none"> • Rapid charging (CHAdeMO – 50kW DC) 	A round four-pin plug, this connector is only used for rapid charging points
4		<ul style="list-style-type: none"> • Rapid charging (Combined Charging System (CCS)– 50kW DC) 	Standardised by the EU, this connector is only used for rapid charging points

Slow Charging;

All plug-in electric vehicles can charge using at least connector numbers 1 and 2. Often home charging points will be compatible with the same Type 2 cable used for public charging, or be tethered with the Type 1 connector.

Ubitercity, for example, use a Smart Cable equipped with a Type 2 connector.

Standard/Fast Charging;

Connector numbers 1 and 2 tend to be found at destinations, such as car parks, supermarkets, or shopping centres – somewhere an electric vehicle will potentially be parked at for an hour or more.

The majority of fast chargers are untethered, though some home and workplace-based units have cables attached. The latter units mean only those vehicles that can use that connector type will be able to charge on them; in contrast to the more common use of a driver's own connector cable. Untethered units are therefore more flexible and can be used by any driver that has the correct cable.

Charging speeds from fast chargers will depend on the car's on-board charger, with not all models able to accept 7kW or more. These models can still be plugged in to the charging point but will only draw the maximum power accepted by the on-board charger. For example, a Nissan Leaf with standard 3.3kW on-board charger will only draw a maximum of 3.3kW, even if the fast charger is 7kW or 22kW.

Rapid Charging (connectors numbered 2, 3 and 4);

AC - only available on one or two electric vehicle models in the UK – more common is the Rapid DC option described below. Due to their high power, Rapid AC units are equipped with a non-removable tethered cable. Rapid AC chargers provide power at up to 43kW and use the Type 2 charging standard.

Users of rapid AC units select the Type 2 connector for their vehicle and use the tethered cable to plug the car in, rather than their own cable.

DC – This charging is the fastest and most powerful. It uses direct current instead of AC. Rapid DC chargers provide power at up to 50kW, using either the CHAdeMO or CCS charging standards. The DC connector charges at the same time as the AC connector and drops to a slower rate once charging reaches 80%. Users of rapid DC units select the appropriate connector for their vehicle and use the tethered cable to plug the car in, rather than their own cable.

Tesla's Supercharger network also provides Rapid DC charging but at a much higher rate of up to 120kW. While all Tesla models are designed for use with Supercharger units, many Tesla owners use adaptors which enable them to use a 50kW rapid unit fitted with a CHAdeMO connector. While these provide less power than a Supercharger, they are far more common in the UK and elsewhere.

CHAPTER 4

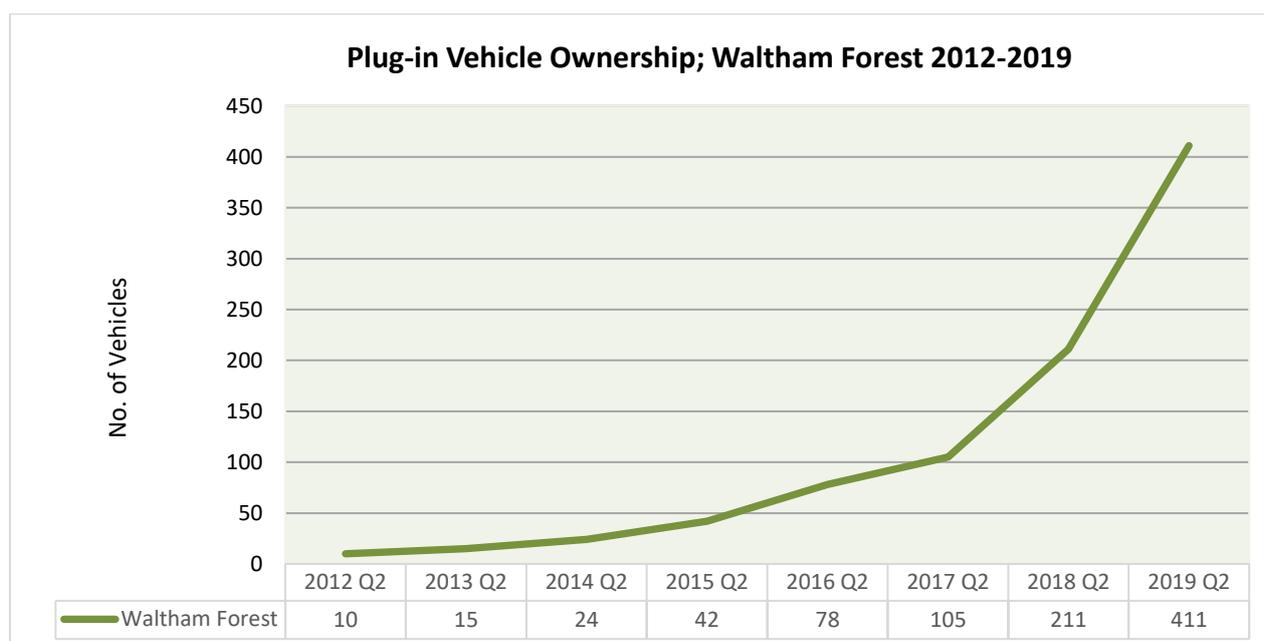
Current EV ownership, charging provision and demand

The latest Department for Transport figures show electric vehicle uptake across the country has been increasing steadily over the past 5 to 7 years, with 211,430 electric vehicles registered in the UK. The table below shows this increase in the UK, London and Waltham Forest.

	2012 Q2	2013 Q2	2014 Q2	2015 Q2	2016 Q2	2017 Q2	2018 Q2	2019 Q2
Waltham Forest	10	15	24	42	78	105	211	411
London	1,560	1,790	2,402	4,415	7,070	11,351	16,800	25,549
UK	7,210	10,116	16,012	39,581	70,671	108,843	157,785	211,430

Source: Department for Transport statistical data

The table above shows the number of plug-in vehicles licensed at the end of quarter 2 in the UK, from 2012 to 2019. Of the 25,549 vehicles registered in London (Q2 of 2019), only 1.6% (411 vehicles) are from within Waltham Forest. There is however, a clear and evident increase in electric vehicle ownership in the borough as highlighted by the graph below. In addition, with the introduction of the ULEZ in 2019 (Page 11), ownership of electric vehicles is likely to increase further.



Source: Department for Transport statistical data

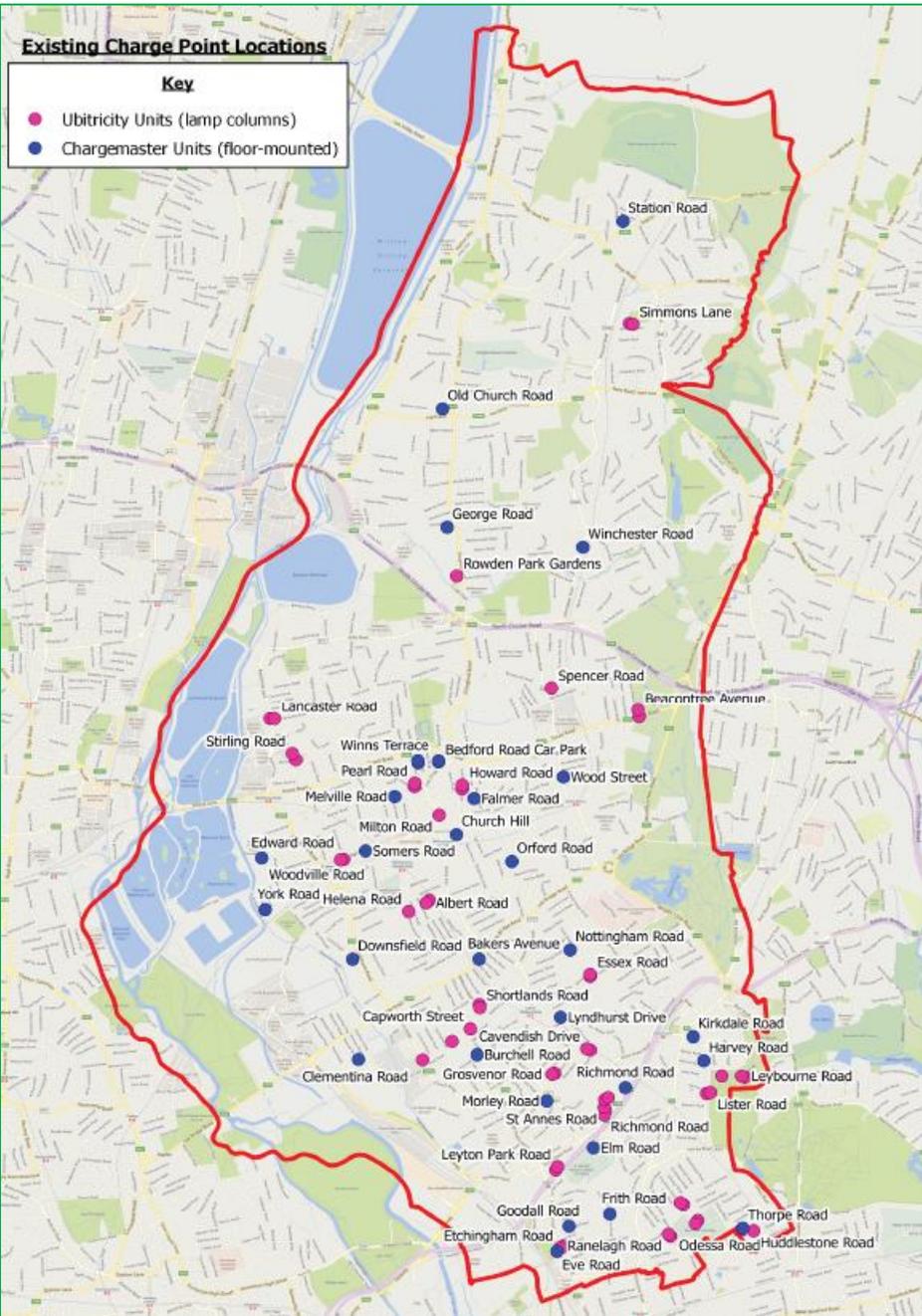
Review of LBWF's existing charging points

The 'Charging Point Locations' map overleaf displays existing charging points. The blue points are the standard floor-mounted charging point locations, operating on the POLAR network. The pink points show the locations of the lamp column residential charging units, operating on the Ubitricity network.

As ownership figures continue to rise, Waltham Forest will see a corresponding demand for charging points. The borough will endeavour to support this uptake by providing a greater number of reliable and user-friendly charging points across the borough.

Existing Charge Point Locations

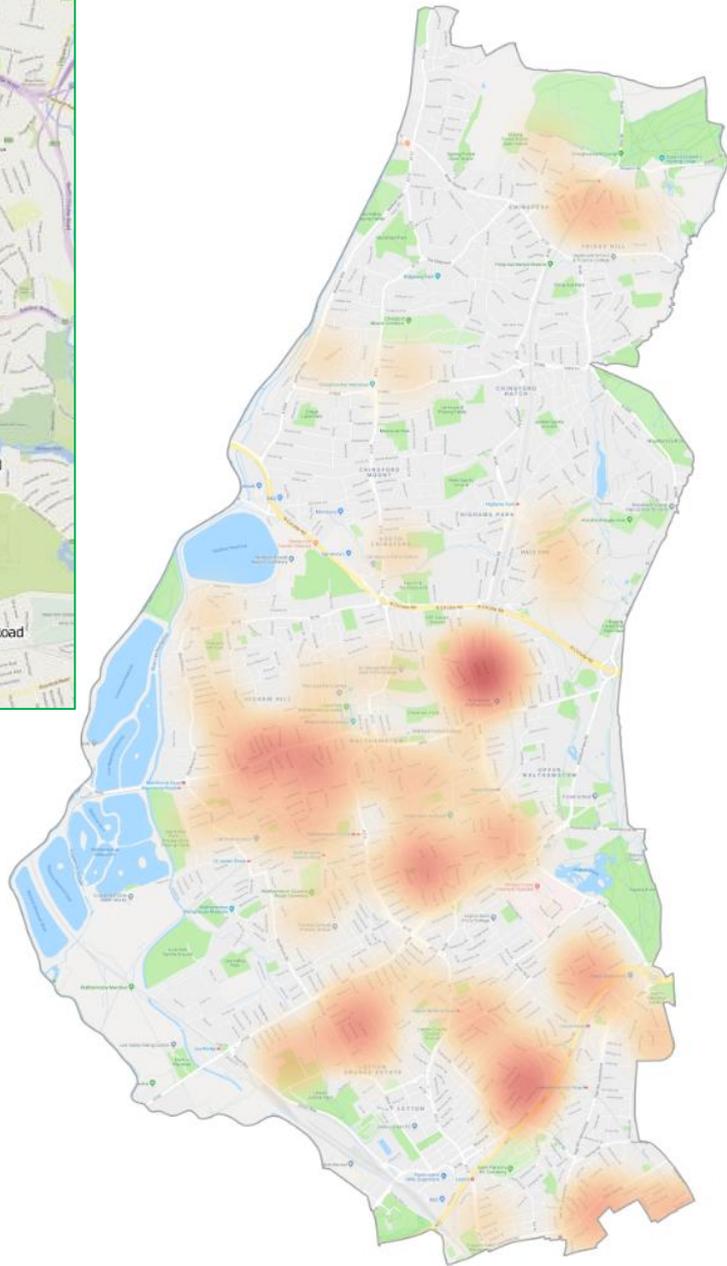
- Key**
- Ubitricity Units (lamp columns)
 - Chargemaster Units (floor-mounted)



Waltham Forest also plan on electrifying car club bays subject to funding. The intention is to install standard floor-mounted dual charging points in fixed car club bays, one for car club use and one for public use; this will increase the spread of charging points across the borough.

Demand Areas

The heat map to the right highlights the areas within Waltham Forest where demand for on-street electric vehicle charging points is highest, based on requests. Demand appears to be highest in the south of the borough, particularly around Walthamstow and Leytonstone. Demand data will help the borough to highlight focus areas for charging infrastructure and ensure supply can meet demand.



As is reflected by the ‘Existing Charging Point Locations’ map above, certain criteria such as demand and areas without access to off-street parking, will help us to prioritise where to install charging infrastructure.

Forecasts for future EV uptake

Electric vehicle ownership in Waltham Forest is forecast to rise rapidly in the next eight years, with an estimated 2,457 plus electric vehicles registered to Waltham Forest residents and businesses by 2025 (TfL ULEV Delivery Plan). This represents a huge rise in ownership levels in the borough from just 411 electric vehicles registered during Quarter 2 of 2019.

Borough Name	Baseline Scenario			High Scenario		
	2015	2020	2025	2015	2020	2025
Barnet	332	2,200	9,215	332	4,741	16,337
Richmond upon Thames	276	1,719	7,372	276	3,872	11,839
Hillingdon	243	1,598	6,764	243	3,469	17,541
Croydon	216	1,661	6,618	216	3,214	13,322
Westminster	204	1,314	5,593	204	2,893	7,832
Wandsworth	195	1,310	5,460	195	2,793	10,022
Redbridge	173	1,208	4,970	173	2,506	11,261
Ealing	157	1,263	4,963	157	2,373	11,270
Brent	153	1,208	4,768	153	2,293	8,551
Harrow	153	1,078	4,428	153	2,226	10,718
Bexley	142	1,128	4,440	142	2,127	10,247
Islington	137	916	3,831	137	1,964	5,397
Camden	131	1,060	4,169	131	1,984	6,151
Kensington and Chelsea	127	802	3,431	127	1,794	5,917
Tower Hamlets	123	871	3,553	123	1,784	5,567
Bromley	119	1,053	4,034	119	1,860	12,677
Enfield	110	966	3,695	110	1,710	10,835
Kingston upon Thames	101	716	2,933	101	1,468	7,453
Haringey	98	716	2,897	98	1,433	6,295
Hammersmith and Fulham	85	577	2,390	85	1,216	4,615
Sutton	79	688	2,648	79	1,224	8,103
Hounslow	78	728	2,741	78	1,235	7,070
Waltham Forest	71	650	2,457	71	1,117	6,512
Havering	67	788	2,777	67	1,162	8,805
Hackney	64	536	2,080	64	981	4,018
Lambeth	56	476	1,840	56	864	5,098
Greenwich	53	444	1,714	53	808	6,065
Merton	52	506	1,890	52	839	5,105
Southwark	48	435	1,654	48	758	3,636
Lewisham	36	386	1,398	36	599	5,298
Newham	31	311	1,136	31	501	4,157
Barking and Dagenham	21	309	1,038	21	399	4,210
City of London	16	106	447	16	232	525

Table showing projected figures of electric vehicles in London boroughs by 2025. Source: TfL ULEV Delivery Plan

CHAPTER 5

Key Targets and Objectives for the Next 3 -5 Years

Where are we now?

The London Borough of Waltham Forest is seeing a gradual growth in electric vehicle ownership and by 2025 expects to be supporting over 2,400 electric vehicles (TfL ULEV Delivery Plan).

By Spring 2020, Waltham Forest will have installed 31 standard charging units for public charging and 65 lamp column charging units for residential charging, with further sites proposed for 2020.

To ensure that the footway is not compromised for pedestrians and other footway users, one of the Council's main design criteria will be installing all standard floor-mounted charging units on the public highway.

Waltham Forest have been running an electric vehicle charging point demand survey since February 2018 and to date has received 382 responses. The Council will continue to communicate with residents to ensure that they are installing charging infrastructure where there is demand. The link for the survey is provided here: <https://www.surveymonkey.co.uk/r/EV-EOI>

What do we want to achieve and deliver?

The following 6 objectives are tailored to ensure targets are realistic and achievable.

Objective 1: Continue to deliver an electric vehicle charging network that meets the demands of residents, businesses and visitors in the context of wider transport aims

- Residential areas
 - Provide a mixture of lamp column and standard 7kW chargers;
 - Install lamp column charging points in clusters of 2 or 3 to ensure points are accessible for residents;
 - Respond to local demand and install in locations identified by residents;
 - Understand demand on housing estates and consider the provision of charging infrastructure where appropriate;
 - Ensure that charging units are included for consideration at the planning stage as part of all new housing developments, in line with the London Plan, and all housing re-developments.
- Town centres and other key destinations
 - Ensure charging points are installed in high visibility, high footfall areas without compromising road or pavement space – all standard units will be placed on the public highway;
 - Install a mixture of 7kW standard charging units and rapid charging units;
 - Identify opportunities for chargers near leisure centres, supermarkets and places of work;
 - Develop sites with a minimum capacity of two vehicles per site;
 - Utilise Council owned car parks and install at least 1 charging point in each car park.

- Car club vehicles
 - Gradually install charging points in fixed car club bays and providing for flexible car clubs, subject to funding availability.
- Freight and Servicing
 - Work in partnership with TfL to install rapid charging points;
 - Install 20 rapid charging units by 2025, with a further 10 units installed between the Low Hall Depot site, Leyton Jubilee Park and Jubilee Sports Ground;
 - Ensure Low Hall Depot has the appropriate infrastructure in place to charge an electric fleet that will service the borough;
 - Ensure the Town Hall has enough infrastructure in place to provide charging for residents, staff and businesses;
 - Using electric cycles to revolutionise deliveries.
- Taxis
 - Provide rapid charging both in off and on-street locations, with consideration to locations near taxi ranks.
- To provide for electric vehicles in the wider context of reducing car ownership, thereby prioritising those who need to use vehicles; this includes businesses, taxis and Car Clubs.
- To ensure Waltham Forest stay on top of emerging technologies and charging options as they develop. This will help to ensure that infrastructure remains fit for purpose and continues to meet the needs and demands of users

Objective 2: Designing sites that take into consideration all road users

Selecting and designing sites correctly is essential when building a charging network, including:

- **Ensuring that the location of the charging point does not take valuable pedestrian space;** when designing a new site, the start point will be for the charging point to be positioned in the parking bay, on the public highway, rather than on the footway to ensure efficient footway widths are maintained. This is the most appropriate location for technology that is provided for vehicles. If pavements are obstructed by street furniture, pedestrians may be forced on to the road creating difficulties for people with reduced mobility or visual impairment. The Healthy Streets initiative, explained in Chapter 2, emphasises the importance of creating environments that are safe and inviting for journeys made on foot or by cycle; charging infrastructure should not jeopardise this.

In order to ensure no net increase in street clutter, consideration could be given to transforming redundant electrical street furniture into electric vehicle charging points, such as disused phone boxes and parking meters.

Trailing cables are a potential trip hazard for pedestrians and footway users. Sites should be designed in a way that minimises trailing cables and considers pedestrian safety.

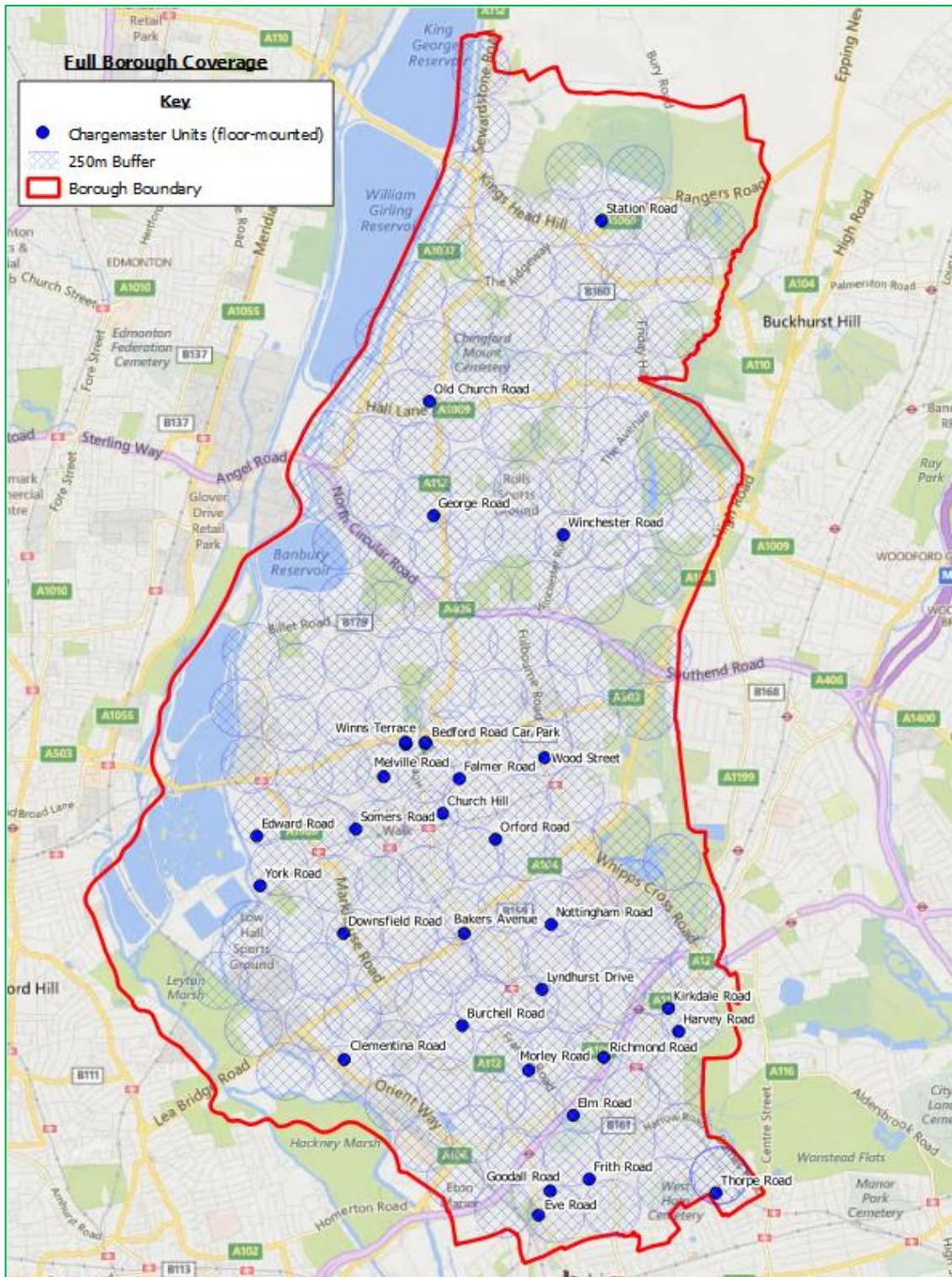
- **Ensuring charging points are accessible;** accessibility covers a whole host of aspects. For example:

- Proximity of the charging point to traffic; will using the charging point in its chosen location contribute to traffic or affect other road users?
- Signing and wayfinding; how easy are the charging points to find?
- Are the charging points installed in locations which are closed off to the public at certain times of the day?
- Are we installing enough units at each location to account for the number of users who may require them?

Objective 3: Ensure 80% of residents and businesses are within 250m of a charging point by 2025

The map below shows that 163 buffer zones, not including reservoirs and open space, would be required to give suitable coverage to Waltham Forest, and achieve our target of having 80% of residents within 250m walking distance of a charging point. Waltham Forest aims to install a standard floor-mounted 7kW charging point or a rapid charging point within each of these buffer zones; these will also be supplemented by lamp column charging points. The first phase of units operating on the Chargemaster POLAR network already cover 28 of these 163 zones.

250m takes around 2-3 minutes to walk, depending on walking speed



Objective 4: Ensure the charging network has capacity for further expansion

The focus of Objective 4 is ensuring that the network installed now is easily expandable in the future, when electric vehicle uptake increases and there is more demand for suitable infrastructure. As charging infrastructure is slowly integrated into our transport network, it will be imperative to monitor usage of charging points to determine whether sites are appropriate and to make certain that Waltham Forest is in a position to expand the network, whilst ensuring charging points are installed in optimum locations.

When expanding the charging network, consideration should be given to electric cycles. These are easy to charge as only a standard plug is required; however, the bike may need to be charged whilst out and about. Charging provisions could potentially be introduced next to cycle parking spaces or electric vehicle charging points could be fitted to accommodate cycles as well, by having a socket fitted within them.

Objectives include:

- Install active and passive charging points in new developments to account for future growth and take-up. Active charging provision refers to points which are ready to use, and passive charging provision refers to cabling being prepared so that chargers can be added when demand increases in the future;
- Monitor EV charging usage data to ensure locations are suitable and charging points are being used;
- To review lamp column positioning once trials have been implemented, to see whether going forward, standard practise should involve lamp columns being installed at the front of the pavement;
- To embed capacity for electric vehicle infrastructure into other Highways and Transport projects and programmes and ensure these are aligned with the electric vehicle objectives as far as possible, to encourage and support further expansion;
- To ensure infrastructure meets demand, considering expanding the network to include charging facilities for alternative modes of transport, such as electric cycles.

Objective 5: Encourage the uptake of electric vehicles through trials, initiatives and public engagement

Installing a suitable charging network is only one aspect of this strategy; encouraging the uptake of electric vehicles within Waltham Forest is also crucial to seeing a change in air quality and to really experience the benefits of green and sustainable travel. In order to encourage car owners to make the transition to an electric vehicle, it is important to engage with residents and business owners to understand any concerns and to use their knowledge of the borough to identify potential charging point locations.

Objectives include:

- Seek expressions of interest from the public for new charging points;
- Use trials to familiarise residents and users with the technology and to raise public awareness;
- Review and update the strategy annually to ensure delivery of actions and targets;
- Work with businesses within the borough to promote workplace charging;
- Encouraging the use of electric cycles.

Objective 6: Identify income opportunities that will lead to the provision and maintenance of electric vehicle charging points becoming cost neutral to the borough

The provision of electric vehicle infrastructure should remain cost neutral wherever possible so as not become a financial burden on the council. Waltham Forest should incorporate electric vehicle charging requirements as part of policy discussions and the new Local Plan and should make use of all available funding and revenue including government grants, partnerships with private companies which provide profit shares and fees and making use of planning powers (Section 106).

Objectives include:

- Maximising use of funding opportunities (TfL, GULCS, OLEV);
- Develop a pricing strategy for points funded by the borough to ensure maintenance costs are covered;
- Waltham Forest can use Council owned assets for charging points, for example, car parks and housing estates.

Targets Summary

Period	Charging points targets			Other key actions
	Standard charging units (aiming for 2 bays per location)	Lamp column chargers in clusters of 2 or 3	Rapid chargers	
by 2025	79	300	30	Review the strategy to ensure targets have been met
Total = 409 over the next 5 years				

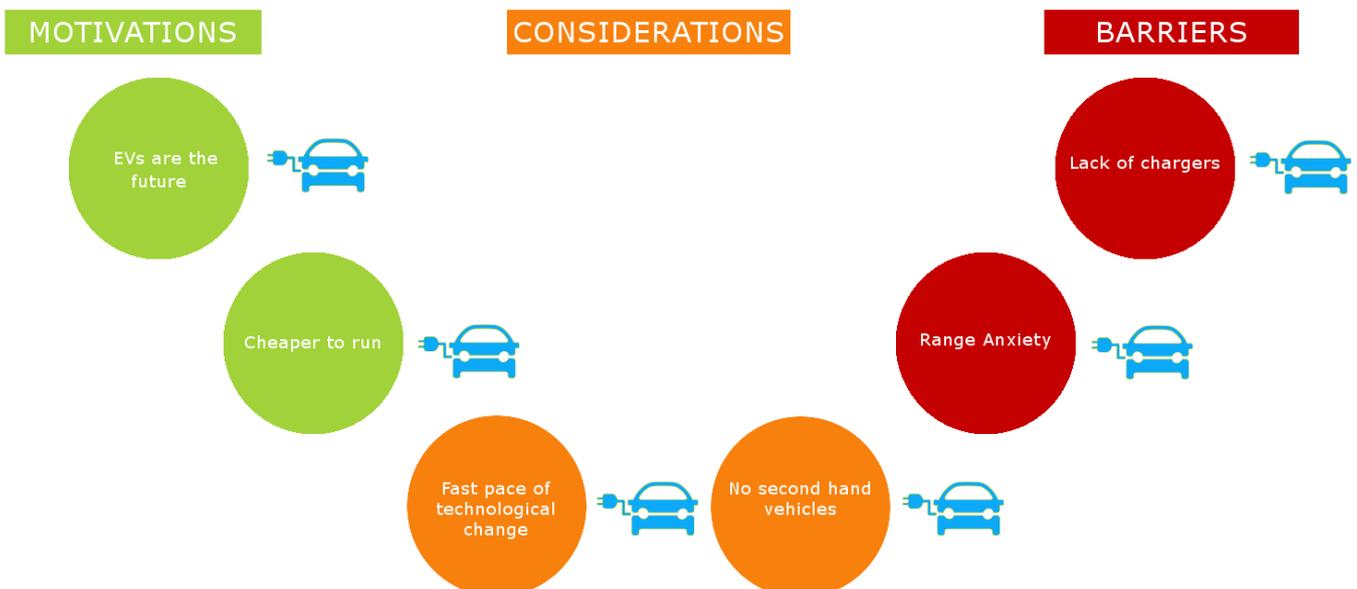
Key considerations for locations

Potential factors that may affect demand

When building a charging network, there are factors which may influence uptake and consequently demand for charging points. These challenges are presented below. In order to overcome them, the borough must engage with residents and businesses to raise awareness and increase understanding.



Considerations which may influence demand



Current CPZ Permit Data

When prioritising next locations and the future network, current CPZ permit data is useful to consider.

CPZ resident permit data from August 2018 to September 2019 (42,708 total permits issued), highlights the following CPZ areas as having the highest proportion of lower emitting vehicles:

- Queens Road/ Boundary Road
- Fulbourne Road North
- Cann Hall East
- Market East
- Market West

CPZ business permit data from July 2017 to June 2018 (667 total permits issued), highlights the following CPZ areas as having the highest proportion of lower emitting vehicles:

- Leytonstone East
- Grove Green West
- Market East

This data could assist Waltham Forest in locating areas which may have higher demand for charging infrastructure.

Low emitting vehicles are categorised as follows:

Vehicles that were registered before 1 March 2001 are charged according to the engine size (CCs). Vehicles registered after 1 March 2001 are charged according to its emission category (g/km).

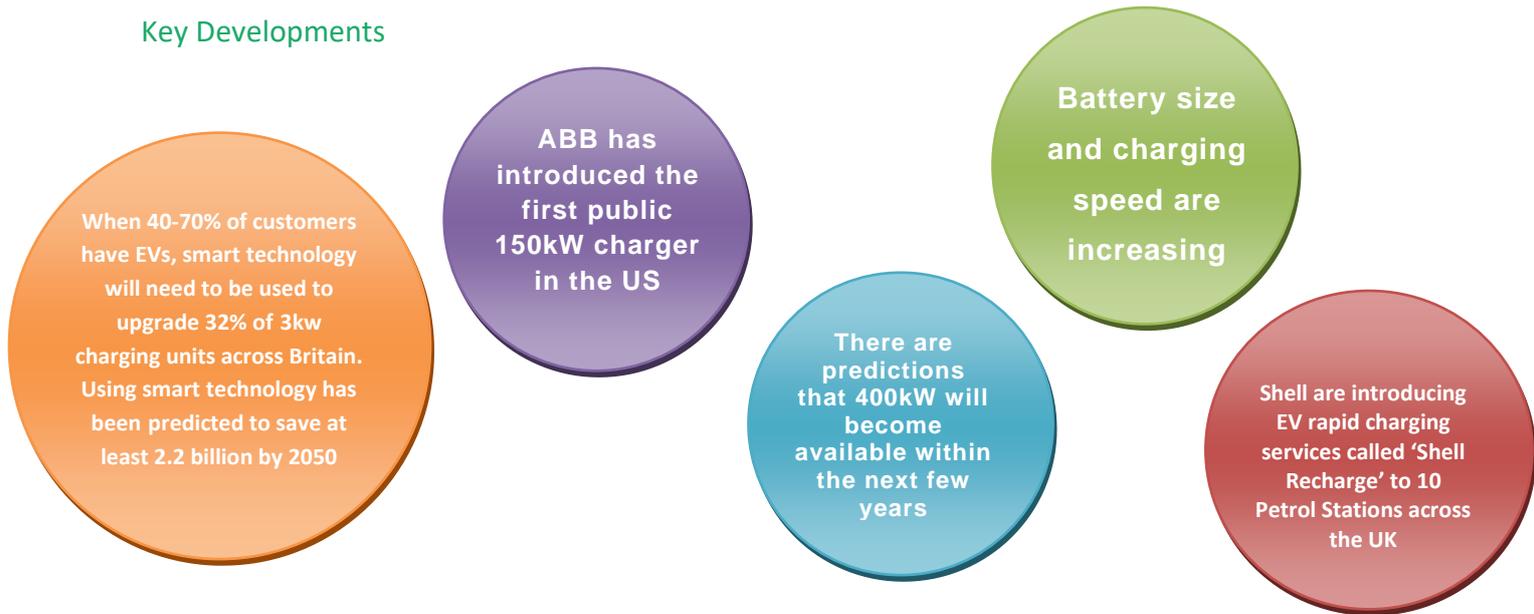
	Vehicle type – engine size/CO ₂ emissions (g/km)
Category 1	Up to 100 g/km
Category 2	101 – 170g/km or up to 1549cc
Category 3	Over 170g/km or 1549cc

CHAPTER 6

Key Developments and Emerging Technologies

Objective 1, to deliver an electric vehicle charging network that meets the demands of residents, businesses and visitors, will involve keeping on top of emerging technologies and charging options as they develop, to ensure infrastructure remains fit for purpose and meets the needs and demands of users. With advances in technology, some of which we are already witnessing, the charging needs of those within Waltham Forest may change.

Key Developments



Fast Charging

What is Fast Charging?

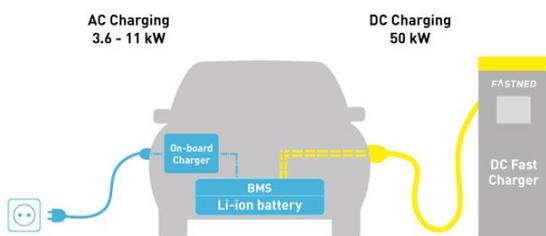
All batteries, including those in electric vehicles, use Direct Current (DC) for charging and discharging. But the electric grid delivers Alternating Current (AC). AC from the grid needs to be converted to DC so it can be used to charge the battery; this is done by an AC/DC converter.

This AC/DC converter is part of what we call a charger. Chargers can either be integrated into the vehicle as an onboard charger, or can be external to the vehicle (for example, a fast charger). Today, virtually all electric vehicles have a small onboard charger. A cable may be used to connect the onboard charger to a regular AC socket at home or can be plugged it into a charging point. The charging point delivers the AC required for the onboard charger to charge your vehicle battery. The on-board converter however is limited in power for reasons of cost, space and weight, meaning the process of re-charging your car usually takes several hours.

Fast charging is different....

An external charger that does the AC/DC conversion can be a lot bigger, heavier, more complex and more expensive than an onboard charger, however it is also much faster. That is why they are usually referred to as 'DC fast chargers' or just 'fast chargers'.

DC charging is capable of charging to 80% the electric vehicle's battery in less than 20 minutes for most cars, making the electric vehicle charging process much faster than the normal charging process.



This diagram highlights the difference between AC charging and DC fast charging, which communicates with the battery management system within the vehicle directly, providing faster charging speeds.

The technology surrounding charging an electric vehicle is rapidly being developed and altered. It will be imperative to maintain an understanding of these changes as they arise and whether they will influence our charging network and the way in which electric vehicle users charge within the Borough.

