



**Transport for London**

**London Freight Consolidation Feasibility  
Study**

**Final Report**

**07/02/19**

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## Executive Summary

### Overview

London has been growing at a high rate and its population is expected to reach 10 million by the 2030s, generating an additional six million journeys every day. The city now faces several significant challenges over the next 25 years to support this growing population, maintain its competitiveness, tackle pollution and improve its liveability.

London's continued success critically relies on safe, reliable, sustainable and efficient goods delivery and servicing. Currently, 90 per cent of all freight is carried on the Capital's roads. Freight vehicles account for around 20% of motorised vehicle kilometres travelled both in London and in central London. During the AM peak, freight traffic accounts for around a third of the total traffic in central London.

The Mayor's Transport Strategy and the London Plan both refer to the need to introduce consolidation solutions to minimise the impacts of freight. The MTS calls for 'a strategic consolidation and distribution network' and the London Plan states 'sufficient capacity for industry and logistics should be identified and protected, including last mile distribution, freight consolidation and other related service functions'.

### Consolidation Models

Transport for London (TfL) commissioned this study to identify appropriate models for consolidation in London – both physical and behavioural. Once identified, the costs and benefits of each model, plus their operating conditions and policy framework, were assessed to identify parameters for selection of potential sites.

A combination of desktop reviews and stakeholder interviews resulted in the examination of six different consolidation models:

- Opportunity area – enforced and voluntary participation in consolidation
- Network of consolidation centres serving Central Activities Zone (CAZ)
- Preferred suppliers
- Micro consolidation / last mile
- Outer London town centre
- Technology solutions

A profile for each model type has been produced and covers: description and type of model, relevant examples, scale, typical profile, vehicle type to service the site, regulatory framework, financial support required, target sector, market location, consolidation locations, supporting measures, stakeholder feedback, appraisal and recommendation.

Key recommendations relating to each model are shown in the following table:

Model	Pursue further?	Recommendations
<p><b>Opportunity area – enforced / voluntary participation</b></p> <p>The focus of this model is on an opportunity area, which provides a blank canvas for two scenarios to be tested: 1) enforced participation and 2) voluntary participation</p>	<p>Yes</p>	<p>Enforced participation model <b>should be pursued</b> alongside the voluntary model and they need to be explored in tandem. The voluntary model should be pursued even if the enforced model is not considered possible.</p> <p>Strong potential impact for vehicle reductions from both models (less so for voluntary participation).</p> <p>Political will required to implement these models will be high. The financial support will be significant for the voluntary model but with enforced participation being mandatory the right charging regime could achieve a break-even scenario. Building in mandatory consolidation to relevant policy and strategy documents needs to start now.</p> <p>Potential site locations include the Isle of Dogs and Old Oak Common.</p> <p>The potential to create a BID for the areas should be explored further as a mechanism to ensure participation and control delivery and servicing operations.</p>
<p><b>Network of consolidation centres serving CAZ</b></p> <p>The focus of this model is on a network of consolidation centres located on the North and South circular roads or as geography, SILs, LSILs and supply chains dictate</p>	<p>No</p>	<p>A network of consolidation centres serving CAZ <b>should not be pursued</b>. It is not possible, or efficient, to try and provide a one size fits all solution. The variety of supply chains, different sectors and end customers is too vast, dense, complex and nuanced for a network of consolidation centres to be able to effectively cater for all requirements. Shortage of available land for logistics activity is another limiting factor.</p> <p>Political will and policy changes required is extremely challenging given the scale of what would be needed (e.g. wholesale change of long-established supply chains, the buy in of Boroughs and the GLA, new regulatory framework and financial commitment to underwrite the operation of the consolidation centres. Restrictions on HGV and van (delivery) movements during peak periods will need to be introduced.</p> <p>A better approach for the CAZ area is a package of measures including: consolidation across different sectors (i.e. food, construction, waste and public sector), BID consolidation, micro-consolidation, preferred suppliers, development-</p>

		lead consolidation and retiming deliveries.
<p><b>Preferred Suppliers</b></p> <p>The focus of this model is adopting a preferred list of suppliers to serve a geographical area</p>	Yes	<p>Using preferred suppliers and micro-consolidation centres for multi-tenanted office buildings <b>should be pursued</b>. City of London has set a precedent with 22 Bishopsgate and this should be rolled out as a planning condition to other similar developments.</p> <p>Supplementary Planning Guidance will be required.</p> <p>Should also be retrospectively applied to existing (appropriate) developments.</p>
<p><b>Micro-Consolidation / Last Mile</b></p> <p>The focus of this model is providers of last mile solutions such as micro consolidation depots, mobile consolidation options served by cycle logistics and electric vans</p>	Yes	<p>The concept of micro consolidation centres and last mile solutions <b>should be pursued</b> further. These are a proven and effective way of reducing the number of freight delivery vehicles. There is scope to expand the Gnewt style Portering initiative (see case study in Appendix B) to other locations.</p> <p>The biggest barrier to implementation is finding suitable premises and their subsequent cost. TfL and Boroughs should work together to identify potential locations such as non-traditional logistics facilities including car parks, basements of large office blocks and shopping centres and undeveloped land.</p> <p>Consolidation centres must be serviced by zero emission vehicles to ensure air quality benefits are maximised. The site locations will need to have a supply of charging points and within accessible reach of the geographical area it is intending to serve.</p>
<p><b>Outer London Town Centre Model</b></p> <p>The focus of this model is existing outer London town centres and retrofitting consolidation solutions</p>	Yes	<p>The appraisal findings indicate strong potential impact for vehicle reductions and this model <b>should be pursued</b>.</p> <p>Whilst the political will required is high it is considered feasible. The financial support required is also significant, but if participation can be made mandatory and with the right charging regime a break-even scenario should be possible.</p> <p>The level of development occurring in some outer London town centres (e.g. Croydon, Barking and Kingston) could make it viable for a consolidation scheme to operate.</p> <p>Further work may be required to look at necessary infrastructure, operational, financial and contractual requirements to ensure buy-in and commitment.</p>
<b>Technology</b>	Yes	Technological advances in data platforms should



<p><b>Solutions</b></p> <p>The focus of this model is to consider the solutions that already exist and what is coming soon</p>		<p>enable greater functionality and increase the potential for consolidation including en-route load consolidation as operators are able to collect / deliver each other’s consignments (if they collaborate).</p> <p>Technology will also continue to drive purchasing habits, increasing demand and expectation for more instantaneous delivery.</p> <p>TfL needs to work with industry and help facilitate the uptake of technology to improve efficiency. Understand the potential impact of technological advancements on the urban environment and society and regulate to ensure negative impacts are minimised. Policy making, regulations and land-use planning will need to be more agile to facilitate technological change and the implications of data protection, sharing, accessibility and commercial sensitivity will need to be collectively addressed to overcome them as potential barriers.</p>
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**Next steps**

This study provides a high-level overview of the feasibility of implementing consolidation models in London to help reduce traffic congestion and improve air quality, safety and health.

Key recommendations from the consolidation model assessments include:

- The following models should be pursued in more detail: enforced / voluntary participation; preferred suppliers; micro-consolidation / last mile; outer London town centres; and technology solutions as examples of good practice already exist. Transferability and scalability of these models is an option
- Network of consolidation centres (e.g. located near the north and south circular roads) should not be pursued as the variety of supply chains, different sectors and end customers is too vast, dense, complex and nuanced for a network to be able to effectively cater for all requirements. Shortage of available land for logistics activity also limits this option
- An integrated package of measures including consolidation that considers different sectors (where it adds value) should be considered
- Further work is required to carry out a detailed assessment of the necessary infrastructure, operational financial and contractual requirements to ensure buy-in and commitment for future consolidation solutions.

## 1.0 Introduction

### 1.0 Project Overview

- 1.0.1 WYG and PBA were commissioned by Transport for London (TfL) to deliver the London Freight Consolidation Feasibility Study. The aim of the study is to provide an evidence base to inform the development of freight management policy for the Mayor's Transport Strategy and the London Plan.
- 1.0.2 The objectives of the study are to:
- identify appropriate models for consolidation in London – both physical and behavioral
  - provide a robust assessment of their costs and benefits
  - identify the operating conditions and policy framework which increase their potential for success
  - identify parameters for site selection
  - subject to the aforementioned objectives, identify potential sites.
- 1.0.3 An assessment of the consolidation models has been made based on existing literature, data, the project team's knowledge and experience and engagement with stakeholder. A high-level appraisal of the impact of the different consolidation models has also been made. This report also provides a summary of the key guiding principles, assessment parameters and consolidation models to be assessed as well as a summary of the stakeholder engagement. A number of best practice case studies have also been produced and summaries are provided in the appendices.

### 1.1 Consolidation Definition

- 1.1.1 Consolidation is the action or process of combining a number of things into a single more effective or coherent whole. For the purposes of this report the act of consolidation is specifically looking to provide a reduction in the number of delivery vehicles transporting goods on the road network.

### 1.2 Guiding Principles

- 1.2.1 Key points that were considered to help shape and guide the study included, but are not limited to:
- Blue sky thinking – nothing off the table, but needs to be assessed from a grounded perspective of political, financial and objective perspective
  - Think about what we could achieve in the future and what steps (policy / strategy) we need to start taking now to make it happen
  - Potentially highly interventionist / regulatory – road user charging, zoning London deliveries, using planning conditions to dictate terms, forcing suppliers / hauliers to work together, TfL owning and operating assets, applying additional charges for same day/next day delivery, forcing retimed deliveries through restrictions.
  - Key objective – reducing number of vehicles on the roads especially at network peak times. The target is to reduce freight traffic in the central London morning peak by 10

per cent on current levels by 2026, and to reduce total London traffic by 10-15 per cent by 2041

- Also, consider the kerbside impact - i.e. increased dwell times.
- Risk and reward – who benefits, who pays
- Freight now similar in some way to the old bus industry – continually increasing service levels – now potential means more intervention in needed to achieve TfL objectives
- Model assessment based on parameters including geography, objective, outcome, market sector, technology, type of goods – ambient, food etc.

### 1.3 Parameters

1.3.1 The parameters which form the basis of the appraisal are:

- **Type** – Consolidation Centre, Procurement, Preferred Supplier, Delivery Point etc
- **Scale** – Size, Flexibility, Operating Parameters (Premises, Vehicles, Operatives)
- **Policy Objective** – Congestion, Road Safety, Security, Place, Economy, Emissions
- **Regulatory Framework** – Statutory Instrument, Bye Law
- **Financial Support** – Primary (subsidy), Secondary (revenue), Tertiary (congestion charge)
- **Target Sector** – Retail, Office, School, Public Sector, Hospitality, Domestic/personal
- **Market Location** – CAZ, Outer London Town Centres, Opportunity Areas, Business Districts
- **Consolidation Location** – SILs, LSILs, North & South Circular, Within CAZ or other town centre, Proximity of TRN / Highways England routes

### 1.4 Consolidation Models

1.4.1 Several consolidation models were put forward for further development and assessment along with a baseline position. At this stage, no future predictions are included, as this would require more detailed analysis of London Government growth forecasts and how this could influence logistics activity in the Capital. The models developed for this study cover:

- The cost of consolidation centre operations
- Impact of consolidation on Opportunity Area delivery vehicle flows (case study: Old Oak Common)
- Impact of consolidation on Central Activities Zone (CAZ) delivery vehicle flows
- Outcome of using a micro consolidation centre
- Impact of consolidation on suburban centres (case study: Croydon)
- Cost of delay on road users due to on-street deliveries and
- Estimation of CO<sub>2</sub>e emissions and air quality factors for options

0.	<p><b>Name:</b> Baseline position</p> <p><b>Description:</b> Where will we be in ten years' time - i.e. what measures will likely be in place in London: ULEZ – uptake in low/zero emission vehicles, potential new road user charger scheme (time, route, vehicle based), tougher Safer Lorry Scheme. Plus the extent to which consolidation occurs naturally through supply chains and how this may develop further. This baseline position will likely mean that AQ is much less of an issue, but congestion will still be high</p>
1.	<p><b>Name:</b> Opportunity Area</p> <p><b>Description:</b> Focus on an Opportunity Area such as the Isle of Dogs or Old Oak. The reason being it can be considered as a new area - i.e. a blank canvas. Two scenarios to be considered:</p> <ul style="list-style-type: none"> <li>a) Enforced participation in consolidation by banning all other types of delivery</li> <li>b) Voluntary participation in consolidation with a public subsidy provided</li> </ul>
2.	<p><b>Name:</b> Network of Consolidation Centres Serving CAZ</p> <p><b>Description:</b> Develop a network of consolidation centres located on the North and South circular roads or as geography, SILs, LSILs, supply chains dictate to serve CAZ. Consolidation funded with subsidy plus increased charging regime for non-consolidated deliveries.</p>
3.	<p><b>Name:</b> Preferred Suppliers</p> <p><b>Description:</b> Preferred suppliers approach – area based, focussing on multi-tenanted buildings using planning conditions to enforce use of preferred suppliers for business supplies and personal deliveries. Consider locations such as Old Oak and More London. Look as Canary Wharf as a potential existing example.</p>
4.	<p><b>Name:</b> Micro Consolidation / Last Mile</p> <p><b>Description:</b> Focus on micro-consolidation and last mile logistics. Consider systems such as 'Gnewt 2.0' with cycle logistics, UPS mobile solution etc. Locations to be considered include CAZ and town centres e.g. Brixton</p>
5.	<p><b>Name:</b> Outer London Town Centre</p> <p><b>Description:</b> Focus on existing outer London town centres. Retrofitting consolidation solutions. Consider locations such as metropolitan or major centre e.g. Kingston, Croydon, Barking, Sutton.</p>
6.	<p><b>Name:</b> Technology Solution</p> <p><b>Description:</b> What technology solutions already exist and what is coming in the future e.g. virtual consolidation, real time data, load sharing, 3D printing, drones and robots. What impact will they have on deliveries in particular when combined with consolidation. Less quantifiable model assessment – more of a research and qualitative appraisal.</p>

NOTE: We will also include commentary on other consolidation models such as multi-modal (rail and water) options, but not carry out a formal assessment.

## 2.0 Existing and Proposed Policy Measures

### 2.1 Baseline Position

- 2.1.1 **Description:** Where will we be in ten years' time - i.e. what measures will likely be in place in London: ULEZ – uptake in low/zero emission vehicles, potential new road user charger scheme (time, route, vehicle based), Direct Vision Standards, tougher Safer Lorry Scheme. Plus, the extent to which consolidation occurs naturally through supply chains and how this may develop further. This baseline position will likely mean that air quality is much less of an issue, but congestion will still be high.
- 2.1.2 A summary of existing and proposed policy measures that influence deliveries in London is provided below along with a look at industry trends and changes over the next ten years. This is then combined to provide a vision of what delivering in London could look like in 2027 to provide a baseline scenario for the study.

### 2.2 Existing and Proposed Policy Measures

- 2.2.1 **Congestion Charging Zone:** The Congestion Charge is an £11.50 daily charge for driving a vehicle within the charging zone between 07:00 and 18:00, Monday to Friday. A number of exemptions and discounts are available including for cars and vans <3.5t that meet Euro 5 emission standards.
- 2.2.2 **Safe Lorry Scheme:** Vehicles over 3.5 tonnes (with some exemptions) are required to be fitted with Class V and Class VI mirrors giving the driver a better view of cyclists and pedestrians around their vehicles and have side guards to protect cyclists from being dragged under the wheels in the event of a collision. The scheme operates across London, 24 hours a day, seven days a week, covering the same area as the Low Emission Zone.
- 2.2.3 **Ultra-Low Emission Zone:** The Ultra-Low Emission Zone (ULEZ) is an area within which all cars, motorcycles, vans, minibuses, buses, coaches and heavy goods vehicles (HGVs) will need to meet exhaust emission standards (ULEZ standards) or pay a daily charge. The current proposals will see the most-polluting vehicles pay a daily charge to enter central London from 8 April 2019. This will be expanded across Greater London for heavy diesel vehicles, including buses, coaches and lorries, in 2020, and up to the North and South Circular roads for cars and vans in 2021. ULEZ will operate 24 hours a day, 7 days a week. ULEZ will require HGVs to meet Euro VI emission standards or pay a daily charge of £100. It will also require large and small vans to meet Euro VI (diesel) and Euro IV (petrol) emission standards or pay a daily £12.50 charge.
- 2.2.4 **Direct Vision Standard:** On 30 September 2016 the proposal for a Direct Vision Standard (DVS) for HGVs was launched. It was created to improve the safety of all road users, particularly vulnerable road users like pedestrians, cyclists and motorcyclists. The DVS will rate HGVs from 0 (lowest) to 5 (highest), based on how much a HGV driver can see directly through their cab windows, as opposed to indirectly through cameras or mirrors. Under the proposal, 0-star rated HGVs **without a safety permit** will be banned or restricted from entering London

from 2020, and by 2024 only those rated 3 star, or above, will be allowed into the city. These proposals are subject to consultation and review before implementation.

**2.2.5 Mayor's Transport Strategy 2018:** The main aim for the new Mayor's Transport Strategy (MTS) is that by 2041 80 per cent of all Londoners' trips will be made on foot, by cycle or by public transport – currently the figure is 64%. The MTS proposes a number of policies for deliveries and servicing, the most relevant to this study are:

- Proposal 15 Work with the boroughs, businesses and the freight and servicing industry to reduce the adverse impacts of freight and service vehicles on the street network. The Mayor aims to reduce the number of lorries and vans entering central London in the morning peak (07:00-10:00) by 10 per cent by 2026.
- Proposal 16 Improve the efficiency of freight and servicing trips on London's strategic transport network by reviewing the potential benefits of a regional freight consolidation and distribution network
- Proposal 17 Work with the boroughs, the Freight Forum, landlords and all parts of the supply chain, including the freight industry, BIDs and individual businesses, to improve the efficiency of last-mile deliveries and servicing
- Proposal 33 The Mayor, through TfL and the boroughs, will introduce regulatory and pricing incentives to support the transition to the usage of Ultra Low Emission Vehicles in London.
- Proposal 35 The Mayor, through TfL and the boroughs, and working with Government, will seek to implement zero emission zones in town centres from 2020 and aim to deliver a zero emission zone in central London from 2025

**2.2.6** The MTS also recognises that the existing congestion charge could change and will be kept under review particularly in light of advances in technology.

**2.2.7 The London Plan:** was published with minor suggested changes in August 2018 and is the Mayor's spatial development strategy. It provides strategic direction for new development in London, as well as direction for the Boroughs' Local Plan preparations and for individual planning decisions.

**2.2.8** The Plan includes references to freight within the following policies:

- Policy SD4 The Central Activities Zone (CAZ) – 'sufficient capacity for industry and logistics should be identified and protected, including last mile distribution, freight consolidation and other related service functions within or close to the CAZ and Isle of Dogs (North) to support the needs of businesses and activities within these areas'
- Policy D1 London's form and characteristics – 'new developments should be designed and managed so that deliveries can be received outside of peak hours and if necessary in the evening or night-time without causing unacceptable nuisance to residents. Appropriate facilities will be required to minimise additional freight trips arising from missed deliveries'
- Policy E4 Land for industry, logistics, and services to support London's economic function – promotes the maintaining maintenance of a sufficient supply of land and premises in different parts of London for industrial and related functions
- Policy E7 Industrial, intensification, co-location and substitution – encourages the intensification of business uses in Use Classes B1, B2 and B8 occupying all

categories of industrial land, and sets out how residential uses can co-locate with industrial uses to make the best use of land in line with Policy GG2

- Policy SI15 Water transport – supports increased use of wharves for freight, reactivation of wharves currently not in use and protects activities at wharves through the Agent of Change principle
- Policy T1 Strategic approach to transport – ‘The Mayor will work with partners to minimise freight trips on the road network including through consolidation. He will promote efficient and sustainable essential freight functions, including by road, rail, water and, for shorter distances, by bicycle’
- Policy T7 Deliveries, servicing and construction – promotes freight strategies in area-based plans, encourages railheads to be safeguarded, and ensures freight is catered for through design in line with the principles in this Action Plan and Healthy Streets

2.2.9 **T-Charge:** From the 23 October, a new charge will operate in central London (same area as the Congestion Charge). Cars, vans, minibuses, buses, coaches and heavy goods vehicles (HGVs) will need to meet minimum exhaust emission standards, or pay a daily £10 Emissions Surcharge (T-Charge) **in addition to the £11.50 daily congestion charge before discounts and excluding exemptions.**

2.2.10 **Road User Charging:** It is possible that by 2027 the congestion charge will be replaced with a more sophisticated system. The system would potentially change from being area based and a blanket charge to a road user charge based on parameters including time (of travel), distance, location, vehicle type and occupancy etc. Singapore is working towards such a system with implementation scheduled for some time in 2020.

## 2.3 Industry Trends and Changes

2.3.1 The points below are an attempt to summarise the vast array of factors shaping the industry both now and in the future:

- **Rising demand:** increasing population and quality of life
- **Customer demand:** pushing service levels up – next day delivery, same day delivery, one-hour delivery, and returns
- **E-commerce:** increasing demand, greater breadth of products and commodities, showrooms not shops
- **Connectivity and communication:** internet of things, sharing economy, smart cities
- **Mobility as a Service (MaaS):** changing perception of travel and transport in general
- **Open data and co-operative systems:** open source data, data sharing – collaboration between companies driving efficiency
- **Traction, fuel, emissions:** Alternative fuels – CNG, Hydrogen, Electric Vehicles (EVs) – battery technology, range improvements, quiet vehicles, zero emissions
- **Connected and autonomous vehicles:** lorry platooning on strategic roads, connected vehicles and infrastructure, autonomous (delivery) vehicles
- **Alternative delivery modes/types:** drones, droids and bots, peer to peer delivery, cycle and e-bike logistics, 24hr delivery as the norm
- **Consolidation, last mile:** multi-user shared consolidation facilities, micro-urban consolidation, delivery point consolidation, more last mile operations



- **Changes in point of delivery:** home, work, click and collect, local collection points, locker banks
- **Infrastructure:** reallocation of road and kerb space, loss of industrial land, mixing land uses – layered buildings, multi-storey warehouses, dynamic shared use loading bays
- **Warehousing:** greater automation, reducing manufacturing and fulfilment costs, 24hr operation
- **3D printing:** at warehouse, store, home, work – eliminating part of the supply chain
- **Policy and regulation:** road charging, Ultra Low Emission Zone, Direct Vision Standard, London Lorry Standard, autonomous vehicles only in urban areas

2.3.2 PBA completed a study for TfL focussing on industrial land supply in London. The study involved stakeholder engagement on a range of topics some of which are relevant to this study. The TfL project sponsor has confirmed they are happy for the relevant stakeholder feedback to be used for this study, although it would need to remain internal within TfL. Stakeholders engaged included logistics and distribution companies, freight forwarders, pallet networks, construction logistics companies, retailers, service providers, manufacturers, developers, industry associations and academics.

2.3.3 A summary of the relevant feedback received from industry stakeholders is provided in the following table.

**What changes in the next 10 – 20 years will influence your business – industry, suppliers, customers, technology, legislation?**

- The delivery market is / will potentially become saturated – numerous companies, ever increasing demand and increasing service levels - i.e. next day, same day, 2- hour delivery – coupled with finite and reduced road and kerb space could mean authorities may need to regulate to reduce demand or ensure businesses collaborate
- Likely industry trends: more online/e-commerce, more click & collect – potentially leading to more mini urban consolidation - i.e. small-scale central warehousing, potentially shared facilities where delivery vehicles can re-stock and go again
- New delivery methods will keep coming forward - i.e. peer-to-peer delivery, delivery bots and drones – although there is some scepticism on the role of drones in dense urban areas. Likely more use of EVs and cycle logistics depending on sector and products
- General thought that there will be more IT integration and simplified systems – Uber style functionality being adopted by the logistics industry enabling slicker supply chains and fulfilment
- Legislation such as ULEZ and DVS standards will have a bearing on fleet renewal. Stakeholders felt clarity was needed as it was creating uncertainty in the industry and timescales were relatively short and not necessarily in tandem with fleet renewal cycles
- Autonomous vehicles were generally thought to be on their way and could bring benefits - i.e. safety, emissions (if electric) and will help with driver shortage issues. However, it was thought the freight and logistics operations will still require a human element in order to make the final delivery or provide a supervisory role. It was also thought likely that platooning vehicles on the strategic road network would come first before fully autonomous vehicles making deliveries
- Also likely to see more automation of manufacturing processes and warehouse operations across the board. It was thought this would increase order fulfilment and productivity leading to intensification of operations, potentially requiring more vehicle movements. It was thought this could happen across a range of sectors and any location type

**Thoughts on potential changes to industrial land use – intensification, mixed land uses, warehouse / depot sharing?**

- There was a general consensus that intensifying the use of industrial land would happen naturally, most likely due to land scarcity. It was thought that this was most likely to occur in industrial locations in north and east London, although anywhere within the M25 had potential.
- The potential for mixing land uses received a mixed reaction. Some believed there were opportunities for mixing land uses both horizontally and vertically with careful attention to design needed in particular in relation to noise and health and safety. An example of vertical mixing put forward was for a small/medium sized logistics

operation at ground or basement level, retail or similar land use on the ground or first floor and residential or office above. One example of mixing land uses was provided by a stakeholder whose existing depot had been re-provided (still at ground floor level), but on a slightly smaller scale as part of a wider redevelopment and now had student accommodation above it. It was also noted that this approach is already coming forward in Paris through ‘logistics hotels’.

- Others believed it was not workable with the needs of each land use being too different and conflict likely in particular in relation to 24-hour operations. It was also mentioned that collocating industrial land with lower cost housing could be beneficial in terms of providing a local workforce.
- Warehouse/depot sharing is already happening to some extent, mainly between businesses and customers where their needs are complimentary. It is thought this practice will become more common as pressure on land increases and stakeholders look to maximise the use of premises. Sharing between competitors is thought to be much less likely, although it may happen in the future especially if the commercial case is compelling. This is most likely to occur in more central London locations due scarcity of premises.

#### Supply Chain Consolidation

- Consolidation already occurs in supply chains as a process driven by efficiency. As retailers grow their supply chains become more sophisticated with multiple product lines being brought together at National and Regional Distribution Centres (NDC and RDC) for onward delivery by fewer and fuller vehicles to their final destination(s). This form of consolidation most commonly occurs for larger supermarket and retail operations.

Examples of existing supply chain consolidation:

- **John Lewis Partnership:** Services its London stores from an RDC located near Milton Keynes run by Kuehne & Nagel and its Waitrose stores from an RDC in Aylesbury, Kent. For customer home delivery John Lewis still have hubs in Park Royal, Enfield, Weybridge and Bluewater to serve London. Mainly run as a hub and spoke operation. For John Lewis stores, it has both multi-drop and direct to store deliveries from the RDC to maximise consolidation (vehicle load factor). Plus, for Waitrose a backhaul figure of 80% vehicle fill is quoted.
- **Lidl:** Several RDCs serve London – Belvedere (Kent), Enfield and Northfleet near Gravesend. They will also be supported by a new NDC in Southampton. Some of Lidl’s RDCs are supported by satellite warehouses for non-food products. Approx. 70 Lidl stores inside M25. Deliveries in to stores usually one / two per day (depending on size of store). Most stores located outside of the CAZ. All haulage outsourced to 3PL – mainly 44t temperature controlled arctics. Deliveries fully consolidated to maximise vehicle usage.
- Comments from the stakeholders who were interviewed as part of this research suggest that consolidation already occurs through supply chains and this will likely continue and potentially intensify in the future. This demonstrates that attempting to consolidate these types of operation further would be counterproductive and would result only in adding cost to a consolidation operation. The potential exception to this would be if it was desirable to break a

supply chain to enable multiple deliveries to a specific area to be combined rather than consolidation based on a specific retailer/business. However, the net gain would likely be negligible in terms of trip reduction and efforts to consolidate would be better focused elsewhere i.e. there are easier wins to be had.

## **2.4 A vision for 2030**

- 2.4.1 The combination of the policy measures, aimed at either reducing the impact of vehicles or enhancing vehicle standards, plus the identified trends and changes will mean that industry will need to adapt if it is to comply and stay competitive. The ability to do this will vary from sector to sector, as well as by the size and nature of company. It may result in some logistics companies being unable or not willing to make deliveries in to London their priority. This in turn could result in a smaller number of traditional operators working alongside more new/different types of operators that are more agile, flexible and technology driven. Consolidation may occur more readily in supply chains for London through collaboration (forced and voluntary) between companies (competitors) due to increasing competition, regulation, scarcity of premises and commercial necessity. This could be realised through traditional competitors collaborating or through traditional operators entering in to partnership with new operators.
- 2.4.2 It is foreseen that zero or very low emission goods vehicles in the van to 12t lorry sector will be widespread at this stage, as technology improves, costs fall, and policy pushes persuade operators to invest in these vehicles.

### 3.0 Appraisal Methods

3.1.1 The following table illustrates the strategic level appraisal methods for assessing each of the consolidation options.

Strategic Indicator	Source	Requirement
Traffic flow	<ul style="list-style-type: none"> <li>Traffic composition - Overall delivery / waste collection vehicle numbers as a component of all traffic in a target area. Assess how this might change as a result of consolidation measures.</li> </ul>	<ul style="list-style-type: none"> <li>Exiting traffic flow data (e.g. AADF, LA / TfL traffic counts)</li> </ul>
	<ul style="list-style-type: none"> <li>Miles travelled - Provide a comparative indication of the miles travelled using a consolidation method(s) vis-à-vis 'normal' delivery. This would involve developing aggregated mileage data for single / multi-drop operations and comparing with the overall miles generated by vehicles delivering to and onward deliveries from the consolidation point(s).</li> </ul>	<ul style="list-style-type: none"> <li>Operator data, UCC data</li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>High level application of air quality values associated with the reduction in delivery / waste collection lorry / van traffic. Potential appraisal method is the use of the Emissions Factors Toolkit (EFT) published by Defra and the Devolved Administrations to assist local authorities in carrying out Review and Assessment of local air quality.</li> </ul>	<ul style="list-style-type: none"> <li>Traffic composition on a relevant road link before and after the implementation of a consolidation method.</li> </ul>
Scalability	<ul style="list-style-type: none"> <li>Ease of implementation: Would assess the transferability of consolidation method from one area to another, based on a compatible set of conditions</li> </ul>	<ul style="list-style-type: none"> <li>Identify core components and criteria applicable to a consolidation method or combination of methods that would facilitate the development of a consolidation method across multiple locations.</li> </ul>
	<ul style="list-style-type: none"> <li>Expansion of coverage: Determine the ability to escalate a consolidation method or combination of methods to serve a variety of centres / target areas / market sectors etc. from a single location</li> </ul>	<ul style="list-style-type: none"> <li>Identify other markets sectors that could be served by operation and/or establish if other consolidation methods could be incorporated into the downstream final transport chain</li> <li>Assess the aggregated benefits of expanded coverage</li> </ul>
Economy	<ul style="list-style-type: none"> <li>Establishment and operating cost: - estimate the unit cost of consolidation</li> </ul>	<ul style="list-style-type: none"> <li>Determine operating cost of setup and operation - facility cost (lease /</li> </ul>

	method (e.g. £/delivery; £/package; overall method cost)	purchase <sup>1</sup> ); vehicles; workforce; fuel / energy; tax
	<ul style="list-style-type: none"> <li>Social benefit value: estimate the social benefit as a financial value</li> </ul>	<ul style="list-style-type: none"> <li>based on estimated saved miles, use accepted social benefit values such as DfT <i>Modal Shift Benefit</i> or Webtag</li> </ul>
	<ul style="list-style-type: none"> <li>Cost of delay - Assess the cost that delivery/collection vehicles impose on other traffic. Apply an excepted TfL hourly value of time. Options in include those used in the assessment of grants from Lane Rental Funding (i.e. Vehicle: £15.14; Cyclist: £9.00; Pedestrian: £7.00), or alternatively £20.83 per vehicle quoted in <i>Traffic Note 4: Total vehicle delay for London 2014-15</i></li> </ul>	<ul style="list-style-type: none"> <li>Develop a set of assumptions regarding the 'imposed' delay on moving vehicles by a stationary lorry that would be agreed in liaison with TfL's Outcomes, Insight &amp; Analysis team</li> </ul>
Political	<ul style="list-style-type: none"> <li>Policy drivers: Meeting timeframe targets for implementation of x number of consolidation methods</li> </ul>	<ul style="list-style-type: none"> <li>Setting realistic horizons.</li> <li>Develop an achievable rollout / take up plan</li> </ul>

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<sup>1</sup> It is assumed that a ready-to-use facility is leased or purchased (e.g. warehouse / location) and to operate the consolidation method does not require a specialist build.

## 4.0 Stakeholder Engagement

### 4.1 Introduction

4.1.1 This section sets out the stakeholder engagement task and includes a summary of the topics discussed and the responses received. The engagement consisted of semi-structured telephone interviews with a range of stakeholders including logistics and distribution companies, freight forwarders, pallet networks, retailers, manufacturers, developers, industry associations and academics. The responses have been anonymised to protect the stakeholder's identity, views and any commercially sensitive information. During the interviews various examples of best practice and innovation were discussed and these have then been converted in to a series of case studies in the Appendices.

**1. Do you think it is possible for an organisation such as TfL to legislate effectively to bring about behaviour change and make deliveries more efficient in London?**

Uncertainty if TfL can be effective – TfL can influence, but legislation may need to come from DfT to have an impact. TfL sometimes seen as being reactive rather than pro-active.

Need to work in tandem with boroughs and GLA – only way to achieve significant change - i.e. LLCS needs to be changed to allow more out of hours deliveries.

Political will and understanding of the industry and supply chains is critical for effective policy – engagement key.

Planning policy needs to catch up and reflect current and future logistics trends - i.e. retimed deliveries, last mile, home delivery boxes etc. New developments should enable efficient deliveries to occur.

**2. Do you think the current and proposed policy measures (congestion charge, ULEZ, DVS, Safer Lorry Scheme etc) will be sufficient to bring about more efficient deliveries in London?**

In a word – no! These policies are targeting different aspects of transport - i.e. emissions and safety and compliance could actually be detrimental to efficient deliveries.

ULEZ and DVS are potentially difficult to comply with due to lack of vehicle options available from manufacturers and fleet renewal cycles.

No >3.5T alternative fuelled vehicles available.

Need to protect industrial land in cities – proximity to end customers is key.

**3. What additional policy measures might be needed to help achieve more efficient deliveries? Use as a prompt if needed: stricter ULEZ, delivery restrictions, mandatory consolidation centres, preferred supplier, more micro-consolidation, additional delivery charges, creating delivery zones? Who should pay for this?**

Not mandatory consolidation centres for the courier express parcel sector – doesn't reduce vehicle numbers – still same number of parcels to be moved and vehicle fill is usually 97%

More regulation is needed around delivery drivers – need to be paid living wage, insured, etc. current industry set up and gig economy encourages poor standards and behaviour. This in turn would impact of delivery cost prices and reflect true cost.

Policy to enable more out of hours needs to be adopted - i.e. unpicking planning conditions that prevent it and ensure new developments can receive out of hours and unattended deliveries.

Road user charging could be used as a way to influence delivery and servicing behaviour - i.e. financial incentives not to deliver in peak hours and using cycle logistics.

- 4. Should consumers be charged an additional delivery fee to incentivise more efficient deliveries? If so, how much additional delivery charge would be needed to change behaviour and achieve more efficient deliveries? Use as prompt if needed: make next day or same day delivery less attractive, promote the use of local collect services, use a consolidation centre if one was provided etc. Cost can be an absolute number or percentage of delivery cost.**

Retailers delivery pricing is not reflective of delivery cost. Retailers should indicate the environmental impact of earlier delivery. Customer needs to understand an earlier delivery is likely to generate extra value trips and there is an environmental cost to this.

Very difficult to change consumer behaviour now as it has become the norm

Pushing back on same day, next day delivery doesn't change number of parcels being delivered and vehicle numbers. Counter argument is that same day, next day delivery alters the supply chain operation – how and where it needs to be located - i.e. close to end customers and the vehicles used - e.g. vans.

Could look at providing information on the impact of the different delivery options - i.e. congestion, emissions, etc. Similar to food packaging labels.

Remove free delivery option, £15 next day, £5 within a week – would allow supply chains to organise themselves more efficiently.

- 5. Which delivery sectors do you think offer the greatest opportunity to achieve more efficient deliveries (consolidation)? - i.e. supermarkets, retail, office, hospitality, domestic/home delivery, construction, public sector etc**

The consolidation opportunity for each sector is considered on the basis of their primary purpose - i.e. supermarkets and retail receiving stock rather than other deliveries such as back office supplies etc.

- Supermarkets – little opportunity, already consolidated and considered efficient
- Retail – little opportunity, difficult to influence supply chain and little consolidation gain. Unless large shopping centre with single service yard - i.e. Westfield – although retiming probably better option.
- Office – significant opportunity with large multi-tenanted office (see City of London example)
- Hospitality – significant opportunity with restaurants, hotels and large events centres
- Domestic/home – most opportunity with facilitating unattended delivery through use of drop boxes, concierge services and click and collect.

- Public Sector – significant opportunity (see TSC/Southampton example). All public sector organisations should be considered including TfL. Potential to use security as the reason (lever) as per Houses of Parliament.
- Construction – significant opportunity – good progress being made – needs to continue and keep pushing their use. Mandatory use for large developments (over 100m?)
- Fresh produce - Consolidation is taking place for fresh produce from bulk market through wholesale distribution. Potential to do more, perhaps not as difficult as people perceive (see London Food Hub example).
- Service sector should also be considered – currently relies on a man with van coming out to fix everything often meaning they are driving during network peak hours.

Key message is there is no one size fits all solution – mandatory consolidation centres were considered non-starter unless starting from scratch - i.e. a new area (Old Oak?).

**6. *Where (geographically) do you think it would be possible to achieve the greatest improvement in efficient deliveries? - i.e. within ULEZ, CAZ, Opportunity Area, outer London town centre, BIDs etc***

Anywhere where there is a great density of people, businesses (demand for goods).

Potential to ring fence areas by postcode and coordinate deliveries within defined area.

CAZ offers greatest density of goods being delivered.

BIDs in areas of high footfall offer a good opportunity to influence/dictate terms.

Landlords could influence delivery times through tenancy agreement.

New development offers the greatest opportunity to embed new delivery and servicing behaviour and the necessary infrastructure. It should look to help solve the issues associated with the wider area, not just the development itself. Earl's Court – consolidation centre space available within the development – should be used to serve the whole area.

**7. *What do you think the impact of technology might be in terms of enabling greater levels of consolidation to occur naturally through supply chains?***

Tech likely to create as many problems as it solves. Connectivity and e-commerce will continue to drive purchasing habits and demand for instantaneous delivery. At the same time it will allow supply chains to achieve greater visibility and integration increasing efficiency. May not necessarily lead to reduction in vehicle trips though.

Data platforms will enable greater functionality and increase the potential for consolidation (greater efficiency) - i.e. TNT and Fed Ex slowly integrating systems.

Tech could enable load consolidation en-route as operators are able to collect/deliver each-others consignments.

Tech should enable greater efficiency in terms of getting the right vehicle, right route, right time, right place.

**8. *What types of technology do you think will offer the greatest opportunity for more efficient deliveries? - i.e. automation, real time data sharing, order consolidation tech, road network cameras, delivery booking systems etc***

Connected city data structure – open access data stream

Potential through virtual Loading Bays – centrally operated by logistics operator not on the go via smart phone. Enforcement is problematic.

Tech will eventually solve AQ through EV's

Turn loading bays / service yards in High Streets into last mile logistics bases.

Tech will help open up 24hr delivery window – if legislation allows it.

Autonomous vehicle will help, but still need people for final delivery. Insurance Companies will make it unaffordable to use non-autonomous vehicles.

Capacity of electric supply – need to ensure that electric network capacity can cope – problem at Nine Elms.

Tech & Education: SMEs not members of nation organisations to learn about best practice = route planning, efficient use of space etc.

Sainsbury use Chop Chop = and app based food ordering system in central London. Shop for up to 25 items, picked at Sainsbury local store then delivered by bike all within 60 minutes.

Sainsbury's also investigating use of river Thames – detail confidential currently.

Vehicles over 15t payloads very unlikely to be electric for a long time – fuel cells a long way off too. More likely gas for fuel and refrigerants. Need refuelling infrastructure.

Drones generally considered a bad idea with very limited application in urban areas – no one wants loads of drones in the skies over London!

**9. *Would you be willing to share delivery cost information with the project team to help inform this study?***

Costs developed on a 'per drop cost' which includes: Vehicles, drivers, warehouse, maintenance etc. Not included: Utilities, premises rent etc.

Anywhere between £2 – 20 per delivery. Potential to look at delivery costs on logistic company's websites - i.e. Hermes delivery changes will have around 5-15% net margin the rest will be the cost of delivery.

Use a 'Stop Cost' for each vehicle – includes vehicle, driver, maintenance etc., aim for approx. £3 per stop. Doesn't include costs such as sales team and other overheads.

Potential to reduce delivery cost by 30% to 40% if delivered out of hours/overnight.

4.1.2 Table below shows a list of industry stakeholders to contacted as part of the engagement task. Each stakeholder was contacted by a member of the project team and asked to participate in a telephone interview.

Sector	Business Name	Contact Name
Academics / Consultants	University of Southampton	Tom Cherrett
	Future City Logistics	Ian Wainwright
	Transport Systems Catapult	Tom Gadsby / Manuel Martinez
	University of Westminster	Julian Allen
BIDS / Boroughs	Cross River Partnership	Vicky Keeble
	City of London Corporation	Tom Parker
	LB Camden	Mohammed Negm
	LB Croydon	Rose Younger
	LB Lambeth	Andrew Round
Highways Agency	Route Manager – London Orbital (West)	Stephen Hall
Institutions, Trade Associations	Food Storage and Distribution Federation	Chris Sturman / Roger Stone
	Freight Transport Association	Natalie Chapman
	New Covent Garden Market	Helen Evans
	Fresh Produce Consortium	Nigel Jenny
	UK Warehousing Association	Peter Ward
Road Freight	Asda	Scott McSeveney
	Bidvest Foodservice	Mark Pierce / Graham Rennie
	Brakes Group	Paul Vernon
	Clipper Logistics	Bruce Carnaby
	DHL	Amanda Zambon
	DPD	Rob Fowler
	Gnewt Cargo	Sam Clarke
	John Lewis	Jerry Ward
	Kuhne + Nagel	Mark Waby

Lidl UK GmbH	Iqbal Johal
Palletline	Mark Saggars
Sainsbury's Supermarkets Ltd	Kevin Greenaway
Saint-Gobain – Solar Glass	Ian McClone
TNT	Andy Wilson
Wiles Greenworld	Toby Robins
Wego Carbon Neutral Couriers	Chris Beattie
Wincanton	Peter Flinders

## 5.0 Consolidation Model Assessment

### 5.1.1 Each consolidation model is based on the following assumptions:

- The **cost model** for consolidation centre (CC) operations is identical for each CC option considered in the study. It comprises five cost components: warehouse facility, utilities, vehicle leasing, staffing and vehicle running. For each option, the costs are adjusted to reflect the different operation. The cost data used in each option is based on published sources
- Each of the **impact models** use data that builds an estimate of the number of deliveries to the area being considered. The data is broken down into that pertaining to: i) residential deliveries; and ii) commercial and social premises deliveries. For the residential estimate, the data is based on results from a comprehensive TfL survey of 4,000 households' home delivery activity. The commercial sector deliveries use collated data on deliveries per day per 100m<sup>2</sup> of floorspace by premises classification (e.g. A1-5, B, C, etc.). To convert the number of deliveries into trips, an assumption on package size has been used, which provides an indication of the total volume of deliveries. Vehicle numbers are established by dividing the volume of a large van and 7.5t lorry into the volume, using an assumed 85:15 ratio of vans to lorries. To obtain the CC requirement of vehicles, it is assumed deliveries would only be carried out using a 7.5t lorry
- The removal of vehicles from delivering at the kerb-side has an impact of the level of delay experienced by other road users. As part of the appraisal, an indicative example of the saved **cost of delay** is included. Without solid data on traffic flows and delivery vehicles stopping on roads that would be affected by kerb-side deliveries, it is not possible to include a 'real' figure. However, to show the principle behind the 'cost' to other road users, an example sets out how this could be calculated. The cost of delay is based on the cost per hour per vehicle used by TfL (£15.14) in calculating grant funding for Lane Rental Schemes. It is assumed that vehicles experience a 10 second delay when passing a delivery vehicle at the kerbside.
- The example set out in each of the option appraisals is: Delay cost is £15.14/hr per veh<sup>1</sup>; 10sec delay = £0.04 / veh; Assuming for each kerbside delivery 200 vehs delayed over 20min / day = £8.41. For the year = £2,624. Assuming 20 deliveries / day over year delay cost to economy = £52,485. **The example does not reflect the 'real' cost of the option.**
- To estimate the potential carbon dioxide equivalent (CO<sub>2</sub>e) emissions and air quality factors savings, an assumed driven round distance of 10km is used for current delivery vehicles; it is also assumed that all deliveries from a CC would be made using zero emission vehicles. CO<sub>2</sub>e amalgamates several gaseous compounds (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O) into a single CO<sub>2</sub> factor. The CO<sub>2</sub>e data is taken from the 2017 DEFRA Conversion Factor tables, which can be used to report on greenhouse gas emissions by UK based organisations, while the other compounds (NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, CO, VOC, NH<sub>3</sub>, SO<sub>2</sub>, Benzene, N<sub>2</sub>O) are from the UK National Atmospheric Emission Inventory for road vehicle fleets.

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<sup>1</sup> TfL Lane Rental Grant rate

## 5.2 Option 1a. Opportunity Area – Enforced participation in consolidation

Model	1a: Opportunity Area – Enforced Participation in Consolidation
Description	Focus on an Opportunity Area (OA). Old Oak Common was chosen because it is a new area - i.e. a blank canvas. This scenario envisages enforced participation in consolidation by banning all other types of delivery or mandating use of a consolidation service.
Type	Consolidation Centre (CC)
Relevant examples	Heathrow CC, Houses of Parliament CC, Regents Street CC, North London CC, Bristol and Bath CC, Gnewt Micro-CC, Southampton SDC, 22 Bishopsgate and 1 Leadenhall CC, LEN Micro CC, UPS Mobile CC
Scale	Opportunity Area wide - i.e. serving a specific location, but one that encompasses many businesses, offices, residential properties, school, hospital etc.
Typical profile	A physical consolidation centre circa 20-60,000sq ft ground floor, plus 1 <sup>st</sup> floor for welfare, back office systems etc. CC would expand as Old Oak built out and more participates join. Total site area circa 2.5 to 3 acres. Vehicle numbers would range in magnitude, depending on the composition of the fleet. Estimated maximum number vehicles: 55 lorries/vans. Staffing in order of: 55 drivers, 12 support staff, 4 managers. Potential for TfL to own & operate the CC. Would need to operate 24hr especially for inbound deliveries.
Vehicle types	Initially pedal / electric cycles, electric vans & 7.5t rigid lorries to optimise consolidation and delivery potential. However, could also incorporate up to 26t electric rigid lorries once these are available (potential within next 10 years), leading to a reduction in circulating vehicles between FCC and OA, and within OA.
Operating conditions / Regulatory framework	<p>Enforced participation – most likely in the form of mandating the use of the consolidation centre through planning conditions, leases and contracts for both residential and commercial land uses.</p> <p>Exemptions could be possible if a business - i.e. supermarket can demonstrate their supply chain is already consolidated and a full vehicle will be making the delivery. Exemptions could also be made for certain products that are difficult to consolidate or add significant cost to a consolidation operation - i.e. frozen &amp; chilled food.</p> <p>Enforcement regime needed to ensure consolidation centre is not being bypassed - i.e. end receivers not using it or suppliers flouting the non-consolidated delivery ban, with penalties for non-compliance. A network of ANPR cameras would be required (or other monitoring system) to capture non-consolidation vehicles.</p> <p>An Old Oak Common BID could be established during the planning stage and become policy with mandatory participation for any business that wishes to locate there. The remit of the BID could be expanded to include residential developments as well as any public sector facilities with the overall aim of controlling delivery and servicing operations within the area.</p>
Financial support	<p>Enforced participation should mean the consolidation service is self-financing (Secondary Funding). The cost of the service could be levied through business rates and council tax or through a BID being set up or TfL becoming an owner operator of the service. Some initial kick-start funding may be beneficial to help cover set up costs.</p> <p>Alternatively, the facility could be set up as a Social Enterprise and financed as a</p>



	<p>Limited Community Interest Company (CIC).</p> <p>It should be the aim of the CC operator not to have a specific facility built, but lease an existing development or ‘piggy back’ on spare capacity at an existing distribution centre if the facility can meet the operating criteria - e.g. fast cross-docking capability.</p> <p>Overall operating cost estimates: circa £2.6m – £3.1m per annum – subject number of vehicles and staff required.</p>																						
<b>Target sector</b>	Retail, Office, School, Public Sector, Hospitality, Domestic/personal – everything within the OA. Possible exemptions made as described above.																						
<b>Market location</b>	Old Oak Common Opportunity Area.																						
<b>Parameters for site selection</b>	<p>Accessible to the Strategic Road Network.</p> <p>Outside of the congestion charging zone.</p> <p>Should not be located near residential developments as the site would need to operate 24hr especially for inbound deliveries.</p> <p>Space required: 20-60,000 sq ft ground floor plus 1<sup>st</sup> floor for welfare and back office systems. Total site area circa 2.5 to 3 acres to include space for un/loading.</p>																						
<b>Consolidation locations</b>	Vicinity of Greenford / North Holt industrial location – considered practical and accessible for both and inbound and outbound vehicle movements (See map in Appendix A). Isle of Dogs as a potential site in East London.																						
<b>Supporting measures</b>	Lockers banks, concierge service, cold storage facilities, preferred suppliers for food/perishable non-consolidated items. Out of hours / 24hr delivery.																						
<b>Stakeholder feedback</b>	<p>Stakeholder feedback suggests targeting an Opportunity Area such as Old Oak makes sense. Responses from stakeholders included:</p> <ul style="list-style-type: none"> <li>• Anywhere where there is a great density of people and/or businesses (demand for goods).</li> <li>• Potential to ring fence areas by postcode and coordinate deliveries within defined area.</li> <li>• New development offers the greatest opportunity to embed new delivery and servicing behaviour and the necessary infrastructure.</li> <li>• It should look to help solve the issues associated with the wider area, not just the development itself.</li> </ul>																						
<b>Appraisal</b>	<p><b>Congestion Impact:</b> Estimated that a 66% reduction in delivery vehicle trips could occur compared to a baseline of no consolidation occurring. Assuming all CC vehicles are zero emissions, a 100% reduction in vehicle emissions would be achieved.</p> <p><b>Potential air quality savings:</b></p> <table border="1"> <thead> <tr> <th>Total Annual Emissions</th> <th>Kg NOx</th> <th>Kg PM1</th> <th>Kg PM2.5</th> <th>Kg CO</th> <th>Kg VO C</th> <th>Kg NH3</th> <th>Kg SO2</th> <th>Kg Benzene</th> <th>Kg N2O</th> <th>Tonnes CO<sub>2e</sub></th> </tr> </thead> <tbody> <tr> <td>Total saved emissions</td> <td>1,215</td> <td>0</td> <td>5</td> <td>237</td> <td>37</td> <td>2</td> <td>1</td> <td>0.5</td> <td>8</td> <td>272</td> </tr> </tbody> </table> <p><b>Scalability:</b> This approach could be implemented at other OAs or in specific areas that wish to prohibit non-CC deliveries. Each CC is operated as a separate facility and therefore transplantable. Scale of CCs would be dependent on size of area, scope of inclusion and type of area to be served.</p> <p><b>Political will:</b> Meets the policies set out in the London Plan. Demonstrates the implementation of improved urban realm and quality of life for inhabitants and</p>	Total Annual Emissions	Kg NOx	Kg PM1	Kg PM2.5	Kg CO	Kg VO C	Kg NH3	Kg SO2	Kg Benzene	Kg N2O	Tonnes CO <sub>2e</sub>	Total saved emissions	1,215	0	5	237	37	2	1	0.5	8	272
Total Annual Emissions	Kg NOx	Kg PM1	Kg PM2.5	Kg CO	Kg VO C	Kg NH3	Kg SO2	Kg Benzene	Kg N2O	Tonnes CO <sub>2e</sub>													
Total saved emissions	1,215	0	5	237	37	2	1	0.5	8	272													

	<p>visitors. Enforced participation is likely to be politically challenging to implement with resistance from businesses, logistics companies and potentially boroughs.</p> <p><b>Economy:</b> The absence of unauthorised delivery traffic could lead to increased footfall and more prosperous public and business realms. Traffic calming and removal of vehicles has demonstrated that footfall to an area will rise<sup>2</sup>. Improved environment could act as a factor to attracting businesses - offers ‘green’ credentials to meet social responsibility commitments. Alleviates public concerns toward presence of freight vehicles on streets. Might act as a factor to attracting residents to area.</p> <p><b>Kerbside/Cost of delay:</b> Dependent on traffic flow and length of time delivery vehicle parks at kerbside. Example: Delay cost is £15.14/hr per veh<sup>3</sup>; 10sec delay = £0.04 / veh; Assuming for each kerbside delivery 200 vehs delayed over 20min / day = £8.41. For the year = £2,624. Assuming 20 deliveries / day over year delay cost to economy = £52,485.</p>
<p><b>Recommendation</b></p>	<p>The appraisal findings indicate strong potential impact for vehicle reductions. Whilst the political will required is high is it considered feasible with the area being new and therefore the ability to influence policy is easier. The financial support required is also significant, but the mandatory participation means that with the right charging regime a break-even scenario should be possible. Building in mandatory consolidation to relevant policy and strategy documents needs to start now. The potential to create a BID for the area should be explored as a mechanism to ensure participation and control delivery and servicing operations. Further work may be required to the look at necessary infrastructure, operational, financial and contractual requirements to ensure buy in and commitment.</p> <p><b>The Opportunity Area – Enforced Participation model should be pursued further.</b></p>

<sup>2</sup> Healthy High Streets Good place-making in an urban setting, Public Health England, January 2018

<sup>3</sup> TfL Lane Rental Grant rate

### 5.3 Option 1b. Opportunity Area – Voluntary Participation in Consolidation

<b>Model</b>	<b>1b: Opportunity Area – Voluntary Participation in Consolidation</b>
<b>Description</b>	Focus on an Opportunity Area (OA) – Old Oak Common was chosen because it can be considered as a new area - i.e. a blank canvas. This scenario envisages enforced participation in consolidation by banning all other types of delivery or mandating use of a consolidation service.
<b>Type</b>	Consolidation Centre (CC)
<b>Relevant examples</b>	Heathrow CC, Houses of Parliament CC, Regents Street CC, North London CC, Bristol and Bath CC, Gnewt Micro-CC, Southampton SDC, 22 Bishopsgate and 1 Leadenhall CC.
<b>Scale</b>	Opportunity Area wide - i.e. serving a specific location, but one that encompasses a large number of businesses, offices, residential properties, school, hospital etc
<b>Typical profile</b>	A physical consolidation centre circa 20,000-40,000sq ft ground floor, plus first floor for welfare, back office systems etc. CC would expand as Old Oak built out and more participants join. Total site area circa 1.5 to 2.5 acres. Vehicle numbers would range in magnitude, depending on the composition of the fleet. Estimated maximum number vehicles: 33. Staffing in order of: 33 drivers, 7 support staff, 4 managers  Potential for TfL to own & operate the CC. Would need to operate 24hr especially for inbound deliveries.
<b>Vehicle types</b>	Initially pedal / electric cycles, electric vans & 7.5t rigid lorries to optimise consolidation and delivery potential. However, could also incorporate up to 26t electric rigid lorries once these are available (potential within next 10 years), leading to a reduction in circulating vehicles between FCC and OA, and within OA.
<b>Operating Conditions / Regulatory framework</b>	Voluntary participation – business case for using the CC will need to be made to potential end receivers (across all land uses) and their supply chains.  Participation can be encouraged through direct or inferred regulation such as road user charging, Safer Lorry Scheme, ULEZ, access restrictions by time of day and vehicle type, additional charges for certain delivery types e.g. same day.
<b>Financial support</b>	Voluntary participation will likely mean the consolidation service will require public subsidy (primary funding) potential in perpetuity. Public subsidy could be used in different ways e.g. fund the running of the consolidation centre or provide discounts on business rates to participants etc. Alternatively, the facility could be set up as a Social Enterprise and financed as a Limited Community Interest Company (CIC).  It should be the aim of the CC operator not to have a specific facility built, but lease an existing development or ‘piggy back’ on spare capacity at an existing distribution centre if the facility can meet the operating criteria - e.g. fast cross-docking capability.  Overall operating cost estimates: Circa £1.7 – 1.9M per annum – subject number of vehicles and staff required.  FCC charging regime: Users of the FCC would be charged on a ‘freight’ volume basis. This would be a bespoke arrangement agreed on a case-by-case basis and would be determined by the type of goods, volume, frequency, added value services etc.



<b>Target sector</b>	Retail, Office, School, Public Sector, Hospitality, Domestic/personal CC would not look to target businesses such as supermarkets whose supply chain is already consolidated. Certain products that are difficult to consolidate or add significant cost - i.e. frozen & chilled food could also be excluded.																						
<b>Market location</b>	Old Oak Common Opportunity Area.																						
<b>Parameters for site selection</b>	Accessible to the Strategic Road Network. Outside of the congestion charging zone. Should not be located near residential developments as the site would need to operate 24hr especially for inbound deliveries. Space required: 20-60,000 sq ft ground floor plus 1 <sup>st</sup> floor for welfare and back office systems. Total site area circa 2.5 to 3 acres to include space for un/loading.																						
<b>Consolidation locations</b>	Vicinity of Greenford / North Holt industrial location – considered practical and accessible for both and inbound and outbound vehicle movements. (See map in Appendix A). Isle of Dogs as a potential site for East London																						
<b>Supporting measures</b>	Lockers banks, concierge service, cold storage facilities, preferred suppliers for food/perishable non-consolidated items, out of hours / 24hr delivery.																						
<b>Stakeholder feedback</b>	Stakeholder feedback suggests targeting an Opportunity Area such as Old Oak makes sense. Responses from stakeholders included: Anywhere where there is a great density of people, businesses (demand for goods). Potential to ring fence areas by postcode and coordinate deliveries within defined area. New development offers the greatest opportunity to embed new delivery and servicing behaviour and the necessary infrastructure. It should look to help solve the issues associated with the wider area, not just the development itself.																						
<b>Appraisal</b>	<p><b>Impact:</b> A 66% reduction in delivery vehicle trips could occur. This is lower than the enforced participation estimate as the voluntary nature of the scheme would likely mean less businesses/organisations would participate. Assuming all CC vehicles are zero emissions, a 100% reduction in vehicle emissions would be achieved.</p> <p><b>Potential air quality savings:</b></p> <table border="1" data-bbox="418 1417 1490 1570"> <thead> <tr> <th>Total Annual Emissions</th> <th>Kg NOx</th> <th>Kg PM10</th> <th>Kg PM2.5</th> <th>Kg CO</th> <th>Kg VOC</th> <th>Kg NH3</th> <th>Kg SO2</th> <th>Kg Benzene</th> <th>Kg N2O</th> <th>Tonnes CO<sub>2</sub>e</th> </tr> </thead> <tbody> <tr> <td>Total saved emissions</td> <td>1,215</td> <td>51</td> <td>36</td> <td>237</td> <td>37</td> <td>2</td> <td>1</td> <td>0.5</td> <td>8</td> <td>272</td> </tr> </tbody> </table> <p><b>Scalability:</b> This approach could be implemented at other OAs or in specific areas that wish to prohibit non-CC deliveries. Each CC is operated as a separate facility and, therefore, is transplantable. Scale of CCs would be dependent on size of area, scope of inclusion and type of area to be served.</p> <p><b>Political will:</b> Meeting the policies set out in the London Plan. Demonstrating the implementation of improved urban realm and quality of life for inhabitants and visitors. The voluntary scheme is considered less challenging to implement politically.</p> <p><b>Economy:</b> The absence of unauthorised delivery traffic could lead to increased footfall and more prosperous public and business realms. Traffic calming and removal of vehicles has demonstrated that footfall to an area will rise. Improved environment could act as a factor to attracting businesses - offers 'green' credentials to meet social responsibility commitments. Alleviates public concerns</p>	Total Annual Emissions	Kg NOx	Kg PM10	Kg PM2.5	Kg CO	Kg VOC	Kg NH3	Kg SO2	Kg Benzene	Kg N2O	Tonnes CO <sub>2</sub> e	Total saved emissions	1,215	51	36	237	37	2	1	0.5	8	272
Total Annual Emissions	Kg NOx	Kg PM10	Kg PM2.5	Kg CO	Kg VOC	Kg NH3	Kg SO2	Kg Benzene	Kg N2O	Tonnes CO <sub>2</sub> e													
Total saved emissions	1,215	51	36	237	37	2	1	0.5	8	272													



	<p>toward presence of freight vehicles on streets. Might act as a factor to attracting residents to area.</p> <p><b>Kerbside/Cost of delay:</b> Dependent on traffic flow and length of time delivery vehicle parks at kerbside. Example: Delay cost is £15.14/hr per veh; 10sec delay = £0.04 / veh; Assuming for each kerbside delivery 200 vehs delayed over 20min / day = £8.41. For the year = £2,624. Assuming 20 deliveries / day over year delay cost to economy = £52,485.</p>
<p><b>Recommendation</b></p>	<p>The appraisal findings indicate reduced, but still strong potential impact for vehicle reductions compared to enforced participation. The political will required is considerably less due to the voluntary nature of the consolidation scheme. The financial support required is greater than the enforced model due to the consolidation scheme being reliant on participants seeing value in the scheme and subsequently agreeing to participate and pay for the service. Building in voluntary consolidation to relevant policy and strategy documents needs to start now to give it best chance of success. Further work may be required to the look at necessary infrastructure, operational, financial and contractual requirements to ensure buy in and commitment. Direct or inferred regulation such as road user charging, Safer Lorry Scheme, ULEZ, access restrictions by time of day and vehicle type, additional charges for certain deliveries types - i.e. same day are considered key to assist a voluntary scheme.</p> <p><b>The Opportunity Area – Voluntary Participation model should be explored further</b> if the enforced participation model is not considered possible. Also, potential to explore both in tandem.</p>

## 5.4 Option 2. Network of consolidation centres serving CAZ

Model	2: Network of Consolidation Centres Serving CAZ
Description	Develop a network of consolidation centres located in proximity to the N & S Circular Roads or as geography, SILs, LSILs, supply chains dictate to serve CAZ. Consolidation funded with subsidy plus increased charging regime for non-consolidated deliveries.
Type	Consolidation Centre (CC) - dedicated cross-docking facility with minimal storage, which must include sufficient open space for goods vehicle parking.
Relevant examples	Heathrow CC, Houses of Parliament CC, Regents Street CC, North London CC, Bristol & Bath CC, Southampton SDC, 22 Bishopsgate & 1 Leadenhall CC,
Scale	<p>Serving a wide range of end receivers within the CAZ across different sectors: Retail, Office, School, Public Sector, Hospitality, Domestic/personal.</p> <p>Likely to require a minimum of four CCs to ensure sufficient geographical spread and coverage of supply chain routes.</p> <p>Likely to require a phased introduction as throughput builds.</p> <p>Deliveries that originate within the CAZ would be omitted from using CCs. Would need operate 24hr especially for inbound deliveries.</p>
Typical profile	<p>Each physical consolidation centre circa 80-100,000sq ft ground floor, plus 1<sup>st</sup> floor for welfare, back office systems etc. Total site area circa 4 to 6 acres</p> <p>Vehicle numbers would range in magnitude of 100 vehicles, depending on the composition of the fleet. Number of delivery vehicles to operate from each CC would need to be determined through a specific feasibility study of the CC network proposal.</p> <p>Potential for TfL to own &amp; operate the CC or to work with third-party logistics service provider.</p>
Vehicle types	Likely 7.5 – 18t rigid lorries to maximise consolidation potential. However, could also incorporate electric vans and cycle logistics as part of a mixed fleet.
Operating conditions / Regulatory framework	<p>Introduce additional delivery charges for non-consolidated deliveries. Could be achieved through increased business rates. Unless the business can demonstrate their deliveries will already be consolidated through their supply chain. The business can either opt in to the consolidation service in which case they receive a lower business rate and vice versa. The revenue generated by the business rates then goes to help fund the CC.</p> <p>Public sector buildings enforced participation – most likely in the form of the Mayor, Boroughs and or central Government mandating or committing to the use of a consolidation centre for public sector buildings in the CAZ.</p> <p>Utilise planning conditions to mandate use of CC for new office, retail, hospitality developments in the CAZ. Occupiers who can demonstrate consolidated deliveries can be omitted.</p> <p>Domestic/personal deliveries – New residential developments could also be mandated to use the CC through planning conditions.</p> <p>Non-consolidated deliveries could also be restricted by time of day, emissions and vehicle type - i.e. electric or cycle only.</p>

	<p>Deliveries with an origin and destination within the CAZ would potentially need to be omitted, which is also difficult to monitor and enforce. Restrictions on HGV and van (delivery) movements during the peak periods would need to be introduced.</p> <p>Enforcement regime needed to ensure consolidation centre is not being bypassed. A network of ANPR cameras or another monitoring system to capture non-consolidation vehicles. However, this is also problematic given the level of through traffic and non-delivery traffic (servicing and construction) the CAZ receives.</p>
<p><b>Financial support</b></p>	<p>A combination of enforced and voluntary participation will likely mean the consolidation service will require public subsidy (primary funding) potential in perpetuity.</p> <p>Public subsidy could be used in different ways e.g. fund the running of the consolidation centre or provide discounts on business rates to participants etc.</p> <p>Alternatively, the facility could be set up as a Social Enterprise and financed as a Limited Community Interest Company (CIC). Third-party LSP could be contracted to manage and provide the service.</p> <p>It should be the aim of the CC operator not to have a specific facility built, but lease an existing development if the it can meet the operating criteria - e.g. fast cross-docking capability.</p> <p>Cost estimates: £4.55M to £5.25M per annum per CC.</p> <p>FCC charging regime: Users of the FCC would be charged on a 'freight' volume basis.</p>
<p><b>Target sector</b></p>	<p>Retail – considered potentially difficult given the scale of retail in the CAZ. Medium – Large retailers will already be operating with consolidated supply chains. Business rates could provide a mechanism as described above.</p> <p>Public sector buildings – Follow Houses of Parliament lead – mandate all public sector buildings in the CAZ must use a CC. Be seen to be taking a lead, potentially a lot easier to influence compared to private sector. This could also cover schools and hospitals.</p> <p>Offices – High potential in particular through use of planning conditions.</p> <p>Domestic/personal – considered potentially difficult to implement and control compared to other sectors in a retrofit scenario. Other mechanisms may be more appropriate.</p>
<p><b>Market location</b></p>	<p>Central Activities Zone (CAZ)</p>
<p><b>Consolidation locations</b></p>	<p>Potential locations aligned with SILs for availability of land, facilities, access to road network and maximising vehicle trip reduction and mileage.</p> <ol style="list-style-type: none"> <li>1. Lee Valley &amp; North Thames SILs (North)</li> <li>2. South Thames SILs (East)</li> <li>3. Park Royal &amp; Willesden / Brent SILs (West)</li> <li>4. Merton SILs (South)</li> </ol>
<p><b>Supporting measures</b></p>	<p>Locker banks, Click and collect, collection points, preferred suppliers, micro-consolidation, 24hr deliveries, electric vehicle, cargo bikes, mobile consolidation.</p>
<p><b>Stakeholder feedback</b></p>	<p>Stakeholders believed the network of consolidation centres to serve CAZ would not be achievable and should be avoided. Comments included:</p> <p>Not mandatory consolidation centres for the courier express parcel sector – doesn't reduce vehicle numbers – still same number of parcels to be moved and existing vehicle fill is usually 97%.</p>

	<p>There is no one size fits all solution – mandatory consolidation centres were considered non-starter unless starting from scratch - i.e. a new area.</p>																						
<p>Appraisal</p>	<p><b>Congestion Impact:</b> Estimated that a 56% reduction in delivery vehicle trips could occur once entire CC network in operation. Based on analysis of Central Cordon traffic data potential to remove an estimated 15,000 daily delivery and collection trips from the current estimated 26,600.</p> <p>Assuming all CC vehicles are zero emissions, a 100% reduction in vehicle emissions would be achieved to the serviced area and an overall reduction on transit routes to and from the CAZ. Improved air quality along the routes between CCs and CAZ, and within CAZ.</p> <p><b>Potential air quality savings:</b></p> <table border="1" data-bbox="406 651 1492 801"> <thead> <tr> <th>Total Annual Emissions</th> <th>Kg NOx</th> <th>Kg PM10</th> <th>Kg PM2.5</th> <th>Kg CO</th> <th>Kg VOC</th> <th>Kg NH3</th> <th>Kg SO2</th> <th>Kg Benzene</th> <th>Kg N2O</th> <th>Tonnes CO<sub>2</sub>e</th> </tr> </thead> <tbody> <tr> <td>Total saved emissions</td> <td>94,295</td> <td>3,493</td> <td>2,375</td> <td>23,464</td> <td>2,366</td> <td>191</td> <td>91</td> <td>11.1</td> <td>674</td> <td>18,115</td> </tr> </tbody> </table> <p><b>Scalability:</b> This approach is specific to the CAZ. Each CC is operated as a separate facility but is anticipated to generate overlapping delivery rounds to service supply chains approaching for different geographical locations. Scale of CCs would be dependent on size of area, scope of inclusion and type of area to be served. A more specific feasibility study of the CC network proposal would be required to determine the facility sizes for this concept</p> <p><b>Political capital:</b> Meeting the policies set out in the London Plan. Demonstrating the implementation of improved urban realm and quality of life for inhabitants and visitors. Very ambitious plan that would be world leading.</p> <p><b>Economy:</b> The absence of unauthorised delivery traffic could lead to increased footfall and more prosperous public and business realms. Traffic calming and removal of vehicles has demonstrated that footfall to an area will rise. Improved environment could act as a factor to attracting businesses - offers 'green' credentials to meet social responsibility commitments.</p> <p><b>Kerbside/Cost of delay:</b> dependent on traffic flow and length of time delivery vehicle parks at kerbside. Example: Delay cost is £15.14/hr per veh; 10sec delay = £0.04 / veh; Assuming for each kerbside delivery 200 vehs delayed over 20min / day = £8.41. For the year = £2,624. Assuming 20 deliveries / day over year delay cost to economy = £52,485.</p>	Total Annual Emissions	Kg NOx	Kg PM10	Kg PM2.5	Kg CO	Kg VOC	Kg NH3	Kg SO2	Kg Benzene	Kg N2O	Tonnes CO <sub>2</sub> e	Total saved emissions	94,295	3,493	2,375	23,464	2,366	191	91	11.1	674	18,115
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Total saved emissions	94,295	3,493	2,375	23,464	2,366	191	91	11.1	674	18,115													
<p>Recommendation</p>	<p>It is not considered possible or efficient to try and provide a one size fits all solution for the CAZ. The variety of supply chains, different sectors and end customers is too vast, dense, complex and nuanced for a network of consolidation centres to be able to effectively cater for all requirements. The political will and policy changes required are considered to be extremely challenging given the scale of what would be needed - i.e. the wholesale changing of long-established supply chains, the buy in of Boroughs and the GLA, the regulatory framework particularly if some exemptions are made and the financial commitment to underwrite the operation of the consolidation centres.</p> <p>A better approach for the CAZ is believed to be a package of measures including consolidation (across different sectors – food, construction, waste, public sector), BID consolidation, micro-consolidation, preferred suppliers, development lead consolidation - i.e. 22 Bishopsgate and opening up the 24hr delivery window.</p> <p><b>It is recommended that the network of consolidation centres to serve CAZ is not pursued.</b></p>																						

## 5.5 Option 3 Preferred Suppliers

<b>Model</b>	<b>3: Preferred Suppliers</b>
<b>Description</b>	Preferred suppliers’ approach – area based, focussing on multi-tenanted buildings using planning conditions to enforce use of preferred suppliers / consolidation centre for business supplies and personal deliveries.
<b>Type</b>	Preferred Suppliers and consolidation centres
<b>Relevant examples</b>	22 Bishopsgate and 1 Leadenhall CC, BID waste consolidation, Wiles Greenworld – all in one office supplier, Grosvenor Duke of Westminster HQ, Mayfair (see case study)
<b>Scale</b>	Targeting a specific multi-tenanted building or groups of buildings predominantly office based to use preferred suppliers. Can also incorporate personal deliveries for staff rather than an outright ban. Public sector buildings - i.e. Council offices, TfL, central Government, schools, libraries, hospitals etc.
<b>Typical profile</b>	The specification of the preferred supplier / consolidation centre will vary depending on the scale and type of development and requirements for the delivery service - i.e. product types, off-site storage etc. The size of the consolidation centre could range from a few thousand to hundreds of thousands of square feet.
<b>Vehicle types</b>	The ideal scenario would be to see the use of electric vehicles or cargo bikes replacing traditional petrol/diesel fuelled vans.
<b>Operating conditions / Regulatory framework</b>	Public sector buildings – most likely in the form of the Mayor, Boroughs and or central Government mandating or committing to the use of a preferred supplier / consolidation centre. Utilise planning conditions to mandate use of preferred suppliers for new multi-tenanted buildings / developments. Incorporate the need to use preferred suppliers within an ISO 14001 environmental management system Suppliers to TfL, GLA family and boroughs to demonstrate how they operate a preferred suppliers’ scheme within their tender responses Supplementary Planning Guidance will be required
<b>Financial support</b>	No public subsidy should be required. Existing examples of using preferred suppliers demonstrate that savings can be made by centralising ordering, processing invoices and achieving economies of scale with better rates for products and deliveries. Costs to the business(s) involved may come in the form of initiating a centralised ordering system, changing procurement regimes and undertaking preferred suppliers tendering etc. However, these are offset by savings made once the operational. Developers / landlords can also collaborate to help share costs or piggy back on an existing operation - i.e. they don’t or shouldn’t need to have their own specific consolidation centre / preferred supplier. The preferred supplier / consolidation centre can be viewed as outsourcing the post rooms of big offices. This frees up additional space within the development that can be used for other purposes and therefore monetised to



	offset the costs of a CC.
<b>Target sector</b>	<p>Predominantly office - i.e. stationery, consumables, cleaning products etc</p> <p>Some deliveries for other land use in the same building could be incorporated - i.e. back office supplies for retail or hospitality land uses. Food and catering should also be investigated for inclusion.</p> <p>Staff personal deliveries can also be mandated to be directed to the preferred supplier / consolidation centre.</p>
<b>Market location</b>	Pan-London – mandating preferred suppliers and consolidation centres in planning conditions could be adopted by any borough
<b>Consolidation locations</b>	Dictated by preferred supplier supply chain and warehouse locations – opportunity to specify a preference through the procurement process.
<b>Supporting measures</b>	Out of hours / 24hr deliveries, electric vehicles, e-cargo bikes
<b>Stakeholder feedback</b>	Stakeholders were non-committal regarding preferred suppliers. There was general consensus that it could work, but a need to see it put in to practice. Suggestion that the public sector could take a lead on this type of initiative.
<b>Appraisal</b>	<p><b>Impact:</b> Grosvenor state that up to 21 deliveries per day are now being delivered by a single electric vehicle. Although many of these trips are displaced rather than removed from the network. 22 Bishopgate believe they can achieve a 50% reduction in daily delivery trips.</p> <p><b>Scalability:</b> Significant potential to roll this concept out to new developments (over a certain size) as well as look to retrofit to existing developments. Smaller office developments nearby should also be incorporated allowing for agglomeration.</p> <p><b>Political will:</b> Now the precedent has been set it should be less politically sensitive and easier to implement. This type of consolidation scheme should now be considered best practice and adopted across London.</p> <p><b>Economy:</b> The reduction in delivery traffic to specific buildings or development clusters could lead to an improved local environment and more prosperous public and business realms. Improved local environments could be a factor to attracting businesses - offers 'green' credentials to meet social responsibility commitments.</p> <p>Kerbside/Cost of delay: dependent on traffic flow and length of time delivery vehicle parks at kerbside. Example: Delay cost is £15.14/hr per veh; 10sec delay = £0.04 / veh; Assuming for each kerbside delivery 200 vehs delayed over 20min / day = £8.41. For the year = £2,624. Assuming 20 deliveries / day over year delay cost to economy = £52,485.</p>
<b>Recommendation</b>	<p>Now the precedent has been set by the City of London the concept should be easier to roll out as a planning condition to other similar developments. This should be applicable across all London Boroughs and should also be investigated as a retrospective action for appropriate developments.</p> <p><b>It is recommended that the preferred suppliers' model is pursued further.</b></p>

## 5.6 Option 4 Micro consolidation / last mile

Model	4: Micro Consolidation / Last Mile
Description	Focus on micro-consolidation and last mile logistics. Consider systems such as ‘Gnewt 2.0’ with cycle logistics, UPS mobile solution etc. The City of London (CoL) was chosen as they are currently considering several locations for future use as a micro-consolidation centre.
Type	Consolidation centre (CC) – Micro-Consolidation (MC), Last Mile (LM)
Relevant examples	Gnewt, 22 Bishopsgate and 1 Leadenhall CC, LEN Micro CC, UPS Mobile CC
Scale	Serving a specific location – City of London – one that encompasses a large number of end receivers. More suitable for certain product types - i.e. ambient goods – parcels, packets, envelopes rather than bulky, heavy items and non-ambient products.
Typical profile	<p>Physical consolidation centre(s) (or equivalent space) circa 15,000sq ft. ground floor, inclusive of welfare, back office systems etc. Total site area circa curtilage of CC.</p> <p>Vehicle requirement assumes demand of 16 x full loads in 7.5t lorries, equivalent to 512m<sup>3</sup> of parcels. Estimated number of CC vehicles: 85 cargo bikes; 87 small &amp; medium sized e-vans</p> <p>Potential for TfL or LA to own &amp; operate the CC or to work with third-party Logistics Service Provider (LSP).</p> <p>Vehicle access inbound would be needed 24hr to enable out of hours/overnight trunking deliveries to arrive for rigid lorries potentially up to 18t.</p>
Vehicle types	Electric cargo bikes, electric vans (could include electric tugs towing one or more trailers but not costed in this model)
Operating conditions / Regulatory framework	<p>Public sector buildings enforced participation – most likely in the form of the Mayor, Boroughs and or central Government mandating or committing to the use of a MC/LM solution in the target area for relevant products.</p> <p>Utilise planning conditions to mandate use of MC/LM for new office, retail, hospitality developments in the target area for relevant products.</p> <p>Participation can also be encouraged through direct or inferred regulation such as road user charging, Safer Lorry Scheme, ULEZ, access restrictions by time of day and vehicle type, additional charges for certain deliveries types - i.e. same day.</p> <p>A purely privately-run operation may need little supporting regulation so long as the established commercial relationships between the participating logistics companies can be maintained.</p>
Financial support	<p>Existing examples are privately run and commercially successful. The operator is seen as a neutral carrier’s carrier. The biggest financial and physical constraint is suitable premises – due to the need to be located close to the target market appropriate premises are difficult to find and expensive.</p> <p>A public (TfL) run or supported MC/LM operation may be able to utilise existing property portfolio or that of associated organisations. A public run service may have more difficulty persuading logistics companies to trust them with final delivery and pay for it. Although it is assumed an operator would be brought on-board to run the service.</p> <p>Mobile solution potentially zero cost to operate – cost in the form of providing</p>



	<p>space and permitting logistics companies to drop off their trailer.</p> <p><b>Estimated costs based on serving whole of City of London:</b></p> <p>2 x 15,000sq ft CCs sited in different locations - north and south in CoL with a total of 172 cargo bikes and e-vans.</p> <p>Assuming even split in resources &amp; all bikes purchased in year 1, first year cost approx. £5.9M, following years £5.6M. Each facility would probably be set up separately in different years. Costs could also be significantly reduced if premises were provided or let at a discounted rate by an organisation such as CoL or TfL</p>																						
<b>Target sector</b>	Retail, Office, School, Public Sector, Hospitality, Domestic/personal – anything that receives parcels – target sector dictated by products as described above.																						
<b>Market location</b>	Potential application across a range of locations - i.e. CAZ – potential for multiple operations, town centres across London, BID etc.																						
<b>Parameters for site selection</b>	<p>Accessible to the Strategic Road Network.</p> <p>Outside of the congestion charging zone and within the North/South Circular boundary.</p> <p>Sufficient power supply to enable electric delivery vehicles to be recharged</p>																						
<b>Consolidation locations</b>	Nature of MC/LM operation means the CC is located close by to its market and end receivers of goods/products - i.e. Whalbrook Wharf in the City of London.																						
<b>Supporting measures</b>	Locker banks, Click and collect, collection points, preferred suppliers, 24hr deliveries, electric vehicle, cargo bikes.																						
<b>Stakeholder feedback</b>	Stakeholders believed that micro-consolidation and last mile operations																						
<b>Appraisal</b>	<p><b>Congestion Impact:</b> Estimated that an equivalent of 37 van trips into CoL would be removed. However, estimated that a higher combined number of cargo bike and e-vans would be required to undertake equivalent level of deliveries and collections.</p> <p>Assuming all CC vehicles are zero emissions, a 100% reduction in vehicle emissions would be achieved to the serviced area.</p> <p><b>Potential air quality savings:</b></p> <table border="1"> <thead> <tr> <th>Total Annual Emissions</th> <th>Kg NOx</th> <th>Kg PM10</th> <th>Kg PM2.5</th> <th>Kg CO</th> <th>Kg VOC</th> <th>Kg NH3</th> <th>Kg SO2</th> <th>Kg Benzene</th> <th>Kg N2O</th> <th>Tonnes CO<sub>2</sub>e</th> </tr> </thead> <tbody> <tr> <td>Total saved emissions</td> <td>119</td> <td>6</td> <td>4</td> <td>18</td> <td>4</td> <td>0</td> <td>0</td> <td>0.1</td> <td>1</td> <td>30</td> </tr> </tbody> </table> <p><b>Scalability:</b> This approach assumes that all parcel deliveries from parcel carriers are delivered through a MC facility. The aim would be to combine deliveries from each carrier to deliver on consolidated round from the MC, to avoid overlapping delivery rounds which occur at present through multi-carrier operations. The concept could be expanded to introduce other MC to cover wider or specific areas or alternative sectors - e.g. food. Scale of CCs would be dependent on size of area, scope of inclusion and type of area to be served.</p> <p><b>Political capital:</b> Meeting the policies set out in the London Plan. Demonstrating the implementation of improved urban realm and quality of life for inhabitants and visitors. Resistance by parcels carriers and potentially seen as interfering with free market operations.</p> <p><b>Economy:</b> Health cost benefit due to improved air quality - reduction in respiratory related illness: impact on workers' absenteeism and health care costs. Potential reduction in cost of delays for all road users through introduction of</p>	Total Annual Emissions	Kg NOx	Kg PM10	Kg PM2.5	Kg CO	Kg VOC	Kg NH3	Kg SO2	Kg Benzene	Kg N2O	Tonnes CO <sub>2</sub> e	Total saved emissions	119	6	4	18	4	0	0	0.1	1	30
Total Annual Emissions	Kg NOx	Kg PM10	Kg PM2.5	Kg CO	Kg VOC	Kg NH3	Kg SO2	Kg Benzene	Kg N2O	Tonnes CO <sub>2</sub> e													
Total saved emissions	119	6	4	18	4	0	0	0.1	1	30													



	<p>smaller vehicles and cargo bikes. Overall traffic delay reduction not clear and would require further examination.</p>
<p><b>Recommendation</b></p>	<p>The concept has been demonstrated to work effectively with both electric vans and cargo bikes – there is also scope for the Gnewt style Portering (see case study) to be incorporated in to the scheme. The biggest barrier to implementation is finding suitable premises and their subsequent cost. Therefore, TfL and the Boroughs should work to identify potential locations in particular non-traditional logistics facilities - i.e. car parks, undeveloped land etc that can be utilised even on a temporary basis for MC/LM operations.</p> <p><b>It is recommended that the Micro Consolidation / Last Mile model is pursued.</b></p>

## 5.7 Option 5 Outer London Town Centre

<b>Model</b>	<b>5: Outer London Town Centre</b>
<b>Description</b>	Focus on existing outer London town centres. Retrofitting consolidation solutions. Consider locations such as metropolitan or major centre – Croydon
<b>Type</b>	Consolidation Centre (CC), Preferred Suppliers (PS) – see Model 3 for further information, Delivery Point (DP)
<b>Relevant examples</b>	Heathrow CC, Houses of Parliament CC, Regents Street CC, North London CC, Bristol and Bath CC, Gnewt Micro-CC, Southampton SDC, 22 Bishopsgate and 1 Leadenhall CC, LEN Micro CC, UPS Mobile CC
<b>Scale</b>	Town centre wide, encompassing a large and eclectic number of retail outlets, hotels and other businesses, offices (including local authority buildings) and residential properties. Current assumption for Croydon is to service the area bounded by Ruskin Road / Poplar Walk / Bedford Park to the north; Dingwall Road / George Street / Park Lane to the east; The Croydon Flyover to the south; and Old Town to the west.
<b>Typical profile</b>	A physical consolidation centre circa 20,000-40,000sq ft ground floor, plus 1 <sup>st</sup> floor for welfare, back office systems etc. Total site area circa 1.5 to 2.5 acres. Vehicle numbers would range in magnitude, depending on the composition of the fleet. Estimated maximum number of vehicles: 19 lorries/vans. Staffing in order of: 19 drivers, 4 support staff, 6 managers. Potential for TfL to own & operate the CC with third-party Logistics Service Provider (LSP). Vehicle access inbound would be needed 24hr to enable out-of-hours/overnight trunking deliveries to arrive for rigid lorries potentially up to 18t
<b>Vehicle types</b>	Initially pedal / electric cycles, electric vans and 7.5t rigid lorries to optimise consolidation and delivery potential. However, could also incorporate up to 18t electric rigid lorries once these are available (potential within next 10 years), leading to a reduction in circulating vehicles between CC and town centre, and within the town centre.
<b>Operating conditions / Regulatory framework</b>	Public sector buildings enforced participation – most likely in the form of the Mayor, Boroughs and or central Government mandating or committing to the use of a CC solution in the target area for relevant products. Utilise planning conditions to mandate use of CC / PS for new offices, retail, hospitality developments in the target area for relevant products. Participation can also be encouraged through direct or inferred regulation such as road user charging, Safer Lorry Scheme, ULEZ, access restrictions by time of day and vehicle type, additional charges for certain deliveries types - i.e. same day
<b>Financial support</b>	A combination of enforced and voluntary participation will likely mean the consolidation service will require public subsidy (primary funding) potential in perpetuity. Public subsidy could be used in different ways - e.g. fund the running of the consolidation centre or provide discounts on business rates to participants etc. Alternatively, the facility could be set up as a Social Enterprise and financed as a Limited Community Interest Company (CIC). Third-party LSP could be contracted to manage and provide the service. It should be the aim of the CC operator not to have a specific facility built, but



	<p>lease an existing development if the it can meet the operating criteria - e.g. fast cross-docking capability.</p> <p>Cost estimates: £1.35M to £1.45M per annum.</p> <p>FCC charging regime: Users of the FCC would be charged on a 'freight' volume basis.</p>																						
<b>Target sector</b>	<p>Likely to be targeting ambient goods - i.e. not frozen or chilled food</p> <p>Retail – considered potentially difficult. Medium – Large retailers will already be operating with consolidated supply chains. Business rates could provide a mechanism as described above.</p> <p>Public sector buildings – mandate all public-sector buildings in the town centre must use the CC. Be seen to be taking a lead, potentially a lot easier to influence compared to private sector. This could also cover schools and hospitals.</p> <p>Offices – High potential for office stationery, consumables, cleaning products.</p> <p>Domestic/personal – considered potentially more challenging to implement and control compared with other sectors in a retrofit scenario. Other mechanisms may be more appropriate such as DP consolidation, although any expansion of high rise residential developments could be more easily included into a CC operation.</p>																						
<b>Market location</b>	Metropolitan or major centre – Croydon																						
<b>Parameters for site selection</b>	<p>Accessible to the Strategic Road Network.</p> <p>Town centre location (i.e. Croydon, Barking, Kingston).</p> <p>Should not be located near a residential development as the site would need to operate 24hr especially for inbound deliveries.</p> <p>Sufficient power supply to recharge electric delivery vehicles.</p>																						
<b>Consolidation locations</b>	<p>Potential to align with SILs for availability of land, facilities, access to road network and maximising vehicle trip reduction and mileage. Most suitable locations probably within Beddington Industrial Estate or The Spitfire Industrial Estate, Purley Way. Kingston and Barking are also potential locations to explore in more detail.</p>																						
<b>Supporting measures</b>	Locker banks, Click and collect, collection points, preferred suppliers, 24hr deliveries, electric vehicle, cargo bikes.																						
<b>Stakeholder feedback</b>	<p>Stakeholder feedback suggests targeting an out London town centre makes sense. Responses from stakeholders included:</p> <p>Anywhere where there is a great density of people, businesses (demand for goods). Potential to ring fence areas by postcode and coordinate deliveries within defined area. New development offers the greatest opportunity to embed new delivery and servicing behaviour and the necessary infrastructure. It should look to help solve the issues associated with the wider area, not just the development itself.</p>																						
<b>Appraisal</b>	<p><b>Impact:</b> In the order of 60% reduction in delivery vehicle trips could occur. This is figure would be dependent on the level of voluntary participation, but since a large area of central Croydon is due for redevelopment, planning conditions on developers could result in higher numbers of businesses/organisations participating. Assuming all CC vehicles are zero emissions, a 100% reduction in vehicle emissions would be achieved.</p> <p><b>Potential air quality savings:</b></p> <table border="1"> <thead> <tr> <th>Total Annual Emissions</th> <th>Kg NOx</th> <th>Kg PM10</th> <th>Kg PM2.5</th> <th>Kg CO</th> <th>Kg VOC</th> <th>Kg NH3</th> <th>Kg SO2</th> <th>Kg Benzene</th> <th>Kg N2O</th> <th>Tonnes CO<sub>2</sub>e</th> </tr> </thead> <tbody> <tr> <td></td> </tr> </tbody> </table>	Total Annual Emissions	Kg NOx	Kg PM10	Kg PM2.5	Kg CO	Kg VOC	Kg NH3	Kg SO2	Kg Benzene	Kg N2O	Tonnes CO <sub>2</sub> e											
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Total saved emissions	366	15	11	71	11	1	0	0.2	2	82
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Were such CCs to emerge in the outer belt of London, potential for supply chain deliveries to be amalgamated into larger vehicles presenting multidrop options to CCs, further reducing the overall level of distribution activity.

**Scalability:** This approach could be implemented for other outer London ‘town’ centres that wish to adopt CC serviced retail / business areas. Each CC would operate as a separate facility and, therefore, is transplantable. Scale of CCs would be dependent on size of area, scope of inclusion and type of area to be served.

**Political will:** Meeting the policies set out in the London Plan. Demonstrating the implementation of improved urban realm and quality of life for inhabitants and visitors. The voluntary scheme is considered less challenging to implement politically.

**Economy:** The absence of unauthorised delivery traffic could lead to increased footfall and more prosperous public and business realms. Traffic calming and removal of vehicles has demonstrated that footfall to an area will rise. Improved environment could act as a factor to attracting businesses - offers ‘green’ credentials to meet social responsibility commitments. Alleviates public concerns toward presence of freight vehicles on streets.

**Kerbside/Cost of delay:** Dependent on traffic flow and length of time delivery vehicle parks at kerbside. Example: Delay cost is £15.14/hr per veh; 10sec delay = £0.04 / veh; Assuming for each kerbside delivery 200 vehs delayed over 20min / day = £8.41. For the year = £2,624. Assuming 20 deliveries / day over year delay cost to economy = £52,485.

**Recommendation**

The appraisal findings indicate strong potential impact for vehicle reductions. Whilst the political will required is high is it considered feasible. The financial support required is also significant, but if participation can be made mandatory and with the right charging regime a break even scenario should be possible. The level of development occurring in Croydon (and other town centres) that could participate in a consolidation scheme is consider sufficient to provide enough demand as well as an opportunity/mechanism to make consolidation work. Further work may be required to the look at necessary infrastructure, operational, financial and contractual requirements to ensure buy in and commitment.

**The Outer London Town Centre model should be pursued further.**

## 5.8 Option 6 Technology Solution

Model	6: Technology Solution
Description	<p>What technology solutions already exist and what is coming in the future e.g. virtual consolidation, real time data, load sharing, 3D printing, drones and robots. What impact will they have on deliveries in particular when combined with consolidation. Less quantifiable model assessment – more of a research and qualitative appraisal.</p>
Type	<p>There are numerous technological advances already occurring within the logistics industry and wider manufacturing and retail sectors as well as powering consumer demand. Given the sheer number of technologies that could be considered a small number have been researched for discussion as they are thought to potentially have the greatest impact.</p> <p><b>Artificial intelligence and machine learning:</b> In the future all parts of the logistics operation can work as an integrated supply chain – cargo ships connected to port infrastructure, rail and road operations connected to their respective environments including real time traffic data; and all connected to each other and then to manufacturers, depots, warehouse management systems, retailers’ and wholesalers’ systems. Combining Artificial Intelligence and machine learning with connectivity and decision making itself can become more automated. The whole supply chain can be a single automated, digitalised, autonomous system, adjusting volumes, routes and schedules in response to events, pressures and demands. This can potentially occur from the global to the local level.</p> <p><b>Automation:</b> Automation goes hand in hand with Artificial Intelligence and the impact is already being seen in the warehouse with larger players such as Amazon using some 45,000 Kiva robots in its 20 UK warehouses. It has been predicted that some 60% of existing warehousing and logistics functions could be automated and handled by a variety of different robots and machines. This can range from autonomous fork lift trucks and order fulfilment robots to autonomous delivery trucks and drones and robots, although there is scepticism regarding the scope of drone and bot delivery in densely populated urban areas. There is also doubt over the potential for fully autonomous delivery vehicles, currently this focuses on battery technology to support larger (&gt;7.5t) lorries and the need for human interaction to make the final hand over in some delivery sectors.</p> <p><b>3D Printing:</b> The vision of a world where almost anything can be 3D-printed is no longer so far-fetched. 3D printing is already a major disruptive trend in some industries, and it is likely to impact logistics and especially the design of supply chains. 3D printing may not replace traditional manufacturing of standard items, the highest potential to disrupt looks in the production of highly complex and customised products. In these segments, there could be changes in the patterns of goods transportation, both in terms of volume and flow with inventory levels likely to decrease, as companies switch to a ‘build-to-order’ model. Build-to-order production strategies could fundamentally challenge the dynamics between manufacturers, wholesalers and retailers. This might require rethinking logistics, potentially shifting a company’s business model from storing and moving inventory to 3D-printing inventory on-demand closer to the consumer.</p> <p><b>Hyperloop cargo:</b> DP World and Virgin Hyperloop One have partnered to</p>



	<p>create new global company that provides hyperloop-enabled cargo systems. Hyperloop is a futuristic mode of passenger and freight transportation in which a pod-like vehicle is propelled through a near-vacuum steel tube, with most of its air removed, at higher than airline speed. Next-generation magnetic levitation technology combined with a low pressure tube environment enables the pods to move quickly with little friction. Hyperloop can achieve top speeds of up to 300 metres/second, making it two to three times faster than highspeed rail. The technology facilitates autonomous operations designed to reduce human errors and run with minimal delays. It will look to transport high-priority, time-sensitive goods including fresh food, medical supplies, electronics, and more. It will expand freight transportation capacity by connecting with existing modes of road, rail and air transport. This may currently seem farfetched, but it is the type of concept in terms removing road transport for at least part of the supply chain that may need to be considered.</p> <p>Technological advances are likely to enable an exponential increase in productivity and output across the industry. Data platforms should also enable greater functionality and increase the potential for consolidation including en-route load consolidation as operators are able to collect/deliver each-others consignments (if they collaborate). However, there will still be a basic need to move physical product from point of manufacture/distribution to the end customer. It is also anticipated that technology will continue to drive purchasing habits, increasing demand and expectation for more instantaneous delivery. Therefore, the impact on vehicle movements is unknown and could potentially be negative rather than positive despite the optimisation of supply chains, vehicle fill and routes. This is unless technologies such as 3D printing or a system such as the Hyperloop cargo can fundamentally alter how we manufacture and transport goods.</p>
<b>Operating conditions / Regulatory framework</b>	Policy making, regulations and land use planning will need to be more agile to facilitate technological change and the implications of data protection, sharing, accessibility and commercial sensitivity will need to be collectively addressed to overcome them as potential barriers.
<b>Financial support</b>	The market and private investment will dictate with little or no support other than kick start/seed funding required from the public sector
<b>Target sector</b>	All sectors and elements of the supply chain will be affected in some way
<b>Market location</b>	Pan-London
<b>Supporting measures</b>	24hr delivery (considered key), unattended delivery facilities.
<b>Stakeholder feedback</b>	Technology is likely to create as many problems as it solves. Connectivity and e-commerce will continue to drive purchasing habits and demand for instantaneous delivery. At the same time, it will allow supply chains to achieve greater visibility and integration increasing efficiency. May not necessarily lead to a reduction in vehicle trips.
<b>Recommendation</b>	Work with industry and facilitate the update of technology to improve efficiency. Understand the potential impact of technological advancements on the urban environment and society and regulate to ensure negative impacts are minimised.

## 5.9 Impact Assessment

The table below provides a qualitative impact assessment of each different consolidation model based on the outcomes presented in the consolidation model tables in the previous section. Each parameter (Congestion, Political will etc) has been given a score out of five with 1 being low and 5 being high. For example, model 1a scores four for political will as it is considered difficult to deliver an enforced participation consolidation scheme, but two for financial support as the enforced nature means the costs of running the consolidation centre should be covered by the participants. The table should be viewed as a summary of the impact of **each** model but **should not be used for comparison** between the different models as they are vastly different targeting different geographical areas, scales and types of consolidation. Model 6 Technology Solution is not included in the table as it is not possible to complete an impact assessment. The results show there is no dominant model but options can be combined into a package of measures to meet specific sector / supply chain / geographical requirements.

Number and Name	Congestion / vehicle trip reduction	Kerbside	Road Safety	Economy	Political Will	Deliverability	Scalability	Financial Support
1a: Opportunity Area – Enforced Participation in Consolidation	4	4	3	3	4	3	4	2
1b: Opportunity Area – Voluntary Participation in Consolidation	3	3	3	3	3	4	4	4
2: Network of Consolidation Centres Serving CAZ	2	3	3	3	5+	1	3	5
3: Preferred Suppliers	3	4	3	3	2	4	4	1
4: Micro Consolidation / Last Mile	3	4	3	3	2	3	4	2
5: Outer London Town Centre	3	3	3	3	3	3	4	4

## 6 Recommendations

6.1.1 A summary of the recommendations from the consolidation model assessments is provided in this section. Several additional recommendations have also been put forward based on the outcomes of the research, model assessment and feedback from stakeholders. The impact assessment scores included in the recommendations are specifically for each option and should not be compared between options. Each parameter (Congestion, Political Will, etc.) has been given a score out of five with 1 being low and 5 being high.

### 6.1 Model 1a&b: Opportunity Area – Enforced/Voluntary Participation in Consolidation

6.1.2 The Opportunity Area – Enforced Participation model **should be pursued** with the voluntary model also explored if the enforced participation model is not considered possible. Also, potential to explore both in tandem. The scores from the Impact Assessment are:

	Congestion / vehicle trip reduction	Kerbside	Road Safety	Economy	Political Will	Deliverability	Scalability	Financial Support
1a	4	4	3	3	4	3	4	2
1b	3	3	3	3	3	4	4	4

6.1.3 The appraisal findings indicate an effective potential to reduce the number of circulating goods vehicles in both models (albeit less so for voluntary participation). Whilst the political will required is high, it is considered feasible as the OA development is new and therefore the ability to influence policy is easier. The financial support required is also significant, but with mandatory/enforced participation and the right charging regime a breakeven scenario should be possible.

6.1.4 Building in mandatory consolidation to relevant policy and strategy documents needs to be incorporated at the masterplan stage - i.e. now. The potential to create a BID for the area should be explored as a mechanism to ensure participation and control delivery and servicing operations.

6.1.5 Potential locations to be explored in more detail include Old Oak Common and the Isle of Dogs. Further work will be required to look at infrastructure, operational, financial and contractual requirements to ensure buy in and commitment from end users.

### 6.2 Model 2: Network of Consolidation Centres Serving CAZ

6.1.6 It is recommended that the network of consolidation centres to serve CAZ should not be pursued. The scores from the Impact Assessment are:

Congestion / vehicle trip reduction	Kerbside	Road Safety	Economy	Political Will	Deliverability	Scalability	Financial Support
2	3	3	3	5+	1	3	5

6.2.1 It is not considered possible or efficient to try and provide a one-size-fits-all solution. The variety of supply chains, different sectors and end customers is too vast, dense, complex and nuanced for a network of consolidation centres to be able to effectively cater for all requirements. The political will and policy changes required are considered to be extremely challenging given the scale of what would be needed - i.e. the wholesale changing of long-

established supply chains, the buy in of Boroughs and the GLA, the regulatory framework particularly if some exemptions are made and the financial commitment to underwrite the operation of the consolidation centres. Additional HGV and van (delivery) restrictions would need to be introduced.

- 6.2.2 A better approach for the CAZ is believed to be a package of measures including: consolidation (across different sectors – food, construction, waste, public sector), BID consolidation, micro-consolidation, preferred suppliers, development lead consolidation - i.e. 22 Bishopsgate and offering 24hr delivery windows.

### 6.3 Model 3: Preferred Suppliers

- 6.1.7 The model of using preferred suppliers and consolidation centres, in particular for multi-tenanted office buildings, **should be readily pursued**. The scores from the Impact Assessment are:

Congestion / vehicle trip reduction	Kerbside	Road Safety	Economy	Political Will	Deliverability	Scalability	Financial Support
3	4	3	3	2	4	4	1

- 6.3.1 A precedent for this approach has been set by the City of London, supporting the concept to be easily rolled out as a planning condition to other similar developments. This should be applicable across all London Boroughs and should also be investigated as a retrospective action for appropriate developments. Supplementary Planning Guidance will be required.

### 6.4 Model 4: Micro Consolidation / Last Mile

- 6.1.8 It is recommended that the Micro consolidation / Last Mile model **should be pursued**. The scores from the Impact Assessment are:

Congestion / vehicle trip reduction	Kerbside	Road Safety	Economy	Political Will	Deliverability	Scalability	Financial Support
3	4	3	3	2	3	4	2

- 6.4.1 The concept has been demonstrated to work effectively with both electric vans and cargo bikes – there is also scope for the Gnewt style Portering (see case study) to be rolled-out to other areas. It should be noted that private sector companies including Gnewt, WeGo Couriers and Wilson James are already supplying micro consolidation / last mile services and our stakeholder engagement interviews suggest other new market entrants are likely to be established without the support of the public sector.
- 6.4.2 The biggest barriers to implementation are locating suitable premises and their subsequent cost. Therefore, TfL and the Boroughs should work to identify potential locations, including non-traditional logistics facilities - i.e. car parks, basements of large office blocks and shopping centres, and undeveloped land. Consolidation centres must be serviced by zero emission vehicles to ensure air quality benefits are maximised. The site locations will need to have a supply of charging points and within accessible reach of the geographical area it is intending to serve.
- 6.4.3 Examples of potential locations include Strategic Industrial Locations (SIL) in the London boroughs of Newham, Tower Hamlets, Camden, Wandsworth and Ealing (see Appendix A).

### 6.5 Model 5: Outer London Town Centre

- 6.1.9 It is recommended that this model option **should be pursued** further. The scores from the Impact Assessment are:

Congestion / vehicle trip	Kerbside	Road Safety	Economy	Political Will	Deliverability	Scalability	Financial Support
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reduction							
3	3	3	3	3	3	4	4

- 6.5.1 The appraisal findings indicate strong potential impact for vehicle reductions. Whilst the political will required is high, it is considered feasible. The financial support required is also significant, but if participation can be made mandatory and with the right charging regime a break-even scenario should be possible.
- 6.5.2 The level of development occurring in some outer London town centres (e.g. Croydon, Barking and Kingston) could make it viable for a consolidation scheme to operate. Further work may be required to look at necessary infrastructure, operational, financial and contractual requirements to ensure buy-in and commitment.

## 6.6 Model 6: Technology Solution

- 6.6.1 Technological advances are likely to enable an exponential increase in productivity and output across the industry. Data platforms should also enable greater functionality and increase the potential for consolidation including en-route load consolidation as operators are able to collect/deliver each other’s consignments (if they collaborate). However, there will still be a basic need to move physical product from point of manufacture/distribution to the end customer. It is also anticipated that technology will continue to drive purchasing habits, increasing demand and expectation for more instantaneous delivery. Therefore, the impact on vehicle movements is unknown and could potentially be negative rather than positive despite the optimisation of supply chains, vehicle fill and routes. This is unless technologies such as 3D printing or a system such as the Hyperloop cargo can fundamentally alter how we manufacture and transport goods.
- 6.6.2 Therefore, to help maximise the potential of technological advances TfL needs to work with industry and help facilitate the uptake of technology to improve efficiency. Understand the potential impact of technological advancements on the urban environment and society and regulate to ensure negative impacts are minimised. Policy making, regulations and land use planning will need to be more agile to facilitate technological change and the implications of data protection, sharing, accessibility and commercial sensitivity will need to be collectively addressed to overcome them as potential barriers.

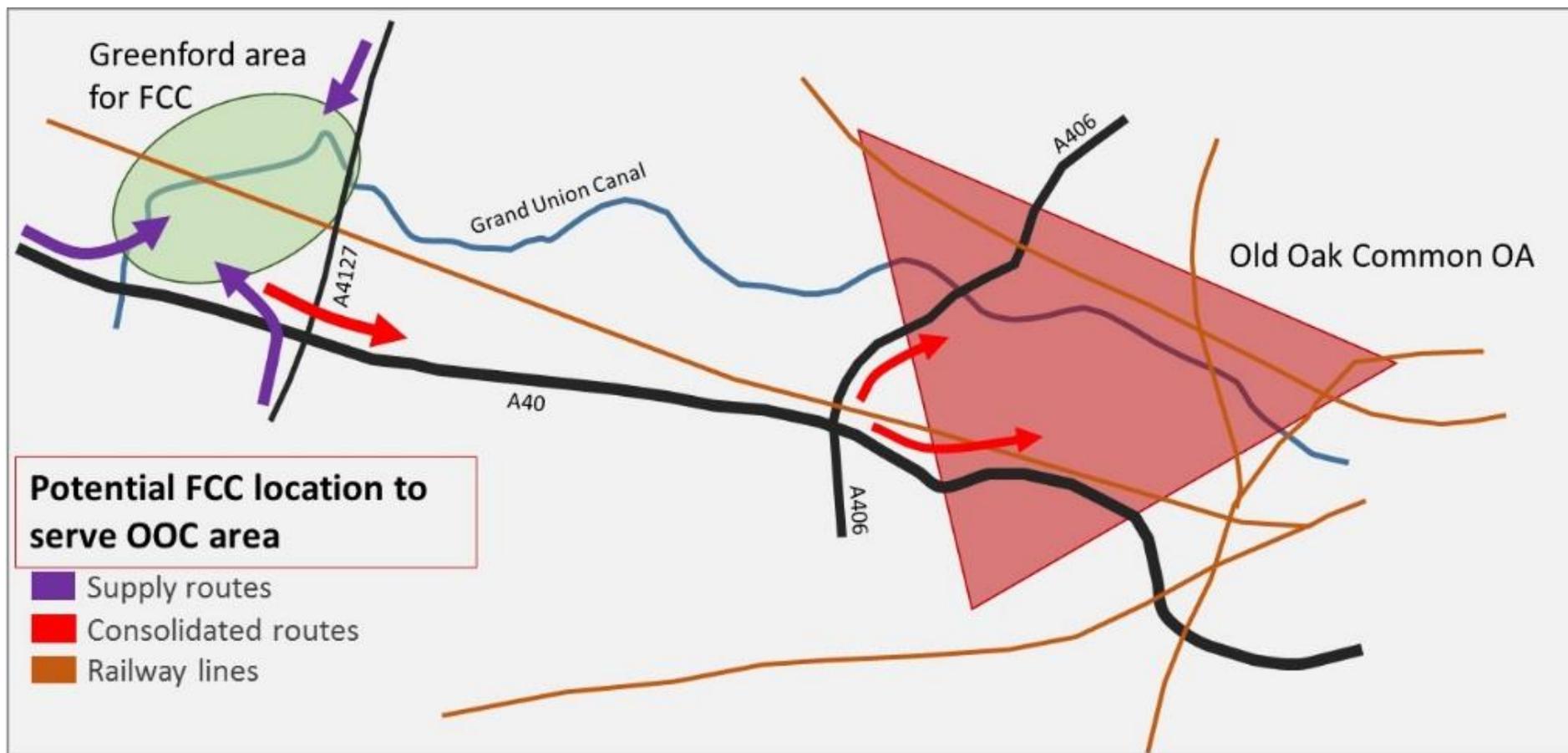
## 6.7 Additional Recommendations

- 6.7.1 In addition to the overall recommendations regarding the different consolidation models several other recommendations have been produced based on a combination of feedback from stakeholders, research and the outcomes from the consolidation model assessment. The recommendations are listed in no particular order and can be regarded as suggestions for policy and further work.
  - Use Delivery and Servicing Plans (DSPs) as the tool / mechanism to introduce planned measures such as consolidation, preferred suppliers etc. Follow the example set by the TfL Construction Logistics Plans (CLP) work programme as a template for implementing DSPs through a combination of guidance, tools, training, monitoring and enforcement. Commitment to DSPs and their effective implementation could be enable TfL and the Boroughs to understand delivery and servicing requirements and ensure suitable measures are utilised
  - TfL should lead by example and implement DSPs across their organisation. This should include undertaking procurement re-organisation, using preferred supplier and consolidated deliveries across its offices and locations. The City of London are set to start using a consolidation service for their office deliveries in the near future. Transport Systems Catapult (TSC) have demonstrated it can be done effectively for the public sector in Southampton. Once established TfL could open the service to other public sector organisations

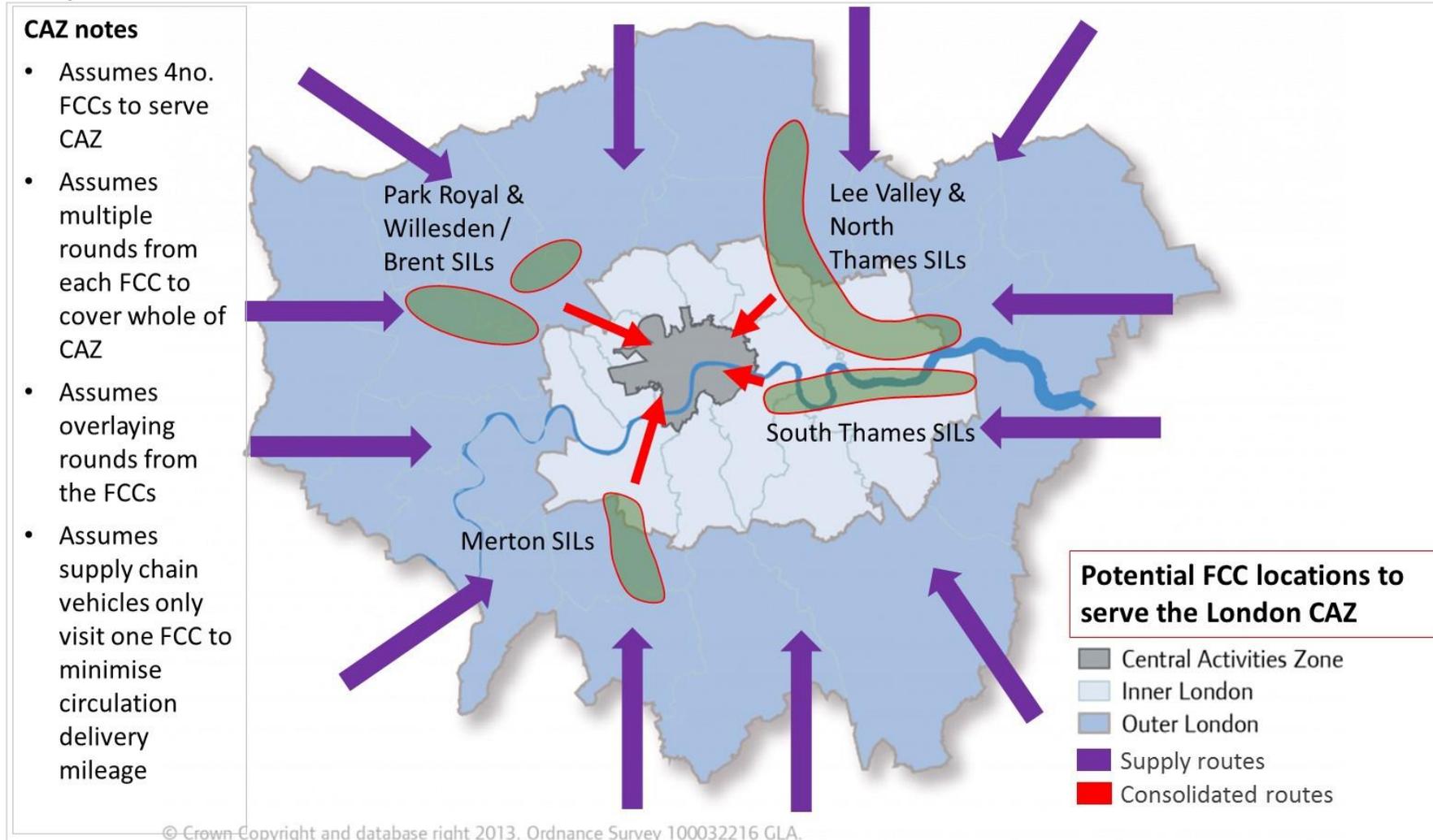
- Public sector consolidation scoping study – scoping exercise to understand the number, type, location, number of buildings and (high level understanding) of current delivery and servicing patterns of public sector organisations in London. The findings can be analysed, and the consolidation potential of each organisation can be ranked to produce a targeted list. DSPs should then be produced working in conjunction with each organisation. Consolidation (or other efficient delivery measures) can be implemented through the DSP process
- Investigate the potential to legislate for the removal of the ‘free delivery’ option from online purchases. The notion of free delivery has become normalised and is driving up public expectations of service levels. The true cost of delivery needs to be relayed out to consumers to help foster responsible ordering habits. Force businesses to price delivery responsibly. It is appreciated that this would likely require national legislation from DfT or a London specific delivery charge, both of which are recognised as difficult to achieve. An alternative could be to look at the providing additional information regarding deliveries such as the environmental and congestion costs of choose same day or next day delivery
- Opening up the 24hr delivery window is seen as key to improving delivery efficiency in London by all stakeholders. The work of the Retiming Deliveries Consortium has achieved considerable success, but more needs to be done and in order to achieve this more resource is needed. In particular, working with Boroughs to unpick planning conditions and undertake the necessary engagement with all stakeholders to find solutions to out of hours’ delivery issues
- An integrated package of measures including consolidation of different sectors (where it adds value) should be considered

## Appendix A

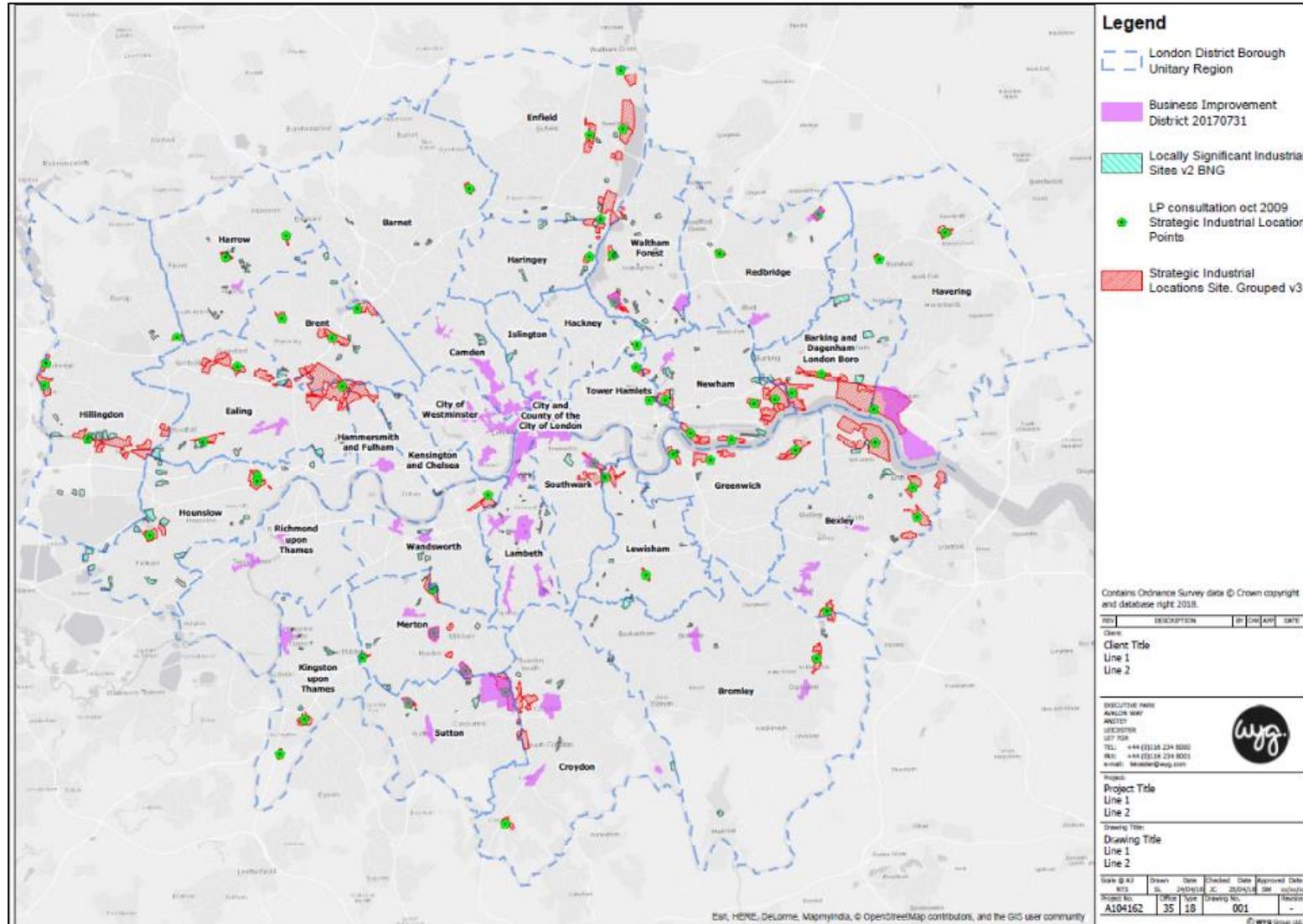
The figure illustrates the potential location of the consolidation centre to serve the Old Oak common development.



The figure illustrates the potential location of the consolidation centres to serve the CAZ.



This figure shows a combined map of BIDs, locally significant industrial sites and strategic industrial locations



## Appendix B

### Case study examples developed from the literature review

#### Heathrow Airport Consolidation Centre

Retail development within Heathrow airport has increased dramatically over the past ten years, but the infrastructure has seen little change to accommodate this growth. Terminals 1 to 4 at Heathrow were not designed for retail logistics, access is quite restricted and is shared with staff and passengers. There are also insufficient loading bays and limited back-room storage within the buildings themselves.

In 2000, Excel Logistics was chosen to run a consolidation centre trial at the airport. It was so successful that the company won a permanent contract one year later. All deliveries to Heathrow now pass through a mandatory off-site consolidation centre. Retailers receive deliveries according to a schedule or as and when required. The impacts of the consolidation centre can be summarised as follows:

- A reduction in vehicles travelling to terminals and driving airside (reduction of 35 vehicle deliveries into the airport per week)
- Faster deliveries for distribution companies (at the consolidation centre compared with shops calculated to be 234 hours per week saved in making deliveries)
- More frequent and reliable deliveries for retailers in the airport
- Vehicle kilometres reduction (approximately 560 fewer vehicle kilometres travelled per week)
- Reductions in CO<sub>2</sub>, carbon monoxide, nitrogen oxide and particulate emissions (weekly reductions of 426 kg of CO<sub>2</sub>, 1.06 kg non-methane volatile organic compounds, 3.79kg nitrogen oxide, and 0.28 kg of particulates)

#### Benefits:

- There is a 99% delivery success rate
- Overall project plan reliability has increased by 4%
- Total transport and logistics costs have been reduced, owing to the elimination of part loads and night-time deliveries
- A decrease in supplier handling and a reduction in on-site storage requirements

#### North London Consolidation

The London Boroughs of Camden, Enfield and Islington have a diverse community to serve and require a wide range of goods and services for their several hundred separate addresses including municipal buildings, libraries, schools, care homes, depots, offices, hostels, day and sports centres, commercial premises and households. In the summer of 2012, the Chief Procurement Officer at the London Borough of Camden embarked on a project to further explore the consolidation centre concept and the feasibility of such a solution for Camden and its borough partners. The project secured funding from two sources, the European Union and the Mayor's Air Quality Fund.

The consolidation activity is performed utilising 2,000 sq. ft. of shared use warehousing space and employs two drivers, one warehouse person and part-time, 87 suppliers and 19 delivery companies are using the facility. Throughput is currently between 400 to 500 items per day, of which 6% consist of pallets.

Suppliers deliver into the centre at pre-agreed time slots between 6.30am and 8am with a turnaround time of around 15 minutes per vehicle. Deliveries to end-recipients who are spread over an area of 143 km<sup>2</sup> are made between 9.30am to 4pm. The vehicles capacity utilisation is maximised as they

collect returns.

The centre is capable of handling a wide variety of goods, ranging from library books, furniture, gym equipment, retail products, facilities equipment, ICT equipment, documents and mail and cleaning supplies to records, linen, ambient foods, office supplies, stationery and public health literature. Feedback from both suppliers and customers has been positive.

#### Lessons Learned:

- The consolidation model should be procurement led and be included within tender documents
- Delivery costs are not transparent to buyers
- Negotiations with suppliers should take account of delivery supply chain savings as a result of suppliers reduced delivery costs
- Deliveries 'to desk' are expensive and not necessary
- A freight consolidation scheme can have a greater overall positive outcome than merely converting supplier's fleets to zero emission
- The collection of waste or goods returns by the delivery vehicles on the return leg maximises the efficiency of the vehicles
- Zero emission vehicles are not readily available on a short-term hire basis
- Emergency or 'rush' deliveries are not needed if stock levels are managed and orders are planned
- Staff behaviour change is critically important – sufficient time should be allocated to communications so that staff understand the changes
- Use a combination of communications channels – intranet, targeted emails, phone calls and workshops
- Don't try to change too many processes all at once (e.g. minimum order volumes/values)
- Councils should work together with Universities, Business Improvement Districts, Hospitals, Offices and Retailers in their local areas to achieve maximum throughput. Once the facility is in place, adding volume increases the efficiency, cost effectiveness and environmental benefits for all

### **One Hyde Park**

Consisting of 86 apartments, spread over four pavilions overlooking Hyde Park and Knightsbridge, the OHP project commenced in July 2006 and was completed in October 2010. During the planning and construction phase, the contractor had implemented logistics best practice to improve material handling, recycling and efficiency. OHP lies within a severely space-constrained construction site which leads to a number of issues including:

- Severe traffic congestion on and off site
- Limited access points to site
- Limited capacity on site for storage of materials
- Restricted lay-down space on site for materials
- Limited working hours for deliveries
- Neighbours

Located in Wembley, the consolidation centre had 8,000m<sup>2</sup> of internal and 3,000m<sup>2</sup> of external storage space. It also provided short term secure storage for all materials used during the fit-out phase of construction. A penalty system, with a set fine per pallet, had been implemented for materials that were stored at the facility for longer than 28 days. This ensured that materials were not left on site beyond the agreed timescale. Operations at the CCC were outsourced to a third-party contractor whose responsibilities included:

- Managing the delivery and safe storage of materials
- Checking the condition of materials received at the facility

- Storage of high value and easily damaged materials in a secure area
- Delivery of all materials to site, as called off by the trade contractor
- Ensuring trade contractors are satisfied with the condition of delivered material
- The return of packaging and pallets to the facility for storage until required for re-use or taken for recycling

#### Benefits:

- The use of the facility resulted in no materials delivered to the site being out of specification
- During the development period, no damage to material was recorded at either the consolidation centre or at the OHP development, resulting in zero damaged goods being returned to suppliers
- 66% reduction in on-site construction vehicle movements
- 100% on-time deliveries
- Effective waste management through reverse logistics
- 13.8 tonnes of recyclable waste returned to the consolidation centre

### **Veolia Waste Consolidation**

During the construction of The Queen Elizabeth Olympic Park in preparation for the London 2012 Olympics and Paralympics, a Waste Consolidation Centre (WCC) was set up to achieve economies of scale and minimise the effects of several waste management services operating across the Park. The WCC consisted of two large covered 'sheds' to prevent the waste getting wet and to avoid light items being blown away. It also had a number of other bays outside, which could change size depending on the incoming waste streams from construction.

Veolia invested £1.2 billion to build the temporary onsite waste consolidation centre and also acted as a centralised waste management service. Veolia were responsible for collection, consolidating, handling and bulking of materials from the park. Where possible, they removed waste from the site by water via the River Lea, which was then processed at their facility in Essex.

#### Lessons Learned:

- Waste had to be transported on internal roads from the WCC to the wharf, causing double-handling. This was one of the inevitable issues of a space restricted site but it was not an efficient way of handling waste
- It is recommended that future projects focus on minimising waste through design, procurement and construction
- Detailed forecasting and reporting is essential for best practice waste management

#### Benefits

- More than 95% of construction waste from the site was recycled – equivalent to 28,970 tonnes
- Off-site vehicle movements were reduced by over 80% with 2,300 tons of timber, plasterboard, paper and card being removed from site by water
- 100% of this waste was recycled and 124 tons of materials were reused by local charities

### **Multi-carrier Consolidation – Central London trial**

A trial was set up in 2014 by the Greater London Authority using a range of electric vehicles to operate final deliveries within Central London, with the results of this collated within a final report written by Sam Clarke and Jacques Leonardi. In the Agile Gnewt Cargo trial, the demonstrator carried parcels for final delivery in central London for several major parcels businesses, home deliveries, and business-to-business operations in London and the UK). The Consolidation Centre set up as part of this trial was located on Carlton House Terrace, London, SW1. The location is

shown in Figure B.1.

The purpose of this case study trial was to:

- Understand how to better manage the set-up of a new consolidation centre with clean vehicles, in order to secure long term growth
- Demonstrate a good practice in expanding city centre delivery operations into a new area using a micro-consolidation centre approach
- Expand the delivery area covered by Gnewt Cargo towards the West of Central London, while at the same time better understanding the management of multiple depots and the operating of an increased number of electric freight vehicles for deliveries in all of Central London, for a single client

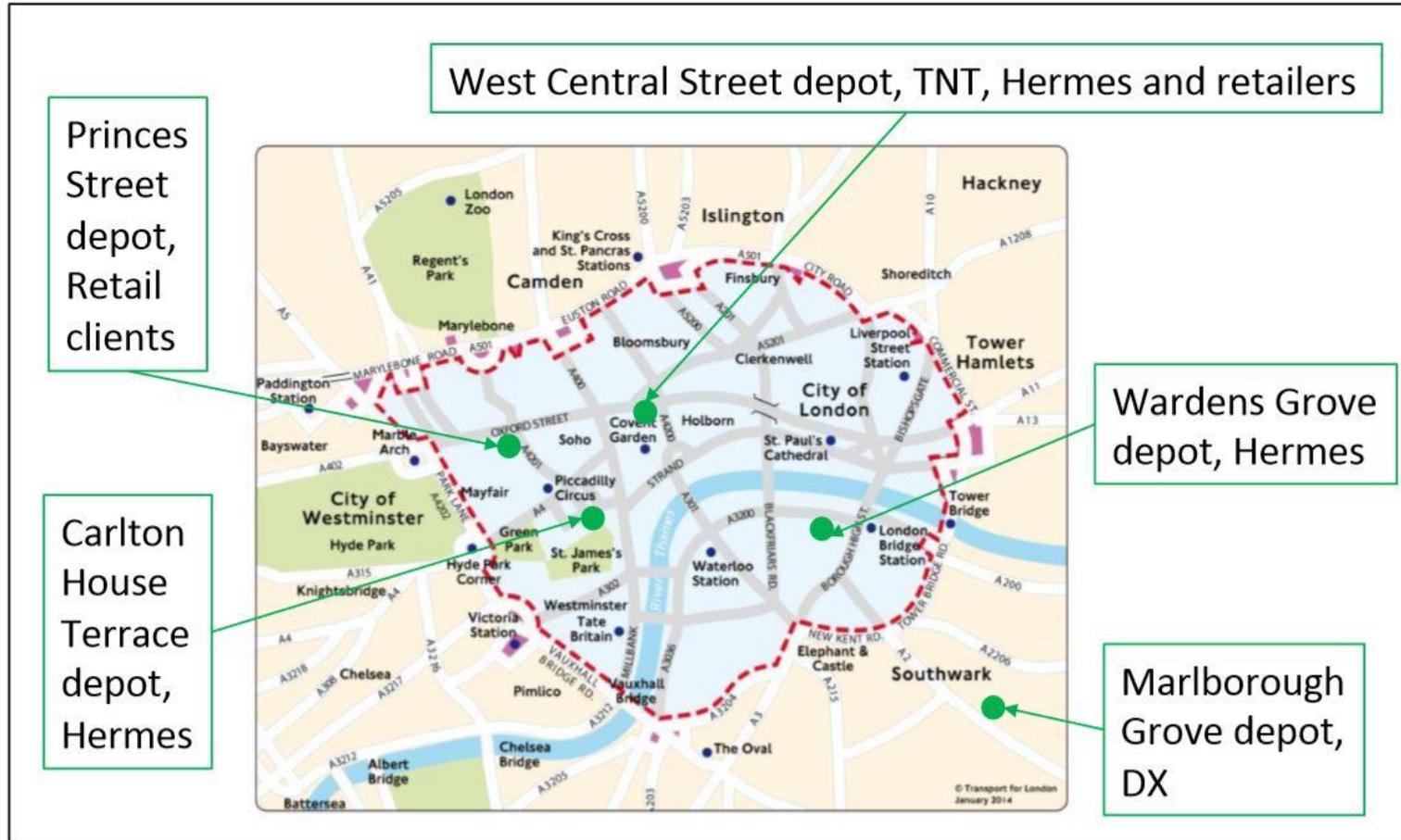
Lessons Learned:

- The new management knowledge and the additional high-quality data on how to open a new depot are essential for the future growth of this type of electric parcels delivery
- The main operative advantage is the additional available depot space for the huge demand peak at Christmas time, with up to 10,000 parcels more per day to be delivered, on top of the existing business
- It is not necessary to pay the high rental price of this additional depot for the whole year when it is not needed

Benefits:

- The new depot operations were successfully set-up and run for the peak Christmas delivery period at the end of 2014
- The new electric vehicles were successfully introduced into the operations
- This Case Study has helped to demonstrate how to successfully open a new depot and operate an electric fleet in Central London, starting from an existing business
- The solution is viable and scalable. The Case Study resulted in a reduction of 20% vehicle kilometres
- Compared to the situation before the business with electric vehicles and depot operations commenced, the total distance travelled, measured in kilometres per parcel, has been reduced by 52%

Figure B1: Location of Consolidation Centre



Source: TfL 2015, Agile Gnewt Cargo demonstration 2014-2015

## **The London Construction Consolidation Centre (LCCC), Silvertown**

The LCCC is conveniently located in Silvertown, East London; easily accessible from either the A13 or the DLR (Pontoon Dock). It provides 12,541 square metres (135,000 square feet) of fully managed and secure storage for contractors. The purpose of the LCCC is to improve operations on the construction site by providing off site logistics support and more control and coordination over delivery management. The LCCC achieves this in a number of ways including:

- Reducing the risk of HGVS to other road users and problems associated with air pollution, by reducing traffic congestion on roads in Central London
- Reducing the burden of deliveries from multiple suppliers on site by decreasing the number of loads as a result of consolidation
- Providing a single point of contact for deliveries which is extremely useful if circumstances change and delivery arrangements need to be amended or cancelled at short notice
- Reducing material congestion on site as a result of just in time (JIT) planning, leading to clearer, safer sites with an improved standard of housekeeping
- Facilitating reverse logistics, where items that retain a value to the supply chain can be returned to the LCCC for collection by the supplier, without obstructing space on site

### Lessons Learned:

- The LCCC is not intended for long term storage
- Its value is highest when used to facilitate the efficient flow of materials from suppliers to site
- This means using it for high volume/fast turn-over of stock

## **Better Bankside Waste Consolidation Programme, London**

The Better Bankside Waste Consolidation Programme is a waste micro-consolidation scheme. It was awarded funding from Transport for London to deliver an innovative waste micro-consolidation scheme in 2018. The initiative also forms part of our wider commitment to deliver air quality projects in Bankside. The Better Bankside consists of 620+ companies in the Business Improvement District (BID); the BID is an independent business-owned and led company seeking to improve a given location for commercial activity. The 620+ companies pay its annual 'levy'.

Better Bankside's Maintenance Team, in partnership with First Mile Recycling, will collect the rubbish from businesses using our zero emissions vehicle and transport the waste to Borough Market's compactor. There will be no changes to the waste collection service and participating businesses are expected to put out their waste in the usual way. Switching to a zero emissions vehicle will have significant impact on the number of trips to and from Bankside by diesel waste vehicles and improve local air quality.

## **Bee Midtown, London**

Bee Midtown comprises London's best-connected postcodes; WC1 and EC1, which includes the areas of Holborn, Bloomsbury, St Giles, Farringdon & Clerkenwell. Bee Midtown is not a current example of freight consolidation, however offers the potential for freight consolidation practices to take place in future. A brief description of the Bee Midtown concept (as found on the bee-midtown.org website) is outlined below:

"We are the collective voice of over 400 businesses; from global stalwarts, to local start-ups and everything in-between. We are here to bring the people and businesses of Midtown together to drive long-term, sustainable, commercial and social growth. We do this by connecting the eclectic mix of people and businesses of the area together through our range of services, events and projects."

## Southampton Citylab

Data gathered for the World Health Organisation (2016) shows that the PM10 and NOx levels in Southampton just exceeded the limits. Southampton City Council (SCC) has been considering a range of complementary measures to tackle pollution, including freight transport.

CITYLAB aimed to reduce freight vehicle movements and to use less-polluting vehicles for transport generated by large municipal organisations (LMOs). From the project outset, CITYLAB focussed on large municipal organisations' role in reducing vehicle impacts by investigating incoming freight consolidation. The project undertook case studies with the Universities' residence halls, Southampton General Hospital and the Isle of Wight Hospital Trust to quantify the case for consolidation.

Recognising the fact that there is no single 'solution' to the problem of air quality, the Southampton living lab has considered complementary approaches:

- Promoting and undertaking 'delivery and servicing plans' (DSPs) across various business and LMOs to review and rationalise their procurement processes and mitigate the negative impacts of freight and service vehicle movements
- Using the SSDC for consolidation of incoming deliveries and off-site storage
- Using electric vehicles in large municipal fleets

While the concepts themselves are not necessarily innovative per se, the individual application areas are. Participants in the lab identified them as potential solutions to problems encountered:

- The consolidation centre traditionally serviced smaller, independent retailers, thus private companies use the SSDC already. Of interest is the broader application to LMOs and the freight generated by 9000 university students living in halls. Also, reducing freight movements into hospitals and how short-term off-site storage can aid ward-based infrastructure maintenance and refurbishment; and
- Small electric vehicles are now commonplace in both passenger and light freight activity. Of interest here is to what extent they can serve the needs of larger-scale municipal fleets.

Various public-sector institutions were reviewed and interviewed to assess the level of interest and potential benefits. Extensive data were collected for deliveries to the University of Southampton and Southampton Solent University. While potential for consolidation was identified for both universities various barriers currently prevent operational changes, including financial constraints and concerns about any delays to urgent deliveries (e.g. where same day delivery required). In the hospital sector, there appears to be both potential for consolidation and an interest in changing operations from both the Isle of Wight NHS Trust and University Hospital Southampton NHS Foundation Trust with Citylab partners and stakeholders currently discussing options. It is noted that since the CITYLAB study, a number of the public institutions mentioned above have begun using the Southampton SDC, which is discussed in more detail in the following section.

## Southampton Sustainable Distribution Centre (SDC)

Southampton City Council appointed Meachers to run the SDC after securing funding through the Government's Local Sustainable Transport Fund. The SDC operates from a 20,000 square foot site based on the Nursling Industrial Estate in Southampton. Isle of Wight Logistics provider Steve Porter Transport, a strategic partner of Meachers will ship the goods to the island and make the last mile deliveries. The SDC has been operating in Southampton and the surrounding areas since 2014. Existing public sector users of the service total fourteen and include Southampton University, Southampton Solent University, New Forest District Council, Southampton General Hospital and Southampton City Council.

Meachers is midway through a 4-year contract with the City Council, which has seen it consolidate 300 pallets of items that were stored in 5 separate units across the city into one central location. By using the SDC the council is expected to make financial savings in excess of £40,000 over the life of

the contract by reducing fixed overhead costs and improving storage and retrieval procedures by using new bar-coding technology. The SDC has recently won a contract with St Mary's Hospital, part of Isle of Wight's NHS Trust to serve their logistical requirements. The newly signed agreement is expected to be the forerunner to a larger contract, which could see NHS hospitals in both Southampton and Portsmouth take part in the scheme.

Benefits for the Public Sector:

- Time saved through framework agreement as procurement already taken place for any public body in a 20-mile radius of the SDC
- Opportunity for savings through joint procurement (bulk buying)
- Potential savings through smart procurement practices
- Potential savings through variable rates (only pay for what you use on a weekly basis)
- Factory Gate / Ex works pricing becomes possible
- By reducing the need for council/ customer properties you can reduce Capital borrowing by selling properties or rent out premises for extra income
- Demonstrate that you are trying to improve the economy and the environment

Benefits for the Public and Private Sector:

- Reliable, controllable, direct scalable deliveries
- Increased sales/office space
- Increased ability to benefit from bulk buying
- Improved use of staff time/reduced staff cost
- Collection of returns, transfers and waste management
- Avoids congestion at delivery places
- Reduce delivery cost through cutting out last mile
- Fuel saving
- Opportunity for night time delivery
- Less delays through convenient times of travel
- Reduced wear and tear on vehicles and roads
- Less Congestion
- Less Pollution
- Just in time delivery options
- Better inventory management
- Alternative pick up points
- Better Security

## **Regent Street Delivery Consolidation Scheme, Crown Estate & Clipper Logistics (RSDCS)**

Crown Estate, a major freeholder in the area, have identified commercial activity as an opportunity for reducing vehicle movements at the Regent Street / Oxford Street junction in central London relating to retail tenants along Regent Street. The principal aim of the scheme was to reduce delivery vehicle movements by providing a handling centre /storage space to which smaller deliveries are made and combined into a large timed delivery to each destination. Surveys were undertaken to assess baseline conditions (origin of deliveries, business types, delivery types, delivery timings and volumes, locations used) and interviews were undertaken with retailers and tenants of businesses above the retail units.

A delivery survey was undertaken in January 2009, by Clipper Logistics, and considered both retail and non-retail business tenants. Findings indicated a larger number of deliveries to the area were made from the north rather than the south, predominantly made by LGVs (75%) rather than HGVs (3%). The average delivery duration was 45 minutes and deliveries occurred between 07:00 and 19:00, with a peak (12%) between 09:00 and 10:00. Business and hospitality sectors provided most

opportunity for vehicle reduction, accounting for 28% and 39% of the observed deliveries respectively). Retail activity accounted for 19% of deliveries.

Driver interviews suggested that delivery day and time were determined by the logistics provider and not the customer. Reception functions of commercial tenants were found to be visitor-focused rather than service provider-oriented and had no consistent receiving process. Most consignments arriving at Regent Street were described as ‘small’, able to be easily processed by one person without mechanical assistance. These accounted for 27% of all packages and provides a consignment consolidation opportunity. The study identified an opportunity for consolidating deliveries, particularly for commercial tenants where impact would be greater than retail (where storage would be the main benefit of consolidation). Hospitality would be a prime candidate for consolidation given the large number of deliveries currently experienced.

The implementation of the consolidation scheme involved setting-up a consolidation centre on the outskirts of London (Enfield) which streamlined deliveries to various retailers along Regent Street. The scheme is based on voluntary participation and to date 35 retailers (of the total 135 units) have taken part. To-date the scheme is considered a success. Key benefits of the scheme include:

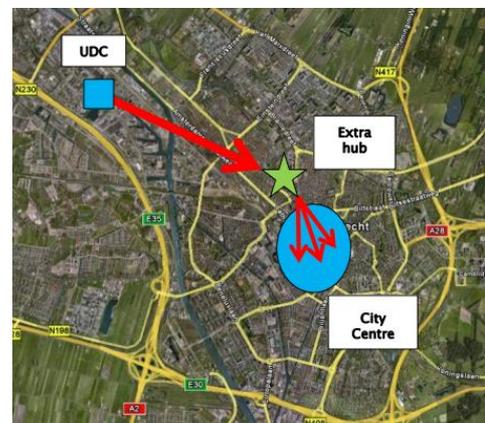
- Vehicle movements for participating stores reduced by 85%
- Better-timed deliveries
- Less storage space required per store

## International Case Studies

### **Utrecht and Freight Policy (April 2013) – Urban Distribution Centres (UDC) in Utrecht**

The Urban Distribution Centres (UDCs) concept is promoted by the Dutch government. Existing transport companies (DHL) can integrate UDC into operation as part of recognition scheme. Vehicles at least Euro5. Cargohopper (a logistical concept) as an example of a private initiative of UDC. Operational within 4 months and facilitated by the city. Successful and looking for secondary hub. Restricted to maximum of 5 vehicles in the city centre pedestrian zone at any one time and can make use of bus lanes. Resulted in higher efficiency for existing logistics and unique selling point for future business. Cargohoppers are electric and comprise of simple trailers at the rear with solar panels on top. Serve up to 100 addressed per day. Newer vehicles are larger, faster, narrower and electrical and can provide services for pallets and roll containers. These vehicles are shown in Figure B2.

**Figure B2: Cargohopper Vehicles / Location Plan**



## UCC Experiences from Stockholm, 2013

The city of Stockholm is built on 14 islands, connected by 54 bridges. In 2013, it was found that HGVs accounted for 5-10% of traffic, however are responsible for 50% of emissions. It is estimated that approximately 7,000 heavy trucks enter the inner-city area on a daily basis. Existing traffic management measures in place include an Environmental Zone for Heavy Vehicles and a Congestion Charging Tax. Examples of UCC practices implemented within Stockholm include:

- Hammarby Waterfront Logistic Centre for construction material. Includes the co-transportation of goods from logistic centre to each building site and includes temporary storage. 1 HGV delivery every 30 seconds. Building material takes a lot of space at the construction site. Very successful outcome, less congestion and fewer trucks in the area, and a reduction of 100 ton of CO<sub>2</sub> per year
- Old Town which is a medieval island with narrow streets and hard to access. Restaurant and hotels require food deliveries each day and have a lack of storage on site. Home2You is a private company which operates a UCC for food deliveries. Provides 2 methane powered vehicles, battery powered cooling, the UCC is based in Sodermalm. 35 out of 80 use the service and has lots of spare capacity for further uptake
- Undertook a simulation of a UCC on Sodermalm for all food deliveries undertaken on a typical day (1,010 deliveries). Showed potential for 31% lower driving distance and less emissions, 42% less no. of vehicles and 44% less driving time

### Lessons Learned:

- An area with evident problems related to goods deliveries, is an important prerequisite
- The location of the UCC is crucial (depending on city structure and objectives)
- The city should be ready to help the contractor meet the administration, the legal issues, etc
- Deep commitment from at least one large actor who can be the driving force
- Good marketing of the benefits and the purpose of the project to potential customers
- A full-scale project from the start, creates a more focused project and increases willingness for investments (not a limited time frame). However, a pilot project may be necessary to prove the positive effects of the scheme
- Create demand for participating (incentives like value added services, show economical and practical benefits, show good examples)

## Stockholm Construction Consolidation Centre

With 7,000 vehicles regularly clogging up the city centre of Stockholm, it was clear that action needed to be taken. The (Hammarby) Consolidation Centre (SHCC) was created for the duration of a redevelopment project. The city funded 95% of the cost of the facility. Once operational, the benefits of the SHCC to its users became better understood and valued, allowing and charges to be introduced.

The end result was that the public share of funding reduced to 40 per cent by the end of the project, suggesting that there was an increasing willingness to pay for the service. The SHCC offered 3,500 sq. m. of storage indoors and a further 4,000 sq. m. outside. It was located adjacent to the construction site, acting as a focal point for all delivery vehicles coming to the site. If flows had not been coordinated, 700 tonnes of materials would have been delivered into the site by 400 vehicles each day, with an average consignment size of 1.75 tonnes.

### Benefits:

Reductions for deliveries from consolidation centre to site of:

- 90% in energy use
- 90% in CO<sub>2</sub> emissions
- 90% in NO<sub>x</sub>

- 90% in PM
- 55dB (A) was regularly exceeded 260 times/day without the use of the consolidation Centre
- Instrumental in achieving on-time completion of new buildings

The principal impacts were:

- A significant reduction in energy use, CO<sub>2</sub> and other air-borne pollutants
- A significant reduction in noise levels
- A reduction in vehicle distances from 64 kilometers a day to 26 kilometers a day per vehicle
- A percentage increase of vehicle load factor from approximately 50% to 85%
- A reduction on stop time from approximately 60 minutes per trip to six minutes

## **Copenhagen**

By 2025, Copenhagen aims to be the first capital city in the world to be carbon neutral. To reach this ambitious goal, the city council has adopted a comprehensive and targeted carbon reduction master plan, which aims to take the city's CO<sub>2</sub> emissions from its current level of around 2.5 million tonnes to under 1.2 million tonnes. According to local research carried out, it is estimated that 750 trucks and vans enter the city centre every day and a third of these are in the city centre for less than 10 minutes. This is an indicator of inefficient supply chains and only serves to exacerbate city centre congestion, noise and air pollution.

Research and analysis carried in 2012 by local academic Transport Authority concluded that if one in every 10 deliveries was channelled through a consolidation centre, a reduction of 40% to 45% of onstreet freight vehicles and a minimum 10% reduction in pollutant emissions could be achieved. An Urban Consolidation Centre was therefore established on the outskirts of Copenhagen (7km from the city centre), which currently takes inwards deliveries of multiple non-food pallets from Monday to Friday between the hours of 7am and 4pm. All multiple pallets are broken down, consolidated and delivered to the end user on zero emission electric vehicles.

The consolidation centre operator currently operates two delivery vehicles, a Peugeot partner van and a 3.5 tonne Modec truck with 2 delivery runs being made each day. Twelve retailers have signed up for the scheme already. The retailers are charged a monthly subscription fee. Up to 40% of the operating cost is currently subsidised by Copenhagen's Local Authority. It is estimated that at the current growth rate, the consolidation centre will achieve breakeven point within 3 years'.

Lessons learned:

- The importance of financial sustainability of the business model is of prime importance to customers and other stakeholders
- Understanding the importance of customer perception of consolidation and how it can create value for their business requires active stakeholder engagement and integration
- Balancing financial sustainability with environment sustainability is a challenge faced by many organisations and requires careful planning

## **Distripolis – Micro-Consolidation Centres in Paris**

Distripolis adopts a new approach to urban deliveries. The concept harnesses expertise and innovation to create better living conditions in towns and cities. GEODIS, a large road transport operator, is rolling out a scheme they named Distripolis. The scheme consists of Micro Consolidation Centres that are strategically located within the city centre of Paris, and which receive goods from a central depot (hub) by trucks. The final mile deliveries are performed with zero emission vehicles (battery powered – electric vans and tricycles).

Operation

- Consignments from Geodis's various networks are aggregated at a depot outside the city of Paris
- Eight micro consolidation centres in Paris, located throughout the city, receive freight for delivery in the city throughout the day
- Final mile deliveries are carried out with zero emission vehicles such as cargo bikes

Benefits:

The environmental impact of Distripolis in Paris is reflected in:

- A 364-tonne reduction in CO<sub>2</sub>
- An annual reduction of 1,747 tonnes of CO<sub>2</sub> equivalent. This equates to a full 85% reduction
- The number of Geodis vehicles on the road has decreased by 20% and noise levels have reduced
- by 20 decibels per vehicle
- Geodis plans to roll out Distripolis to some 30 towns and cities in France and a number of major European cities.

## Monaco

As one of the world's most densely populated countries, traffic congestion in Monaco has become a major issue. Trucks and vans were seen as significant contributors to the problem. In order to reduce the number of freight vehicles operating in the Principality, the local government decided to procure a Consolidation Centre (the MoCC) to create a more efficient urban logistics system, coupled with a move towards electric vehicles.

The MoCC is a 1,300sq.m platform located on the south west edge of Monaco, located on land reclaimed from the sea. It is situated approximately 20 minutes from Monaco. The centre handles deliveries and for both the retail and construction sectors. The use of the MoCC is mandatory for all vehicles over 8.5 tonnes wishing to enter Monaco. The Centre offers additional value-added services such as storage, order picking, delivery and collection. Currently, goods vehicles under 8.5 tones may access the city at certain times only. At times when these vehicles are not allowed to deliver, drivers can make deliveries on foot.

Benefits:

The introduction of a compulsory use consolidation facility for Monaco has delivered significant benefits for the Principality. These include reductions of:

- 26% in fuel consumption
- 25% in NO<sub>x</sub>
- 35% in CO
- 26% in SO<sub>2</sub>
- 26% in CO<sub>2</sub>
- 30% in PMs
- 30% in vehicle noise pollution

Other benefits include:

- 38% reduction in traffic congestion
- 42% reduction in space used by vehicles for delivery

## Appendix C

### Case study examples developed from the stakeholder interviews

During the course of the project through a combination of stakeholder engagement, research and industry knowledge a number of case studies have been collated and summaries are provided in the break out boxes below. It should be noted that a number of the case studies are currently confidential due to being either conceptual or in the pilot stage. Therefore, they need to remain out of the public domain and cannot be published at this time.

#### Highlands & Islands Parcel Consolidation

John Menzies plc bought AJG Parcels Limited (AJG) in 2015, which operates in the Scottish Highlands and Islands. The purchase was made to help Menzies establish itself in the growing e-commerce parcel market having traditionally focused on newspaper and magazine distribution.

AJG has a purpose-built 10,000 sq ft hub in Inverness and offers express delivery throughout the Highlands. It also has a similar-sized regional hub in Linwood, outside Glasgow, servicing the Argyll area. It then has a network of 13 satellite depots providing next-day delivery as far as the Western Isles and Orkney. This network makes around 3m deliveries and 300,000 pick-ups each year. It has 140 staff and a fleet of more than 100 vehicles and has provided the final stage of delivery in Scotland for carriers including DPD, APC, UPS and UK Mail.

The acquisition allows Menzies to collaborate with the national carriers and use their established network to act as a cost-effective neutral delivery and collection agent consolidating multiple supply chains in to one for the final last stage of delivery. The commercial proposition is compelling and cost efficient due to the geographical complexity and access to harder to reach locations.

**Learning point:** If the conditions are right (commercially attractive) then carriers will collaborate and allow a third party to deliver on their behalf. Is it possible to create, potentially artificially, similar conditions in London to enable greater collaboration?

#### Gnewt Portering Project

Gnewt are working with TfL and the University of Southampton on a 'Portering' project in central London. In essence making the final delivery by hand from a stationary vehicle or storage space (possibly mobile). Porters then utilise large wheelie or carry bags to take parcels to their end destination. For the purposes of the trial, bags originally used to carry field hockey goalkeeper kit have been utilised. They have approximate dimensions of 100cm x 50cm x 50cm and a volume of around 235 litres.

The rationale behind the project stemmed from evidence gathered from tracking a delivery driver working in the West End, which showed that:

- The driver made over 200 parcel drops during the delivery round.
- The average vehicle speed when driving was 2.5 miles an hour.
- Due to traffic conditions and kerbside loading provision the driver ended up driving 5 miles and walking 6.

**Learning point:** Non-vehicular modes of transport are more effective and efficient for the final (last mile) delivery leg of the supply in high demand areas such as central London.

## Gnewt Grosvenor Group HQ

Gnewt has begun a pilot scheme with the Duke of Westminster's property business Grosvenor Group to reduce the number of deliveries to their HQ in Mayfair. The scheme works by re-routing all personal and business deliveries that would have arrived by multiple different vans at the HQ to a depot in Bow, east London, which is run by Gnewt. All of the personal and business items are then grouped on to a single electric vehicle for delivery to Mayfair.

It is estimated that before the intervention up to 21 individual deliveries were taking place each week day. It is acknowledged that many of the delivery vans are displaced rather than removed from the road network entirely. However, the intention is to roll out the pilot scheme to thousands of Grosvenor tenants in Mayfair and Belgravia and across the West End, which should see the impact of the scheme increase.

**Learning point:** Landlords have the ability to significantly intervene in the operations of their premises and change existing delivery practises. In this case the impact is felt most at the destination itself rather than the wider road network.

## City of London – Consolidation Work Streams

The City of London are progressing with a number of consolidation work streams as part of their transport strategy due to be published in 2019.

1. **Macro-consolidation:** Through S106 agreements the City have been (since 2016) mandating that large multi-tenanted office buildings - i.e. 100 Bishopsgate, Bloomberg and Goldman Sachs use a consolidation centre. It is up to the developer to decide and provide the consolidation service at their cost although the efficiency savings in procurement etc can offset this. Security is the mechanism (lever) being used to ensure participation. The City is also moving to a consolidation service for its buildings, which should be starting in summer 2018.
2. **Sustainable logistics:** The City has been working with businesses in the square mile to understand their supply chains and the commercial decisions taken when choosing suppliers. The City are now planning to divide the City up in series of areas based on business density (similar to BID areas) and provide and co-locate dedicated suppliers for each area. The supplier vehicles will also look to collect commercial waste for the return journey. The scheme is set to launch later in 2018.
3. **Micro-consolidation:** Four potential locations (London Wall car park, Guildhall basement car park, Middlewar Street, and Walbrook Wharf (once commercial waste contract finishes) have been identified by the City to provide micro-consolidation facilities for last mile logistics operations. The City are currently working with logistics operators to develop an appropriate scheme.

**Learning point:** An engaged and motivated Local Authority committed to understanding how supply chains and businesses function can positively influence operations and deliveries in their area through policy and strategy measures.

## **DPD – Central London Micro-Consolidation**

DPD has secured a small site (believed to be Caxton Street, but location confidential) suitable for last mile logistics in central London. They believe this will allow them to serve a nine square mile delivery area with vehicles returning to the location to reload. They will be approaching TfL once they have developed their proposals further.

**Learning point:** This demonstrates that industry is moving to establish centralised last mile solutions with the largest barrier being the availability of suitable land/premises.

## **TSC / Southampton Public Sector Consolidation**

TSC have been working with the CityLAB project in Southampton developing the business case for the public sector involvement in their Sustainable Distribution Centre (SDC) project that serves University Hospital Southampton as well several other organisations.

They have developed a business case spreadsheet tool that calculates the costs of using the SDC to the organisation and then monetises the benefits both direct and indirect for the business / organisation. The direct cost savings cover elements such as staff time, admin and managerial savings, operational space savings etc. Indirect benefits include savings to the freight industry - i.e. operational savings from delivering to the SDC rather than the hospital. The penalty fees from entering the Clean Air Zone (CAZ) once introduced in Southampton. Wider societal impacts include noise, air, accidents, congestion (value of time) savings. The study demonstrated that when all of these factors are monetised the business case is positive.

**Learning point:** The study has demonstrated the business case for the public sector using a consolidation centre and this could be replicated in London.

## **London Food Hub – ‘Cool Running’**

The Food Storage and Distribution Federation (FSDF) is working with a consortium on an EU Horizon 2020 funded project to develop the concept, business case and undertake a food consolidation trial.

The trial is being run from Solstar’s hub at Crayford and it utilising Paneltex electric 7.5t temperature-controlled vehicle. Products used included confectionary (Mars) and citrus fruits. Extrapolated results indicate a 43% reduction in loaded tonne KMs and 33% reduction in empty running KMs. The consortium is now looking to expand the concept, bring on-board more partners - i.e. supermarkets and food suppliers and potentially integrate the consolidation system with New Covent Garden Market to serve more of central London. Also, utilising enviro pod – silent running, temperature-controlled roll cages and looking to exploit 24hr delivery window.

**Learning point:** Consolidation opportunities are not just limited to ambient goods. Significant potential for food consolidation across London.

## Sainsbury's e-cargo bike home delivery trial

Sainsbury's is trialling the UK's first grocery delivery service by electric cargo bike. The fleet of five zero emission bikes is being trialled across South London – delivering up to 100 orders a day to local customers who have shopped online. The trial is using routing technology to determine which orders are delivered by a traditional van or by electric cargo bike. The trial is using e-cargo bikes, which have a capacity of 480 litres and a payload of 125kg in front and rear lockable boxes. Data analysis and field trials indicated 96.7% of grocery home deliveries could be made by cargo bike. Riders are employed full time (not gig economy style) with same hour delivery slot capability – delivery time is still governed by customer preference; the cargo bike trial is currently seen as a bolt on to the existing online order fulfilment systems and scale to meet future increases in demand.

**Learning point:** Demonstrates that industry is moving towards alternatives to traditional lorry/van deliveries and applying it to non-ambient goods including chilled and frozen produce.

