Quality Management

### EARLS COURT DEVELOPMENT

#### Rail Freight Feasibility Report

31/07/2014

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1 Introduction and Executive Summary

1.1 Introduction

1.1.1 Outline planning permissions were issued on 14 November 2013 by the London Borough of Hammersmith and Fulham and the Royal Borough of Kensington and Chelsea. The permissions provide for the comprehensive phased redevelopment of the Earls Court Site. An overarching Section 106 Agreement was entered into, which ensures, alongside planning conditions, that the redevelopment of the Site is acceptable in planning terms.

1.1.2 EC Properties Ltd appointed WSP to undertake a Rail Freight Feasibility Study further to Schedule 2 section 28 of the Earls Court Development Section 106 (S106) Agreement.

1.1.3 The outline scope described by the S106 Agreement is to comprise consideration of the following as a minimum:

- Physical constraints
- Deliverability
- Benefits
- Costs
- Cost / Benefit analysis and business case.

1.1.4 The scope of this Feasibility Study has been discussed and agreed with the Councils as required by the S106 Agreement and detailed below.

1.1.5 In addition, the S106 Agreement Schedule 2 paragraph 28.2 states that if the Feasibility Study demonstrates that a rail freight facility is feasible then the Feasibility Study should contain an implementation timetable agreed with the Councils in consultation with TfL, LU, and Network Rail (NR). Paragraph 28.3 states that the Feasibility Study should specify freight volumes which are the minimum necessary for the facility to be considered feasible.

1.1.6 In accordance with the Section 106 agreement, the results of the study need to be tested against the following criteria to determine ‘Feasibility’, which “…means financially and technically feasible in relation to the provision of the Rail Freight Facility during Demolition and construction such that the provision and operation of such a facility;

- is shown to significantly reduce the number of heavy vehicles on surrounding roads over the course of Demolition and construction of the Earl’s Court Development; and
- is shown to significantly reduce the environmental impact of Demolition and construction; and
- is not prohibitively more expensive than the use of road freight with particular regard to the potential environmental benefits; and
- is acceptable to, and all necessary consents are forthcoming from, inter alia, Network Rail, LUL and rail freight operators for the construction of and operation of such a facility and there is no detriment to the contractual or operational requirements of TFL.”

1.1.7 During consultations regarding the brief for this study, TfL requested the following supplementary items:

- Include consultation with London Overground and London Underground (LU)

- Include consultation with rail freight companies to ensure that there is both demand and resource to operate any paths that become available

- Define a service level aspiration – both the number of paths and the gauge

- Identify timetable restrictions – any work on timetables needs to consider origin of trains to ensure timetables match across all geographical areas

- Provide a full signalling plan and consider hours of operation

- Any implementation timetable should indicate the level of impact on passenger services during the construction period

- A maintenance schedule should be considered

- Provide a strategy of how the deliverables will be completed and the approach re: reports, plans, meeting minutes etc.

1.1.8 The Councils were also consulted, and requested the following supplementary items:

- Provide a justification for the discounting of the earlier options; and

- Undertake a review of the potential for other developments nearby to also use the facility in order to potentially improve the feasibility of a Rail Freight Facility

1.1.9 The Environmental Statement (ES) and the Transport Assessment (TA) submitted with the planning applications for the Earls Court site assessed the likely significant environmental impacts of the redevelopment of the Earls Court site on the basis that road freight would be used throughout the demolition and construction operations, rather than rail freight. It assesses details of the routing and numbers of vehicles and concludes that there will be a negligible impact in terms of traffic; a minor adverse impact in terms of pedestrian access; a negligible impact in terms of traffic noise; and a negligible impact in terms of vehicle and plant emissions. Overall, the redevelopment of Earls Court (using road freight) is considered acceptable in environmental and transport terms and has been granted permission on that basis.

1.2 Site Location

1.2.1 The Feasibility Study is in respect of the redevelopment of the Earls Court Site. The Earls Court Site comprises the following main land holdings:

- Earls Court Exhibition Centres One and Two on land within RBKC and LBHF respectively

- The West Kensington and Gibbs Green Housing Estates – on land mostly owned by LBHF. The western section of the site is occupied by two estates — West Kensington (to the south) and Gibbs Green (to the north) — which are typically 1960s in their form and character. Though a few substantial tower blocks of 9, 10 and 11 storeys are present, the estate accommodation is primarily low and medium scale density in buildings. This area also includes the Gibbs Green School, as well as a low rise factory building

- The Lillie Bridge Depot – owned by London Underground Limited. This maintenance yard and rail tracks are located in the central and northern portions of the site. The depot is currently used as a 24-hour maintenance facility by LU, and provides stabling for ten S-Stock trains. A nine storey office building (Ashfield House) is located on the northern edge of the ECWKO and is used primarily as a LU training facility

- The West London Line (WLL) which passes through the site from north to south – owned by NR.
1.2.2 The site location is shown on Figure 1.

Figure 1: Location Plan Showing EC1, EC2 and Lillie Bridge Depot

1.3 Feasibility Report Structure

1.3.1 The feasibility report is set out as follows:

- Chapter 2 summarises the input parameters for the Feasibility Study, as set out in the ES (including volumes of materials and phasing of the development).
- Chapter 3 considers the main groups of materials to be transported and the potential for their transport via rail freight.
- Chapter 4 considers the operational requirements for rail freight services.
- Chapter 5 reviews rail freight terminal options at Earls Court.
- Chapter 6 sets out the potential costs of the rail operation and compares them to the cost of the road operation (which was assessed by the ES and is therefore the “Reference Case” for this Feasibility Study).
- Chapter 7 summarises the feasibility of rail freight.
- Chapter 8 sets out the conclusions on key issues and recommendations.

1.4 Consultation

1.4.1 As required, the Feasibility Study has been informed by consultations with various key stakeholders. Details of the consultations are set out in Appendix A.

1.5 Executive Summary

1.5.1 The Lillie Bridge Depot is currently an industrial manufacturing facility which uses the road network to transport its products to and from the depot. The existing rail tracks within the depot are used for stabling trains and the Masterplan for Earls Court proposes that this stabling facility will be maintained throughout the construction and operation of the development

1.5.2 A rail freight facility would require the following:

- Modifications to the existing or proposed layout of the stabling element within the depot
- A track switch to facilitate rail freight trains transferring from the NR tracks to LU tracks entering the depot
- Amendments to the signal system and interface signalling equipment to enable rail freight trains to move between the NR and LU rail systems
- Consolidation centre facilities remote from the Earls Court site to enable inbound and outbound materials and goods to be transferred between road and rail.

1.5.3 The constraints that would need to be addressed to implement a rail freight facility include:

- The current LU operational requirements of the manufacturing facility
- The current LU stabling of trains which will be ongoing throughout the development
- Integration of the rail freight facility on land being demolished and constructed as part of the development
- Health and safety requirements associated with the potential co-existence of a rail freight facility for the development works within the operational depot and stabling facility
- Constrained rail access to the depot adjacent to the West London Line at the north of the site where it passes below the Cromwell Road (A4) and over the district line.

1.5.4 The findings of this Feasibility Study are summarised under the following sub-headings which reflect the S106 Agreement definition of Feasibility.

1.5.5 Technical Feasibility

Rail Freight is not regarded as technically feasible until at the earliest the existing Lillie Bridge Depot operations are re-located and the site is made available (within Phase 4 of the Earls Court Development, i.e. until after at least the first seven years from commencement of demolition and construction of the development). Additionally this must have regard to the stabling facility which remains fully operational throughout the phased development. However, if conditions change then EC Properties Ltd and TfL would re-assess the feasibility and viability of providing a rail freight facility in consultation with rail specialists and the Councils. NR and other consents would still be needed at that time.

The installation of a track switch between the West London Line and the District Line, and the creation of a “run round loop” for locomotives at Whiteleys Siding would be required in order to provide rail access to a freight facility at Earls Court. These installations would provide a link between two totally separate railways operated by NR and LU, and therefore involve significant complexities in terms of signalling, control, and safe operation. Consultations with LU have indicated that operational compatibility between the signalling systems of NR and LU would pose a risk to
safety-critical railway operations and NR commented that interchange between the lines was far too complex. Even if LU and NR approval was to be forthcoming, the timescales normally associated with design and implementation of NR and LU track and signalling assets suggests that the WLL and Whiteleys Siding track switches would not be operational for a minimum of 18 months. As a result it would not be possible to implement the facility for use during the demolition of EC 1 & 2.

1.5.7 It would not be feasible for a rail freight facility to co-exist with the operational activities at Lillie Bridge Depot. LU has commented that the signalling and safe operational requirements of a rail freight facility accessed via Lillie Bridge Depot would be significant. The requirement for LU operations, including planned and unplanned maintenance or renewals to always take priority means that a rail freight facility could not be reliably operated. The number of safety and operational issues to be resolved means that a rail freight facility could not be implemented while the Lillie Bridge Depot remains operational. This would negate its use during the demolition of EC1 & 2.

1.5.8 Should the Lillie Bridge Depot come forward for development and operations have been relocated, then land could be made available by LU to establish a suitable loading area for rail freight within the Lillie Bridge Depot site. However, as stated the Masterplan proposals are to maintain the train stabling facility throughout the development and the phasing of the development requires that once vacated the depot site is re-developed.

1.5.9 LU has advised that it will not accept a rail freight proposal which potentially impacts upon operational requirements, the passenger train timetable, and health and safety.

Financial Feasibility

1.5.10 In summary, in the context of the development, transport via rail freight is considered to be prohibitive in financial feasibility terms. The capital and operational costs of rail freight being double that (£20million more) than road freight and not financially worthwhile in the context of the relative insignificance of any resulting environmental impact reduction (see further below).

1.5.11 The financial appraisal of rail options is sensitive to:

- the capital cost of the rail connections and other alterations described in section 6
- any additional on-site operational costs relative to the road transport option ("the Reference Case")
- the transport cost differences between rail and the Reference Case, which depend on the destinations for outbound materials and the origins of inbound materials.
- liabilities arising from health and safety, and insurance risks arising from operation of rail freight
- securing and operating a consolidation centre to service the rail freight facility.

1.5.12 The capital costs include the costs involved with implementing changes to rail infrastructure by adding connections between the WLL, District Line and Whiteleys Siding, plus the necessary signalling changes. Any locomotives crossing from the NR network onto the LU network would have to be fitted with LU signalling activation systems and with the advent of automatic train operation (from 2018) it will be necessary to fit locomotives with LU automatic train control recognition equipment.

1.5.13 These capital costs are estimated to total £15M as set out in Table 1. In addition, the additional on-site operational costs would amount to some £163,000 / year for the provision of on-site Containerlift units and staff. Organising the efficient delivery of a variety of construction materials by rail would necessitate the use of an off-site Consolidation Centre with an estimated annual cost of £1.33M / year.

1.5.14 The overall costs of the road and rail options over the 11 year period 2021 – 2031 are summarised below.

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinstate WLL Connection</td>
<td>£5M</td>
</tr>
<tr>
<td>New Connection at Whiteleys Siding</td>
<td>£2.5M</td>
</tr>
<tr>
<td>Lillie Bridge Depot Alterations</td>
<td>£0.5M</td>
</tr>
<tr>
<td>LU signalling activation systems (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>ATO control recognition equipment (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>Contingency (50% of the above)</td>
<td>£5M</td>
</tr>
<tr>
<td>Overall Capital Cost</td>
<td>£15M</td>
</tr>
<tr>
<td>Haulage Costs (to/from Consolidation Centre)</td>
<td>£0.8M / year</td>
</tr>
<tr>
<td>2 Containerlift Units and Staff</td>
<td>£0.16M / year</td>
</tr>
<tr>
<td>Construction Consolidation Centre</td>
<td>£1.33M / year</td>
</tr>
<tr>
<td>Overall Operating Costs (over 11 years)</td>
<td>£25.2M</td>
</tr>
<tr>
<td>Total Rail Capital and Operating Costs</td>
<td>£40.2M</td>
</tr>
<tr>
<td>Haulage Costs / Tonne</td>
<td>£10 / Tonne</td>
</tr>
<tr>
<td>Tonnage over 11 years (from Table 2)</td>
<td>1.96M Tonnes</td>
</tr>
<tr>
<td>Overall Operating Costs (over 11 years)</td>
<td>£15.6M</td>
</tr>
<tr>
<td>Total Road Capital and Operating Costs</td>
<td>£15.6M</td>
</tr>
</tbody>
</table>

1.5.15 The overall summary shows that the rail costs would be over double the cost of the road-based operation assessed by the ES.

1.5.16 Additionally, commercial and legal terms would need to be agreed with TfL for use of the site.

1.5.17 It is concluded that in the context of the development, transport via rail freight would be financially prohibitive and not financially worthwhile in the context of the relative insignificance of any resulting environmental impact reduction (see further below).
Significance of Heavy Vehicle Reduction

1.5.18 If it was feasible to operate a rail freight facility during construction then a daily train would remove a maximum of six lorries per hour from local roads over an average working day. The significance of this reduction can be considered in the context of the current lorry flows on the nearby road network. The existing lorry flows are recorded by Table 7-11 of the Environmental Statement. Paragraph 7.161 of the Environmental Statement concluded:

“Table 7-11 indicates that the change in vehicle flows and percentage change in HGVs will be small during the demolition and construction of the Earls Court Development Proposals and does not exceed 1% in general traffic and 62% in HGV traffic although a high % change, in actual change the difference is imperceptible at 8 HGVs on Lillie Road.”

1.5.19 The Reference Case impact of eight lorries per hour was assessed as imperceptible in the Environmental Statement, and so a reduction due to rail freight of six lorries per hour from the Reference Case would also be imperceptible on the same basis of assessment.

Significance of Environmental Impact Reduction

1.5.20 As noted above, the environmental significance of the savings in lorry movements when comparing rail freight with the Reference Case would be imperceptible. The potential magnitude of Green House Gas (GHG) emissions for the use of rail freight for the Earls Court project has been assessed using Government guidance, taking account of the haul distances for the range of likely destinations and origins for outbound and inbound materials respectively.

1.5.21 The analysis shows that rail could save just 4,500 tonnes of CO2 relative to the Reference Case over the life of the project, which is equivalent to removing 80 cars from the roads each year. This is not significant in relation to the baseline GHG emissions.

1.5.22 These benefits also need to be balanced against the additional local impacts which could arise from on-site rail freight activities including additional materials handling, site logistics, accessing the rail freight facility for works on the east side of the West London Line, and overnight activities. The environmental impacts and mitigation requirements would need to be assessed through the planning process for a rail freight terminal.

1.5.23 In particular, any rail freight operation which served other sites in addition to the Earls Court Development would generate additional heavy goods vehicle movements on the local road network in excess of the Reference Case, and this would require careful consideration.

Conclusion

1.5.24 This Report has considered the feasibility of a rail freight facility in accordance with planning obligations contained in the Earls Court development Section 106 Agreement.

1.5.25 It is concluded that a rail freight facility is not currently feasible. There are significant technical constraints and challenges associated with the presence and operation of the Lillie Bridge Depot and significant concerns over obtaining necessary consents. In addition, rail freight would, overall, be financially prohibitive and is not considered to be worthwhile in the context of the relative insignificance of any resulting environmental impact reduction relative to the road-based operations found to be acceptable in the Environmental Statement and for which permission has been granted. In addition, the local environmental dis-benefits arising from any rail freight facility would need to be assessed through any planning process.

1.5.26 Any rail freight facility could only be potentially technically feasible (if at all) once Lillie Bridge Depot operations have been relocated, the site vacated and sufficient land has been made available by LUL for rail freight purposes for the duration of the construction programme. Based on the current development programme this could not be until Phase 4 of the development at the earliest, and even then subject to necessary consents and approvals and still with very high financial costs and the relative insignificance of any resulting environmental impact reduction.

However, if conditions change then EC Properties Ltd and TfL would re-assess the feasibility and viability of providing a rail freight facility in consultation with rail specialists and the Councils. NR and other consents would still be needed at that time.
2 Input Parameters

2.1 Introduction

2.1.1 This section provides an overview of the relevant information from the ES in terms of the demolition and construction programme and the volumes of materials to be transported.

2.2 Programme

2.2.1 It should be noted that the project is complex and multi-phase, with complex land ownerships, and the planning permissions are in outline. Small areas of the Earls Court Site have full detailed planning permission and now Phase 1 has reserved matters approval. However, reserved matters remain outstanding for the majority of the site. This means that the overall programme is indicative and subject to change.

2.2.2 Due to the scale of redevelopment, the Earls Court Development proposals have been divided into a number of phases. Deconstruction and demolition of the existing buildings and infrastructure and construction of the development is divided into six indicative phases and an overall 19-year deconstruction / demolition and construction program is anticipated.

2.2.3 Each phase has been subdivided into yearly ‘timeslices’. To account for the overlap in phases, the ‘timeslices’ have been grouped to form three Deconstruction / Demolition and Construction Sequences.

2.2.4 The timing of each of the 6 phases is set out in the ES and summarised below:

- Phase 1 – Year 1 to Year 8 inclusive;
- Phase 2 – Year 3 to Year 10 inclusive;
- Phase 3 – Year 3 to Year 10 inclusive;
- Phase 4 – Year 7 to Year 11 inclusive;
- Phase 5 – Year 9 to Year 15 inclusive; and
- Phase 6 – Year 13 to Year 19 inclusive.

2.2.5 The 6 phases of development have been sub divided into one year ‘timeslices’ which have then been grouped into logical ‘Deconstruction / Demolition & Construction Sequences’ as follows:

- Sequence 1 – Phases 1, 2 and 3, which equates to a 6-year time period;
- Sequence 2 – The remainder of Phases 1, 2 and 3 plus Phases 4 and 5, which equates to a 6-year time period; and
- Sequence 3 – the remainder of Phases 5 and 6, which equates to a 7-year time period.

2.3 Demolition Proposals

2.3.1 The demolition proposals have been developed by Keltbray, who have compiled a deconstruction sequence spanning the 82-week period from the start of Development Phase 1, as shown in Appendix B.

2.3.2 The proposals involve deconstruction of EC2 to slab level by week 24, and the complete deconstruction of the EC2 deck structure by week 54. Once the EC2 deck has been removed, the area beneath becomes available for the stockpiling and storage of demolition arisings from EC1 and of excavated material.

2.4 Materials Volumes Forecast

2.4.1 Chapter 5 of the ES (dated 2011 and subsequently supplemented) provides forecasts of the volumes of movements of key materials during each phase of the project. These volumes have been analysed in more detail in order to provide an initial indication of the volume of material required to be transported during each year of the potential development period.

2.4.2 The main commodities to be transported are as follows:
Demolition / Deconstruction

- Concrete: A total of 282,000 tonnes of concrete which will be presented in a range of forms from large sections (>20t each) to crushed concrete.
- Steel: 15,000 tonnes in total
- Other materials: Under 7,000 tonnes

Construction

- Bulk excavation: 500,000m$^3$ which converts to approximately 900,000 tonnes of material
- Earth filling: 255,000m$^3$, or 459,000 tonnes
- Concrete: over a million tonnes of concrete in various forms and types
- Steel: over 120,000 tonnes of various types of steel
- Large volumes of a wide variety of “other materials” such as glazing, floor finishes, etc..

2.4.3 It is important to note that some of the demolition concrete and excavated material will be reused on site. However, the volume that can be reused is constrained by the lack of storage space on the site. The ES Chapter 5 estimates that 28% of demolition concrete arising during Phase 1 will be reused, and 20% during Phase Two.

2.4.4 The volumes are summarised in Table 2 below.
### Table 2: Summary of Materials Volumes from the ES. Volumes converted to estimated tonnes for this report.

The tonnage total EXCLUDES fit out materials which are converted from m\(^2\) to lorry loads.
2.5 Materials Profiles

2.5.1 Figure 3 illustrates the potential volumes by year during the development programme. The assumptions are that demolition materials are spread over the first 2.5 years of each sequence, that bulk material use for construction is geared towards the early years of each sequence, and that lighter materials are required towards the end of each sequence.

![Figure 3: Forecast Bulk Materials Volumes Per Annum](image)

2.5.2 It is worth noting that a significant proportion of the volumes shown in Figure 4 consist of earth fill or excavated earth. The chart below illustrates annual volumes, but excluding bulk fill or excavated earth and also excluding concrete which is reused on site.

![Figure 4: Forecast Bulk Materials Volumes Per Annum - Excluding Excavated Earth, Earth Fill, and Reused Concrete](image)
3 Commodity Analysis

Outbound Materials

3.1 Principles

3.1.1 Article 4 of the revised EU Waste Framework Directive sets out five steps for dealing with waste, ranked according to environmental impact – “the Waste Hierarchy”. Prevention, which offers the best outcome for the environment, is at the top of the priority order and followed by Reduction; Re-use; Recycling; Other Recovery and Disposal.

3.1.2 The aim in this case is to maximise the level of recycling and to minimise environmental impact by reducing the distance which materials have to travel, particularly by road.

3.2 Demolition Concrete

Volumes

3.2.1 It is estimated that 282,000 tonnes of concrete will be produced during demolition and deconstruction works.

3.2.2 A proportion of this material can be stored temporarily on site and reused for fill. The current proposals by Keltbray envisage some 20,000 tonnes from the demolition of Earls Court 1 and 2 as being retained for on-site reuse.

3.2.3 It is likely that the volumes of concrete required to be taken off site will be around 50,000 tonnes per annum during the first two years of the project, with varying volumes each year thereafter from very small volumes up to around 25,000 tonnes per annum.

Characteristics

3.2.4 Crushed concrete is a useful secondary aggregate material, commonly used as low grade fill on construction projects. Whether the concrete is crushed on site depends on the volume produced and the space available on site.

3.2.5 If concrete is not crushed on site can be broken down into manageable pieces during demolition works and then transported to a crusher in the vicinity if available. Such crushers are either at specialist aggregates recycling facilities or, occasionally, on other major construction sites. The crusher will often charge a “gate fee” to accept the concrete, depending on market conditions at the time.

3.2.6 If the concrete is crushed on site it can be reused elsewhere on the site or sold to other nearby construction sites. The value of the material varies with market conditions but is generally very low.

3.2.7 Crushed concrete can be handled in a similar way to other aggregates, using conveyors, hoppers, bucket cranes, etc.. Uncrushed demolition waste can generally be handled using mechanical grabs. Either material could be carried in standard bulk “box” wagons.

Potential for rail freight

3.2.8 There are several ways in which rail freight could potentially be used for the transport of demolition concrete.

3.2.9 Transport to Off-Site Crusher: There are facilities in the London area which crush concrete and have access for rail freight. Rail could be used to carry general concrete rubble to the crusher location and then back to Earls Court.

3.2.10 Transport to Off-Site Consolidation Centre: An alternative would be to take concrete to an off-site facility where it could be stored pending reuse on site or third party sale. The demolition concrete could be transported by rail either as rubble (with a crusher at the Off-Site Consolidation Centre) or as crushed stone (if crushing takes place at Earls Court). This option would incur a cost for the Consolidation Centre, but would potentially increase the volume of material that could be recycled while also releasing land on the Earls Court site for alternative use.

3.2.11 Transport for Reuse: Rail could be used to transport crushed concrete or rubble to a location where it could be used for low grade fill. As demolition concrete is a low value material, the preferred option would generally be to find a nearby use for the material and transport it at low cost. If the end use is further afield, rail may prove to be a cost effective option.

Potential Destinations

3.2.12 There are a variety of potential destinations with rail freight facilities for crushed concrete, ranging from local secondary aggregates producers to major land reclamation schemes. Examples include, for example:

- Powerday, Old Oak Sidings, Park Royal – a large aggregates facility and recycling centre with direct access to the railway close to Earls Court
- Riverside Recycling (Longs), River Road, Barking - close to the Box Lane rail freight depot (owned by AXA) and Barking Rail Terminal (owned by DB Schenker), and cited as a potential destination by Keltbray
- Hunts Waste, Chequers Lane, Dagenham – also close to the Box Lane rail freight depot and Barking Rail Terminal, and cited as a potential destination by Keltbray
- Calvert in Buckinghamshire – which also received fill materials from the Olympic Park for capping of its land fill operation and other remediation work. This site has an ongoing requirement for fill, although future rail access to Calvert might be restricted by the East West (Oxford/Bedford) rail route project and HS2 construction
Significant volumes of scrap steel are transported by rail in the UK. However, this is all from scrap.

Earth spoil is suitable for use at a wide range of construction and remediation projects, including, for rail could be used to transport excavated material to a location where it could be carried.

It is estimated that 900,000 tonnes of excavated material will be produced during demolition works. In addition, 150,000 will be produced from the piling operation. Of this, approximately 40% is associated with Sequence 1, and approximately 50% with Sequence 2.

The steel will arise in a number of forms from large beams to reinforcing mesh and wire. This material is suitable for recycling and would be accepted by any scrap merchant. It could be handled using a mechanical grab and loaded into standard “box” bulk wagons. The box wagon could carry over 70 tonnes of steel, although payload is more likely to be 60 tonnes due to the shape and variety of pieces to be carried.

Rail freight could be used for the transport of excavated material or fill. There are two ways in which rail freight could be used for the transport of excavated material or fill. The steel will arise in a number of forms from large beams to reinforcing mesh and wire. This material is suitable for recycling and would be accepted by any scrap merchant. It could be handled using a mechanical grab and loaded into standard “box” bulk wagons. The box wagon could carry over 70 tonnes of steel, although payload is more likely to be 60 tonnes due to the shape and variety of pieces to be carried.

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Excavated material can readily be used for fill on construction sites. Like concrete, it can be transported in bulk “box wagons”, but is unlikely to be amenable to handling in hopper wagons as the material may be very sticky. This means that such material would have to be transported in wagons from which it could be tipped or physically removed if necessary.

There are two ways in which rail freight could be used for the transport of excavated material or fill. The steel will arise in a number of forms from large beams to reinforcing mesh and wire. This material is suitable for recycling and would be accepted by any scrap merchant. It could be handled using a mechanical grab and loaded into standard “box” bulk wagons. The box wagon could carry over 70 tonnes of steel, although payload is more likely to be 60 tonnes due to the shape and variety of pieces to be carried.

Transport to Off Site Consolidation Centre: As with concrete, the excavated material could be taken to an off-site facility where it could be stored pending reuse on site or third party sale. The material could be transported by rail to such a location. This option would incur a cost for the Consolidation Centre, but would potentially increase the volume of material that could be recycled while also releasing land on the Earls Court site for alternative use.

Transport for Reuse: Rail could be used to transport excavated material to a location where it could be used for construction fill. Due to the low value of excavated material, the preferred option would generally be to find a nearby use for the material and transport at very low cost by road. However, it can be difficult to find local destinations for very high volumes of material. If the end use is further afield, rail may prove to be a cost effective option. An example is that demolition waste was transported from the London Olympic Park to Calvert in Bedfordshire.

There are several scrap yards in the Park Royal area, and it is most likely that road transport would be the most cost effective method of transport. European Metals Recycling (EMR) has a major scrap facility adjacent to Powerday, and so trains carrying concrete to Powerday could possibly also transport scrap steel, which could then be carried from the Powerday site to EMR by lorry. The other scrap yards do not have rail connections.

An alternative would be to transport scrap along with other materials to an off-site Consolidation Centre from which it could be collected by road.

Inbound Materials

Concrete

Based on an average weight of 2 tonnes per m³, the whole project will require an estimated 892,000 tonnes of concrete materials. This is broken into the following main types:

- 160,000 tonnes in foundations and substructures
- 180,000 tonnes for infrastructure
- 132,000 tonnes for roads and paving

There will generally be two categories of concrete material:

- Bulk concrete poured on site – for example for foundations of buildings and other structures or for roads
- Fabricated concrete products – for example concrete beams or floor panels

Bulk concrete can be delivered to the site as ready mix, or mixed on the site from the component materials of sand, aggregates, cement, and water. It is currently thought most likely that concrete
will be delivered as ready mix from local suppliers – several of which are at railheads elsewhere in London.

3.5.4 Fabricated products may come from a wide range of suppliers in a large variety of shapes and sizes. The maximum product size needs to be considered in conjunction with the gauge of the railway line(s) used for transport, as explained further in section 4.2.

Potential for rail freight

3.5.5 Ready mixed concrete is not generally transported by rail – although rail is used for transport to railway construction projects, and could be used for concrete transport to Earls Court, subject to the choice of suppliers for the construction phases of the project.

3.5.6 Rail freight is frequently used to bring sand, cement or aggregates to concrete batching plants when the plants are located at a railhead. This includes bringing materials onto major construction projects such as the Olympic Park. However, the maximum volume of aggregates per year for concrete for Earls Court is not particularly high. For example, assuming that 50% of concrete required is ready mixed, the aggregates input over the life of the project would be around 250,000 tonnes, and rarely over 25,000 tonnes per annum. This would equate to a train every week or two, and would require space to store the material on site.

3.5.7 However, if aggregates and sand could be transported via an off-site Consolidation Centre, rail could be used to transport smaller volumes onto the site each day.

3.5.8 Rail has often been used to transport fabricated concrete, particularly for rail based projects such as Crossrail and rail renewal projects. However, relatively few of the producers of concrete fabrications have direct access to rail, and, in practice, a range of sources and manufacturers are likely to be involved and so direct rail freight from the source is unlikely to be a viable solution.

3.5.9 Again, concrete fabrications could be taken to an off-site Consolidation Centre and then taken to Earls Court by a daily train.

Potential Origins

3.5.10 Concrete could be sourced from a variety of suppliers and transported direct to Earls Court. Alternatively it could be taken to an off-site Consolidation Centre, and then transported from there to Earls Court by rail or by road.

3.6 Steel

Volumes

3.6.1 In total, 120,000 tonnes of steel are required for the project. This can be split into three categories:

- 41,000 tonnes of rebar for substructure, infrastructure, and roads
- 50,000 tonnes of steel for infrastructure
- 29,000 tonnes of steel framework

Potential for rail freight

3.6.2 Steel is very suitable for transport by rail, taking advantage of the high weight payloads of typical rail wagons. Rail can also carry beams of 20m or more in length.

3.6.3 Again, an issue for rail freight will be that the volume concerned is spread over a relatively long period. This would suggest that trains would be infrequent, and large volumes may need to be stored on the site. In addition a range of sources may be involved – including imported steel.

3.6.4 Therefore, an off-site Consolidation Centre with good road and rail connections is being tested in this feasibility study, with the options of road or rail used to transport the steel the final miles into Earls Court.

Potential Origins

3.6.5 As would be the case for concrete, steel could be sourced from a variety of suppliers and transported direct to Earls Court. Alternatively it could be taken to an off-site Consolidation Centre, and then transported from there to Earls Court by rail or by road.

3.7 Finishes etc. and Landscaping

Volumes

3.7.1 This category covers a huge range of materials including: façade cladding and glazing, roof finishes, internal walls, ceilings, and wall and floor finishes.

3.7.2 Volumes have been provided generally in terms of the area to be covered by each type of commodity. For example, 340,000m² of cladding and glazing. This has been converted to approximate lorry loads on the basis of 267m² of material per lorry.

3.7.3 Hard and soft landscaping forecasts have been provided in terms of cubic metres. On the basis that much of this material will be earth, brick, or stone, this has been converted to tonnes on the basis of 2 tonnes per cubic metre.

3.7.4 Therefore volumes can be summarised thus:

- Façade Cladding and Glazing = 1,273 vehicles
- Roof finishes = 1,049 vehicles
- Internal walls = 6,367 vehicles
- Ceilings = 3,745 vehicles
- Wall and Floor Finishes = 8,989 vehicles
- Landscaping = 379,500 tonnes

Characteristics

3.7.5 Landscaping materials will be similar to other bulk products, but will be diverse in terms of source and commodity type.

3.7.6 Finishes include a potentially huge range of products from a variety of suppliers, including, potentially, significant volumes of imported products. Typically, these materials would be transported in shipping containers or standard gauge side articulated lorries.

Potential for Rail Freight

3.7.7 It is unlikely that landscaping materials will come from a rail connected source, and so a Consolidation Centre would be needed in order to bring these materials to Earls Court by rail. These materials can be transported in a similar way to other bulk materials.

3.7.8 Finishing materials will come from a range of origins, including ports. Rail transport could be undertaken in intermodal containers or standard box wagons. Intermodal containers have the advantage of reducing double handling and therefore eliminating a potential cause of damage and loss.
4 Rail Operational Requirements

4.1 Train Sizes

4.1.1 While it is unlikely that rail would be used to transport 100% of any commodity, it is useful to consider the number of wagons per day which would equate to the materials profiles in Figures 3 and 4.

4.1.2 There are four sets of volume forecasts.

- Scenario 1: All bulk materials, including all exported and imported demolition waste and bulk fill. This is based on Figure 3.
- Scenario 2: All bulk materials, but excluding reused fill or concrete. This scenario would involve such material being stored on site for re-use
- Scenario 3: As Scenario 2 but excluding excavated spoil or imported fill, which would be transported by road in this scenario
- Scenario 4: Excludes all demolition concrete, excavated material, and bulk fill, which would all be transported by road in this scenario

4.1.3 The volume forecasts are produced in Table 3 and Table 4 expresses the volume forecast in terms of wagons per day.

4.1.4 Scenario 1 would involve maximum use of any rail freight facility, with daily requirements for up to 22 inbound rail wagons per day.

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Sequence 1</th>
<th>Sequence 2</th>
<th>Sequence 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Arisings</td>
<td>189,000</td>
<td>79,000</td>
<td>20,000</td>
<td>282,000</td>
</tr>
<tr>
<td>Concrete Fill</td>
<td>52,640</td>
<td>14,800</td>
<td>20,000</td>
<td>87,440</td>
</tr>
<tr>
<td>Other Demolition Materials</td>
<td>13,500</td>
<td>5,300</td>
<td>2,060</td>
<td>21,060</td>
</tr>
<tr>
<td>Excavation Arisings</td>
<td>410,000</td>
<td>310,000</td>
<td>180,000</td>
<td>1,090,000</td>
</tr>
<tr>
<td>Earth Fill</td>
<td>180,000</td>
<td>225,000</td>
<td>54,000</td>
<td>459,000</td>
</tr>
<tr>
<td>Landscaping</td>
<td>115,000</td>
<td>172,500</td>
<td>92,000</td>
<td>379,500</td>
</tr>
<tr>
<td>Concrete Fabrications</td>
<td>126,000</td>
<td>200,000</td>
<td>120,000</td>
<td>446,000</td>
</tr>
<tr>
<td>Bulk Concrete</td>
<td>126,000</td>
<td>200,000</td>
<td>120,000</td>
<td>446,000</td>
</tr>
<tr>
<td>Steel</td>
<td>40,000</td>
<td>50,000</td>
<td>30,000</td>
<td>120,000</td>
</tr>
<tr>
<td>Finishes</td>
<td>8,240</td>
<td>6,667</td>
<td>6,517</td>
<td>21,423</td>
</tr>
<tr>
<td>Outbound Tonnes</td>
<td>611,500</td>
<td>589,500</td>
<td>152,060</td>
<td>1,353,060</td>
</tr>
<tr>
<td>Inbound Tonnes</td>
<td>647,080</td>
<td>860,957</td>
<td>442,157</td>
<td>1,950,263</td>
</tr>
</tbody>
</table>

Table 3: Volume Forecast for each scenario
Table 4: Summary of volume forecasts in terms of rail wagons per day

<table>
<thead>
<tr>
<th>Category</th>
<th>Volume Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscaping</td>
<td>2.30 T per m³</td>
</tr>
<tr>
<td>Cladding etc</td>
<td>267.00 m² per truck</td>
</tr>
<tr>
<td>Days Per Annum</td>
<td>250</td>
</tr>
<tr>
<td>Tonnes Per Wagon</td>
<td>60 60' Container Flat</td>
</tr>
<tr>
<td>Demolition Concrete</td>
<td>60</td>
</tr>
<tr>
<td>Other Demolition Materials</td>
<td>60</td>
</tr>
<tr>
<td>Earth / Landscaping</td>
<td>60</td>
</tr>
<tr>
<td>Concrete Fabrications</td>
<td>40</td>
</tr>
<tr>
<td>Bulk Concrete</td>
<td>60</td>
</tr>
<tr>
<td>Steel</td>
<td>40</td>
</tr>
<tr>
<td>Finishes</td>
<td>1.5</td>
</tr>
</tbody>
</table>

![Graphs of Scenario 1 to 4 showing Wages Per Day](image-url)
4.2 Rail Service Options

4.2.1 There are two possible forms of rail freight service.
- Direct train services between Earls Court and the destinations of outbound materials or suppliers of inbound materials
- Use of a Consolidation Centre where outbound materials would be stored for reuse at Earls Court or elsewhere, or where inbound materials would be organised into trainloads for efficient deliveries to the Earls Court site.

4.3 Direct Train Services

4.3.1 There is no absolute definition of what is a high enough volume or consistent enough demand to justify a rail freight service. Rail freight operators are most competitive when a daily train is required, as this allows them to dedicate train crew and rolling stock to the operation. One issue to be addressed in site planning is that a less frequent train service would result in more material being stored at Earls Court.

4.3.2 There is no strict definition of the minimum viable length for a freight train, although 500 tonnes is often cited. This would equate to 15 to 18 wagons and is similar to the train lengths in the Table 4 scenarios.

4.3.3 The only commodities which offer potential for regular reasonably full freight trains are demolition concrete and excavated spoil. In combination these could provide potentially 20 wagons per day of exported material. Volumes would be highest during the early (demolition and digging) phase of each sequence of construction, with relatively low volumes during other periods.

4.3.4 However, the intention is to re-use as much as possible of the demolition concrete and excavation spoil. If rail were used only to transport the net exported material, the potential volume would fall to 13 to 14 wagons per day. The existing sidings at Lillie Bridge Depot cannot accommodate trains of this length, so the existing layout would need to be adapted. This is considered further in section 5.

4.4 Consolidation Centre Train Services

4.4.1 A Consolidation Centre is a distribution facility through which material deliveries are channelled to construction sites. Specialist material handling, storage and consolidated delivery combine to improve the overall resource efficiency of a construction project. These facilities have been used for major construction projects such as the Olympics (where the rail freight terminal at Box Lane was operated by DHL) and have been piloted more widely in London.

4.4.2 The typical model of a Consolidation Centre is a facility which receives deliveries by road, stores them, and then arranges daily or more frequent deliveries to the construction site by road. This has several benefits including reduced space requirements on the building site, reduced delivery costs, and improved order control leading to reduced costs.

4.4.3 If such a facility were located at a rail terminal, then the final delivery into Earls Court could be made by rail. For modelling purposes, a potential facility for a Consolidation Centre at Wembley has been tested. This location has 24 hour road access close to the A40 and North Circular. The rail movement to Earls Court is very direct, which assists in keeping transport costs low. A further test has been conducted for the Barking / Dagenham sites listed in section 3.2. These have better road connections for inbound construction materials, being located close to the A13 some 6 miles from the M25. They also benefit from proximity to River Thames wharves and a direct rail connection to the London Gateway port, operated by DP World.

4.4.4 The benefits and disbenefits of using a rail-connected Consolidation Centre include:
- Materials where the volume is too low for a direct rail operation could be consolidated at the Consolidation Centre and transported onto the site on a daily train.
- A wide range of materials could be carried.
- Space requirements for storage of materials could be considerably reduced at Earls Court.
- It is possible that rail could be used to bring materials in to the Consolidation Centre on an as required basis, for instance, a weekly train of steel products, and stored at the Consolidation Centre before being moved by the daily rail shuttle to the site.
- Potentially the Consolidation Centre could store volumes of demolition concrete and spoil which could then be taken back to Earls Court by rail. This would ease storage requirements at Earls Court if they became a limitation on the percentage of material that is reused. This could however involve double-handling, at extra cost and environmental impacts due to increased noise and dust depending on the material being handled.
- Additional costs would be incurred

4.4.5 As Table 4 illustrates, the maximum potential volume of rail freight for all materials is 22 wagons per day inbound. However not all potential materials would be carried on the shuttle service. Direct deliveries could still be made, or road lorries would be used to supplement the rail shuttle.

4.4.6 The Consolidation Centre shuttle operation could be combined with occasional trains to take away spoil or demolition concrete, as illustrated opposite. In effect, during demolition phases the service
might focus on demolition concrete and spoil, while during construction phases the rail service would focus on bringing in materials from the Consolidation Centre.

4.4.7 The Consolidation Centre could be operated by a third party. This is discussed under the “Recommendations” section of the final chapter.

4.5 Rail Capacity

4.5.1 All trains would have to use the West London Line between Earls Court and Willesden. The WLL is a very busy route, with plans to increase the number of passenger services along the line. However it is also a critical freight route as it is the main cross London freight line, particularly for trains to and from the Channel Tunnel.

4.5.2 There is spare freight capacity because 35 train paths per day are provided each way for Channel Tunnel trains and in practice only 3 or 4 of these are currently used. There is also adequate capacity at night, when fewer passenger trains operate.

4.5.3 For the proposed service of one train inbound and outbound per day, sufficient train paths should be available at suitable times of the day, outside of the main passenger peak hours, LU has commented that freight movements at the start and end of the operational day should not prove problematic. However, LU would be opposed to any measure that led to the alteration or cancellation of any passenger train services, and a full assessment would be required to determine the impact on passenger services throughout the operational life of a rail freight facility.

4.6 Rail Wagon Options

Bulk Wagons

4.6.1 For bulk services carrying spoil and concrete there are basically two traditional options, which are each types of “bulk box wagon”. Bulk hopper wagons would be suitable for aggregates or sand, but are not suited to excavated earth or to demolition concrete.

4.6.2 Examples of bogie wagons are illustrated below. Typically these bogie wagons can operate up to a GLW of 102 tonnes and have a payload of up to 79 tonnes.

However, there is a risk of overloading such wagons due to the high cubic capacity, particularly for dense material such as excavation spoil. For construction projects, simpler lower sided wagons are preferred, which include 2 axled wagons such as the MFA illustrated below.

Vans

4.6.5 This is a general term for covered wagons with sliding doors. Their advantage is that they have a very high payload for heavy materials. Vans need to be loaded and unloaded by fork lift truck, which increases handling costs.

Intermodal Wagons

4.6.6 Intermodal wagons are flat wagons, generally around 60 feet long, although some wagons are 40 feet long. They can carry a range of intermodal boxes, typically deep sea ISO containers or swap bodies.

4.6.7 The swap bodies or containers are lifted on and off the wagon by cranes. The cranes can range from port style gantry cranes to reach stackers, which are similar to giant fork lift trucks.

4.6.8 Using intermodal wagons at Earls Court could have several potential benefits:

- A wider range of materials could be carried than using bulk wagons
- Handling costs and the risk of damage to non-bulk materials would be reduced
- Potentially, containers could arrive by rail from ports and be transferred between wagons at the Consolidation Centre
4.6.9 Intermodal wagons could be used for bulk transport, by using intermodal open top “bulktainers”. Similar operations have been undertaken in the past to transport coal.

4.6.10 The advantage of an intermodal operation would be that wagons could shuttle between Earls Court and the Consolidation Centre, and the materials carried could be mixed on each train and completely flexible to suit different stages of the project.

4.6.11 Alternatively bulk wagons could be used during demolition phases and intermodal wagons during construction.

4.6.12 Fit out materials could be carried in curtain sided intermodal containers. If so, they could be unloaded from the side using fork lift trucks. Alternatively, the whole container could be moved around the site to the point at which it was required (see discussion of Containerlift below).

4.7 Materials Handling

4.7.1 There are basically two categories of materials to be handled: bulk and non-bulk. The bulk materials include demolition products and spoil to be loaded to rail, and aggregates, and soil which would need to be unloaded from rail. The preferred method of handling such materials would be to use a crane and bucket system.

4.7.2 One option is that concrete and brick material could be processed on site in a dedicated area within the zone of EC2 at low level and transferred to the train loading area using dumper trucks to transport and stockpile material on the existing concrete apron.

4.7.3 Non bulk materials will comprise a much wider range of commodities, from bricks and tiles to windows and pipes. For vans the wagons are unloaded or loaded using fork lift trucks. Goods would then have to be stored and reloaded to internal road vehicles for delivery to the point of need. This would add double handling costs, additional noise and possibly dust and the potential for damage.

4.7.4 Section 4.6 suggested that intermodal wagons could provide a flexible and cost effective solution. If curtain-sided containers are used, wagons could be unloaded using fork lift trucks in the same way as rail vans would be unloaded. Unloaded materials would then have to be transported to the point on the site where they were needed (whereas a lorry would deliver straight to the point of need).

4.7.5 A more flexible solution would be to use specialised lorries to lift containers from the wagons and carry them directly to the point of use. One such system is called Containerlift (which is a commercial trademark) and is illustrated below.

4.7.6 The potential benefits of Containerlift for Earls Court would include:

- A cost effective system for container transfer
- The lorries can transport containers from the rail siding to any location on the site, and then place the containers on the ground for easy access
- The containers could include bulk containers carrying spoil or demolition materials, easing some of the complications of bulk handling.

4.7.7 However, a Containerlift lorry cannot tip, and therefore local unloading would have to use a bucket system for bulk materials. An alternative would be for containers to be lifted by crane from the rail wagon to the required area on site.

4.7.8 However, any proposal which involved an increase in on-site vehicle movements and double handling within the demolition and construction phases of the project would require increased management to increase the risk of incidents.
5 Rail Freight Terminal Options

5.1 Existing Terminals

5.1.1 If direct train services are operated to carry demolition products from Earls Court for use as fill on other projects, then terminal facilities will need to be available at the destination. Similarly an off-site Consolidation Centre would require a rail freight facilities together with good road access and space to store products, handling equipment, and, ideally, a warehouse.

5.1.2 Examples of potential existing facilities include:
- Powerday. This terminal is in West London and can be reached from Earls Court via a very short train trip.
- Wembley Intermodal Terminal. This facility is operated by DB Schenker and is currently used for a variety of functions, including as a transhipment centre for spoil from Crossrail which is carried by rail to Calvert. It should be noted that this terminal is being safeguarded for use during the construction of HS2 and this may rule out its use during most of the demolition / construction period of the Earls Court Development.
- Calvert. A landfill site presently undergoing remediation.
- Barking. Various rail terminals including rail connected warehousing.
- Tilbury. One of several ports and wharves in London with rail freight facilities.
- Northfleet. Currently being used for Crossrail spoil and could be suitable for bringing materials to and from Earls Court.

5.2 Lillie Bridge Depot

5.2.1 Lillie Bridge Depot is located close to the centre of the Earls Court development, as shown by Figure 10.

The Lillie Bridge Depot is currently an industrial manufacturing facility which uses the road network to transport its products to and from the depot. The existing rail tracks within the depot are used for stabling trains and the Masterplan for Earls Court proposes that this stabling facility will be maintained throughout the construction and operation of the development. It includes overnight train stabling for ten S7stock trains, with the last train arriving around 01:00 and the first train departing around 05:00. LU has commented that all 12 berths are required: ten for the stabling, one spare for operational flexibility and one for engineering vehicles.

It has been considered whether Lillie Bridge Depot could provide direct access to the Earls Court demolition and deconstruction site. However, LU has commented that as a result of the reconfigured layout of Lillie Bridge Depot and the relocation of its stores, there is no room available to fit another track. The lack of space within Lillie Bridge Depot means that land would be required outside and adjacent to the Depot (for example the Blue Car Park and, once demolished, the EC2 footprint) for material handling and storage. This would involve a change of use which was not considered by the ES and the planning implications would need to be assessed.

There are a number of significant challenges and constraints to transporting materials by rail using Lillie Bridge Depot as an access route, certainly until at the earliest the start of Sequence 2 (Phase 4) when the Lillie Bridge Depot facilities are anticipated to move off site and the land potentially becoming available. However, this must have regard to the stabling facility which remains fully operational throughout the phased development. These are considered in the following sections and are summarised as:
- The Depot would continue as a live operational site with passenger trains stabled in the roads between approximately 01:00 and 05:00, blocking access to the areas closer to the demolition and deconstruction site. This means that access and egress for freight trains can only be provided during limited time-slot because a freight train would need to arrive before the passenger trains are stabled and could only leave once the passenger trains had departed in the morning.
- The handling area would need to relocate at least once during the life of the project as the focus of demolition and construction moves.
- The need to provide a connection between the LU Lillie Bridge tracks and Network Rail’s tracks on the WLL.
- Signalling issues associated with providing this connection.
- Lillie Bridge Depot will continue to operate as a train stabling facility both during construction and occupation of the development.
- There is no spare capacity at night to accommodate wagons within the Depot so an existing road would need to be extended into the EC2 footprint for loading and unloading, and accessed via the operational Depot.
- All trains entering LU tracks must have a locomotive or control car at each end as pushing wagons is not permitted on LU tracks. This will restrict siding capacity.
- LU has particular safety-related requirements and restrictions when operating non-LU trains on their tracks. There will be a requirement for LU operations, including planned and unplanned maintenance or renewals to always take priority, which would adversely affect the operation of a rail freight facility.
- From 2018 the depot will operate fully automatically under Automatic Train Operation (ATO), meaning that all trains will need to communicate with LUL’s centralised control system. It is understood this can be addressed by vehicles at the front and rear of any freight train moving through the depot being equipped with a communication package.
5.3 Previous Options Considered

5.3.1 Prior to this study two other options were considered to provide rail freight access to Lillie Bridge:
- Routing trains from West Ruislip via the District Line
- Providing a new connection from the Down West London Line and sidings in a plot of land along the eastern side of the WLL south of the A4.

5.3.2 The West Ruislip option was summarised in Appendix M of the Transport Assessment. This would have involved trains being routed from the NR network onto the LU network at Ruislip and then being routed via the Metropolitan Line, Piccadilly Line and District Line through to West Kensington station. After further discussions with LU, this was ruled out because the permitted axle loadings on LU infrastructure would have reduced freight train payloads by 50%. Furthermore, the permitted freight train speeds would be incompatible with scheduling freight trains to follow passenger trains.

5.3.3 The option alongside the WLL was considered in section 4.4 of the Transport Assessment Appendix M. It was ruled out due to cost, its poor location relative to the construction site and the Northern Access Road, and its proximity to nearby housing on Philbeach Gardens which would impact negatively on local residents.

5.4 Requirements for Freight Access

5.4.1 The key requirements to allow freight trains to access Lillie Bridge Depot and be loaded or unloaded are:
- Reinstate the connection to the WLL at Kensington Olympia
- Possibly provide a connection at the end of the Whiteley Sidings to create a “run round loop” for locomotives as described in section 5.5
- To identify potential areas within the depot for loading and unloading freight trains.

5.4.2 These are assessed below.

Reinstate Connection

5.4.3 Until the 1980s the District Line and WLL were connected at Kensington Olympia via a crossing just to the South of the station onto the Up WLL. Initial site visits suggest that the location of this connection is not impeded by any more recent buildings or rail equipment, and so, physically, the connection could be reinstated.

5.4.4 Reinstating the connection would allow trains to pass between Lillie Bridge and the WLL towards and from the North. While the WLL is a very busy route in the daytime, and is in use by freight trains throughout the night, there is capacity at night for one additional train to and from Lillie Bridge Depot although there is no capacity within the Depot itself until the current operations have relocated.

5.4.5 The connection may have benefits for LU as it would provide an alternative access to their network, for example for empty stock movements or the movement of materials.

5.4.6 Reinstating the connection would have complexities in terms of signalling, control, and safe operation as it would be providing a link between two totally separate railways operated by NR and LU. Nonetheless, such connections are in place elsewhere, and discussions with NR and LU have found no fundamental reason why such a connection cannot be provided, although LU has commented that the signalling and operational requirements could be complex.

5.4.7 In discussions with LU and NR it was agreed that the process of considering the detailed feasibility and cost of such a connection could be led by NR and use its GRIP process for project management. LU would be consulted and provide inputs as required. However, because of the additional complexity of providing this connection it was suggested that the feasibility study should be started as soon as possible in order to ensure that a satisfactory solution could be provided and an opportunity for the engineering works could be programmed in for both NR and LU.

5.4.8 The timescales normally associated with design and implementation of NR and LU track and signalling assets suggests that the Olympia and Whiteley sidings track switches would not be available for a minimum of 18 months after all formal agreements and consents are in place, and commercial legal arrangements are concluded. This would result in a significant reduction in the
material volumes which could be carried by rail as the EC1 and EC2 demolition and waste removal will have been completed before the rail freight facility could be established and operational.

Potential Handling Areas

5.4.9 Even if it was possible for the completion of track switches and associated works to be completed on a fast-track programme so that the rail freight facility could be operational during EC1 and EC2 demolition, this would require various temporary configurations during the EC1 and EC demolition.

5.4.10 There are some possible handling areas which would need to be utilised at various stages of demolition and construction. The possible handling areas available at each stage have been evaluated as follows.

From Programme Timeslice 5 (week 25 to 30) – “Phase D1”

5.4.11 After removal of EC2 down to deck level, with superstructure demolition material being stockpiled on the Blue Car Park site (which has capacity for some 7,500 cubic metres of bulk materials), it could be possible to park wagons on retained and non-electrified sections of Roads 1 and 9.

5.4.12 The possible temporary arrangement is shown below.

Figure 12: Possible Phase D1 Layout
5.4.13 However, the level differences (circa 8 m) from the retained EC2 deck over the West London Line (WLL) and finished demolition level either side of the WLL presents logistical issues as there is a lack of available land to locate a ramp or suitable means of moving the material from circa +12 AOD to +4 AOD.

5.4.14 Loading demolition waste, from 8m above in to wagons situated below the deck, would require specific handling and protection measures to mitigate risks of damage to the train wagons and associated rail tracks and equipment.

5.4.15 Therefore, EC2 demolition and a significant amount of EC1 demolition would need to complete in order to free up sufficient land for ramp and vehicle haul road to be established. However this would require the majority of demolition waste to have already been removed from site by road.

From Programme Timeslice 9 (week 49 to 54) – “Phase D2”

5.4.16 After complete removal of the EC2 deck, it could be possible to extend Road 12 into the EC2 footprint.

Figure 13: Possible Phase D2 Layout

5.4.17 Wagons parked on this non-electrified extension to Road 12 could be loaded from the Blue Car Park stockpile, or from material stockpiled on the EC2 site.

Beyond Programme Timeslice 14 (week 82) – “Construction Phase”

Figure 14: Possible Construction Phase Layout
Once demolition of EC1 and EC2 is complete, the rail freight terminal would need to be adapted again for use in transporting and handling inbound construction materials. This adaptation could make use of the Blue Car Park and the EC2 footprint.

Figure 15: Possible Construction Phase Layout

A check has been made as to whether any areas within Lillie Bridge Depot (such as the P&C Workshop and storage areas) could become available, such that it would be possible to construct a new track, “Road 13” to allow loading / unloading of wagons within the LBD site. However, establishing a loading area for rail freight within the depot would not be possible due to a lack of space within the depot.

In any event, the layout shown on Figure 16 below shows that a 200m facility could not be provided at this location, and the maximum train length would be around 170m.

Figure 16: Possible Construction Phase Details

In summary, there would be several complex issues and constraints to resolve in order to establish a temporary rail freight facility during EC1 and EC2 demolition, even if the installation of the NR / LU crossover and signalling alterations could be fast-tracked. It is unlikely that these constraints could be resolved.

Access Via the Operational Depot

The following sections consider whether a rail freight facility could be accessed from, and co-exist with, the existing operational use of Lillie Bridge Depot.

Having accessed the Depot, if a freight locomotive pulled the train into the Road 1 the locomotive would be “stuck” at the end of the train and would have to push the train backwards out of the siding after loading / unloading because there is no other track for the locomotive to escape onto. LU has commented that pushing wagons is not permitted unless with a riding pilot who has control of the
brakes. Ideally the wagons would be left in place all day to allow loading and unloading and so the locomotive would be stuck for a whole day.

5.5.3 The preferred operation would see one set of wagons arriving, being left at the depot for a day, and the previous day’s wagons being removed by the train. Obviously, in this case, the rakes of wagons have to pass each other during the “handover” operation.

5.5.4 LU has noted that the cycle times for trains would be determined by the routing and reversing needs, which would determine the numbers of trains needed for the operation. The availability of suitable rolling stock could be a problem.

5.5.5 One option is to convert the Whiteleys Siding into a “loop” by connecting its northern end back into the District Line access line. This would allow the freight locomotive to pull free from its train, collect the previous day’s wagons, pull them into the loop, then “run round” to the rear of the incoming wagons and push them into Road 1. However, LU has commented that the resulting “run round loop” would have a limited length and is only long enough to accommodate 139m long engineering trains.

5.5.6 Whichever solution is progressed, at some point the freight train will be pushed by the locomotive at its rear. This is termed “propelling” the train. Propelling movements are routine within freight depots, but need to be managed carefully to ensure they are safe. However, LU is concerned about the risks of propelling trains within a working depot at night.

5.5.7 Potentially it may be possible to “top and tail” trains, allowing control of braking (at least) from both ends. This could mean using two locomotives unless other options could be agreed, such as using a cheaper local shunt locomotive or a form of brake van.

5.6 Operation of Non LUL Trains within Lillie Bridge

5.6.1 LU have indicated that operational compatibility between the signalling systems of NR LU would pose a significant risk to safe railway operations, especially when the LU system is due to be upgraded to Automatic Train Operation and Control.

5.6.2 The signalling and control systems on LUL and NR are different, so any “main line” trains running on signalled LUL tracks have to be modified, not least to include tripcock devices which are a key LUL safety requirement. Several locomotives have been suitably modified but it is not clear if they would be available considering the timescales for any rail freight operation at Earls Court.

5.6.3 It has been proposed that the District Line, including Lillie Bridge, will be converted to fully Automatic Train Operation by 2018. This means that monitoring and control of trains will be centralised, and all vehicles will need to be able to communicate with LUL’s control system. In practice it is understood that the vehicles at the front and rear of any freight train moving through the depot would need to be equipped with a communication package.

5.7 Conclusion

5.7.1 LU has commented that the signalling and safe operational requirements of a rail freight facility accessed via Lillie Bridge Depot would be significant. The requirement for LU operations, including planned and unplanned maintenance or renewals to always take priority means that a rail freight facility could not be reliably operated. The number of safety and operational issues to be resolved means that a rail freight facility could be not implemented while the Lillie Bridge Depot remains operational. This would negate its use during the demolition of EC1 & 2.

5.7.2 It is concluded that a rail freight facility is not technically feasible whilst the Lillie Bridge Depot is operational. On the basis of the current development programme, this would not alter until at least Phase 4. Even then, the train stabling facility will remain in use during construction and operation of the development, and NR and LU consents would still be needed at that time.
6 Costs and Benefits of Rail Operations

6.1 Options Tested

6.1.1 It has been concluded that a rail freight facility is not technically feasible whilst the Lillie Bridge Depot operations are ongoing. The availability of any potential rail freight terminals and destinations which could be suitable for use in conjunction with an Earls Court rail freight facility is uncertain beyond that period.

6.1.2 Given this uncertainty, two train service options have been tested in order to establish the potential range of rail freight costs:

- **Outbound Materials**: using bulk MHA wagons to take demolition waste for reuse within London or at Calvert, Bedfordshire (or similar site some 70 miles from Earls Court).
- **Inbound Materials with a Consolidation Centre**: operating a daily shuttle service of intermodal wagons between Earls Court and Park Royal / Wembley or Barking / Dagenham. For this option, during demolition phases bulk containers would transport spoil for reuse, and construction materials would be transported from the Consolidation Centre to Earls Court in a variety of intermodal container types.

6.1.3 A train cost model was developed to make a bottom-up assessment of potential costs and to allow numerous scenarios to be tested. At the same time, a freight operator provided example price estimates for the two main options. The operator’s prices were 20% to 25% higher than the cost estimate. The train operator’s prices have been used in the assessment, but it may be possible to reduce these as requirements are confirmed.

6.1.4 The operational costs (excluding the capital costs of forming the WLL connection and other works) in sections 6.2 and 6.3 are based on a handling cost model, and road haulage costs have been based on haulage quotations for similar options.

6.2 Outbound Materials

6.2.1 Trains would operate on a daily basis during the early years of each phase. Trains would operate loaded outbound, and return empty.

6.2.2 The wagons would be low sided MHA wagons, each carrying an estimated 30 tonnes. It is assessed that 20 wagons could be accommodated within the terminal, each carrying 30 tonnes. This would allow rail to take away around 600 tonnes per day of material. This would be broadly equivalent to the daily volume of concrete plus excavation arisings, during years 7,8 and 9 (as shown by Figure 3).

6.2.3 Empty wagons would arrive at Earls Court late each night and be placed at the loading facility. At the same time, a waiting train of loaded wagons would be collected and taken away. This would allow wagons to stay on the terminal throughout the day to be loaded when convenient.

6.2.4 The cost of loading to rail at Earls Court has been included for rail, but excluded for road in order to take into account potential double handling. The cost of transferring material within the site at Earls Court has been excluded – in effect it is likely to be the same whether road or rail is used.

6.2.5 The daily trains could be taken to an available railhead facility in London such as the Powerday (at Park Royal) or Wembley Intermodal Terminal sites, or the Box Lane rail freight depot Barking Rail Terminal (both in Barking / Dagenham).

6.2.6 The other option would be longer-distance disposal for reuse outside London, such as the Calvert example. In this case, wagons could be combined at Park Royal / Wembley to operate as a double length train to Calvert every second day.

6.2.7 The cost of unloading at Calvert has been calculated as £1 per tonne. In comparison, unloading road vehicles using a tipper lorry would be a negligible cost which is reflected in the unloading time assessed in the financial comparison.

6.2.8 The estimated cost of the rail operation is based on the following estimates from DB Schenker:

- **Earls Court – Wembley round trip**: £2,900 per train carrying up to 600 tonnes of bulk materials
- **Wembley – Calvert round trip**: £4,400 per train carrying up to 1,200 tonnes every two days.

Divided by two = £2,200 per daily segment
These costs will need to be verified by a detailed exercise to be undertaken in conjunction with LU, a rail handling operation using two crawler cranes manned by 3 staff per day would cost an estimated £140,000 per annum which equates to £560 per day based on 250 days per annum.

### Inbound Materials: Consolidation Centre Option

#### Organising the efficient delivery of a variety of construction materials in 600 tonne loads by rail would necessitate the use of an off-site Consolidation Centre, as described in section 4.4. This would not be a requirement for the road-based Reference Case whereby materials are delivered in 20 tonne loads.

Again, wagons would arrive at Earls Court late each night and be placed at the loading facility. At the same time, a waiting train of wagons would be collected and taken to Park Royal / Wembley or Barking / Dagenham. This would allow wagons to be unloaded during the day when convenient.

Trains could also operate loaded outbound to the Consolidation Centre, and return with inbound materials. The balance of inbound and outbound material would change during the life of the project. During the construction phases the majority of loads would be inbound, although there could also be substantial flows of outbound waste material.

The wagons used would be container flats. It has been assessed that 60’ long wagons would be used, given the track gauge, allowing a mix of 20’ and 40’ containers to be carried. It is assessed that 10 wagons could be accommodated within the terminal, each carrying up to around 60 tonnes of bulk material (20 tonnes in a 20’ container). This would allow rail to deliver and potentially take away around 600 tonnes per day of bulk material.

For finishing materials such as windows and panels, it is assumed that each 60’ wagon could carry the equivalent of 1.5 standard lorries. The capacity of the daily train would therefore be equivalent to 15 lorries of finished material per day in each direction.

The overall cost of the rail operation has been estimated by DB Schenker as £3,500 per train for a round trip. The cost is also estimated as £3,700 per train.

A rail handling operation using two Containerlift units manned by 3 staff per day would cost an estimated £163,000 per annum which equates to £650 per day based on 250 days per annum. This would add around £1 per tonne for bulk movements.

In relation to a Consolidation Centre in the rail freight scenario, discussions with Consolidation Centre operators and a review of case studies (noteably the “London Construction Consolidation Centre Final Report revised October 2008”) shows that the principal cost items are:

- 16 staff (estimated at £12,000 per annum)
- Plant and handling equipment (estimated at £67,000 per annum, based on two Containerlift units)
- Rental costs for warehousing and open storage space, based on 5,000sqm of warehousing space at £150 / sqm = £750,000 per annum. The London Construction Consolidation Centre was a 5,000 sq. m. facility located in South Bermondsey. It had a capacity of more than 200,000 pallets per annum, assuming a dwell time of seven days.

It should be noted that in practice the price per tonne would vary depending on the material. For heavy materials such as steel or concrete fabrications, a train could easily carry 600 tonnes and so the price would be similar to the bulk price (but not identical due to different handling costs). For light materials such as panels and windows, it is assumed that a 40’ container could carry the equivalent of a lorry load of material. However, a Consolidation Centre can often pack materials more efficiently, for example mixing heavy and light products to optimise capacity and a load capacity of 600 tonnes has therefore been assumed.

This difference in price per tonne depending on the nature of construction material in each load would also apply to the costs of transporting these materials by road, so the relative costings are valid for the purposes of a road / rail cost comparison.

#### Terminal Development Costs

Within Lillie Bridge Depot the work required to provide a rail unloading or loading area would not be substantial, and would involve extending some of the existing Lillie Bridge Depot track into the EC2 footprint. The hard standing already in place should be adequate for either crawler crane or Containerlift operation.

These costs will need to be verified by a detailed exercise to be undertaken in conjunction with LU, but are expected to amount to some £0.5M.

#### Connection Costs

NR estimated that providing a connection to the Will may cost on the region of £5M. LU commented during consultation that its high-level cost estimate for the Whiteleys Siding loop is around £2.5M. These figures would need to be verified by a detailed exercise to be undertaken in conjunction with NR and LU.

#### LUL Operations Costs

Any locomotives crossing between NR and LUL tracks would have to be fitted with LUL signalling activation systems. This has been completed recently for DB Schenker trains used for weed killing services elsewhere on LUL. The cost is estimated as £1M for the four locomotives which would be required.

In addition, after the introduction of automatic train operation (from 2018) it would be necessary to fit locomotives with LUL automatic train control recognition equipment. The cost is also estimated as £1M for the four locomotives which would be required.

#### Rail Freight Facility Management Options

The possible options include:

- Procure a service from a third party provider, such as Powerday, to provide a specified number of empty wagons per day and / or to provide a goods inward service of up to 600 tonnes per day
- Procure the above service from the rail freight organisation direct
- Manage the rail freight facility via the Capco / TIL joint venture
- The freight facility could be operated by a specialised third party logistics provider, with the cost being met by contractors who would benefit from the supply chain efficiencies.
6.8 Total Costs

6.8.1 All of the up-front capital costs have been uplifted by a contingency / optimism bias of +50%, resulting in a total capital cost of £15M, as summarised by Table 5.

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinstate WLL Connection</td>
<td>£5M</td>
</tr>
<tr>
<td>New Connection at Whiteleys Siding</td>
<td>£2.5M</td>
</tr>
<tr>
<td>Lillie Bridge Depot Alterations</td>
<td>£0.5M</td>
</tr>
<tr>
<td>LU signalling activation systems (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>ATO control recognition equipment (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>Contingency (50% of the above)</td>
<td>£5M</td>
</tr>
<tr>
<td>Overall Capital Cost</td>
<td>£15M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinstate WLL Connection</td>
<td>£5M</td>
</tr>
<tr>
<td>New Connection at Whiteleys Siding</td>
<td>£2.5M</td>
</tr>
<tr>
<td>Lillie Bridge Depot Alterations</td>
<td>£0.5M</td>
</tr>
<tr>
<td>LU signalling activation systems (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>ATO control recognition equipment (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>Contingency (50% of the above)</td>
<td>£5M</td>
</tr>
<tr>
<td>Overall Capital Cost</td>
<td>£15M</td>
</tr>
</tbody>
</table>

Table 5 : Summary of Rail Capital Costs

Outbound Materials

6.8.2 Three Outbound Materials scenarios have been assessed for the three years (7, 8 and 9) of significant demolition and excavation giving rise to outbound flows of material:
- Calvert. Rail used for removal of concrete and spoil. 1 train per day carrying 600 tonnes to Wembley, and then connected with another train to take 1200T to Calvert every second day
- Wembley / Park Royal. A daily round trip by train carrying 600 tonnes.
- Barking / Dagenham. A daily round trip by train carrying 600 tonnes

6.8.3 The estimated rail costs are summarised in the table below:

<table>
<thead>
<tr>
<th>Outbound Materials Scenario</th>
<th>Calvert</th>
<th>Wembley / Park Royal</th>
<th>Barking / Dagenham</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of operation</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Trains Per Annum from Earls Court</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Trains Per Annum to Calvert</td>
<td>125</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rail Haulage Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Per Train from Earls Court</td>
<td>£2,900</td>
<td>£2,900</td>
<td>£3,100</td>
</tr>
<tr>
<td>Cost Per Train Wembley to Calvert</td>
<td>£4,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual cost from Earls Court</td>
<td>£372,000</td>
<td>£725,000</td>
<td>£775,000</td>
</tr>
<tr>
<td>Annual cost to Calvert</td>
<td>£550,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Rail Costs</td>
<td>£1,275,000</td>
<td>£725,000</td>
<td>£775,000</td>
</tr>
<tr>
<td>Handling Costs Per Annum</td>
<td>£162,760</td>
<td>£162,760</td>
<td>£162,760</td>
</tr>
<tr>
<td>Rail costs With Handling</td>
<td>£1,437,760</td>
<td>£887,760</td>
<td>£937,760</td>
</tr>
<tr>
<td>Connection Costs Per Annum</td>
<td>£6,441,438</td>
<td>£6,441,438</td>
<td>£6,441,438</td>
</tr>
<tr>
<td>Total Rail Costs Per Annum</td>
<td>£7,879,198</td>
<td>£7,329,198</td>
<td>£7,379,198</td>
</tr>
</tbody>
</table>

Table 6 : Summary of Outbound Rail Costs per Annum

6.8.4 The following table summarises the volumes involved and the cost per tonne. Costs have been summarised both to include and exclude the connection cost per tonne, which illustrates the sensitivity of the overall costs per tonne versus the out-turn cost of the connection.

<table>
<thead>
<tr>
<th>Volume Handled (Tonnes / Day)</th>
<th>Calvert</th>
<th>Wembley / Park Royal</th>
<th>Barking / Dagenham</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outbound</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Outbound + Return of Bulk Materials</td>
<td>0</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Rail Cost Per Tonne (Excluding Connection)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outbound Only</td>
<td>£1,437,760</td>
<td>£887,760</td>
<td>£937,760</td>
</tr>
<tr>
<td>Outbound + Return of Bulk Materials</td>
<td>£1,037,760</td>
<td>£1,087,760</td>
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</tr>
<tr>
<td>Rail Cost Per Tonne (Including Connection)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outbound Only</td>
<td>£9.59</td>
<td>£5.92</td>
<td>£6.25</td>
</tr>
<tr>
<td>Outbound + Return of Bulk Materials</td>
<td>£3.46</td>
<td>£3.63</td>
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<tr>
<td>Rail Cost Per Annum (Including Connection)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outbound Only</td>
<td>£7,879,198</td>
<td>£7,329,198</td>
<td>£7,379,198</td>
</tr>
<tr>
<td>Outbound + Return of Bulk Materials</td>
<td>£7,472,198</td>
<td>£7,529,198</td>
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</tr>
<tr>
<td>Rail Cost Per Annum (Including Connection)</td>
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<td></td>
<td></td>
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<tr>
<td>Outbound Only</td>
<td>£52.53</td>
<td>£48.86</td>
<td>£49.19</td>
</tr>
<tr>
<td>Outbound + Return of Bulk Materials</td>
<td>£24.93</td>
<td>£25.10</td>
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</tr>
</tbody>
</table>

Table 7: Summary of Outbound Volumes and Rail Costs

Inbound Materials

6.8.5 Two Inbound Materials scenarios have been assessed for the 11 year period (2021 to 2031 inclusive):
- Wembley / Park Royal consolidation centre, with a daily round trip by train carrying 600 tonnes of inbound material, with a sensitivity test where the trains return with an average 200 tonnes of spoil and other outbound materials.
- Barking / Dagenham consolidation centre, with a daily round trip by train carrying 600 tonnes of inbound material, with a sensitivity test where the trains return with an average 200 tonnes of spoil and other outbound materials.

6.8.6 The estimated rail costs are summarised in the table below. This includes the cost of the consolidation centre which would be required to organise inbound loads of 600 tonnes at a time, but it excludes the connection costs. It is considered that rail freight is most likely to be used for inbound construction materials if it has already been used for the outbound materials, in which case the connection cost and other capital spend would already have been made (and included in the costs of the outbound materials scenario).
Table 8: Summary of Inbound Rail Costs per Annum

<table>
<thead>
<tr>
<th>Inbound Materials Scenario</th>
<th>Wembley / Park Royal</th>
<th>Barking / Dagenham</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of operation</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Trains Per Annum</td>
<td>250</td>
<td>250</td>
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<tr>
<td>Rail Haulage Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Per Train</td>
<td>£3,500</td>
<td>£3,700</td>
</tr>
<tr>
<td>Annual Cost</td>
<td>£875,000</td>
<td>£925,000</td>
</tr>
<tr>
<td>Handling Costs Per Annum</td>
<td>£162,760</td>
<td>£162,760</td>
</tr>
<tr>
<td>Consolidation Centre Cost Per Annum</td>
<td>£1,329,000</td>
<td>£1,329,000</td>
</tr>
<tr>
<td>Rail costs With Handling</td>
<td>£1,491,760</td>
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<tr>
<td>Total Rail Costs Per Annum</td>
<td>£2,366,760</td>
<td>£2,416,760</td>
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</table>

Table 8 shows that the operating costs per annum vary little between a Wembley / Park Royal or a Barking / Dagenham consolidation centre, with the rail haulage costs being only a minor component of the annual cost, when the handling and consolidation centre costs are added.

The following table summarises the volumes involved and the cost per tonne. Costs have been summarised both to include and exclude the connection cost per tonne, which illustrates the sensitivity of the overall costs per tonne versus the out-turn cost of the connection:

Table 9: Summary of Inbound Volumes and Rail Costs

<table>
<thead>
<tr>
<th>Volume Handled (Tonnes / Day)</th>
<th>Wembley / Park Royal</th>
<th>Barking / Dagenham</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Materials Only</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Construction + Outbound Materials</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Volume Handled (Tonnes / Annum)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Materials Only</td>
<td>150,000</td>
<td>150,000</td>
</tr>
<tr>
<td>Construction + Outbound Materials</td>
<td>200,000</td>
<td>200,000</td>
</tr>
<tr>
<td>Volume Handled Over Project Life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Materials Only</td>
<td>1,650,000</td>
<td>1,650,000</td>
</tr>
<tr>
<td>Construction + Outbound Materials</td>
<td>2,200,000</td>
<td>2,200,000</td>
</tr>
<tr>
<td>Rail Cost Per Annum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Materials Only</td>
<td>£2,366,760</td>
<td>£2,416,760</td>
</tr>
<tr>
<td>Construction + Outbound Materials</td>
<td>£2,529,521</td>
<td>£2,579,521</td>
</tr>
<tr>
<td>Rail Cost Per Tonne</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Materials</td>
<td>£15.78</td>
<td>£16.11</td>
</tr>
<tr>
<td>Construction + Outbound Materials</td>
<td>£12.65</td>
<td>£12.90</td>
</tr>
</tbody>
</table>

Table 6.9 Road Costs

6.9 Road Costs

6.9.1 Road costs have been assessed based on recent price quotations for similar flows over similar distances. These costs have been assessed for the same Calvert, Wembley / Park Royal and Barking / Dagenham destinations which have been considered for rail operations. In practice the origins of inbound materials will depend on the source or factory and manufacturer, and so the costs derived in Table 10 (and the equivalent rail costs in Tables 7 and 9) cannot be treated as absolute values because they exclude the costs of transport to the consolidation centre locations being considered. In each case the costs of moving materials from their origins to the consolidation centre locations would be common to both the rail- and road-based scenarios.

Table 10: Summary of Road Costs (based on price quotations)

<table>
<thead>
<tr>
<th>Origin</th>
<th>Earls Court</th>
<th>Wembley / Park Royal</th>
<th>Wembley / Park Royal</th>
<th>Barking / Dagenham</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Distance</td>
<td>Miles</td>
<td>69</td>
<td>66</td>
<td>6</td>
</tr>
<tr>
<td>1 Way Journey Time</td>
<td>Hours</td>
<td>2.6</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Handling</td>
<td></td>
<td>Earls Court</td>
<td>Hours</td>
<td>1</td>
</tr>
<tr>
<td>Destination</td>
<td>Hours</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total Round Trip Journey Time</td>
<td></td>
<td>7.2</td>
<td>7.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Estimated Price</td>
<td>£400</td>
<td>£400</td>
<td>£150</td>
<td>£200</td>
</tr>
<tr>
<td>Per Tonne</td>
<td>£20.00</td>
<td>£20.00</td>
<td>£7.50</td>
<td>£10.00</td>
</tr>
</tbody>
</table>

Table 6.10 Road versus Rail Cost Comparison

6.10 Road versus Rail Cost Comparison

6.10.1 All costs in the following comparison include the additional cost of handling at Earls Court for rail but exclude gate fees at the destination, which should be the same for each option.

Table 11: Summary of Rail and Road Costs per Tonne
6.10.2 Table 11 shows that the rail operational costs are consistently higher than the equivalent road operations in each scenario, when assessed on a per Tonne basis.

6.10.3 The overall costs of the road and rail options over the 11 year period 2021 – 2031 are summarised below.

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rail Capital Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Reinstate WLL Connection</td>
<td>£5M</td>
</tr>
<tr>
<td>New Connection at Whiteleys Siding</td>
<td>£2.5M</td>
</tr>
<tr>
<td>Lillie Bridge Depot Alterations</td>
<td>£0.5M</td>
</tr>
<tr>
<td>LU signalling activation systems (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>ATO control recognition equipment (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>Contingency (50% of the above)</td>
<td>£5M</td>
</tr>
<tr>
<td>Overall Capital Cost</td>
<td>£15M</td>
</tr>
<tr>
<td><strong>Rail Operating Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Haulage Costs (to/from Consolidation Centre)</td>
<td>£0.8M / year</td>
</tr>
<tr>
<td>2 Containerlift Units and Staff</td>
<td>£0.16M / year</td>
</tr>
<tr>
<td>Construction Consolidation Centre</td>
<td>£1.33M / year</td>
</tr>
<tr>
<td>Overall Operating Costs (over 11 years)</td>
<td>£25.2M</td>
</tr>
<tr>
<td><strong>Total Rail Capital and Operating Costs</strong></td>
<td>£40.2M</td>
</tr>
<tr>
<td><strong>Road Capital Costs</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Road Operating Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Haulage Costs / Tonne</td>
<td>£10 / Tonne</td>
</tr>
<tr>
<td>Tonnage over 11 years (from Table 2)</td>
<td>1.96M Tonnes</td>
</tr>
<tr>
<td>Overall Operating Costs (over 11 years)</td>
<td>£19.6M</td>
</tr>
<tr>
<td><strong>Total Road Capital and Operating Costs</strong></td>
<td>£19.6M</td>
</tr>
</tbody>
</table>

*Table 22: Summary of Overall Rail and Road Costs*

6.10.4 The overall summary shows that the rail costs would be over double the cost of the road-based operation assessed by the ES.
7 Business Case and Cost / Benefit Analysis

7.1 Business Case Criteria

7.1.1 The business case for the use of rail has been considered in three ways, which reflect the requirements of the brief for this study:
- The financial cost analysis of rail compared to road based logistics solutions
- The benefits and disbenefits of using rail for the logistics of the Earls Court project
- The benefits and disbenefits of using rail in terms of the environment and local communities

7.2 Financial Business Case

7.2.1 Chapter 6 of this report concludes that the financial cost of using rail significantly exceeds that of road. Despite rail operational costs being lower per tonne (when the connection cost is excluded), this operational cost advantage is significantly exceeded by the high capital costs.

7.2.2 The 50% contingency is necessary to allow for unforeseen costs at this stage and could be reduced once any detailed design had been completed although it should be noted that the costs may be underestimated. However, in the case of the Wembley / Park Royal and Barking / Dagenham destinations, the cost of transporting materials by rail would still significantly exceed the road transport cost even if the contingency was zero.

7.2.3 The comparison of road versus rail operational costs is not sensitive to the distance travelled to Consolidation Centre options in London. A Barking / Dagenham Consolidation Centre would have a similar rail transport cost to a Wembley / Park Royal Consolidation Centre, and the cost of both options would exceed the cost of transport by road.

7.3 The Logistics Case

7.3.1 The preferred option for concrete arising from demolition or earth arising from excavation would be to reuse the material on site. However, this will only be possible for a percentage of the material due to on-site storage and stockpiling limitations, and the rest must be exported.

7.3.2 Such materials can be used on other construction sites to provide fill material, or, for example, to build bunds. For small construction projects it is often possible to find neighbouring sites which can receive such materials. For a large site like Earls Court spoil disposal may be more difficult to arrange, and material may need to be transported longer distances. Depending on their construction programmes, the quality and nature of the fill, and the willingness of other developers/contractors, some relatively local and significant opportunities to reuse spoil on other construction sites could include:
- Project Lille
- The Westfield London extension
- The White City Opportunity Area
- The Vauxhall Nine Elms Battersea Opportunity Area
- Old Oak Common Opportunity Area

7.3.3 The reuse of excess spoil materials at neighbouring sites would minimise overall transport requirements. However, as the above sites do not have rail freight terminals, the reuse of excess spoil materials would involve transport by road in order to provide more opportunities to recycle or reuse material and that may cause some issues at other sites.

7.3.4 If an Earls Court rail freight facility was used to transport materials to and from other sites, which the Councils requested to be considered by this study (see paragraph 1.1.8), then the materials would have to travel between Earls Court and the other sites by road. While this could increase the utilisation of a rail freight facility, it would also involve more lorry movements on the local roads accessing the facility. This would be likely to generate a scenario involved more lorry movements in and out of the Earls Court site than had been assessed by the ES.

Consolidation Centre

7.3.5 Use of a Consolidation Centre involves additional costs. Research and practical experience on major projects (e.g. reported in London Construction Consolidation Centre Final Report, October 2008 and other research) has demonstrated benefits for the use of such a facility including:
- 24 hours per day access
- Significant reduction in space on the construction site that would otherwise be used for storing, sorting, and handling materials
- Reduction in the problem of lorries queuing on the site
- Reduction in the number of missed or delayed deliveries – leading to an increase in productivity on the site
- Reduced returns and better control over ordering
- A potential reduction in costs if loads can be consolidated

7.3.6 A Consolidation Centre could be operated by a specialised third party logistics provider, with the cost being met by contractors who would benefit from the supply chain efficiencies.

7.3.7 If a Consolidation Centre were linked to Earls Court by a daily train using a Containerlift system, products could be lifted from the train at Earls Court without being handled, and delivered straight to the point of use. The container could be placed on the ground at the point of use, acting as a secure weather proof store, with workers unloading materials when required rather than stopping work to unload a lorry when it arrives, and then double-handling to move materials from store to workplace.

7.3.8 In practice, the uptake of construction consolidation centres has been limited. This is primarily due to the additional costs involved in their operation.

7.4 Environmental Benefits and Disbenefits

7.4.1 If it was technically feasible to establish a rail freight facility then a daily train carrying 600T of materials could replace 30 lorry deliveries of 20T each, equating to 60 lorry movements per day (counting both directions of travel).

7.4.2 The rail scenarios would have some sustainability benefits, including reduced Green House Gas (GHG) emissions and reduced impact on the road network.

7.4.3 Transport of goods by rail generally produces lower volumes of GHG emissions than the equivalent journey by road, per tonne moved. The Government provides guidance for business to use when reporting on GHG emissions. The levels currently assessed are set out in the table below.
The calculated benefits add up to over £1M over the whole life of the project. TfL has a similar

Spoil - Calvert
2,254,492
£4.03
15,369
2,266,234
53
600
1.3279 kg CO2 per v km

£4.03
£1,787,640
313
£22.17
Total
111
10
0
6
131,588
6
Total
10
4,441,962
2,936,018
6
2,737,010
302
684,258
£1,362,910
In order to assess the potential magnitude of GHG emissions for the use of rail freight at Earls

881
600
6,912,575
3,250
£681,455
407,810
£982,313
111
There are a very limited number of options for attracting public sector funding of rail freight. The

The DfT’s “Guide to Mode Shift Revenue Support (MSRS) Scheme outlines the criteria and

Total
10
4,441,962
2,936,018
6
2,737,010
302
684,258
£1,362,910
In order to assess the potential magnitude of GHG emissions for the use of rail freight at Earls

Table 14: Summary of GHG Emissions By Road and Rail

7.4.5 The table shows that moving all residual concrete and spoil to Calvert by rail instead of road could save 4,400 tonnes of CO2 over the life of the project. The Consolidation Centre option shows a benefit of 4,500 tonnes, which is equivalent to removing 880 family cars from the roads for one year, or 80 cars per year over the 11 years period being considered (2021 – 2031). This is not significant in relation to the baseline GHG emissions on the local road network (for example, the A4 carries some 4,000 vehicles per hour at peak times).

7.4.6 The environmental disbenefits of using a rail freight facility at Earls Court would arise at a localised level. These impacts would involve night-time activity including noise impacts and potential dust issues depending on the nature of the materials being handled. Any double-handling of materials would increase the overall level of impact. The magnitude of such impacts arent the extent to which they could be mitigated would need to be assessed in detail based on a layout for the loading and unloading areas which were agreed by NR and LU.

<table>
<thead>
<tr>
<th>Road</th>
<th>Spoil Disposal Centre</th>
<th>Consolidation Centre</th>
<th>Consolidation Centre</th>
<th>Consolidation Centre</th>
<th>Consolidation Centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (one way) (miles)</td>
<td>69</td>
<td>69</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Distance (one way) (km)</td>
<td>111</td>
<td>111</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Loaded Lorry Journeys</td>
<td>30,738</td>
<td>15,369</td>
<td>30,738</td>
<td>93,750</td>
<td></td>
</tr>
<tr>
<td>Empty Lorry Journeys</td>
<td>30,738</td>
<td>15,369</td>
<td>0</td>
<td>93,750</td>
<td></td>
</tr>
<tr>
<td>Total CO2 Emissions (kg)</td>
<td>7,468,487</td>
<td>4,250,273</td>
<td>407,810</td>
<td>2,254,492</td>
<td>6,912,575</td>
</tr>
</tbody>
</table>

Table 14: Summary of GHG Emissions By Road and Rail

Table 15: Estimated Mode Shift Benefits

7.5 Other Quantifiable Benefits

7.5.1 The Department of Transport uses a measure known as “Mode Shift Benefit” (MSB) to quantify the benefit of removing lorries from roads. MSB is used to measure the potential value of freight grants.

7.5.2 MSB provides a single value for each road type which covers the following benefits:

- Congestion costs
- Accidents costs
- Noise costs
- Climate change costs
- Air pollution costs
- Infrastructure costs
- Other costs

7.5.3 These costs vary significantly depending on the type of road. The values vary from £0.07 per lorry mile for some motorways to £1.43 for roads which are not A roads or motorways. The DIT provides a calculator which works out the saving for any particular road movement based on the route and roads used. Using this tool for the two scenarios tested provides the following results.

<table>
<thead>
<tr>
<th>Road</th>
<th>Spoil Disposal Centre</th>
<th>Consolidation Centre</th>
<th>Consolidation Centre</th>
<th>Consolidation Centre</th>
<th>Consolidation Centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (one way) (miles)</td>
<td>69</td>
<td>69</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Distance (one way) (km)</td>
<td>111</td>
<td>111</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Payload</td>
<td>1,200</td>
<td>1,200</td>
<td>600</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Loaded Train Journeys</td>
<td>625</td>
<td>313</td>
<td>625</td>
<td>3,250</td>
<td></td>
</tr>
<tr>
<td>Loaded Train km</td>
<td>81,283,552</td>
<td>41,647,776</td>
<td>3,621,028</td>
<td>18,829,325</td>
<td></td>
</tr>
<tr>
<td>Total CO2 Emissions (kg)</td>
<td>3,026,524</td>
<td>1,513,262</td>
<td>131,588</td>
<td>684,258</td>
<td>2,329,108</td>
</tr>
<tr>
<td>Saving</td>
<td>4,441,962</td>
<td>2,737,010</td>
<td>276,222</td>
<td>1,570,235</td>
<td>4,581,468</td>
</tr>
<tr>
<td>Average Family Cars (5.2t pa)</td>
<td>854</td>
<td>526</td>
<td>53</td>
<td>302</td>
<td>881</td>
</tr>
</tbody>
</table>

Table 14: Summary of GHG Emissions By Road and Rail

7.6 Potential for Third Party Financial Support

7.6.1 There are a very limited number of options for attracting public sector funding of rail freight. The Department for Transport (DIT) no longer provides Freight Facilities Grants towards the capital cost of setting up rail freight facilities, but it does sometimes subsidise rail freight movements through a scheme called Mode Shift Revenue Support (Bulk Rail) – MSRS.

7.6.2 MSRS can be claimed where the rail option is more expensive than the road options, and is designed to facilitate and support modal shift, generating environmental and wider social benefits from reduced lorry journeys on Britain’s roads.

7.6.3 The DIT’s “Guide to Mode Shift Revenue Support (MSRS) Scheme outlines the criteria and processes in place for applying for support from the Mode Shift Revenue Support scheme, also known as MSRS. However, it stresses that “there is no automatic entitlement to grant support and any offer of grant which may be made remains entirely at the discretion of the appropriate administrative body”.

<table>
<thead>
<tr>
<th>Road</th>
<th>Spoil Disposal Centre</th>
<th>Consolidation Centre</th>
<th>Consolidation Centre</th>
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</tr>
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<tbody>
<tr>
<td>Distance (one way) (miles)</td>
<td>69</td>
<td>69</td>
<td>6</td>
<td>6</td>
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</tr>
<tr>
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<td>111</td>
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<td>6,912,575</td>
</tr>
</tbody>
</table>

Table 14: Summary of GHG Emissions By Road and Rail

Table 15: Estimated Mode Shift Benefits

7.5.4 The calculated benefits add up to over £1M over the whole life of the project. TfL has a similar method for quantifying social benefits in business cases and it aims to achieve Benefit to Cost Ratios (BCRs) of 1.4 to 1.5.

7.5.5 However, comparing the mode shift benefits with the summary of overall road and rail costs in Table 12, it is clear that the mode shift benefit is insignificant and not worthwhile when faced with the material extra cost of rail transport.

7.6 Potential for Third Party Financial Support

7.6.1 There are a very limited number of options for attracting public sector funding of rail freight. The Department for Transport (DIT) no longer provides Freight Facilities Grants towards the capital cost of setting up rail freight facilities, but it does sometimes subsidise rail freight movements through a scheme called Mode Shift Revenue Support (Bulk Rail) – MSRS.

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<tr>
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<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Payload</td>
<td>1,200</td>
<td>1,200</td>
<td>600</td>
<td>600</td>
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<td>Average Family Cars (5.2t pa)</td>
<td>854</td>
<td>526</td>
<td>53</td>
<td>302</td>
</tr>
</tbody>
</table>
7.6.4 A formal application for grant would need to be submitted, and the Guide strongly recommends that the application for support is made by the goods service operator (GSO) of the service in question. In this case, the GSO cannot be identified at present.

7.6.5 Proposals would be prioritised on the basis of value for money and factors which may be considered include the previous record of the applicant, and the deliverability of the traffic volumes contained in the application for grant.

7.6.6 The DfT made awards following the January 2014 Bid Round under the MSRS scheme, and these amounted to £566,533 across 12 successful applications for the 2013-14 financial year – an average of some £45,000 per successful application.

7.6.7 Based on this level of funding support, MSRS would not change the overall economics of the rail freight option.

7.6.8 In response to a request made to the Mayor’s Office to inquire about potential funding sources, TfL has advised that funding seems unlikely as the TfL Business Plan is allocated until 2021/22. TfL stated that it should see this report in full and be able to understand the cost-benefit analysis in detail before commenting finally on whether a case for funding could be made.
8 Summary and Conclusions

8.1 Summary

8.1.1 The findings of this Feasibility Study are summarised under the following sub-headings which reflect the S106 Agreement definition of Feasibility.

Technical Feasibility

8.1.2 Rail Freight is not regarded as technically feasible until at the earliest the existing Lillie Bridge Depot operations are re-located and the site is made available (within Phase 4 of the Earls Court Development, i.e. until after at least the first seven years from commencement of demolition and construction of the development). Additionally this must have regard to the stabilising facility which remains fully operational throughout the phased development. However, if conditions change then EC Properties Ltd and TfL would re-assess the feasibility and viability of providing a rail freight facility in consultation with rail specialists and the Councils. NR and other consents would still be needed at that time.

8.1.3 The installation of a track switch between the West London Line and the District Line, and the creation of a “run round loop” for locomotives at Whiteleys Siding would be required in order to provide rail access to a freight facility at Earls Court. These installations would provide a link between two totally separate railways operated by NR and LU, and therefore involve significant complexities in terms of signalling, control, and safe operation. Consultations with LU have indicated that operational compatibility between the signalling systems of NR and LU would pose a risk to safety-critical railway operations and NR commented that interchange between the lines was far too complex. Even if LU and NR approval was to be forthcoming, the timescales normally associated with design and implementation of NR and LU track and signalling assets suggests that the WLL and Whiteleys Siding track switches would not be operational for a minimum of 18 months. As a result it would not be possible to implement the facility for use during the demolition of EC 1 & 2.

8.1.4 It would not be feasible for a rail freight facility to co-exist with the operational activities at Lillie Bridge Depot. LU has commented that the signalling and safe operational requirements of a rail freight facility accessed via Lillie Bridge Depot would be significant. The requirement for LU operations, including planned and unplanned maintenance or renewals to always take priority means that a rail freight facility could not be reliably operated. The number of safety and operational issues to be resolved means that a rail freight facility could not be implemented while the Lillie Bridge Depot remains operational. This would negate its use during the demolition of EC1 & 2.

8.1.5 Should the Lillie Bridge Depot come forward for development and operations have been relocated, then land could be made available by LU to establish a suitable loading area for rail freight within the Lillie Bridge Depot site. However, as stated the Masterplan proposals are to maintain the train stabling facility throughout the development and the phasing of the development requires that once vacated the depot site is re-developed.

8.1.6 LU has advised that it will not accept a rail freight proposal which potentially impacts upon operational requirements, the passenger train timetable, and health and safety.

Financial Feasibility

8.1.7 In summary, in the context of the development, transport via rail freight is considered to be prohibitive in financial feasibility terms. The capital and operational costs of rail freight being double that (£20million more) than road freight and not financially worthwhile in the context of the relative insignificance of any resulting environmental impact reduction (see further below).

8.1.8 The financial appraisal of rail options is sensitive to:

- the capital cost of the rail connections and other alterations described in section 6
- any additional on-site operational costs relative to the road transport option ("the Reference Case")
- the transport cost differences between rail and the Reference Case, which depend on the destinations for outbound materials and the origins of inbound materials.
- liabilities arising from health and safety, and insurance risks arising from operation of rail freight
- securing and operating a consolidation centre to service the rail freight facility.

8.1.9 The capital costs include the costs involved with implementing changes to rail infrastructure by adding connections between the WLL, District Line and Whiteleys Siding, plus the necessary signalling changes. Any locomotives crossing from the NR network onto the LU network would have to be fitted with LU signalling activation systems and with the advent of automatic train operation (from 2018) it will be necessary to fit locomotives with LU automatic train control recognition equipment.

8.1.10 These capital costs are estimated to total £15M as set out in Table 1. In addition, the additional on-site operational costs would amount to some £163,000 / year for the provision of on-site Containerlift units and staff. Organising the efficient delivery of a variety of construction materials by rail would necessitate the use of an off-site Consolidation Centre with an estimated annual cost of £1.33M / year.
8.1.11 The overall costs of the road and rail options over the 11 year period 2021 – 2031 are summarised below.

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Capital Costs</td>
<td></td>
</tr>
<tr>
<td>Reinstall WLL Connection</td>
<td>£5M</td>
</tr>
<tr>
<td>New Connection at Whiteleys Siding</td>
<td>£2.5M</td>
</tr>
<tr>
<td>Lillie Bridge Depot Alterations</td>
<td>£0.5M</td>
</tr>
<tr>
<td>LU signalling activation systems (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>ATO control recognition equipment (for 4 locomotives)</td>
<td>£1M</td>
</tr>
<tr>
<td>Contingency (90% of the above)</td>
<td>£5M</td>
</tr>
<tr>
<td>Overall Capital Cost</td>
<td>£15M</td>
</tr>
<tr>
<td>Rail Operating Costs</td>
<td></td>
</tr>
<tr>
<td>Haulage Costs (to/from Consolidation Centre)</td>
<td>£0.8M / year</td>
</tr>
<tr>
<td>2 Containerlift Units and Staff</td>
<td>£0.16M / year</td>
</tr>
<tr>
<td>Construction Consolidation Centre</td>
<td>£1.33M / year</td>
</tr>
<tr>
<td>Overall Operating Costs (over 11 years)</td>
<td>£25.2M</td>
</tr>
<tr>
<td>Total Rail Capital and Operating Costs</td>
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<tr>
<td>Road Capital Costs</td>
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</tr>
<tr>
<td>Road Operating Costs</td>
<td></td>
</tr>
<tr>
<td>Haulage Costs / Tonne</td>
<td>£10 / Tonne</td>
</tr>
<tr>
<td>Tonnage over 11 years (from Table 2)</td>
<td>1.96M Tonnes</td>
</tr>
<tr>
<td>Overall Operating Costs (over 11 years)</td>
<td>£19.6M</td>
</tr>
<tr>
<td>Total Road Capital and Operating Costs</td>
<td>£19.6M</td>
</tr>
</tbody>
</table>

Table 4: Summary of Overall Rail and Road Costs

8.1.12 The overall summary shows that the rail costs would be over double the cost of the road-based operation assessed by the ES.

8.1.13 Additionally, commercial and legal terms would need to be agreed with TfL for use of the site.

8.1.14 It is concluded that in the context of the development, transport via rail freight would be financially prohibitive and not financially worthwhile in the context of the relative insignificance of any resulting environmental impact reduction (see further below).

8.1.15 If it was feasible to operate a rail freight facility during construction then a daily train would remove a maximum of six lorries per hour from local roads over an average working day. The significance of this reduction can be considered in the context of the current lorry flows on the nearby road network. The existing lorry flows are recorded by Table 7-11 of the Environmental Statement. Paragraph 7.161 of the Environmental Statement concluded:

"Table 7-11 indicates that the change in vehicle flows and percentage change in HGVs will be small during the demolition and construction of the Earls Court Development Proposals and does not exceed 1% in general traffic and 62% in HGV traffic although a high % change, in actual change the difference is imperceptible at 8 HGVs on Lillie Road"

8.1.16 The Reference Case impact of eight lorries per hour was assessed as imperceptible in the Environmental Statement, and so a reduction due to rail freight of six lorries per hour from the Reference Case would also be imperceptible on the same basis of assessment.

8.1.17 As noted above, the environmental significance of the savings in lorry movements when comparing rail freight with the Reference Case would be imperceptible. The potential magnitude of Green House Gas (GHG) emissions for the use of rail freight for the Earls Court project has been assessed using Government guidance, taking account of the haul distances for the range of likely destinations and origins for outbound and inbound materials respectively.

8.1.18 The analysis shows that rail could save just 4,500 tonnes of CO2 relative to the Reference Case over the life of the project, which is equivalent to removing 80 cars from the roads each year. This is not significant in relation to the baseline GHG emissions.

8.1.19 These benefits also need to be balanced against the additional local impacts which could arise from on-site rail freight activities including additional materials handling, site logistics, accessing the rail freight facility for works on the east side of the West London Line, and overnight activities. The environmental impacts and mitigation requirements would need to be assessed through the planning process for a rail freight terminal.

8.1.20 In particular, any rail freight operation which served other sites in addition to the Earls Court Development would generate additional heavy goods vehicle movements on the local road network in excess of the Reference Case, and this would require careful consideration.

8.1.21 This Report has considered the feasibility of a rail freight facility in accordance with planning obligations contained in the Earls Court development Section 106 Agreement.

8.1.22 It is concluded that a rail freight facility is not currently feasible. There are significant technical constraints and challenges associated with the presence and operation of the Lillie Bridge Depot and significant concerns over obtaining necessary consents. In addition, rail freight would, overall, be financially prohibitive and is not considered to be worthwhile in the context of the relative insignificance of any resulting environmental impact reduction relative to the road-based operations found to be acceptable in the Environmental Statement and for which permission has been granted. In addition, the local environmental dis-benefits arising from any rail freight facility would need to be assessed through any planning process.

8.1.23 Any rail freight facility could only be potentially technically feasible (if at all) once Lillie Bridge Depot operations have been relocated, the site vacated and sufficient land has been made available by LUL for rail freight purposes for the duration of the construction programme. Based on the current development programme this could not be until Phase 4 of the development at the earliest, and even then subject to necessary consents and approvals and still with very high financial costs and the relative insignificance of any resulting environmental impact reduction.

8.1.24 However, if conditions change then EC Properties Ltd and TfL would re-assess the feasibility and viability of providing a rail freight facility in consultation with rail specialists and the Councils. NR and other consents would still be needed at that time.
## Appendix A - Consultees

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danielle Shadbolt</td>
<td>RBKC and LBHF</td>
</tr>
<tr>
<td>Angus McConchie</td>
<td>Network Rail</td>
</tr>
<tr>
<td>Guy Bates</td>
<td>Network Rail</td>
</tr>
<tr>
<td>Jonathan Cornelius</td>
<td>TFL</td>
</tr>
<tr>
<td>Alex Andrews</td>
<td>TFL</td>
</tr>
<tr>
<td>Adrian McCrow</td>
<td>Strategy &amp; Service Development, London Underground</td>
</tr>
<tr>
<td>Matthew Rheinberg</td>
<td>Rail Transport Planning, London Underground</td>
</tr>
<tr>
<td>Alan Smart</td>
<td>Rail Transport Planning, London Underground</td>
</tr>
<tr>
<td>Stuart Howard</td>
<td>TFL Tube</td>
</tr>
<tr>
<td>Paul Godwin</td>
<td>TFL Tube</td>
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<tr>
<td>Fred Green</td>
<td>TFL Tube</td>
</tr>
<tr>
<td>Richard Meeks</td>
<td>TFL Rail</td>
</tr>
<tr>
<td>David Kang Gil</td>
<td>Network Rail South East – Asset Management</td>
</tr>
<tr>
<td>Subramaniam Logan</td>
<td>Network Rail</td>
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</table>