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## INTRODUCTION

This document is the Non-Technical Summary (NTS) of the Supplementary Environmental Statement (ES) for the Crossrail project. The Supplementary ES provides additional information to that provided in the ES, which was published (together with an Addendum) in February 2005. The additional information relates to the works and environmental impacts for certain aspects of the project. The information is provided either because it has become available since the ES was published or because it was considered necessary to consider variations to the assumptions in the ES. The Supplementary ES should be read in conjunction with the ES.

The additional information addressed in this Supplementary ES relates to the following:

- construction timetable and strategy;
- noise insulation;
- climate change;
- impacts relating to health;
- Hanbury Street;
- Bow Midland Yard West; and
- Romford depot and station transport assessment.

Errata which have been identified since the submission of the ES are set out in *Appendix 1* to the Supplementary ES. Those errata which are considered to have more important implications have been highlighted so as to draw the reader's attention to these. However, the reader is encouraged to check the relevant sections of the errata to determine whether these affect matters of particular interest in the ES.

Additional information on alternatives to Crossrail, specifically SuperCrossrail and Superlink, is available in a CLRLL report entitled "SuperCrossrail and Superlink Update Report" (May 2005). Additional information with respect to the selection of the site for the Crossrail depot is available in a CLRLL report entitled "Depot Location Options Update" (May 2005) (Report No. 1d0600-e1d17-50000).

## *CONSTRUCTION TIMETABLE AND STRATEGY*

### *INTRODUCTION*

The Supplementary ES considers the implications of changes to the normal construction working hours and the start year of construction assumed in the ES.

### *WORKING HOURS*

The normal working hours assumed for the ES were 7am to 7pm (Monday to Friday). The Supplementary ES considers the implications of reducing the normal working hours to 8am to 6pm (Monday to Friday), assuming that the other requirements for working hours identified in the ES would be unchanged.

The principal implication of this change would be to reduce the period available for delivering material to worksites and removing excavated material from worksites. The loss of the hour between 7am and 8am is particularly important. This is because it is in the first hours of the working day that hauliers aim to clear excavated materials stockpiled from works during the previous night, whether this material is taken to be re-used on other projects or disposed of to landfill sites.

There is a significant advantage in being able to clear material as early as possible the following morning, both in order to avoid periods when traffic congestion is at its worst and to enable work to start on the cleared site first thing in the morning with minimum delay. Any loss of working hours will reduce the flexibility available for removing excavated material. Worksites are constrained in size, and their ability to store large amounts of materials is limited, due to the urban location of the works.

Reduced working hours would also reduce the ability of the project to meet the programme assumed in the ES. The overall effect of a reduction in working hours would be a risk that the opening date for Crossrail would be delayed.

The difference in noise impact between a 10 and a 12 hour working day has been assessed to be insignificant.

In summary, a reduction in normal hours, to the extent set out above, would significantly affect the project's ability to deliver materials to

worksites, effectively to manage the removal of excavated materials from worksites and to meet the assumed construction programme.

## *CONSTRUCTION PROGRAMME*

### *Introduction*

The ES assumed that construction would start in 2007. The Supplementary ES sets out the differences in environmental impacts that might be expected to arise if construction did not commence until 2009 (with the start of operation in 2015). The only environmental impacts of significance that would potentially change relate to traffic, noise and air quality.

### *Traffic*

With a later construction start, the base traffic flows are likely to have increased and the percentage increases due to construction traffic will, if anything, marginally reduce. The potential for traffic growth in central London is, however, severely constrained by traffic congestion, the Congestion Charge Zone, parking controls and other traffic management measures. A delayed construction start would not be expected to have a material effect on the assessment of traffic impacts set out in the ES. Similarly, a delay of two years to the completion of Crossrail would not change the permanent traffic and transport impacts reported in the ES, even though there would have been a small growth in base traffic in the interim.

### *Noise*

The predicted increase in noise levels brought about by changes in base traffic flows is very low and would not change the conclusions of the construction noise assessment reported in the ES. The conclusions of the assessment of railway and road traffic noise during operation of Crossrail would also be unchanged.

### *Air Quality*

The impact of Crossrail construction traffic on air quality would not change significantly, should the construction start in 2009 instead of 2007. Baseline air quality is expected to improve in the period between 2007 and 2009. This is mainly because the improved fuel efficiency of vehicles will more than offset the effects of the predicted growth in traffic. As a consequence, fewer breaches of the National Air Quality Objectives are expected, both with and without Crossrail. The increase

in pollutant concentration due to construction traffic would be the same in relative terms, and smaller in absolute terms, in 2009 in comparison with 2007.

This reflects the reduction in vehicle emissions described above and the marginal contribution that Crossrail construction traffic will make to concentrations.

### *Interaction with Other Projects*

The main effect of a later start to construction would involve changes in the extent of overlap between the construction programmes for Crossrail and other transports projects as described in *Chapter 12* of the ES. These changes would principally occur at Paddington, Tottenham Court Road, Farringdon and Whitechapel stations.

Further explanation is provided in *Box 1* along with an overview of the anticipated changes in environmental impacts.

#### **Box 1**

### ***Later Construction Start: Crossrail Interaction with Other Transport Projects***

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#### *Paddington station*

The assumption in the ES is that the Span 4 development at Paddington can not commence before Crossrail because the area required for this development is needed as a temporary taxi facility for the duration of the Crossrail Paddington station construction programme.

If the Crossrail construction works are delayed by two years, it may be possible for the Span 4 development to commence and be sufficiently advanced to provide a transport interchange deck, which will contain a permanent taxi facility. This would obviate the need for Crossrail to:

- undertake any works in the area of the Red Star deck and associated listed train shed, and
- reinstate taxi facilities back to the Departures Road on completion of the Crossrail station works.

If works in the area of the Red Star deck and associated train shed are not required, then this will reduce the construction noise impacts of Crossrail in this area, which are set out in the ES.

#### *Tottenham Court Road station*

The ES assumes that the works to construct Tottenham Court Road station tunnels and eastern ticket hall would commence simultaneously in 2007, immediately after Royal Assent of the Crossrail Bill. It has also been assumed that London Underground (LU) would undertake the ticket hall works and would appoint their own separate contractor for these works.

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If the Crossrail construction works are delayed by two years, the assumed phasing may be revised; in that LU would still commence their ticket hall works upon Royal Assent of the Crossrail Bill in 2007, with the main Crossrail station tunnelling works commencing in 2009. In order to commence the ticket hall works, it will still be necessary to undertake some of the service diversions, and to temporarily divert Charing Cross Road.

With the two year delay in the start of Crossrail construction, the staging of the works at Tottenham Court Road would be altered and there would be a reduced overlap between the LU and Crossrail work. This would result in reduced use of worksites at different stages of the works, which, in turn would reduce the duration of impacts on pedestrian movements.

During the LU works the only worksites required would be the Charing Cross Road worksite and the northern part of the Astoria worksite. In the scenario that the LU ticket hall works are completed before the main Crossrail works commence, Crossrail would only require the worksites to the south of Falconberg Court (including the Goslett Yard worksite). As a consequence the impact on pedestrian movements would be reduced further and all access to the Crossrail worksites would be from the south via Charing Cross Road with egress to the north via Tottenham Court Road. It would no longer be possible to use the closed-off Andrew Borde Street as a lorry holding area and an alternative site would need to be identified. Traffic impacts for the Crossrail scheme alone would be expected to be reduced from those assessed in the ES. While the LU and Crossrail schemes starting and finishing separately would potentially extend the duration of construction works and associated construction noise in the area, relatively few sensitive receptors were shown to be impacted by the works as assessed for the ES.

#### *Farringdon station*

The assumption made in the ES was that Thameslink 2000 works at Farringdon would not be substantially complete before Crossrail commenced work in this location. If Crossrail was delayed by two years and the TL2000 programme remains as assumed, the main TL2000 engineering work at Farringdon would be complete by early 2010. This would reduce the duration of overlap of the two projects to approximately one year, although overall duration of the works in the Farringdon area would be increased by approximately eighteen months. The reduction in overlap would reduce the possible cumulative noise and traffic impacts discussed in *Chapter 12 of Volume 3* of the ES.

#### *Whitechapel station*

Crossrail's construction of the new western ticket hall at Whitechapel is dependent on London Underground removing some of the District Line tracks through the District line platforms. London Underground does not yet have a finalised programme for undertaking these works. Delaying Crossrail by two years will give London Underground more time to complete the removal of the District line tracks and associated works. This in turn would make it less likely that Crossrail would have to undertake Scenarios 2 or 3 (as described in paragraphs 8.10.16 and 8.10.17 in the ES) at Whitechapel; Scenario 1 being Crossrail's desired solution.

#### *Other Projects*

A later construction start would also bring about a change in the level of interaction with other transport schemes which are proposed in the same area during the construction period. These include on the current programmes:

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- East London Line Extension (ELLX): It is assumed in the ES (*Chapter 12, Volume 3*) that ELLX will be fully operational by late 2009. With a delayed start to Crossrail construction there will be little overlap with the ELLX works and cumulative impacts of the two schemes will be less likely.
  - Congestion Charging Zone: A delay in the start of construction would make it more likely that the proposed western extension to the Central London Congestion Charging Zone had been implemented prior to the Crossrail works. This would be expected to reduce base traffic levels in the extended zone and could affect predicted temporary and permanent impacts related to traffic levels and delays in Route Windows C1, C2 and C3. While baseline road traffic noise levels may reduce, this would not be anticipated to bring about any significant changes to the assessment of construction noise in the ES.
  - A13 Upgrade works: These are due for completion in 2011 and would be completed prior to the peak period of lorry movements along this corridor to landfill sites with a later Crossrail construction start (Reference ES *Volume 8a*).
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A delayed start could also mean that a number of planned property developments are likely to be under construction at the same time as Crossrail. This would result in possible cumulative impacts, particularly from traffic. At the same time, other planned developments may be completed, thus reducing the potential for cumulative impacts.

## ***NOISE INSULATION***

It was acknowledged in the ES that noise insulation might not always eliminate completely the noise impact from construction even after it has been installed. The ES also explained, however, that noise insulation was likely to be sufficient to mitigate the noise impact of surface construction activity in most cases. The Supplementary ES examines the basis for this latter statement.

The ES assumes a conservative level of attenuation from noise insulation consistent with the specification for noise insulation set out in the Noise Insulation Regulations 1975. Modern noise insulation provides greater attenuation than that set out in these regulations. The implications of this have been assessed as part of the Supplementary ES. The conclusion is that, for those properties that qualify for noise insulation, the installation of modern insulation is likely to mitigate the impact of construction noise in most cases, as assumed in the ES.

## *CLIMATE CHANGE*

The ES included an assessment of the total emission of carbon dioxide during construction. The Supplementary ES examines how sensitive the results of that climate change assessment are to changing the assumptions upon which that assessment was based.

The Supplementary ES indicates that there is considerable sensitivity in the results of the assessment presented in the ES. Although further detailed design is required to quantify the net positive impact of the scheme more accurately, the sensitivity analysis does demonstrate there is high potential for Crossrail to have a net positive impact in terms of reducing CO<sub>2</sub> emissions.

## *HEALTH CONSIDERATIONS*

### *INTRODUCTION*

The Supplementary ES considers the environmental impacts assessed in the ES which are related to human health, focusing on noise and vibration, air quality, electromagnetic interference and contaminated land.

It should be noted that this is not intended to be a health impact assessment (HIA). An HIA is being undertaken for the Crossrail project, in line with appropriate guidance and will be available later in the year.

### *NOISE AND VIBRATION*

The Supplementary ES explains why it is rarely appropriate or necessary to achieve noise exposures no greater than the World Health Organisation's guideline values. This is because the mitigation measures required to achieve these values would often result in unacceptable socio-economic costs or impacts on the population. A balanced judgement is required and this leads to significance criteria and to mitigation thresholds such as those assumed in the ES.

### *AIR QUALITY*

In using the Government's Air Quality Objectives, the assessment of air quality impacts reported in the ES implicitly considered potential health

effects and the extent to which it is appropriate to achieve a level of harmlessness taking into account the costs and benefits of doing so.

The air quality impact of the construction phase of the scheme is limited to a small number of road links where the effect of measures, either in place or included within Air Quality Action Plans, will be deferred until the scheme is built. The temporary breaches are limited to within a few metres of a small number of roads, where only a small number of people are expected to be present.

A quantified assessment of the potential health effects of temporary breaches of the Air Quality Objective during the construction phase and marginal increases in locations where breaches are expected in any event requires an understanding of the extent of exposure of people within the areas of breach and their current health profile. The likelihood of people being exposed for significant periods of time (at least six months, in the case of the annual mean objective) within the limited areas of breach is very low. This is because people do not remain in the same location for such significant periods but move around and experience considerable variation in their exposure to pollutants. Any temporary breach of Air Quality Objectives after 2010 during the construction period needs to be considered in light of future improvements in local air quality when the scheme is in operation. Crossrail is a key element of the Mayor's Air Quality Strategy and, as such, will contribute to delivering better air quality to the population of London as a whole.

#### *ELECTROMAGNETIC INTERFERENCE*

As stated in *Volume 2* the ES (paragraph 7.9.1), the levels of any electromagnetic emissions from the project will not be sufficient to give rise to any effects on human health. The National Radiological Protection Board (NRPB, the statutory body in the UK for radiation emissions) has proposed guidelines for electric and magnetic fields below which no adverse health effects are expected. The magnetic and electrical field strengths from railway operations are considerably less than the NRPB guideline levels.

#### *CONTAMINATED LAND*

The ES identifies sites known or considered likely to contain existing contamination. These sites have been categorised as having low, medium and high risk. Low risk sites are defined as those which are

unlikely to have significant concentrations of contaminants and, through pathways to be generated by Crossrail, have minimal potential for impact upon sensitive receptors. Medium and high risk sites are identified in the ES. *Appendix B1* of the ES identifies remedial measures to be agreed with Local Authorities and the Environment Agency on a site by site basis to ensure Crossrail generates no significant adverse effects in relation to contaminated land.

Any remediation carried out on behalf of the Crossrail project in order to prevent significant adverse effects in relation to contaminated land also has the potential to reduce the risk of future pollution linkages, which may be considered to be indirectly beneficial to health.

### ***HANBURY STREET***

The Supplementary ES considers in more detail the consequences of utilising alternative locations in place of the Hanbury Street site and the impacts which would occur during construction and operation if the site were not used as currently planned.

Two independent functions are proposed for the Hanbury Street site:

- The site would house a permanent operational structure (a shaft), which would be used as an intervention point for the emergency services and as the location of forced ventilation fans.
- The site will also be used temporarily as a launch site for a tunnel boring machine (TBM) for the construction of sections of the Crossrail running tunnels for the scheme.

The Supplementary ES explains in detail the rationale for choosing the Hanbury Street site as the location for both of these uses.

The Hanbury Street site was selected as the location for an emergency intervention point and ventilation shaft, following the identification and review of six other potential sites. The location of the six potential sites is shown in *Figure 6.1* in the Supplementary ES. Five of the six sites were found to have much more severe environmental impacts than the Hanbury Street site which was selected, in that they were adjacent to sensitive buildings such as mosques, in more densely built up residential areas or with restricted access for lorries. The best site was identified as being the Hanbury Street site.

Nevertheless, following initial examination of the alternatives but prior to finalisation of the Bill documentation, two of the alternative sites were re-examined and a further site was considered. The two alternatives re-examined were Option 1, the Cash and Carry site at 87 Hanbury Street and Option 6, the Woodseer Street site. The further site considered was the Trumans Brewery Bottling Plant on the north west corner of Brick Lane and Hanbury Street (Option 8 on *Figure 6.1*).

Preliminary tunnel alignment studies were undertaken for each of these three alternative sites. These studies showed that each of the three alternative sites would impose curvature on the track below the normal minimum radius set out in the Crossrail design standards. In each case, this alignment would impose a very onerous permanent maintenance liability on Crossrail, assessed as requiring re-railing at about seven month intervals. This compares with a normal expectation of re-railing every 12 to 15 years. Moreover, there are a number of other maintenance issues surrounding sub-standard curves, which can, when taken together, present problems in achieving the levels of reliability required on an intensively used railway.

The Supplementary ES explains that, upon further consideration of the three alternatives sites, the Woodseer Street site (Option 6) was found to have the least environmental impact of the three during construction. A detailed appraisal of the Woodseer Street site against the Hanbury Street site was then carried out (*Appendix 2* to the Supplementary ES). That appraisal confirmed the Hanbury Street site as the best available site. Use of the Woodseer Street site would result in similar environmental impacts but incur significant long term maintenance costs and disruption.

The Hanbury Street site has been selected to act as a launch point for TBMs going towards central London and to Whitechapel station, in order to ensure that the overall construction period and, therefore, the route-wide environmental impacts from start of construction to the start of operational services are kept as far as possible to a minimum.

One of the principal environmental mitigation measures adopted for the project was to ensure that, as far as practical, excavated material arising from the construction of the running tunnels would be removed from site by rail or barge rather than by road. The central tunnel section of the Crossrail tunnels is between the portals at Westbourne Park and Pudding Mill Lane. These are the locations where the Crossrail system joins the existing main lines and the option of using rail to remove excavated materials is available from these points. The branch which goes from Stepney Green to Isle of Dogs station and then on Abbey

Wood runs close to the River Thames and there are opportunities to remove excavated material from this part of the tunnelling by barge.

Initially a programme for the works was developed based on tunnelling only from these sites but it became apparent that the duration of the construction period that this would impose on the project would be excessive. It was quickly realised that if the tunnelling activity was divided into three sections, a significant reduction in the time taken for tunnelling could be achieved. As the construction of the tunnels is the critical activity in the programme for the works, this would be directly reflected in an overall reduction in the time taken to build the scheme.

A site was therefore sought for tunnelling which would allow the activity to be split into three sections. This site would preferably be one where excavated material from the tunnels could be removed by rail. In the event there was not an ideal site actually on the route of the tunnels but one fairly close by on disused railway land at Pedley Street was identified. This would be used by sinking a temporary shaft adjacent to the Great Eastern Main Line Railway at Pedley Street with a construction adit from the bottom of this shaft to the bottom of the Hanbury Street shaft. The Pedley Street shaft would then be used to service the construction of the tunnels. Conveyors would be provided from the Pedley Street shaft to Mile End Park where facilities for loading away excavated material by rail would be provided.

It would not, however, be possible to launch the TBMs from Pedley Street as the construction adit intersects with the main tunnel drive at close to ninety degrees. TBMs can only negotiate very large radius curves and it would be impossible to construct such an alignment at Hanbury Street. This problem can be overcome by launching the TBMs from the Hanbury Street shaft. This requires the shaft to be larger in plan than would be necessary if it was only to be used for an emergency intervention point and ventilation shaft, but the method of construction would be generally similar.

If Hanbury Street were not to be used as the location for a TBM launch site, additional costs and programme delays of the order of £500m and 16 months respectively would be incurred. The ES would need to be revised to reflect the increased duration of the works, the changed impacts at other central London worksites and in particular additional works at the tunnel portals at Westbourne Park and Pudding Mill Lane.

## ***BOW MIDLAND YARD WEST***

Bow Midland Yard West is a Crossrail construction worksite to the north of Great Eastern Main Line and Docklands Light Railway (DLR) tracks at Pudding Mill Lane. The site will be used for the handling of materials for the main tunnel drives.

Three rail served businesses are currently located at Bow Midland Yard West: London Concrete Ltd, Aggregate Industries Ltd and Plasmor Ltd. EWS is the freight operating company serving the site. London Concrete Ltd has a batching plant on the site. The other two businesses use the site for transferring aggregates and concrete products from rail to road for local distribution to worksites in the East End of London. The site is one of a very small number of general freight terminals in the London area.

The potential effects of the construction of Crossrail on the business in Bow Midland Yard Worksite West were assessed in the ES as part of a consideration of a wider employment area. Specifically, the ES refers to an estimated cumulative 800 to 1300 jobs at risk in this locality at Clement's Wharf, all parts of Bow Railway Yard (east and west), and on the Heron Industrial Estate. This has been reported as a significant temporary negative impact. The Supplementary ES focuses on the impacts of displacement or disruption of some or all of the businesses in Bow Midland Yard Worksite West.

Displacement or disruption of some or all of the businesses would change the traffic patterns on local roads, as well as potentially on any new locations, and could also have impacts on rail use. Transportation of concrete, aggregates and concrete products from the site would be reduced by such displacement or disruption and would be likely to be matched by increased traffic flows elsewhere if the facility is relocated. It seems likely that if the users do relocate then the use would be at another rail served site, because of the scale and nature of the materials concerned and the distances they are travelling. However, it should be acknowledged that there is a possibility that a relocation of the use would involve some or all of the materials currently travelling by rail transferring to road. It is considered that this is unlikely to occur and the impact on the road network cannot be predicted at this stage, as sites for relocation are not yet known. Therefore the Supplementary ES is based on the likelihood that any relocation would be to a rail served site.

Crossrail will not need the site permanently and will vacate the site once construction is complete. The Supplementary ES therefore considers three possible impact scenarios:

- permanent relocation of all three businesses;
- temporary relocation of all three businesses; and
- partial relocation of one or two of the businesses.

Under all these scenarios the provision of a rail served site has been taken as being the preferred, and in some cases the only practicable, solution. The identification of the location of such a site or sites is outside of the scope of assessment.

The Supplementary ES concludes that, if it were required and found possible to relocate these businesses either temporarily or permanently, then this would result in changes to the both the rail and road traffic in this area and in the areas to which the businesses were relocated. If it were not possible to relocate them, then this would result in their closure. The effect of closure would be improved traffic loadings in the local Bow area but a loss of employment in the immediate term. Once the site is vacated by Crossrail there is still the potential that new firms could locate there off setting some or all of the employment loss. Regardless of which scenario occurs, the impact would not alter the overall socio-economic impact reported in the ES for this route window, that is, a significant negative temporary residual impact.

## ***ROMFORD DEPOT AND STATION - TRANSPORT ASSESSMENT***

### ***ROMFORD DEPOT - TRAFFIC FLOWS***

The transport assessment of the construction of the depot in the ES assumed the most robust scheme for remediation of the contaminated land on the site, which involved removing the contaminated material from the site and importing clean material. In this scenario, most of the excavated materials would be removed by rail, to mitigate the potential impact on the local road network.

The preferred scheme is now to remediate the contaminated material on-site, rather than off-site. The Supplementary ES sets out the results of the transport assessment of this preferred scheme, and any changes to the assessment reported in the ES.

With on-site remediation, the majority of contaminated material would remain on site, with only a small proportion of the contaminated material on the Romford depot site being removed by road. There would be no need to remove material by rail. Changes to the lorry movements associated with the preferred scheme are not expected to

result in significant impacts on road users, pedestrians or cyclists. The additional lorry movements on the Romford Ring Road and North Street would not be of sufficient magnitude to result in significant noise, air quality or community impacts.

#### *ROMFORD STATION - NURSERY WALK UNDERPASS*

The Nursery Walk underpass at Romford station will be extended between Nursery Walk and Stockland Road (as described in paragraph 10.12.14 of the ES). Nursery Walk currently has a subway and overbridge located along its length. The deck of the overbridge is currently redundant. The redundant overbridge structure will be demolished but where the depot site crosses over Nursery Walk a longer, continuous subway will be created, increasing the existing from approximately 43m to 75m. The subway will be designed to enable a clear sighting distance between each end and the detailed design will be developed in consultation with the local crime prevention officer to identify further ways of enhancing safety.