Chapter 3

The environmental impact assessment process

3.1 Introduction

3.1.1 This chapter describes the principles of the assessment methodology. It describes:

- the scope of the assessment in terms of the environmental topics that have been assessed and the timeframe and geographical area within which impacts have been defined;
- the approach that has been used to identify environmental impacts, both adverse and beneficial, and to evaluate their significance; and
- the approach that has been adopted to avoid, reduce and, if possible, remedy significant adverse environmental impacts.

3.1.2 The environmental impacts of the project have been assessed for each relevant environmental topic (for example, landscape and noise) by comparing baseline environmental conditions (that is, the situation without the proposed project) with the conditions that would prevail were the project to be constructed and operated. The environmental impacts of the project have been predicted in relation to environmental receptors and resources (as defined below).

3.1.3 A list of documents referred to in this chapter is given in Section 3.10.

3.2 Environmental Statement

Overview

3.2.1 As described in Chapter 1, powers to construct and operate the project are being sought through a Bill submitted to Parliament. Parliamentary Standing Order 27A requires that an assessment of the environmental implications of the project is undertaken in accordance with the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, referred to in this ES as the EIA Regulations. These Regulations implemented the requirements of EC Directive 85/337/EEC on the Assessment of the Effects of Certain Public and Private Projects on the Environment, as amended by Directive 97/11/EC ("the EIA Directive"). In order to obtain exemption from carrying out EIA at a later stage, Article 1(5) of the EIA Directive requires that the objectives of the EIA Directive, including that of supplying information, are achieved through the legislative process. This is achieved by Standing Order 27A and the EIA process initiated by the production of this ES to accompany the Bill.

3.2.2 Regulation 2(1) of the EIA Regulations defines an ES as a statement that includes such information "referred to in Part I of Schedule 4 as is reasonably required to assess the environmental effects of the development which an applicant can, having regard to current knowledge and methods of assessment, reasonably be required to compile, but that includes at least the information in Part II of Schedule 4" to the Regulations. Schedule 4 Part II lists the following information:

- *"A description of the project comprising information on the site, design and size of the development.*
- *A description of the measures envisaged in order to avoid, reduce, and if possible, remedy significant adverse effects.*
- *The data required to identify and assess the main effects which the development is likely to have on the environment.*
- *An outline of the main alternatives studied by the applicant and an indication of the main reasons for his choice, taking into account the environmental effects.*
- *A non-technical summary of the information provided under the above headings."*

3.2.3 This ES has been prepared in accordance with Regulations and includes all of the information required by the Regulations, as set out above. Table 1.1 in Appendix A1 identifies where each item of information referred to in Schedule 4 of the Regulations can be found in this ES.

3.2.4 The ES also takes account of the checklist of matters to be considered for inclusion in an ES, provided as guidance in Appendix 5 of the former Department of the Environment, Transport and the Regions (DETR) "Environmental Impact Assessment: Guide to the Procedures" (DETR, 2000). In addition, it takes account of government circular guidance published to accompany the EIA Regulations (ODPM, 1999).

3.2.5 It should be noted that the term 'impact' is used in the title of the EIA Regulations to describe the environmental outcome arising from a project, while the main body of the text of the Regulations refers to the term 'effect'. This ES takes these two terms to have the same meaning. For consistency, the term used throughout the ES is 'impact'.

Significance of Environmental Impacts

3.2.6 The EIA Regulations require that the ES reports the likely significant environmental impacts (whether positive or negative) that will result from the construction and operation of the project. Whilst there is no statutory definition of what constitutes a significant impact, it is clear that the primary purpose of identifying the significant impacts of a project is to inform the decision-maker so that a balanced decision in respect of the development consent can be reached. On this basis, a significant impact has been defined for the purposes of this project as "an impact that (either in isolation or in combination with others) should, in the opinion of the EIA team, having regard to relevant criteria, be taken into account in the decision-making process".

3.2.7 This definition has provided a common framework within which to assess the significance of impacts on the environment arising from the project. Within this framework, a set of criteria for each environmental topic has been adopted against which to assess the significance of impacts. These criteria are set out in Appendix A2. Criteria for the assessment of traffic and transport impacts are set out in Volume 8a.

3.2.8 The ES identifies impacts as being either not significant or significant. In addition, where it is judged appropriate, significant impacts have been highlighted for the decision-maker by reporting them as being of 'particular importance'. This category of impact has been reported where the receiving environment is of high value and the magnitude of the impact on that environment is high.

3.2.9 Where the assessment process has identified adverse impacts that could potentially be significant, the ES sets out, where appropriate, mitigation measures that will be implemented to avoid, reduce or remedy such impacts. Any impacts that will remain significant even after the implementation of mitigation measures are referred to as residual impacts, and it is these that are reported in the ES. The approach to mitigation is described in Section 3.7.

Types of Environmental Impacts

3.2.10 Environmental impacts can vary considerably in terms of, for example, their spatial and temporal extent. As required by the EIA Regulations, the potential environmental impacts of the project have been considered during the assessment process, and the terms used to refer to different types of impact are defined in Table 3.1.

3.2.11 The ES is structured in a way that ensures that these impact types, where they are likely to be significant, are reported. Site-specific impacts which are positive or negative, temporary and permanent, are considered in Chapters 8 to 11. Route-wide impacts, positive and negative, temporary and permanent, are considered in Chapter 7. Cumulative impacts are identified in:

- Chapter 7, where they are route-wide in nature;
- Chapters 8 to 11, where they relate to a specific route window; and
- Chapter 12, where they relate to the interaction of Crossrail with other major projects.

3.2.12 Although the assessment has taken account of potential impacts that are direct, indirect or secondary in nature, the focus in terms of reporting is on whether the impact is significant, not whether the impact is explicitly a direct, indirect or secondary one.

Table 3.1 Types of Impact and Definition of Terms

Type of Impact	Definition
Route-wide impacts	Impacts that are felt at a regional level or which cannot be attributed to a particular section of the project route, or which occur across a number of route windows (see also cumulative impacts).
Site-specific impacts	Impacts that result from a geographically localised activity or change in the baseline and which are significant primarily at a neighbourhood or district level.
Positive impacts	Impacts that have a beneficial influence on receptors or resources.
Negative impacts	Impacts that have an adverse influence on receptors or resources.
Temporary impacts	Impacts that persist for a limited period due, for example, to noise from construction activities. Temporary impacts refer to all impacts that will be experienced only during construction works. They may be experienced for anywhere between a few days and six years, the full duration of Crossrail's construction, or more if enabling works are required.
Permanent impacts	Impacts that constitute an irreversible change to the baseline environment (eg land take) or which persist for the foreseeable future (eg noise from operation).
Direct impacts	Impacts that arise from the activities that form an integral part of the project (eg new infrastructure).
Indirect impacts	Impacts that arise from activities not explicitly forming part of the project (eg increased road traffic in neighbouring areas due to changes in road layouts).
Secondary impacts	Impacts that arise as a consequence of a direct impact of the project (eg the implications of the temporary closure of a community facility as a result of construction noise).
Cumulative impacts	The accumulation of impacts of the same type at different locations (eg non-significant individual ecological impacts at different sites collectively may give rise to an overall significant ecological impact in a route-wide context). Impacts that arise from the accumulation of impacts of a different nature at the same location (eg construction noise and visual intrusion affecting a receptor - individually these may not be significant, but the accumulation of different impacts may give rise to an overall significant impact). Impacts which are the result of the combination of activities associated with Crossrail together with other development projects (eg impacts caused by Crossrail construction may be exacerbated by construction activity at other major construction projects nearby).

3.3 Determining the Scope and Assessment Methodology

The Scoping Process

3.3.1 Establishing the scope of the assessment in a rigorous and transparent manner was a key step in the assessment process. Statutory bodies and a range of other bodies with a potential interest in the project were consulted on the scope and methodology of the assessment. An Environmental Scoping Report was produced in September 2002 which set out, in broad terms, the general methodologies that were to be used to assess the environmental impacts of the project. The Environmental Scoping Report was sent to the 95 external bodies listed in Table 1.1 in Appendix A3. Appendix A3 also indicates the general nature of the responses from consultees.

3.3.2 Following the comments received, a subsequent Scoping and Methodology Report was issued in March 2003 to the 118 external bodies listed in Table 1.2 in Appendix A3. This report set out the detail of the methodologies to be used in assessing the environmental impacts of the project. A total of 29 comments were received and these were taken into consideration when the methodologies were being finalised.

3.3.3 The results of the consultation exercise, together with professional opinion, helped define the scope of the assessment.

Temporal Scope

3.3.4 The main construction works for Crossrail are anticipated to take place between 2007 and 2013 and will be preceded in some cases by enabling works that must be carried out before the main works commence (for example, utility diversions). In some cases, these works will need to be undertaken well in advance of the start of the main construction phase in 2007. Works which will be undertaken before the main construction period and included within the definition of the project in the Bill have been assessed.

3.3.5 It is assumed, for the purposes of assessment, that commissioning and commencement of operation will be in 2013.

3.3.6 With regard to socio-economic, transport and road traffic-related impacts during the operational phase, the assessment year is 2016 in order to be consistent with the temporal scope of the Mayor's London Plan and the population and economic forecasts on which this is based. With regard to landscape and townscape, the assessment of impacts extends to 15 years after opening to take account of growth in planting where this is provided by the project.

Spatial Scope

3.3.7 The spatial scope of the assessment was defined as the physical area over which changes to the environment are likely to occur as a result of Crossrail. This is a function of:

- the physical extent of the proposed works (taking into account the temporary and permanent land requirements); and
- the nature of the baseline environment and the manner in which environmental impacts are likely to be propagated.

3.3.8 In addition, the spatial scope takes account of local government administrative boundaries, which provide the planning and policy context for the project.

3.3.9 The significance of impacts will vary spatially. For example, potential impacts on archaeology will generally be confined to those areas physically disturbed by construction works, whilst the impacts of noise or visual intrusion may be experienced at some distance from the source of the impact.

Technical Scope

3.3.10 The range of environmental topics addressed in the assessment is referred to as its technical scope.

3.3.11 Schedule 4 of the EIA Regulations identifies aspects of the environment which should be considered, namely population (human beings), fauna, flora, soil, water, air, climatic factors, material assets (including architectural and archaeological heritage), landscape and the interactions between these factors. This list has been refined and adapted with reference to good EIA practice, relative to rail infrastructure schemes. The refined list takes full account of the matters identified in Schedule 4 of the EIA Regulations and covers:

- built heritage;
- landscape and townscape;
- archaeology;
- ecology;
- water resources, flooding and land drainage;
- traffic and transport;
- noise and vibration;
- air quality and climate change;
- contaminated land and waste;
- electromagnetic effects;
- community;
- socio-economics; and
- planning policy.

3.3.12 As part of the scoping exercise, consideration was given to which of these aspects of the environment should be included in the scope of the assessment ('scoped in'). At the same time, consideration was given to whether any might be wholly or partially omitted from the assessment ('scoped out') on the grounds that they would not give rise to, or experience, significant impacts. Following the scoping exercise, it was concluded that all of the matters listed above should be included in the technical scope of the assessment.

3.4 Baseline Information

3.4.1 Information and data have been collected to determine the baseline situation, that is, the situation that would prevail in the absence of the construction and operation of the project.

3.4.2 Baseline information has been gathered from a variety of sources, including published data, desk studies, consultation, field surveys and monitoring. Unless otherwise stated, the surveys that are referred to in this ES are surveys specifically carried out as part of the Crossrail EIA.

3.4.3 In establishing the baseline, account has also been taken of how this may change in the future. For example, existing traffic data has been 'factored up' to reflect future traffic flow growth. Development with extant planning permission (development that will effectively introduce a new environmental receptor to the baseline situation) has been identified using the Greater London Authority (GLA) database of extant permissions and a survey of planning authorities outside Greater London, and taken into account in the assessment.

3.4.4 Details of the environmental baseline are presented, principally in Chapters 8 to 11, where they are relevant to the identification and assessment of the potential environmental impacts of the project.

3.5 Predicting and Assessing Impacts

Predicting Impacts

3.5.1 The magnitude of each impact has been predicted by a variety of mechanisms (including computer modelling, professional judgement, etc). These mechanisms have allowed the prediction of the changes that will take place to the baseline environment as a result of the construction and operation of Crossrail. The significance of the impacts has been assessed through an examination of the interaction between the following:

- the known or likely presence of an environmental receptor or resource;
- the value of those resources, reflecting for instance their designated status as well as their qualitative character such as rarity, extent and condition;
- the vulnerability or sensitivity of affected resources;
- the number and sensitivity of affected receptors;
- the extent, nature and duration of physical changes resulting from the construction and/or operation of Crossrail;
- the ability of the resource or receptor to absorb change; and
- the effectiveness of mitigation measures.

3.5.2 In assessing the magnitude and significance of impacts, a precautionary approach has been adopted and conservative assumptions have been made where appropriate.

3.5.3 As required by the EIA Regulations, impacts are assessed in relation to the aspects of the environment that are likely to be significantly affected by the development. These can be thought of as falling into two categories, environmental resources and environmental receptors.

3.5.4 Environmental resources are defined as those elements of the environment that are essential to, or of value to, the functioning of natural or human systems. These include areas or elements of ecological, landscape or heritage value, soil, air, watercourses and water bodies, dwellings, places of employment and community facilities.

3.5.5 Environmental receptors are defined as people (as users of dwellings, places of recreation, places of employment and community facilities) and human systems (for example, the employment market).

Prediction and Assessment of Cumulative Impacts

3.5.6 Cumulative impacts may be broadly defined as impacts that result from the accumulation of a number of individual impacts. In undertaking the assessment, attention has been paid to the types of cumulative impact defined in Table 3.1.

Dealing with Uncertainty

3.5.7 The baseline data and the project description used in the assessment are considered appropriate for the purposes of undertaking the assessment and assessing the significance of impacts. Where there has been a need to make assumptions to undertake the assessment of particular impacts, these assumptions have been described and explained in the methodology sections in Appendix A2.

3.5.8 With respect to construction methods, the approach that has been taken in the ES to deal with uncertainty is to identify representative methods of construction, to base the assessment of impacts on those assumptions and to clearly set out the assumptions in this ES. This approach has allowed a robust assessment to be carried out of the likely significant effects resulting from the construction works.

3.5.9 Any contractors undertaking the works to build the Crossrail project will be contractually required to have in place consents with the relevant local planning authorities under Section 61 of the Control of Pollution Act before works commence. These consents will control working methods and times and on-site mitigation of noise and air quality impacts. This approach to the control of the environmental impacts of construction has been normal practice for other similar schemes.

3.5.10 With regard to the design of the project, the ES has taken into account the scope for variation and flexibility within the powers and authorisation sought by the Bill and has assessed the likely significant impacts of the project having regard to that scope for variation. In this way, the likely significant impacts have been covered within the scope of the powers and authorisation sought.

3.5.11 It should be noted, however, that there is in fact relatively little scope for major variations of the project design within the powers and authorisation sought. The vertical and horizontal alignment of the tunnelled section of the scheme is tightly constrained by the presence of other sub-surface structures (tunnels, cables and building foundations) and the surface sections are largely defined by the existing railway corridors along which the project runs.

3.6 Overview of Prediction Methodologies by Environmental Topic

Introduction

3.6.1 This section sets out, in overview, the approach that has been used to assess the impacts of the project with respect to each of the environmental topics considered in the assessment. A full description of the methodologies that have been used for each environmental topic is presented in Appendix A2. With respect to traffic and transport, the methodology is set out in Volume 8a. Appendix A2 and Volume 8a cover the following aspects of the methodology:

- scope of the assessment and related consultation;
- an inventory of the resources and receptors assessed;
- the establishment of the baseline; and
- the prediction and evaluation of impacts, including details of the assessment criteria.

3.6.2 The methodology sections also describe, where appropriate, any difficulties encountered by the environmental specialists in undertaking the assessments, as required by the EIA Regulations.

Landscape/Townscape and Built Heritage

3.6.3 The assessment of impacts on built heritage has focused on the direct physical impacts on the fabric and structure of listed buildings and scheduled ancient monuments (SAMs) with substantial above ground remains. The assessment has taken account of impacts arising from landtake (including demolition or alteration to structures) and settlement which may result from ground movement arising from tunnelling and excavations. The spatial scope was defined from a composite of the areas of temporary and permanent land take required for the project and the potential settlement zone (that is, the area within which, in the absence of mitigation measures, ground settlement might be expected of more than 10 mm). A schedule of relevant listed buildings and SAMs contained within this area was then developed and the significant impacts on these resources were identified.

3.6.4 There is no established prediction methodology for assessing direct impacts on listed buildings. The assessment has therefore drawn upon knowledge of existing practice and professional judgement to predict the likely extent and significance of potential impacts. Where an impact with a magnitude that is moderate or high has been identified, the broad criteria set out in PPG15 and PPG16 have been applied using professional judgement to identify the significant impacts on the heritage interest. These include:

- the importance of the building;
- the particular physical features of the building;
- the contribution of the building to the local scene; and
- the extent to which the proposed works would bring substantial benefits for the community.

3.6.5 The landscape/townscape assessment has addressed the impacts of the project on landscape/townscape resources and on landscape/townscape character. It has also addressed impacts on the setting and character of built heritage resources, namely listed buildings and conservation areas.

3.6.6 Landscape/townscape impacts can arise from the addition of, or changes to, physical features in the landscape. These may affect the physical character of the landscape and/or strategic views within it. In addition, changes of this type can affect the setting of listed buildings which, because they have architectural or historic merit, are particularly sensitive.

3.6.7 The baseline landscape has been described using the Guidelines for Landscape and Visual Impact Assessment (LI/IEMA 2002). No comparable guidance exists for the characterisation of townscape. However, the assessment of townscape impacts has used the urban characterisation methodology whose use is being encouraged by key agencies and public bodies including the Department for Environment, Food and Rural Affairs (Defra) and English Heritage.

3.6.8 The significant impacts have been identified taking into account the sensitivity of the landscape/townscape and the magnitude of impact that they are likely to experience.

Impacts on Visual Amenity

3.6.9 The visual assessment has addressed the impacts of the project on the visual amenity of those groups of people who will have views either of construction activity or of the permanent features and changes in the landscape or townscape.

3.6.10 Impacts on visual amenity can arise as a result of changes to specific views from visual receptors, such as residents and people working in the area. The study area within which these impacts take place is termed the zone of visual influence (ZVI), defined as the area from which changes will be visible. Impacts on visual amenity derive both from changes to the physical geography of the landscape and from more direct changes due to the obstruction of views, intrusion into views or the opening up of new views. The effects of lighting have also been considered

3.6.11 The baseline assessment identified the existing situation, that is, the existing landscape and visual characteristics and the current visual amenity of local residents and other sensitive receptors within the ZVI. This information was recorded on visual amenity baseline plans. These plans identify the locations of places and buildings from which there will be views of the project. Where more extensive views will be possible, the extent of the ZVI mapping was restricted to the area of land within which the project will generate significant visual impacts.

3.6.12 The significant impacts have been identified taking into account the sensitivity of the visual receptor based on defined groupings and the magnitude of impact of visual change that they are likely to experience.

Archaeology

3.6.13 Works involving ground breaking and excavation have the potential to result in the physical removal of, the destruction of or damage to, archaeological resources. At the same time, there is a potential for an increase in knowledge resulting from the recording, analysis and publication of archaeological remains, carried out as part of the mitigation strategy.

3.6.14 The baseline archaeological resources have been identified through desk-based studies that establish the potential for archaeological remains and palaeo-environmental deposits to be affected. The archaeological assessment evaluated the likelihood of archaeological resources being present in land affected by the project, their importance and the extent to which they will be physically affected by the construction and operation of Crossrail. The significance of impacts has been assessed by evaluating the magnitude of the predicted impact in the context of the importance or sensitivity of the potential resource. English Heritage, County Archaeologists and, for works in London, the Greater London Archaeology Advisory Service, have been consulted on the findings of the archaeological assessment and their views on appropriate mitigation measures have been taken into account.

Impacts on Ecology

3.6.15 The ecological baseline has been established through field surveys carried out to identify the presence of important plant and animal communities, habitats and protected species. These surveys have supplemented a review of existing ecological information and records and responses to consultation with relevant organisations, such as English Nature.

3.6.16 The significance of the ecological impacts of the project has been determined by:

- establishing the nature conservation value of the ecological resources (species, populations, communities, habitats, landscapes and ecosystems) affected; and
- assessing the magnitude of the impact (intensity and extent in space and time).

3.6.17 An important consideration in determining the significance of ecological impacts has been the judgement formed as to the ability of the resources to recover from temporary impacts. The assessment was informed by existing guidelines, for example those produced by the former Institute of Environmental Assessment, and emerging guidelines such as those being produced by the Institute of Ecology and Environmental Management.

Traffic and Transport Impacts

3.6.18 An assessment of traffic and transport impacts has been undertaken and reported in a Transport Assessment (TA) report which is appended to this ES as Volumes 8a to 8d. The main findings in terms of significant impacts are summarised in Chapters 8 to 11 where the impacts relate to a specific route window, and in Chapter 7 where they relate to route-wide impacts.

3.6.19 The assessment for the construction phase has focused on road and other network changes primarily due to worksites and construction lorry traffic routes as a result of construction. The extent of the assessment has included consideration of:

- the highway network (including parking, loading and access arrangements) affected by construction worksites and all routes being utilised by construction traffic, focusing on the main road network;
- public transport networks directly affected by construction works including heavy rail, light rail, Underground, bus and coach services and including any lines, routes or stations that may be indirectly affected by the proposals;
- transport interchange arrangements in the vicinity of stations, worksites and elsewhere;
- pedestrian, cyclist and equestrian routes in the vicinity of the works;
- railways used for transport of incoming materials and excavated materials; and
- navigable waterways potentially affected by the proposed works.

3.6.20 The assessment of the operational phase has included consideration of the following:

- the highway network in the vicinity of all Crossrail stations and associated developments and on all routes being utilised by Crossrail related traffic up to the main road network;
- the public transport system, in so far as it interfaces with the Crossrail proposals, including rail, Underground and bus services and those lines, routes and stations that will be indirectly affected by the proposals;
- pedestrian, cycle and equestrian routes in the vicinity of Crossrail stations and infrastructure; and
- navigable waterways potentially affected by Crossrail.

3.6.21 Traffic-related environmental impacts on air quality, noise and community are addressed in the air quality, noise and community sections of the ES.

3.6.22 Assessment criteria have been developed consistent with relevant advice notes and standards. The assessment criteria have taken account of criteria used for recent large-scale rail infrastructure projects amended to suit the particular characteristics of Crossrail. In addition to utilising the criteria that were identified, consultants have exercised judgement in appropriate circumstances in order to determine whether a significant impact is likely.

3.6.23 Assumed working hours are 0700 to 1900 on weekdays and 0700 to 1400 on Saturdays. There are certain exceptions to these hours, which are described in Chapter 2. Construction traffic will generally be spread evenly throughout the working day, except for movements in connection with excavated materials. These movements are assumed to be more heavily concentrated earlier in the day, including the morning peak period, due to the opening hours of disposal sites. The operational assessment is based principally on the three-hour peak period (0700 hours to 1000 hours) with regard to passenger traffic conditions, as this is representative of the period when the greatest level of change is likely to take place.

Noise and Vibration

3.6.24 Crossrail has the potential to cause noise and vibration impacts during both construction and operation. Noise and vibration impacts during construction will potentially arise from activities carried out above ground such as those needed to build or alter stations, shafts, portals or bridges and to remove excavated material from the tunnel portals. The same impacts will also potentially arise from activities carried out below ground, such as tunnel boring and the use of a temporary railway for transporting materials. Impacts which have been considered with respect to the operation of the project include noise and vibration from the passage of Crossrail trains in tunnels and above ground and, potentially, changes in noise from road traffic.

3.6.25 All of the noise levels in the assessment are reported in 'A-weighted' decibels (dB(A)), which is a unit for measuring the loudness of sound. Decibels are based on a logarithmic scale and the 'A-weighting' mimics the response of the human ear to sound.

3.6.26 Baseline noise and vibration levels were obtained from surveys carried out at representative receptors adjacent to construction worksites and along surface sections of the route.

3.6.27 The approach, criteria, methodology and prediction methods used to identify noise and vibration impacts arising from the construction and operation of Crossrail reflect the approach and criteria adopted by other recent, major rail projects together with the application of current best practice for noise and vibration assessments and EIAs.

3.6.28 For noise from surface construction activity, levels generated by construction activities have been considered significant where the total noise (baseline noise level plus airborne construction noise level) has been predicted to exceed the baseline noise level at sensitive receptors by 5 dB or more.

3.6.29 Operational noise impacts for the tunnelled section have been compared with appropriate criteria as set out in Appendix A2. Operational noise impacts for the surface sections have been identified by comparing baseline noise levels at noise-sensitive receptors before the railway becomes operational with future levels including the baseline and the additional noise due to Crossrail services. The significance of the noise change has been determined on the following basis:

- decrease in noise of more than 3 dB – significant positive impact;
- decrease/increase in noise of less than 3 dB – no significant impact;
- increase in noise of more than 3 dB – significant negative impact.

Air Quality, Climate Change and Electromagnetic Effects

3.6.30 During demolition and construction works, emissions to air will arise from site plant and construction traffic. Dust may be generated, for example, from the use of haul roads, wind erosion of stockpiles and from earth-moving operations.

3.6.31 Potential air quality and climate change impacts associated with the operational phase of the project include changes in road traffic emissions brought about by a modal shift from road to rail and emissions associated with electricity generation to power Crossrail.

3.6.32 The assessment has also included an evaluation of the potential for electromagnetic effects that arise because of the electrification (or reconfiguration of power supplies) along the route. Electromagnetic effects can potentially be health-related or nuisance-related.

3.6.33 The local air quality baseline has been established from the air quality data archives collated by the relevant local authorities. This information has been supplemented with baseline traffic data for both the construction and operational phases of the project.

3.6.34 The assessment of the impacts arising from dust follows a risk-based approach which has been developed to identify construction sites with the potential to generate significant quantities of dust near sensitive receptors. The approach is based on a consideration of the duration and magnitude of the dust-generating activity, its proximity to nearby receptors and the extent of the opportunity for control and mitigation of dust impacts.

3.6.35 Changes in the concentrations of roadside pollutants of NO_2 and PM_{10} (these are both pollutants closely related to road traffic) as a result of traffic generated by the construction and operation of Crossrail have been calculated and compared to national air quality objectives for these pollutants.

3.6.36 The extent of greenhouse gas emissions that can contribute to climate change has been estimated taking into account emissions during construction (for example, fuel consumption from equipment/transport) and operation (for example, emissions associated with additional electricity generation and changes associated with modal shift). Emissions of greenhouse gases during the construction phase have been aggregated and analysed in conjunction with the operational emissions assessment to identify the likely net emissions (that is, emissions saved by the project compared to emissions caused by the project).

3.6.37 The electromagnetic effects have been assessed with reference to the recent National Radiological Protection Board and International Commission on Non-ionising Radiation Protection guideline levels for electromagnetic fields and recommended exposure limits for both the public and occupational exposure.

3.6.38 Assessment has established that the changes to the electromagnetic environment caused by Crossrail will not have any significant effect upon human health. It also identified the electromagnetic fields (EMF) that will potentially be generated by Crossrail traction power supplies and how these might affect premises over, or adjacent to, the alignment. The assessment considered, in particular, the potential for interference with sensitive electronic equipment installed in these premises that could be susceptible to electromagnetic interference.

Water Resources

3.6.39 Impacts on water resources may arise from physical and chemical changes to surface waters and groundwater. The baseline environment has been established by identifying surface waters and groundwater within 500 m of the Crossrail alignment. The exception is where major restructuring or dewatering is going to take place, in which case a 1000 m distance has been used. In addition, all groundwater abstractions (wells) have been identified where the project intersects the outer source protection zone of the abstraction. The baseline data has been collected through a review of publicly available resources and consultation with the Environment Agency and Thames Water.

3.6.40 There are a number of interrelationships with other environmental topics that have, where appropriate, been given due consideration. These are:

- designated ecological sites and other areas of ecological value containing water features;
- archaeological resources sensitive to changes in water level;
- potentially contaminated sites close to or containing water resources; and
- settlement due to dewatering activities that may affect sensitive buildings and structures.

3.6.41 The potential impacts on water resources have been considered under six headings:

- groundwater levels;
- groundwater flows;
- groundwater quality;
- surface water levels;
- surface water flows; and
- surface water quality.

3.6.42 Under each of these headings, three levels of impact magnitude have been classified as part of the assessment, ranging from low to high. Using the six headings and the impact magnitude classifications, it has been possible to assess both the likelihood and magnitude of any impact on the water environment, and in turn identify an overall impact rating and appropriate mitigation.

Contaminated Land

3.6.43 Impacts in respect of contaminated land will principally arise where the works break such ground (for example, construction of portals, ventilation shafts or stations) or where the ground is disturbed (for example, through removal of existing railway and ballast) or exposed (for example, through demolition works). Contaminated land may be present as a result of historical activities at a particular location or as a result of current operations. Contaminated groundwater issues are dealt with in the water quality sections of the ES.

3.6.44 Part IIa of the Environmental Protection Act 1990 stipulates that land can only be classified as contaminated if there is a source of contamination and a pathway exists for it to reach a receptor. In light of this, a qualitative risk assessment has been undertaken to determine the presence of any source-pathway-receptor linkages using the methodology described in the Contaminated Land (England) Regulations 2000 (SI 2000 No. 227) and DETR Circular 02/2000 (DETR 2000a).

3.6.45 The potential for areas of land affected by the project to be contaminated was identified through a review of available maps and data gathered from a variety of publicly accessible sources. These baseline conditions were then compared to the project drawings to identify areas where Crossrail would involve significant ground breaking or permanent land take. Once these areas were established, an assessment was undertaken to screen out sites that were considered not to be likely to give rise to significant contamination impacts because of the absence of sources, pathways and/or receptors. No further assessment was undertaken for these locations. For the remaining sites, that is, medium to high risk sites, it was considered that these linkages did exist. Appropriate mitigation measures were prescribed and any residual impacts on the environment identified.

Community

3.6.46 The assessment of community impacts has focused on facilities contributing to the quality of life in the community. Such facilities include schools, hospitals, places of worship, key shops and services, open spaces and the accessibility of the local community to these facilities.

3.6.47 The assessment has reviewed both direct and cumulative impacts. Direct impacts include the demolition of, or land take from, a facility, and severance or diversion of a public right-of-way. They also include secondary impacts (for example, the implications of the temporary closure of a community facility as a result of construction noise). Cumulative impacts take account of the general impairment of the amenity or well being of the community where multiple impacts (noise, dust, visual impacts and traffic) may have caused a significant impact on the same resources or receptors.

3.6.48 Significance was determined based on both professional judgement and criteria used on other major transport projects. In determining significance, the focus has been on impacts that are likely to have significant implications for the community as a whole, or for a discrete section of it, rather than for individuals. The significance of a community impact has been assessed based on the magnitude of the impact and the nature of the resource/receptor, taking into account the availability of alternative resources in the locality.

3.6.49 In addition, it has been assumed that if the residents of 10 or more residential properties are temporarily rehoused as a result of noise from construction works, there will be a significant community impact. (See also Section 3.7 dealing with noise and vibration). If the duration of the re-housing is three months or more and more than five properties are affected, it is assumed that the community impact will be permanent due to the length of time that residents will be absent from the community.

3.6.50 In the case of dwellings, community facilities and other buildings adversely affected by noise, the Secretary of State will exceptionally consider providing additional assistance for cases falling outside of the noise insulation and/or temporary re-housing scheme and for cases where noise insulation may not reduce the noise impact sufficiently. The exercise of this discretion will be considered on a case by case basis having regard to the specific circumstances of the case and to the reasons why the property concerned suffers a noise impact.

3.6.51 The assessment of community impacts has also addressed social inclusion benefits, including improved accessibility to regional hospitals, educational establishments and town centres along the Crossrail route.

Socio-Economics

3.6.52 The assessment has identified the regeneration benefits which would arise as a result of the project, including:

- increases in commercial and residential development as a result of improved public transport accessibility; and
- take up of employment as a result of Crossrail by those who are currently unemployed or economically inactive.

3.6.53 The assessment has also addressed the effects of "agglomeration". These relate to the wider economic benefits that derive from services within the financial and business sector being able to cluster in locations in the West End, the City and the Isle of Dogs as a result of Crossrail.

3.6.54 The assessment has also addressed the extent of employment which would be generated by the construction of the project and by its operation (running Crossrail services and maintenance). In so doing, account has been taken of those jobs which would be genuinely new and those which would be taken up by transfers from within the railway industry.

3.6.55 Regeneration benefits and employment created by Crossrail's construction and operation are reported in Chapter 7, which deals with route-wide impacts.

3.6.56 The assessment has also identified adverse impacts, namely impacts on employment and businesses through landtake and property acquisition required to accommodate the construction of the project. Markets adjust themselves continually to changes in supply and demand, and the scope for the changes brought about by the project to be accommodated by market adjustment has therefore been a criterion in assessing significance.

3.6.57 Impacts arising from loss of employment and businesses are set out by route window, as appropriate, in Chapters 8 to 11.

Planning Policy

3.6.58 Consideration has been given to the extent to which the project complies with national, regional and local planning policy objectives, particularly those relating to the environment. Account has also been taken of any impacts on extant planning permissions and loss of land or buildings allocated for a specified use within emerging or adopted development plans.

Settlement

3.6.59 Settlement is the effect at the ground surface of movement that occurs as a result of the excavation of tunnels, station boxes, shafts and other structures below ground. These ground movements have the potential to cause damage to buildings, structures and utilities. This can range from small internal cracks in plaster through to effects on the structure.

3.6.60 A range of measures will be deployed in order to monitor, control and, where necessary, mitigate or remedy the impact of any settlement which may result from the construction of the railway and associated works. These measures are described in Appendix B1. The issue of settlement is addressed earlier in this section in the context of potential impacts on built heritage and a summary of such impacts is provided in each relevant route window in Chapter 8 and Chapter 11.

3.7 Approach to Mitigation

General Principles

3.7.1 Part II of Schedule 4 to the EIA Regulations[1] requires an ES to include "a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects."

3.7.2 The need to mitigate environmental impacts has been a key consideration for CLRLL throughout the design of the project. Design decisions have included consideration of the environmental constraints and opportunities along the route alignment. Changes to the design have been made, where possible, to avoid or reduce significant environmental impacts. This includes, for example, decisions on the location of ventilation shafts. Further details are given in the route windows in Chapters 8 to 11, as appropriate.

1 Reference to the EIA Regulations should be taken to also refer to the relevant Article of the EIA Directive.

3.7.3 Other means of mitigating impacts arising from the permanent works were also developed as part of a 'mitigation hierarchy'. The hierarchical approach adopted is as follows.

- Impacts have been avoided or reduced at source, where possible. This has involved designing the project so that the impact is avoided (for example, by track design).
- Mitigation measures have been included in the project to reduce the adverse impact where it has not been practicable to avoid or reduce that impact at source. An example of this approach includes the provision of noise barriers for sections of the operational railway.
- For those adverse impacts that still remain significant after the application of the above measures, additional measures were taken to avoid the potential impact or, if not practicable, to compensate for it by some other means.

3.7.4 The same hierarchical approach was used in the identification of mitigation measures for impacts arising during construction. A set of measures has been developed to mitigate these impacts, wherever practicable, during this phase, as discussed below.

3.7.5 Where practicable, residual impacts, that is the impacts remaining once mitigation is in place, have been identified and classified as non-significant or significant, albeit reduced, as appropriate.

Mitigation Strategies

3.7.6 Crossrail has specified mitigation measures that will be adopted to ensure that contractors use good practice during construction to prevent or minimise adverse environmental impacts. The environmental specialists undertaking the assessment have assumed in their assessments that the measures will be implemented. The construction mitigation measures are set out in Appendix B1 and discussed in overview in Chapter 2.

Direct Impacts on Built Heritage

General

3.7.7 Crossrail will avoid damaging or demolishing listed buildings where it is reasonably practicable to do so. In some cases, this has not been possible and, in these cases, significant impacts are predicted.

3.7.8 The noise assessment has identified a number of listed buildings which may be eligible for mitigation in the form of noise insulation by means of secondary glazing (and ventilation, where required), which has the potential to alter the fabric of these buildings. However, installation of such mitigation will be undertaken in such a way as to minimise any impacts. In some cases it may be practical and desirable to remove the noise insulation after the construction works are complete to restore the building to its pre-existing condition.

Settlement

3.7.9 As explained earlier in this chapter, the excavation of tunnels and stations has the potential to give rise to damage to buildings and other infrastructure including utilities, ranging from small internal cracks in plaster through to effects on the structure.

3.7.10 Specific consideration has been given to buildings which are listed as being of special architectural or historic interest in order to protect the building and any sensitive features or features of heritage value. These measures are set out in Appendix B1.

Landscape/Townscape Impacts and Impacts on Visual Amenity

3.7.11 The development of Crossrail has been responsive to the physical context in which the works will be located, as far as practicable. The ventilation shaft in Hyde Park, for example, will be located at a relatively inconspicuous site at the edge of the park within a well-vegetated area. At sites where there is a need to remove mature trees, they will be replaced where practicable, and those that remain will be protected. During construction, hoardings will be used to screen views of construction plant and activity from sensitive receptors.

3.7.12 Design concepts have been progressed to a level that is sufficient to enable adverse landscape/townscape impacts and impacts on visual amenity to be defined and appropriate mitigation identified.

Impacts on Archaeological Resources

3.7.13 The adverse impacts identified in the ES arise from the potential loss of physical remains. The loss is a potential one because, at this stage, it is not possible to know with certainty whether any archaeological remains will be encountered at individual locations. Such physical loss, if it occurs, is irreversible and thus any adverse impacts generated by this loss will be permanent. Although the value of the resources or the efficacy of the mitigation measures cannot be determined with certainty at this stage, it has been assumed for the purposes of the assessment that the potential loss of archaeological resources without record could constitute a significant impact in the absence of mitigation measures.

3.7.14 To mitigate the risk of such impacts, any nominated undertaker or any contractors will be required to implement certain control measures before construction work begins. Prior to works commencing, an assessment of the detailed design will be undertaken and, where appropriate, field evaluation will be carried out. This may then determine the need for site excavation, again before works commence, and/or the implementation of a watching brief during construction works.

3.7.15 In the event that intact and important archaeological remains are identified at Crossrail worksites, it may be preferable, where practicable, to preserve these in situ. Preservation in situ means the physical preservation of archaeological remains and of the physical context within which such remains are situated. If proposed works cannot be relocated so as to avoid completely the location of remains that merit preservation in situ, engineering solutions may, in some situations, be available. These can include sympathetic design of foundations and groundworks, raising of ground levels over the remains using suitable materials and loading, and the maintenance of hydrological regimes.

3.7.16 Where such solutions are impracticable, permanent significant adverse impacts on archaeological heritage may arise. In many instances however, the archaeological resource will not be of sufficient importance to warrant preservation in situ and preservation by record will be the appropriate mitigation method. Furthermore, even where remains affected are of high archaeological importance, it may be acceptable, and indeed more appropriate, to undertake preservation by record.

3.7.17 Preservation by record requires that any archaeological information that is gained from fieldwork (evaluation, excavation, watching brief, recording of above ground structures, etc) be followed by analysis and publication of the results and their deposition in a public archive. In these instances, a potentially significant impact will be mitigated on all but the most important resources.

3.7.18 Where overhead electrification equipment (OHLE) masts are being installed, it will not be possible to undertake preservation by record in the way described above. This is relevant to parts of the western and southeastern route sections. Impacts will be mitigated by a procedure commencing with detailed desk based assessment to identify areas where either targeted or general archaeological watching briefs would be necessary; this will exclude areas of deep cuttings where archaeological remains would not survive, and embankments higher than the depth of the mast foundations. The targeted archaeological watching briefs would be focussed on areas where there is either a high potential for archaeological remains to survive, or where there is a potential for remains of high importance. General watching briefs would cover the remaining works. This fieldwork would be followed by appropriate post-excavation assessment, analysis, publication and archiving. These measures would constitute preservation by record, and result in no significant residual impact.

Ecological Impacts

3.7.19 Adverse ecological impacts arise where important habitats are lost, either temporarily or permanently, or where protected species are directly affected. Loss of habitat can sometimes be mitigated by adjustments to site layouts in order to direct land take to areas of less ecological significance. Where this is not possible, significant adverse impacts may occur. Many of the terrestrial habitats that will be affected by Crossrail, however, tend to be typical of the railway environment, and are, by their nature, capable of regenerating with relative ease. In these cases, temporary land take from such areas rarely results in long-term adverse ecological impacts.

3.7.20 Impacts on protected species can usually be avoided by their early identification. Surveys were commissioned of bats, birds, invertebrates, reptiles, amphibians and badgers and, at some sites, aquatic invertebrates and fish, where the presence of such animals is considered possible. The findings of the surveys have informed the assessment.

3.7.21 Where appropriate, any nominated undertaker or any contractors will be required to carry out further surveys prior to commencing construction to establish whether or not sites have been occupied by protected species in the period between completion of the assessment and the commencement of construction. In the event that such species are identified, necessary measures will be undertaken to ensure, as a minimum, compliance with UK and European legislation; for example, by avoiding breeding areas or by translocating species. These measures are defined in Appendix B1.

Impacts on Water Resources

Prevention of Pollution

3.7.22 Any nominated undertaker will ensure that all necessary measures are taken to protect the water environment during the construction and operation of the project. The risk of adverse impacts on the water environment exists at all of the proposed construction sites along the route. For example, pollution may be caused by activities such as refuelling, stockpiling materials, use of wheel washes, washdowns and from surface water run-off. The risks from these and other similar activities will be avoided by the application of standard mitigation measures and good practice, as set out in Appendix B1. The Environment Agency has published guidelines (PPG 06) for preventing pollution from construction sites. These guidelines will be followed during the construction of Crossrail through the measures set out in Appendix B1.

3.7.23 Any nominated undertaker or any contractors will be required to comply with legal requirements as a minimum. This includes avoidance of pollution of any controlled water (for example, streams and aquifers). They will be required to obtain permits and consents from the relevant drainage authority where discharge to a sewer will be required, or from the Environment Agency where discharge to controlled water will be required.

3.7.24 In certain cases, any nominated undertaker or any contractors will be required to use environmentally sustainable solutions. For example, any nominated undertaker will require the use of only biodegradable hydraulic oils in machines working near or over water. They will be required to develop a specific plan for dealing with major pollution incidents at the main work sites in accordance with Environment Agency guidance.

Groundwater Abstractions

3.7.25 Where adverse impacts are identified on existing groundwater abstractions, the measures required to mitigate these will be unique to each abstraction. Where a potential for an impact has been identified, appropriate measures and monitoring will be undertaken in consultation with the abstraction owners and the Environment Agency. An abstraction wells mitigation strategy has been developed and its main provisions are set out in Appendix B1.

Traffic and Transport Impacts

3.7.26 Appendix B1 sets out measures to mitigate traffic and transport impacts during construction. Any nominated undertaker will ensure that it and any of its contractors operate in such a way as to maintain, as far as reasonably practicable, existing public access routes and rights-of-way during construction. Where existing routes cannot be maintained, suitable alternative routes will be provided where practicable, subject to consultation with the highway authority. Any nominated undertaker or any contractors will carry out the works in such a way that seeks to minimise undue inconvenience to the public arising from increases in traffic flows.

Noise and Vibration Impacts

Construction

3.7.27 It is a requirement, as set out in Appendix B1, that any nominated undertaker or any contractors will obtain prior consent for work on the construction sites from the relevant local authority under Section 61 of the Control of Pollution Act. The use of a Section 61 Consent offers advantages both to contractors and to the local authorities in managing the noise and vibration impacts from construction worksites. It ensures that standards of performance with respect to the control of construction noise and vibration can be agreed well in advance, together with the effective management of the works programmes.

3.7.28 In carrying out the noise assessment, it has been assumed that each worksite will adopt at least the following levels of mitigation:

- 2.4 m high hoardings or, where necessary, 3.6 m or 5.0 m hoarding;
- the use of low noise, well maintained plant, which is in compliance with the latest EC Directive and amendments;
- the use of local noise screens, barriers and enclosures, including the sheeting of buildings during the demolition phase, as practicable; and
- where necessary and practicable, the enclosure of noisy items of plant.

3.7.29 However, if after applying the highest practicable level of on-site mitigation significant noise impacts are still predicted, further noise mitigation will be offered to eligible properties in the form of either noise insulation (or a grant for noise insulation) or temporary re-housing. The specific thresholds for triggering these forms of mitigation are set out in Appendix B1. It should be noted that these predictions and any mitigation measures will be reviewed at a later date when more detailed information is available regarding construction methods.

3.7.30 Some schools and other community facilities are predicted to experience construction noise impacts and it is recognised that this may potentially affect the use of such facilities. When further details of the construction methods, timing and duration of the works is available (during and after detailed design), any nominated undertaker will take necessary steps to ensure that any residual impacts are minimised.

3.7.31 It is recognised that some of the properties at which noise insulation is installed will, despite the insulation, experience internal noise levels that are above the equivalent external level at which significance is defined. Although it is considered probable that this will only apply to a minority of the properties identified as being likely to be eligible for insulation, it is not practical to quantify the numbers of properties at this stage.

3.7.32 It is also acknowledged that noise insulation will not necessarily be taken up by all the affected parties and may not even be technically feasible at some affected properties. It is not possible to predict or estimate the level of take up and it is assumed for the purposes of the assessment that where properties have been identified as eligible for noise insulation, it will be taken up by the affected party.

3.7.33 Furthermore, where noise insulation is installed, while it will mitigate or reduce the predicted noise impacts, there will be some inconvenience to the occupants during the fitting of the insulation, and the property will not benefit from the insulation if windows are opened. In addition, any garden and other outside space will not be protected from noise impact.

3.7.34 In certain circumstances, as defined in Appendix B1, occupants of affected buildings will become eligible for temporary re-housing during times of high noise levels where other forms of mitigation are insufficient. Temporary re-housing allows works to continue in circumstances where unacceptable disturbance and interference with sleep and other activities would otherwise occur. However, it is obviously extremely inconvenient and disruptive for those affected, and for the purposes of the assessment it is therefore assumed to be a significant disruption impact. The route window sections of the ES specify the numbers of properties the residents of which are likely to be offered temporary re-housing.

3.7.35 In addition, it is acknowledged that temporary re-housing of significant numbers of residents from a particular area may result in temporary disruption to the community. Any temporary re-housing of the residents of 10 or more properties in any area is therefore assumed to be a significant community impact and is reported as such (as described in Appendix A2).

3.7.36 It should be noted that residents of properties who are indicated as being eligible for temporary re-housing may also be eligible for noise insulation. This is to mitigate noise at times when construction noise levels are above the relevant noise insulation criteria but do not exceed the temporary re-housing criteria.

3.7.37 The construction of Crossrail will involve a considerable amount of underground activity, including the operation of the tunnel boring machines and the use of trains to move materials within the tunnels using temporary tracks. To mitigate noise and vibration impacts from these temporary trains during construction, resilient rail pads will be inserted between the temporary rails and their sleepers, and controls will also be placed on the quality of the rail joints. If found to be necessary, additional mitigation will be implemented in the form of elimination of rail joints and/or providing resilience between the temporary sleepers and the tunnel invert.

Operation

3.7.38 For the operation of Crossrail, there are two main elements that require consideration, relative to the statutory regulations that apply. Where operational noise impacts are predicted to arise from the surface sections of the railway, the Noise Insulation Regulations (SI 1996 No. 428) clearly define the provisions, duties and powers that apply to the initial, additional or altered works. Where these provisions apply, any nominated undertaker will carry out the work or offer a grant in respect of the provision of noise insulation.

3.7.39 In addition to the above, operational noise impacts from surface sections will be minimised as far as reasonably practicable. Lineside barriers will be incorporated in the design where significant impacts are likely or where buildings may otherwise be eligible for noise insulation. Barriers will reduce noise levels both inside the buildings and outside in gardens or open space. Where lineside barriers are not practicable, or where they are not effective in mitigating significant noise impacts, noise insulation (or grants for noise insulation) will be provided by any nominated undertaker in accordance with the statutory requirements.

3.7.40 Operational groundborne noise from the underground sections of Crossrail will be mitigated such that the noise standards that have been defined for residential and other buildings in sensitive uses will be achieved. To achieve this, the underground railway will run on continuously welded rail and resilient track support systems, where necessary.

3.7.41 However, computer modelling has indicated that, to meet the groundborne noise standards at all locations, it will be necessary for floating slab track (FST) to be used in parts of the tunnel to isolate the track from the tunnel and the surrounding strata. Current modelling indicates that this will be necessary along 632 m of the eastbound twin-bore tunnel beneath Argyll Street, Endell Street, Smarts Place and the Barbican, and 879 m westbound tunnel beneath Macklin Street, Shaftesbury Avenue, Neal Street, Macklin Street and the Barbican. The location and design of FST will be further refined during the detailed design stage.

Impacts on Air Quality

3.7.42 The construction works will be undertaken so that emissions to the air of dust and pollutants will be minimised. Appendix B1 sets out a range of measures to reduce impacts on air quality, including dust. These measures are categorised according to the level of risk of dust nuisance. Measures include the enclosure and damping down of stockpiles and construction materials.

Impacts from Contaminated Land

3.7.43 At all sites where potentially significant contaminated land has been identified as part of the assessment, mitigation will comprise site investigation, quantitative risk assessments and soil and/or groundwater remediation to prevent risks to human health, water quality and building structures. The site investigations and quantitative risk assessments will be carried out prior to construction to inform the selection of the most appropriate remediation measures. This process will be carried out in consultation with the local

authority and the Environment Agency. The site investigations will involve retrieval and analysis of soil and groundwater samples that reflect the known history and setting of the site.

3.7.44 A wide range of remediation techniques are available that can mitigate the impacts resulting from such contaminants. Appropriate techniques that are commonly used and have a successful track record are described in Appendix B1 in categories for inorganic, organic and biological contaminants.

3.7.45 Given the variety of former uses encountered at significant sites, it is likely that a combination of these techniques will be required to ensure that no significant adverse impacts are caused by land contamination.

Community Impacts

3.7.46 The mitigation measures set out in Appendix B1 cover aspects of construction work that could reasonably be anticipated to adversely affect the local community throughout the construction of the project.

3.7.47 Where Crossrail will adversely affect open space or recreational areas, local authorities have been consulted about ways in which to minimise the extent of impact.

Socio-Economic Impacts

3.7.48 The Secretary of State will seek powers to compulsorily acquire the freehold interest of land required for the Crossrail works. These powers are contained in the Bill.

3.7.49 Powers to acquire land for the relocation of businesses are generally not contained in the Bill. Instead, impacts will be mitigated through payment of compensation for land compulsorily acquired in accordance with the general statutory framework incorporated within the Bill, the Crossrail Land Acquisition Policy and the Crossrail Land Disposal Policy.

3.8 Over-Site Developments

3.8.1 The Bill seeks powers for the works which relate to the construction of the Crossrail railway, and the structures necessary for the operation of the railway. There are a number of locations where the Bill seeks powers to demolish listed buildings and buildings in conservation areas, but does not seek powers for the replacement of those buildings above or around the operational (including station) works. These locations effectively fall into two categories:

- those where operational works are to take place, such as the construction of stations or shafts; and
- those where demolition is required for use as a work site, but there are no permanent operational works on the land.

3.8.2 In all such instances the Bill does not seek permission for any non-operational development above the stations or structures (referred to as over-site development, or OSD). The intention is that the form of OSD should be applied for and determined through the normal planning process by the appropriate local planning authority (subject

to call-in by, or appeal to, the First Secretary of State). The Bill contains provisions that modify the 1999 EIA Regulations and which require that any OSD will either require an EIA (where the works are integral to the new works) or will require it where the local planning authority determines that such development is likely to have significant environmental impacts.

3.8.3 Since this ES covers the likely significant environmental impacts arising from the specific authorisation sought from Parliament in the Bill (to which Article 1(5) of the EIA Directive applies), the approach in the Bill to EIA for OSD ensures that any such development which itself is likely to have significant environmental effects will be subject to a full EIA.

3.8.4 Although the Bill does not give powers for OSD, there is a very clear assumption, and indeed an overwhelming likelihood, that in these cases some form of OSD will take place at the same time as the construction of Crossrail, or very soon thereafter. It is unlikely, for the reasons set out below, that the only physical development on these sites will be the operational works authorised by the Bill.

3.8.5 For the purposes of assessing the environmental impact of the works for which the Bill seeks authorisation, it is important to consider what, if any, OSD is likely to take place. Many of the sites are in conservation areas and are highly sensitive. The reasons why it is extremely unlikely that only the operational works will be constructed are as follows:

- All the stations will have to be designed with assumptions being made about the size and general dimensions of the buildings that are likely to go above them. This is necessary in order to ensure the appropriate load bearing and servicing facilities.
- The sites are within areas with very high land values, where there will be a strong financial incentive to redevelop.
- The Secretary of State will give an undertaking to Parliament that outline planning applications for each of the OSDs will be submitted to the appropriate local planning authorities within a reasonable period of the Bill being submitted to Parliament.

3.8.6 In these circumstances, the approach of the ES to these sites is as follows:

- to set out the form of the operational works for which powers are sought under the Bill;
- to produce illustrative material as to the appearance of the operational works in question, for example, shafts and station structures (in Appendix D1); and
- to produce illustrative material (in Appendix D2) of the possible form that OSDs could take, as set by the parameters of the load bearing and servicing that will be allowed for within the Bill works, and taking into account the planning policy context.

3.8.7 However, it is important to recognise that the material in Appendix D2 is only illustrative and is not work for which powers are sought in the Bill. It is nonetheless produced to assist decision makers in their consideration of the likely environmental impact of the proposals and therefore some reliance can be placed on it in broad terms with regard to the scale of the buildings which are likely to be developed on the land having regard to the applicable planning policies for the sites.

3.9 Consultation

Introduction

3.9.1 Consultation on the assessment process has been carried out as part of a wider consultation strategy that has sought to involve major stakeholders at all stages of project development, starting with the route selection process in spring 2002.

3.9.2 Consultation has fed into the EIA at four levels:

- responses to consultation on the scope and methodology for the assessment;
- responses from consultees on specific issues;
- responses from consultation fora relating to environmental matters; and
- responses to public consultation relating to environmental matters.

3.9.3 Consultation undertaken by CLRLL has focused, in particular, on:

- eliciting early views on the overall scope of the assessment and methodologies;
- obtaining relevant environmental baseline data;
- identifying potential significant impacts that could then be addressed or mitigated as part of the design; and
- informing external bodies and residents about the controls that will be put in place to minimise impacts during the construction and operation of Crossrail.

Consulting on the Scope and Methodology for the Assessment

3.9.4 Consultation related to establishing the scope of the assessment is described in Section 3.3.

Consultation on Specific Assessment Issues

3.9.5 Meetings with key environmental bodies and other stakeholders occurred throughout the assessment process, ensuring that appropriate data was used in the assessment and appropriate recommendations incorporated into the emerging design proposals.

3.9.6 CLRLL has undertaken on-going consultation with relevant environmental bodies. For example, English Nature has been consulted to determine the CLRLL approach to assessing impacts on protected species and there has been regular liaison with English Heritage with respect to built heritage and archaeological issues arising during the assessment.

3.9.7 CLRLL has also carried out extensive consultation with local highway authorities and other interested parties with respect to traffic and transport issues, the outcome of which have been taken into account in undertaking the assessment.

Consultation Fora

Overview

3.9.8 Local authorities and other key stakeholders were grouped in a series of fora that covered issues such as the consent process, planning matters, the EIA and the project programme. The list of organisations involved in the fora, the terms of reference of each forum and the way that issues arising have fed into the assessment are detailed in Appendix A3.

High Level Forum

3.9.9 The High Level Forum was established to act as the top tier of the consultative process during the development and implementation of the project. The forum members comprise local authority leaders, consent granting bodies, environmental bodies, representatives of the business community, other government departments and railway industry bodies. The forum meetings commenced on a regular basis starting in autumn 2004.

3.9.10 The forum is the principal focus for discussions with these bodies issues relating to the organisation, methods, objectives and timescales of Crossrail and its consultative processes.

Planning Forum

3.9.11 This forum consists of local authorities along the proposed Crossrail route. Regular meetings commenced in autumn 2004, following the commencement of the High Level Forum.

3.9.12 The forum was established to act as the focus for consultation with local planning authorities on planning and environmental matters and to make recommendations on the principles of the planning powers to be provided in the Crossrail legislation and how these should be interpreted when exercised.

Heritage Forum

3.9.13 The Heritage Forum consists of heritage organisations, local authorities and the Government Office for London. The first meeting of the Heritage Forum took place in January 2005.

3.9.14 The forum was established to act as the focus for discussion with heritage organisations and local authorities regarding heritage matters. The forum was tasked with making recommendations on the principles of the planning powers to be provided in the Bill and how these should be interpreted when exercised.

Statutory Agency Forum

3.9.15 This forum consists of agencies established under statute or which exercise statutory powers, including local authorities. Regular meetings were held from autumn 2004, following the commencement of the High Level Forum.

3.9.16 The forum provides the principal basis for discussing the powers relating to environmental matters set out in the Bill with statutory organisations. The forum was tasked with making recommendations on the principles of the powers to be sought by the Bill and their interpretation when exercised.

Public Consultation

Overview

3.9.17 On 14 July 2003, the Secretary of State for Transport made an announcement requiring CLRLL to undertake a public consultation exercise to explain and seek feedback on the Crossrail project. In July 2004, the Secretary of State for Transport announced that a Bill would be deposited to authorise the project at the earliest opportunity. A second round of consultation was held as a result.

Public Consultation Phases

3.9.18 There have been four distinct phases of public consultation, as set out below.

- Phase 1 – Public Awareness Campaign to introduce and explain the proposal and its benefits to consultees, seek initial comment and announce the forthcoming Public Information Centres. This was undertaken in 2003. A supplementary Public Awareness Campaign was held on the western route section in 2004 to introduce the proposals that had been included in the project since the first round of consultation.
- Phase 2 – Round One: to introduce the route proposals with a programme of Public Information Centres displaying preliminary project designs, explaining the works and the benefits and seeking initial comment. This was undertaken in 2003.
- Phase 3 – Round Two: Public Information Centres showing further design detail and development, the project's response to Round One comments, and seeking further more detailed and structured comment. This was undertaken in 2004.
- Phase 4 – Information Round: a final programme of Public Information Centres to explain the proposals for which powers are being sought for the Bill was undertaken in 2005.

3.9.19 Further detail on each of the above phases can be found in Appendix A3.

3.9.20 This public consultation has been supplemented by the following.

- Consultation meetings with the local community: the Crossrail consultation process also involved early discussions with non-statutory bodies, local businesses, resident groups and individual residents along the route.
- The Crossrail Consultation Helpdesk: throughout the consultation process, Crossrail provided a 24 hour, seven day a week Helpdesk service. A dedicated team dealt with enquiries during office hours and was supported by an experienced, professional call centre at other times.
- Consultation through the media: media coverage followed a similar pattern to the Public Awareness Campaign. Most local newspapers publicised the opening of the local Public Information Centres. The Crossrail website played an integral part in the consultative process. The Public Information Centres display panels for each venue, links to a number of other relevant sites and an email link to the Helpdesk on each page were placed on the website. A consultation micro-site was introduced to prevent overload of the main website.

3.9.21 Since May 2002 a database has been used to record communication with consultees.

Feedback from Consultation

3.9.22 Consultation responses were evaluated by CLRLL and were taken into account, as appropriate, in the design of the project and mitigation measures.

3.9.23 For example, at Whitechapel, feasibility studies identified Vallance Road Gardens as a feasible site for the location of the ventilation shaft. However, following Phase 1 consultation, it became apparent that there were significant concerns from the local residents and the local authority. As a result of this response, CLRLL investigated other potential sites for the shaft which is now to be located at Essex Wharf.

3.9.24 The process by which comments arising from consultation have been evaluated is set out in Appendix A3.

3.10 References

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Landscape Institute (LI) and Institute of Environmental Management and Assessment (IEMA) (2002) Guidelines for Landscape and Visual Impact Assessment

Office of the Deputy Prime Minister (ODPM) (1999) Circular 02/99 – Environmental Impact Assessment, HMSO

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SI 1999 No. 293 Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations (1999) ('the EIA Regulations')

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