

# Lower Thames Crossing

## 9.62 Technical Note on Earthworks Quantification

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# 1 Introduction

- 1.1.1 The outline Materials Handling Plan (oMHP) [APP-338] provides detail on the earthwork quantities that have informed the impact assessments within the Environmental Statement (ES). The purpose of this technical note is to:
- a. Outline the methodology used to determine the earthwork quantities set out in the oMHP.
  - b. Describe how the information regarding earthwork quantities has informed the Development Consent Order (DCO) application.
  - c. Outline the next steps for the construction delivery phase.
- 1.1.2 The technical note is produced in response to a request from Thurrock Council during technical engagements to better understand the methodology used to determine the earthworks quantities. This is covered in the Statement of Common ground between National Highways and Thurrock Council (Application Document [APP-130]) under items: 2.1.201, 2.1.205 (in part), 2.1.114, 2.1.113, 2.1.112.

## 2 Methodology used to determine earthworks quantities

- 2.1.1 To provide an appropriate position for the DCO the earthworks quantities and strategy were determined by a highly competent team of earthworks engineers with extensive experience of earthworks design and construction for major projects, based on a strong robust preliminary design. The earthworks team engaged with all other design teams (highways, tunnels, drainage etc.) to ensure a coherent and coordinated outcome was obtained.
- 2.1.2 The following steps were taken to produce the earthwork quantities:
- a. A 3D design model of the A122 Lower Thames Crossing preliminary earthwork design was produced including the proposed road, cuttings, embankments and landscaping.
  - b. Using the 3D design model together with other design information and the topographical survey data, quantities of excavation and filling were produced.
  - c. Using information from the ground investigation and desk-based sources, the suitability for reuse of the excavated material was estimated based on the specific geologies, chemical (based on assumed reuse criteria) and geotechnical properties.
  - d. Bulking Factors (how the material is anticipated to expand or contract following excavation) were estimated based on geologies.
  - e. Based on the above, a cut–fill balance was undertaken to compare required fill volumes to the excavation volumes which determined the following:
    - i. Volumes of excavation and filling
    - ii. Volumes and classification of imported material required
    - iii. Volumes of clean surplus material for offsite management
    - iv. Volumes of chemically unsuitable material for offsite management
  - f. A mass haul was assessed showing the likely movements of material during construction, both within the Order Limits and offsite, and the timing of the movements aligned to the construction programme. This included an assessment of any double handling of material that may be required and stockpiling requirements which confirmed the adequacy of storage capacities within the Order Limits. General good practice principles were used in developing the mass haul with a hierarchy to minimise the environmental impacts. This included:

- i. Moving the material only once where reasonably practicable.
  - ii. Moving material the shortest permissible distance
  - iii. No movements across the River Thames (in accordance with the oMHP [\[APP-338\]](#), paragraph 2.3.1)
  - iv. Maximise the use of on-site haul roads
  - v. Use the public road network as a last resort.
- g. The majority of the earthworks, including transportation, is assumed to occur over three main earthworks seasons. The mass haul assumes haulage primarily using trucks which is appropriate to reflect a reasonable worst case scenario. The anticipated duration of the earthworks was carefully determined, considering the timing of other activities like utilities diversions, and using assured production rates. Based on this assessment, the majority of the earthworks, including transportation, are anticipated to extend over a three-year period during the construction phase. The peak period for earthworks is expected to occur between late spring and early autumn, coinciding with the drier conditions that favour earthmoving activities. This approach adheres to industry good practices in planning earthwork activities.
- h. The mass haul was then used to inform construction planning such as plant required and programming, as well as the construction traffic modelling for movements using the public road network. This is described in Sections 7.4 and 7.5 of the oMHP [\[APP-338\]](#).
- i. The information obtained from steps 5–8 was used to inform the impact assessments presented in the Environmental Statement [\[APP-138 to APP-486\]](#); further detail is provided in Section 3 of this note.

### 2.1.3

It is important to recognise that earthworks quantification and mass haul planning is not an exact science. It is based on various pieces of information (as outlined above), estimates and interpretations. Hence one Engineer's quantification will be different to another's. The aim for the Development Consent Order submission was to produce a reasonable worst-case scenario and therefore appropriate levels of conservatism were incorporated into the assessment to provide that outcome, such that it is anticipated that the Contractors will be able to work within and better the assessed environmental impacts. This approach is not only appropriate for this stage of the project but also aligns with the industry norm, which makes it neither unique nor diminishes the effectiveness of the project's overall approach

### 3 How has the information on earthwork quantities informed the DCO application?

- 3.1.1 The earthwork quantities obtained from the approach set out in Section 2 of this note were used to inform the following documents submitted for the DCO application.

**Table 3.1 Summary of documents submitted for the DCO and how earthwork quantities were used in the documents**

Application Document	Description of how earthwork quantities were used
6.3 Environmental Statement Appendices Appendix 2.2 – Code of Construction Practice, First Iteration of Environmental Management Plan <a href="#">[REP1-157]</a>	<p>The Register of Environmental Actions and Commitments (REAC) provides a consolidated record of the mitigation which has been identified by the environmental impact assessment process.</p> <p>The earthwork quantities have informed environmental impact assessment that form part of the Environmental Statement, as detailed in the subsequent rows below. The REAC identifies the good practice and essential mitigation commitments that underpin the environmental impact assessments and includes measures on material, soil and waste handling/ management. As with all mitigation items set out in the REAC, the procedures to implement these measures will be developed during detailed design or handover and documented in the second and/or third iterations of the Environmental Management Plan (EMP). These would be produced in accordance with Requirement 4 of Schedule 2 to the draft DCO <a href="#">[REP1-042]</a></p>
6.3 Environmental Statement - Appendix 2.2 - Code of Construction Practice, First iteration of Environmental Management Plan - Annex B - Outline Materials Handling Plan <a href="#">[APP-338]</a>	<p>The earthwork quantities as referenced in paragraph 7.1.1 have been used <i>'to establish an illustrative approach to handling excavated material. This includes mass haul movements, i.e., how is the transportation of excavated material handled between point of excavation to destination for placement, stockpiling and/or management offsite.'</i></p> <p>The earthwork quantities are set out in Table 7.1, and form a baseline position to support the construction traffic and environmental impact assessments.</p>
6.3 Environmental Statement - Appendix 2.2 - Code of Construction Practice, First Iteration of Environmental Management Plan - Annex A - Outline Site Waste Management Plan <a href="#">[APP-337]</a>	<p>This document sets out the overarching principles and procedures that would be applied for the management of waste, including surplus excavated material identified through the earthwork quantities, during the construction phase of the Project. The earthwork quantities have informed Table 5.1,</p>

Application Document	Description of how earthwork quantities were used
	<p>which details the surplus excavated material for offsite management, i.e. waste.</p> <p>As detailed in paragraph 2.4.5 in the outline Site Waste Management Plan (oSWMP): <i>‘The intention of this oSWMP is to reflect the Project’s proposed design, the associated quantities of waste arisings [including excavated material] that are anticipated to be generated and to enable better control over material resources and waste arisings throughout the construction phase of the Project. Volumes of waste described in this document present a forecast and will be regularly updated by the Contractors as part of the CSWMP.’</i></p>
<p>6.1 Environmental Statement - Chapter 11 - Material Assets and Waste <a href="#">[APP-149]</a></p>	<p>The scope of ES Chapter 11 is to assess the likely significant effects on the consumption and use of material assets and production and disposal of waste during the construction and operation of the Project. The earthwork quantities have informed the assessment presented in Section 11.6 of the chapter.</p>
<p>6.3 Environmental Statement - Appendix 11.1 - Excavated Materials Assessment <a href="#">[APP-435]</a></p>	<p>The purpose of the Excavated Materials Assessment is to demonstrate that there is sufficient capacity to manage surplus excavated materials at suitable potential sites. This includes identifying third-party potential receiver sites based on Project-defined criteria, as well as validating available fill capacity.</p>
<p>6.3 Environmental Statement - Appendix 11.4 - Material Assets Assessment Supporting Data <a href="#">[APP-438]</a></p>	<p>The earthwork quantities have informed the key excavated material quantities generated during the construction phase, detailed in Table 1.1.</p>
<p>6.3 Environmental Statement - Appendix 11.5 - Waste Assessment Supporting Data <a href="#">[APP-439]</a></p>	<p>The earthwork quantities have informed the key excavated waste quantities generated during the construction phase, detailed in Table 1.1.</p>
<p>7.19 Carbon Energy Management Plan <a href="#">[APP-552]</a></p>	<p>The Carbon and Energy Management Plan sets out the Project’s carbon ambitions and the mechanisms that it will use to deliver them as secured through the DCO application. The secured carbon commitments are presented in Appendix E of the Carbon and Energy Management Plan. The Carbon and Energy Management Plan focuses on construction, maintenance and operational emissions, including emissions from waste.</p> <p>The earthwork quantities have informed the Project baseline position on carbon emissions produced, including quantification of reductions as a result of reusing excavated material within the Order Limits. The carbon assessment has also quantified emissions from the movement of earthworks within the Order Limits and offsite and aligns with the</p>



Application Document	Description of how earthwork quantities were used
	Transport Assessment [ <a href="#">APP-529</a> ]. Through the secured carbon commitments presented in Appendix E, the Project has set out a framework to incentivise low carbon approaches and innovations.
7.9 Transport Assessment ‘Construction Traffic Modelling’ [ <a href="#">APP-529</a> ]	The Transport Assessment, of which the construction traffic modelling forms part, has been prepared to summarise the transport impacts of the Project. The Transport Assessment has been produced in line with the assumptions contained within the oMHP, including the illustrative approach to handling excavated materials which the earthwork quantities form part of. For example, the movements associated with the removal of surplus excavated material quantities to a third-party receiver site have been modelled within the construction traffic modelling. Further detail on the forecasted earthwork movements on the road network is described in Section 8.6 of the Transport Assessment within Appendix E: Construction Traffic Assessment Supporting Information [ <a href="#">APP-534</a> ].
7.14 Outline Traffic Management Plan for Construction [ <a href="#">APP-547</a> ]	The outline Traffic Management Plan for Construction (oTMPfC) has been produced to provide an outline framework that would be applied for the design, management and communication of construction traffic management, road space booking and transport logistics (refer to the oMHP for further information on Project logistics) for the Project. The oTMPfC details the local roads and the proposed restrictions for HGVs associated with the construction of the Project including earthworks movements.

## 4 Next steps for the construction delivery phase

- 4.1.1 The ground investigation and associated interpretations that have informed the assessments in the Environmental Statement are sufficient for this stage of design (preliminary), to determine the environmental impact of the Project.
- 4.1.2 During the construction phase the Contractors will carry out their own assessments which will include:
- a. Producing their own detailed design in accordance with the DCO.
  - b. Supplementing the available data where necessary, e.g. they may wish to undertake further ground investigations or topographical surveys (GS001, MW008 [\[REP1-157\]](#)).
  - c. Establishing a strategy for managing waste both within the Order Limits and for export. For the management within Order Limits this strategy will most likely include the types of permits they need, where the permitted activities will be located, their duration, and what activities will be undertaken. This will inevitably lead to the Contractors establishing a series of informal and formal (e.g. pre-application) meetings with the regulator. It should be noted that waste activities will be regulated under the Environmental Permitting Regulations (and associated regulation, e.g. Environmental Protection Act 1990) and would assess and be protective of, identified receptors such as ground and surface water, humans and livestock.
  - d. Engaging with the Environment Agency to agree reuse criteria (GS006 [\[REP1-157\]](#)).
  - e. Undertaking their own interpretations of the ground conditions (MW008 [\[REP1-157\]](#)).
  - f. Carrying out their own waste management assessments and planning (MW006, MW010 [\[REP1-157\]](#)).
- 4.1.3 This would result in their own earthworks quantities and earthworks strategy for managing materials on and offsite, which will be described in Contractor's Materials Handling Plan (Second Iteration) and Construction Site Waste Management Plans. These documents will include details of how the Contractors propose to monitor and record excavated materials including waste.
- 4.1.4 The Contractors will develop their detailed Materials Handling Plan (Second Iteration) and Construction Site Waste Management Plan as part of the second iteration of the Environmental Management Plan (EMP2). These will be based on the robust framework and principles contained within the control documents such as the CoCP [\[REP1-157\]](#), oSWMP [\[APP-337\]](#), oMHP [\[APP-338\]](#), submitted as part of the DCO application.

- 4.1.5 No part of the authorised development will start until an EMP2 has been submitted and approved in writing by the Secretary of State, following consultation with the stakeholders identified in Table 2.1 of ES Appendix 2.2 – Code of Construction Practice, First Iteration of Environmental Management Plan [\[REP1-157\]](#).
- 4.1.6 To further reduce carbon, by reducing the amount of earthworks and handling of them, the Contractor will review their proposals within the context of the incentivisation packages contained within the Carbon and Energy Management Plan (CEMP) [\[APP-552\]](#), such as:
- a. To obtain the rewards committed to in CBN11 of the CEMP, the Contractors will design and construct the Project for the lowest practicable emissions, resulting in a financial award for every tonne of carbon reduced below the carbon limit.
  - b. In accordance with CBN12, the Contractor will utilise the framework to invest in low carbon innovations.

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