

Lower Thames Crossing

9.85 Post-event submissions, including written submission of oral comments, for ISH5

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1 Introduction

Please note: this document contains the Applicant’s oral summary of evidence and post-hearing comments on submissions made by others at Issue Specific Hearing 5 held on 7 September 2023.

Where the comment is a post-hearing comment submitted by National Highways, this is indicated. This document uses the headings for each item in the agenda published for Issue Specific Hearing 5 [EV-044] on 18 August 2023 by the Examining Authority.

1.1 Welcome, introductions, arrangements for the hearings

- 1.1.1 National Highways (the Applicant), which is promoting the A122 Lower Thames Crossing (the Project), was represented at Issue Specific Hearing 5 (ISH5) by Isabella Tafur of Counsel (IT).
- 1.1.2 The following persons were also introduced to the Examining Authority (ExA):
 - a. Mustafa Latif-Aramesh, BDB Pitmans LLP, Partner (MLA)
 - b. John Clark-Hughes, Lower Thames Crossing, Tunnel Lead (JCH)
 - c. Dr Tim Wright, Lower Thames Crossing, Head of Consents (TW)
 - d. Barney Forest, Lower Thames Crossing, Environment Lead (BF).
 - e. Rita Oliva, Lower Thames Crossing, Development Consent Order Team (RO)
 - f. Lisa Driscoll, Lower Thames Crossing, Water Environment Lead (LD)
 - g. Dr Federico Fragalà, Lower Thames Crossing, Hydrogeologist (FF)

2 Purpose of the Issue Specific Hearing

2.1.1 The Applicant did not make any submissions under this Agenda Item.

3 Item 3 – Limits of Deviation

3.1 Item 3(a) Limits of Deviation

Items 3(a)(i) and 3(a)(ii)

3(a)(i) The Applicant is asked to justify the limits of deviation (LoDs).

3(a)(ii) Vertical limits of deviation including consideration of protection zones, dredging and scour protection.

3.1.1 IT for the Applicant outlined that both agenda items will be discussed together. Item 3a(i) will be addressed in reference to Tunnel Limits of Deviation Plans [[APP-046](#)].

3.1.2 The LoDs serve four main purposes which can be summarised as follows:

- a. They provide a proportionate degree of necessary flexibility to allow development and optimisation of the detailed design, which is not available at the time of the planning process. Optimisation includes the opportunity to refine the design to benefit from latest technology, materials etc.
- b. They provide flexibility to allow for construction tolerances. That includes things like minor deviation of the tunnel boring machine (TBM) from the preliminary design alignment but also other foreseeable events such as minor additional excavations or processes in the ground to secure the integrity of the works.
- c. They allow minor realignment to overcome any unforeseen or unexpected obstructions / impediments.
- d. They give third parties assurance of the maximum extent of where works take place.

3.1.3 IT explained that the limits of deviation for the tunnel and tunnel structures are set out in Article 6(1) (b) and (c) of the draft DCO [[REP3-077](#)], the tunnel works in particular are controlled by 6(2) (o) and (p) of the draft DCO and shown in the Tunnel Limits of Deviation Plans [[APP-046](#)], where the horizontal and upper vertical limits of the final constructed tunnel position are shown.

(o) subject to paragraph 99(1) of Schedule 14 of this Order (protective provisions), construct the tunnel with the vertical downward limits of deviation shown on the tunnel limits of deviation plans; and

(p) subject to paragraph 99(1) of Schedule 14 of this Order (protective provisions), construct the tunnel with the vertical upward limits of deviation shown on the tunnel limits of deviation plans.

3.1.4 In respect of the upper limits of deviation for the tunnel, that is subject to paragraph 99 of Schedule 14, - Protective Provisions for Port of London Authority (PLA) sets an agreed limit for the Limits of Deviation [[REP3-077](#)].

- 3.1.5 JCH outlined the specific limits of deviation as outlined by paragraph 99 of Schedule 14 – Protective Provisions for the PLA. Those limits are as follows:
- 99.—(1) The detailed design and construction of the tunnelling works in the river Thames must—*
- (a) provide for a protected dredged navigational channel depth of 12.5m below chart datum with an additional 0.5m to allow for over-dredging attributable to standard dredging methodology; and*
- (b) ensure that that channel depth can be maintained where scour protection is required.*
- (2) Prior to commencing construction of the tunnelling works and as soon as reasonably practicable after they each become available, the undertaker must provide to the PLA the following documents—*
- (a) an Approval in Principle, or similar, demonstrating that the design requirement has been incorporated into the detailed design of the tunnelling works;*
- (b) a Design Certificate demonstrating that the detailed design of the tunnelling works has satisfied the design requirement; and*
- (c) a Check Certificate, completed by an independent person, demonstrating that the detailed design of the tunnelling works has satisfied the design requirement.*
- 3.1.6 As submitted by JCH, the above Protective Provisions are available to the PLA to provide assurance that tunnelling works will not proceed until they are comfortable with what is proposed. In addition to the above, JCH outlined with reference to paragraph 99(3) of the PLA Protective Provisions, that the PLA’s involvement in the development of the works is as outlined below:
- (3) The undertaker must supply to the PLA— (a) any of the drawings referred to in either of the certificates specified in sub-paragraphs (2)(b) and (2)(c); and (b) such other information relating to any of the documents provided under sub-paragraph (1) or (2)(a) as the PLA may reasonably require, upon request made by the PLA within 10 business days of the day on which the PLA receives the document that gives rise to the request.*
- (4) If, following receipt of any of the documents supplied under sub-paragraphs (2) and (3), the PLA is not reasonably satisfied that the design requirement will be met, it may within 20 business days of the specified day, notify the undertaker that the PLA is in dispute with the undertaker and accordingly refer the matter to arbitration under paragraph 114 to review the proposed detailed design of the tunnelling works so far as it concerns the design requirement.*
- Art 6(3) allows for upward variation of LoD except for the tunnel works (Article 6(2)(p) sets upper LoD for tunnel limits and this is excluded from article 6(3))*
- 3.1.7 Prior to detailing the relevant LoDs, JCH outlined with reference to the Tunnel Limits of Deviation Plan [[APP-046](#)] the relevant works; they include:
- a. Road tunnels: work no. 4A (includes the construction of twin-bored tunnel and cross passages).

- b. Ground protection tunnel: work no. 4B (includes ground protection tunnel and access shafts for ground treatment works).
 - c. South Portal cutting: work no. 3A (includes South Portal tunnel approach cutting).
 - d. South Portal and tunnel approach: work no. 3C (includes South Portal structure, cut and cover section of tunnel, cross passages, South Portal Tunnel Services Building and South Portal tunnel approach).
 - e. North Portal and tunnel approach: work no. 5A (includes North Portal structure, cut and cover section of tunnel of tunnel, cross passages, North Portal Tunnel Services Building and North Portal tunnel approach).
- 3.1.8 JCH detailed the LoDs for each of the above works and why they are necessary.
- 3.1.9 Beginning with work no. 4A; the Bored Tunnels. The vertical LoDs were chosen based on the need to find the optimal engineering alignment in consideration of the geology which improves with depth, and the vertical alignment of the highway which tends towards a shallower alignment. A balance was required to be struck between those two considerations, as well as the need to both maintain the current river depth and provide for future aspirations of the PLA if they seek to deepen the navigable channel. The vertical limit varies along the length of the tunnel and at the deepest point is 6.7m vertically; and as the tunnel rises towards ground level on either side, reduces to 3m.
- 3.1.10 The downwards vertical LoD is unlimited. JCH explained this is to enable the Contractor to develop the detailed design of the tunnel at any level below the current reference design. In practice however, this would be constrained by other parameters such as the maximum allowable highway gradient.
- 3.1.11 The horizontal LoD provides flexibility to the Contractors to develop the tunnel design with an area defined as 10m either side on lateral flexibility. The lateral 10m is measured from the outer tunnel wall.
- 3.1.12 TW prefaced his submissions on the Tunnel Depth Report [[REP3-146](#)] by outlining the Applicant's understanding of the PLA's position.
- 3.1.13 As detailed by TW, the Applicant and the PLA have been in consistent engagement with each other with respect to the tunnel works. The Applicant has identified the PLA's desire to protect the River Thames' present operation and safeguard the PLA's future aspirations if they wish to increase the capacity of the River Thames by deepening the navigable channel.
- 3.1.14 On that basis, TW submitted that the Applicant's proposal needs to be demonstrated to work in two scenarios: the current circumstance in the River Thames, but also in the event that the navigable channel were to deepen to allow for future use. The PLA have expressed a concern that given the tunnel will be in place for a long period of time they seek for the Applicant to take a precautionary approach so that if scour protection is required that it can be delivered at a future time. It is the Applicant's position that at present, scour protection is not necessary and will not be provided as part of this application and would be required to be authorised under a separate consent.

- 3.1.15 In response to a question from the ExA as to how future scour protection would be secured, TW reiterated that the Applicant is confident that the assessments demonstrate it is not required. However, if it were to be required, on a precautionary basis that the Applicant demonstrates that it could be delivered without impacting the navigable channel. TW accorded with the ExA's expression of the consideration of this matter is that the concern is not around securing scour protection under the DCO, rather demonstrating it can be provided if necessary.
- 3.1.16 The PLA confirmed they accorded with the position taken by both the Applicant and the ExA.
- 3.1.17 TW further emphasised that the Applicant does not see the Project and the future aspirations of the PLA to be in conflict.
- 3.1.18 TW then outlined with reference to the River Restrictions Plan [\[REP1-040\]](#) the controls that have been put in place with respect to the river.
- 3.1.19 The first is the placement of the tunnel and the LoD, the allowance for the tunnel alignment to move vertically within that LoD. The Applicant has applied two protection zones, which both a vertical and lateral implementation and provide a restriction on activities that can happen in the river to protect the asset, outlined below:
- a. First Protection Zone – prevents any dredging, installation of moorings, piling, designation of anchorages, excavations including boreholes, and applies a general restriction on activities that might affect the safe construction, operation or maintenance of the tunnel.
 - b. Second Protection Zone – introduces the same restrictions, but provides a series of exemptions that enable activities that would be required to maintain the operation of the navigable channel, such as certain amounts of dredging, placing of moorings and navigational barges, subject to appropriate restrictions.
- 3.1.20 The above provisions have been agreed with the PLA as set out in the Statement of Common Ground between (1) National Highways and (2) Port of London (item no. 2.1.41) [\[APP-100\]](#).
- 3.1.21 TW directed attention to the Tunnel Depth Report [\[REP3-146\]](#) speaking to the River Restrictions Plan [\[REP1-040\]](#). The Plan overlays two drawings that are both secured within the application: the tunnel LoDs and the River Restrictions Plan, therefore it details in combination how the two plans would work on the depth of the navigable channel.
- 3.1.22 TW noted that there is a minimum level of cover over the tunnel which is within the navigable channel. Therefore, if the PLA sought to deepen the navigable channel, the minimum level of cover would decrease. TW noted that the Tunnel Depth Report [\[REP3-146\]](#) considers this decrease and if it would prejudice any further deepening of the channel. The Tunnel Depth Report demonstrates that it does not.

- 3.1.23 At this point in the submissions the ExA sought clarification on the LoD in relation to the recent change request on the north headwall and whether there are any implications flowing from the change request. TW noted that the change request relating to the LoD on the headwall relates to the movement of the bored tunnel headwall, 275m north on alignment. The change request would increase amount of LoD that that headwall can move but would not change the vertical alignment of the tunnel and therefore has no consequence of the vertical alignment in the area under consideration.
- 3.1.24 TW noted however, that the PLA have requested the Applicant to demonstrate that the level of cover remains sufficient to secure the position of the tunnel. This is referred to as flotation, where the tunnel is not stable in the ground because of the air within the tunnel creates a flotation effect. The Tunnel Depth Report [REP3-146] sets out an assessment that demonstrates that the level of cover is sufficient to secure the stability of the tunnel.
- 3.1.25 TW noted that there are two further matters of discussion outstanding with the PLA. One relating to a technical matter during construction, the other is an assessment demonstrating the amount of capacity space the Applicant has provided is sufficient for scour protection. This assessment has been undertaken and TW confirmed will be provided to the PLA within the next two weeks.
- 3.1.26 IT in response to points raised by PLA on the desire for a continued, productive working relationship with respect to the Protective Provisions noted that the Applicant will continue to work with the PLA and consider further revisions to the draft DCO [REP3-077] if necessary. With respect to the notification of commencement and completion of tunnelling, IT submitted that is common practice which the Applicant intends to implement and are content on discussing how to include a notification requirement.
- 3.1.27 JCH then returned to direct submissions back to the description of the LoD, specifically the tunnel LoD.
- 3.1.28 The horizontal limits of deviation in that regard are 10m, to align with the limits of the bored tunnel. There are a series of associated limits on the bored tunnel headwall, and the cut and cover portal, ensuring the alignment can be continuous.
- 3.1.29 In respect of the headwall, the bored tunnel could be extended to the north by up to 275m. JCH clarified that this is the boundary between the bored tunnel and the cut and cover tunnel that moves. The reason for this LoD is to maximise at detailed design the best possible case for the portal structure and cut and cover structure. There is a balance to be struck between cut and cover and tunnel boring which is dependent on construction technique and methodology, which is why discretion within the LoD is reserved for the detailed design stage.
- 3.1.30 JCH explained the LoD for the bored tunnel on the southern side are the same. Whilst it is shallower at the southern side than in generality, it is deeper than the worst-case position at the pinch point at Diver Shoal. Therefore, the C/D ratio being referred to requires a sensible and proportionate LoD. JCH emphasised that the LoD are necessary and a protection to all stakeholders and assets.

- 3.1.31 JCH then noted in the north, the cut and cover portal itself could be extended northward by 1m. Given it is the physical end of the tunnelling it has a very low LoD because the Environmental Statement (ES) assesses the environmental effects based on that position.
- 3.1.32 In the south, the cut and cover could be extended to the north by 50m and to the south again only 1m for the same reason as outlined above.
- 3.1.33 JCH explained the LoD for the north and south tunnel buildings, they are required to allow the location of the tunnel services buildings to be fixed in accordance with the final, determined design of the cut and cover element. Both are connected between the LoDs. The North Portal Tunnel Services Building can move 125m north, or 10m south, but only 10m laterally, and only 0.5m vertically, and that provides a maximum height, therefore, of 6.15m AOD for visual and landscape assessment purposes.
- 3.1.34 JCH explained that the South Tunnel Services Building, in similar vein, can move 50m north or south, but only 10m laterally. The 10m, obviously, matches the tunnel limit of deviation, with an absolute zero vertically, again, for landscape and visual reasons, and that provides for a height of 6.19m AOD.
- 3.1.35 The flexibility is more limited in the south. Because of the ground conditions being less complex, there is less need for flexibility. In all cases, as we described at the outset, the limits of deviation provide a proportionate balance between the need for certainty that the planning process requires versus the need for flexibility that the design and construction process requires.
- 3.1.36 The limits of deviation for the ground protection tunnel, which is the potential smaller tunnel that sits above the two main alignment bores in the south, and specifically, below the marshes, the Ramsar area – has its own LoD. The ground protection tunnel is situated between the south of Lower Higham Road and to the north of the Medway Canal and North Kent railway, it extends to an approximately 825m. However, if the LoD are applied, there is some flex in that figure.
- 3.1.37 JCH explained that the underground structure would allow the Contractor to carry out ground treatment works under the Thames Estuary and Marshes Ramsar Site; and separately, South Thames Estuary and Marshes SSSI Thames Estuary and marshes. It would be 5.8m outside diameter. It provides a grouting gallery. JCH explained that enabled work from inside of that tunnel to improve the ground as may be required for either general stability, or for face interventions, for maintenance or repair that might be required to the TBM itself. JCH further noted the structure has utility for the construction of cross passages.
- 3.1.38 JCH noted that a ground protection tunnel may not be required, depending on the TBM selected.
- 3.1.39 The vertical upper LoD provide flexibility to the Contractor to develop the ground protection tunnel. Similar to the road tunnels, the downward LoD is unlimited, however, in practice other parameters would mean you would not go deeper than the main tunnel.

- 3.1.40 JCH stressed that the ground protection tunnel serves no permanent operational purpose and is entirely for construction purposes and is assessed on that basis.
- 3.1.41 BF, in response to a concern raised by Shorne Parish Council, submitted that the importance of the Thames Estuary and Marshes Ramsar Site; and separately, South Thames Estuary and Marshes SSSI has been taken into account fully in the Applicant's assessment and the Applicant has engaged with the Environment Agency and Natural England in relation to the water aspects of the tunnelling process and the risks associated. Natural England has recorded in the Statement of Common Ground [REP2-008] that they agree that the ground protection tunnel does not lead to adverse impacts on the Ramsar site.
- 3.1.42 BF further noted that in specific relation to the ground protection tunnel, the Applicant has a Register of Environmental Actions and Commitments (REAC) item, which is within our Code of Construction Practice (CoCP) [REP3-104]. Its reference: RDWE018A.

Item 3(a)(iii)

3(a)(iii) Economic and social effects related to the potential effects on river traffic:

- 3.1.43 In relation to any conflict between the tunnel and the developing plans of the PLA to deepen the navigable channel. On this matter, the Applicant's position is that the tunnel proposals do not prevent the PLA from bringing forward their plans, and as such do not consider that there are any environmental or social effects.
- 3.1.44 IT clarified in response to a query from the ExA question as to the appraisal of the nature of future marine traffic on the Thames, that the LoD will provide for all expected future market needs and future use.

Item 3(a)(iv)

3(a)(iv) Monitoring, remedial works and future maintenance:

- 3.1.45 MLA submitted that the Applicant recognises the importance of the monitoring and management of these works.
- 3.1.46 The Applicant made reference to the Protective Provisions for the benefit of the PLA, which have been included in the draft DCO. These provide the PLA with substantial input and oversight on monitoring and remedial work as follows:
- 3.1.47 Paragraphs 98 and 99 of Part 9 of Schedule 14 to the draft Development Consent Order (draft DCO) [REP3-077] confer protection for the PLA in relation to the design of specified elements of the Project insofar as relevant to the PLA's functions. These and the other provisions of Part 9 of Schedule 14 to the draft DCO have been developed through extensive and long-standing engagement with the PLA. MLA emphasised that these provisions are largely agreed with the PLA.

- 3.1.48 Paragraph 98 relates to the approval of the detailed design of works. Specifically, it provides that the Applicant must not exercise any specified function or begin the construction of any specified work until plans of the work or function have been approved in writing by the PLA. Paragraph 98 sets out the process which the Applicant must follow in seeking that consent and specifies the terms on which the PLA may give its approval (excluding the tunnelling works which are regulated under paragraph 99), including the terms and conditions which the PLA may impose. In particular paragraph 98(4) the approval can be subject to the reasonable modifications for *'the protection of the performance of the functions of the PLA connected with environmental protection.'*
- 3.1.49 The terms “specified function” and “specified work” are defined in each case. A specified function means the exercise of powers of compulsory acquisition in circumstances where this may affect the River Thames or any function of the PLA. A specified work means any part of the authorised development which is, may be, or takes place in, on, under or over the surface of land below the level of mean high water forming part of the River Thames, or may affect the River Thames or any function of the PLA. This includes the works that may affect the River Thames or the function of the PLA.
- 3.1.50 Paragraph 99 relates to the detailed design of the tunnelling works. In particular, it provides that the detailed design and construction of the tunnelling works in the River Thames must meet the depths discussed in detail:
- a. provide for a protected dredged navigational channel depth of 12.5m below chart datum with an additional 0.5m to allow for over-dredging attributable to standard dredging methodology; and
 - b. ensure that channel depth can be maintained where scour protection is required.
- 3.1.51 Paragraph 99 also provides for the provision of documentation and drawings evidencing that these design requirements have been met and of the process which must be followed where the PLA is not reasonably satisfied that those conditions have been met.
- 3.1.52 Regarding remedial works, Paragraph 103 of the Protective Provisions relates to protective action. More particularly, paragraph 103 provides that, if a specified work is constructed or a specified function is exercised other than in accordance with the requirements of the Protective Provisions, or is such as to give rise to consequences which would be materially detrimental to traffic in, or the flow or regime of, the River Thames, then the PLA may by notice in writing require the Applicant, at the Applicant's own expense, to comply with the remedial requirements specified in the notice.
- 3.1.53 Paragraph 103 sets out the nature of the requirements which the PLA may impose, in this regard, and of the further action which the PLA may take where the requirements of the notice are not complied with. It is worth drawing attention to subparagraph 2 which sets out the remedial actions to make good sedimentation, scouring, currents or wave action, or other material changes so far as they are required by the needs of traffic. Overall, MLA submitted these provisions provide appropriate protection for remedial works.

- 3.1.54 MLA briefly directed attention to Paragraph 105 of Schedule 14 which relates to requirements of the survey to be carried out on the river. Finally, per paragraph 112 of Schedule 14 the PLA may give notice to any decayed or abandoned work.
- 3.1.55 In response to a submission from the PLA regarding the protected provisions outlined, the Applicant recognised the PLA's concerns and will continue to engage with them. IT submitted that the Applicant has proposed what it considers to be robust Protective Provisions but will continue to engage on them.
- A.1.1 Post-hearing written submissions: These are contained within Annex A and include:
- a. Section A.2 –Type of Tunnel Boring Machine(s) (ISH5 Action Point 1)
 - b. Section A.3 –Response to comments made by the Port of London Authority and the Port of Tilbury London Limited (POTLL)
 - c. Section A.4 –Response to comments made by the Marine Management Organisation
 - d. Section A.5 –Respond to comments made by Shorne Parish Council
 - e. Section A.6 – Response to comments made by Gravesham Borough Council
 - f. Section A.7 –Response to comments made by Thames Crossing Action Group

4 Item 4 – Tunnel Boring Methodology

4.1 Item 4(a) Tunnel Boring Methodology

Item 4(a)(i)

4(a)(i) To what extent should the DCO allow for flexibility in terms of the tunnel construction methodology:

- a. **Should the type of TBM be secured through the DCO;**
- b. **Should the DCO allow for the potential use of either a single or two TBMs and the associated impacts of these approaches.**

Item 4(a)(i)(a): Should the type of TBM be secured through the DCO.

- 4.1.1 Overall View: The Project is currently at the preliminary design stage. The delivery of the Project is to be procured using a design and construct form of contract. The appointed Contractor will therefore develop the detailed design. Given the current stage of design development the Applicant is at it is appropriate to give flexibility as explained in the Applicant's previous submissions; and it is provided for in the DCO and the ES addendum [\[RE2-040\]](#) outlines there will be no effects.
- 4.1.2 This informs the approach taken for the purposes of the DCO application. While it is appropriate at this stage to define and constrain the final built asset within the scope of the Environmental Statement, it would not be in the public interest to constrain the Contractor's methodology and temporary works any further. The Applicant's position is that it has struck the appropriate balance between flexibility and constraint for this stage of the process.
- 4.1.3 JCH then reinforced this position by noting that the choice of machine type is subject to various parameters, the primary one being predominant ground type. JCH noted that the Applicant anticipates a member of the slurry family of TBM to be selected. JCH considers it would be inappropriate to assume and secure the particular type of machine.
- 4.1.4 JCH explained the assumption that it is a slurry machine then allows the assessment of that methodology as part of the Environmental Statement and the assessment of the supporting and ancillary equipment at ground level including the Slurry Treatment Plant.
- 4.1.5 In response to a query raised by the ExA, IT clarified that the "family type" of TBM is not secured in the draft DCO specifically. However, there are controls which prevent the Applicant from carrying out any construction works which result in materially new or materially different environmental impacts to those which have been assessed.
- 4.1.6 BF responded to a point raised by the ExA as to whether an assessment has been undertaken to provide the basis for the slurry family being the worst-case scenario in comparison with other TBM types. BF noted that the slurry family TBM was chosen as the basis for the assessment of a reasonable worst-case scenario (as an alternative would be unrealistic extreme worst case) because the use of a TBM in the slurry family is the type of machinery that would be used to tunnel chalk. An assessment based on a TBM outside the slurry family

would also be unrealistic due to safety considerations; and in the present context it would not be appropriate to use an inappropriate construction technique as an extreme worst-case scenario.

- 4.1.7 JCH further clarified that the fundamental difference from an environmental assessment perspective between the different types of machine is the nature of the material arising. JCH submitted that with respect to either a slurrified type or a dry material the assessment in terms of environmental impact would largely be the same.
- 4.1.8 BF in support of the above submitted that the characterisation of effects would not be different if a dry material or slurrified type of TBM was used. This is because the Project's material handling strategy is not just based on the type of material being transported but also a desire to reduce the distance the material is being transported and thus reduce environmental impacts on the local community and also carbon impact.
- 4.1.9 The Applicant welcomes the PLA's experts comment that it would not be appropriate to restrict flexibility in this context. The Applicant will respond to the ExA's request for a robust justification as to why the family of TBM does not create worse environmental effects than has been assessed in writing. Refer to Annex A.2 on this.
- 4.1.10 IT confirmed in response to a question from the ExA as to whether a closed-face TBM has been secured in the DCO, that it had not been secured. **[Post-hearing note:** the Applicant is proposing to secure this constraint: please see Annex A.2 for more information.
- 4.1.11 IT further noted the general agreement from all parties, including the PLA, with respect to the benefits of retaining flexibility. In response to a point raised by Gravesham Borough Council, IT confirmed that the approach to tunnelling from the north to the south back through to the north is committed to under REAC reference MW009.
- 4.1.12 TW in response to the community concerns raised by Thames Crossing Action Group (TCAG) on ensuring community engagement drew attention to Sections 5.2.11 to 5.2.15 of the Code of Construction Practice [\[REP3-104\]](#) which obligates the Applicant to set up community liaison groups.
- Item 4(a)(i)(b): Should the DCO allow for the potential use of either a single or 2 TBMs and the associated impacts of these approaches?**
- 4.1.13 In summary the Applicant's position is that the DCO does and should allow for both options.
- 4.1.14 As set out at ISH1 and document 9.10 Post-event submissions, including written submission of oral comments, for ISH1 [\[REP1-183\]](#), the Applicant explained that:
- The use of a single TBM is within the scope of the environmental assessments prepared for the ES – i.e. it does not result in materially new or materially different effects.
 - The DCO application contains no constraint or commitment (either in the draft DCO or control plans) that requires the use of two TBMs. Thus, the application contains a proportionate degree of construction flexibility, which extends to flexibility to employ a single TBM.

- c. The decision on construction methodology, in terms of one or two TBMs, has not been made at this stage and would be made at detailed design and delivery stage.
 - d. It is commonplace for major DCO applications to allow for an appropriate degree of construction flexibility, and indeed in the case of a public project it is very much in the public interest, allowing for projects to be delivered at best value to the public purse – provided always that the controls provided for in the suite of DCO documents are sufficient and adhered to.
- 4.1.15 Subsequently, and in response to Examining Authority Action Point 2 from ISH1, at Deadline 2 the Applicant submitted ES Addendum [\[REP2-040\]](#) Appendix C . This outlines how the works would be undertaken if a single TBM were to be used; starting and finishing at the North Portal, rather than two TBMs both starting at the North Portal and ending at the South Portal, as presented in ES Chapter 2: Project Description [\[APP-140\]](#). It subsequently reviews and demonstrates that the construction effects and conclusions reported within the ES reflect the reasonable worst-case scenario for both the single and two TBM scenarios.
- 4.1.16 The single TBM method for tunnel construction would involve no physical changes to the permanent works of the Project’s footprint presented in the DCO application and the plans which form part of it. It would not require the Applicant to seek new powers over land to deliver the works. The overall length of the construction programme set out in the DCO application would remain the same, whether the tunnels are constructed with one or two TBMs.
- 4.1.17 Additionally at Deadline 2, in response to comments made by Gravesham Borough Council, the Applicant provided a new REAC commitment MW009 which would both start and finish at the North Portal. This is reflected in the latest version of the CoCP [\[REP3-104\]](#). This commitment is applicable whether one or two TBMs are used.
- 4.1.18 In summary, the Applicant’s position is that the use of a single TBM for the tunnel drive, if deemed appropriate by the Contractor, would not constitute a change to the DCO application. No change is required to the draft DCO or other application materials.
- 4.1.19 With respect to the benefits of the use of a single TBM compared to two, BF outlined that outside of the physical TBM, the embedded carbon and energy to create, move it and drive it is the other benefit associated with single TBM.
- 4.1.20 In response to the query raised by Thurrock Council that the claim regarding the carbon benefit is unsubstantiated. The Applicant does not agree, IT noted that provided the Applicant is within the envelope assessed of two TBMs, then whether or not there is a saving in carbon dioxide is not an issue.
- 4.1.21 IT further noted that regarding the issue raised by PoTLL on the Asda roundabout and construction assessment, at ISH4, the Applicant will provide a note which explains the approach to construction traffic modelling; and will also address the point surrounding any differences arising from one or two TBMs (Refer to Section B.2 of this document).

- 4.1.22 IT noted in response to Gravesham Borough Council that the Applicant will continue to engage in discussions on the wording of control documents and the draft DCO.
- 4.1.23 JCH then sought to clarify a query raised regarding the two TBMs working in parallel. JCH noted that it was currently anticipated that in the two-TBM scenario they would be staggered by three months. While this is not secured in the draft DCO (as it is not yet determined), the only impact it would have is the requirement to consider the interaction between the two TBMs in the risk assessment and construction methodology.
- 4.1.24 JCH further clarified a concern raised by Shorne Parish Council. JCH confirmed that this kind of construction method has been used numerous times in various projects. The likely options regarding construction for the ground protection tunnel would be based on the earth pressure balance machine family. However, the Applicant does not want to commit for the reasons outlined above.

Item 4(b)(i) and Item 4(b)(ii)

Item 4(b)(i) The approach to water resource management

Item 4(b)(ii) Mitigation, monitoring and remedial actions

- 4.1.25 In preparing for this agenda item the Applicant has identified four headings under which water resource management can be understood:
- a. Source and supply of water – for non-potable and potable uses
 - b. Treatment and disposal of waste water
 - c. Management and control of impacts on water resources – e.g. groundwater and surface water quality and flows
 - d. Flood risk management and drainage during construction
- 4.1.26 The following approach to water resource management has been considered in the Application:
- Source and supply of water**
- 4.1.27 RDWE004 (ES Appendix 2.2: CoCP [\[REP3-104\]](#)) secures a commitment to use water efficiently during construction, citing examples: water-efficient fittings (taps, toilets) in site offices and welfare facilities, use of misting/atomising systems for dust suppression, drive-on recirculating systems for wheel washing, and sub-metering to help in detecting leaks.
- 4.1.28 The water supplied to the tunnel boring machinery for the main tunnels construction shall be groundwater abstracted from a Northumbrian Water borehole at Linford and provided through a pipeline to the site (Work No MUT6). This supply to the TBM via Work No MUT6 would be raw water. In the eventuality that this water supply would not be available, potable water can be supplied via a pipeline that forms part of the permanent water supply to the North Portal Tunnel Services Building via Work No MU29.

- 4.1.29 Extraction rates would be agreed with Northumbrian Water prior to commencement of main tunnelling works and the supply of groundwater would be within the limits of the existing groundwater abstraction licence (REAC RDWE003, ES Appendix 2.2: CoCP [\[REP3-104\]](#)).
- 4.1.30 In both instances, it is envisaged that there would be no impact to the existing potable water supply for residents and customers within the region, however any associated risk regarding this, i.e., rupturing of a water pipeline, or the TBM supply being ‘turned off’ to meet demands of others due to unforeseen circumstances such as drought, is significantly reduced via the use of raw water. The demands in both instances have been discussed and confirmed with Essex & Suffolk Water, which is the operating company of Northumbrian Water in this region, as communicated with Section 4 of Northumbrian Water Limited’s written representation [\[REP1-265\]](#).
- 4.1.31 Separately there is a supply for potable use for the construction compounds. This is proposed to be sourced from the existing water network within Station Road (Work no. MUT9).
- 4.1.32 LD noted that in terms of water then being used and requiring discharge back into the environment, at the northern tunnel entrance compound, there is a proposed new outfall that would discharge into the River Thames. That outfall would cross the intertidal zone via a shallow sheet pile supported excavation to allow installation of a buried pipeline and would be 300 – 400m long. A constructed outfall below the mean low water line would ensure that discharge is always into the wet channel of the River Thames to secure sufficient dilution (secured by commitment RDWE028). Prior to discharge the water would undergo treatment at the portal site, to achieve compliance with the limits required by an Environment Agency discharge consent secured by the Project (RDWE023) (both items secured via ES Appendix 2.2: CoCP [\[REP3-104\]](#)).
- 4.1.33 LD then detailed the proposals at the South Portal.
- 4.1.34 The majority of water to be managed at this compound is rainfall runoff. Details provided in the Water Framework Directive assessment (Section 3.3, para 3.3.1) [\[APP-478\]](#). Runoff would be segregated, with runoff from areas of the compound that have a low risk of entrained chalk and sediment fines, collected and allowed to infiltrate to ground via vegetated soakaways, to replicate the existing hydrological regime. Where there is a higher risk of entrained chalk fines (e.g. in the chalk stockpile area), runoff would be collected, attenuated and treated using a lagoon system in the compound. The discharge would be into a watercourse referred to in the application as the “western ditch”, a designated Environment Agency main river.
- 4.1.35 To safeguard the receiving water environment, treatment standards and discharge rates from the temporary southern tunnel entrance compound outfall would be governed by the conditions of an EA Discharge Consent as secured by commitment RDWE033 (ES Appendix 2.2: CoCP [\[REP3-104\]](#)).
- 4.1.36 The ExA made a query regarding the discharge consent at the southern side, rainfall runoff, and potential contamination from the chalky area, and queried if the Applicant is restricting discharge rates on the northern side (whether the water used to supply the TBM is groundwater or potable water source). LD clarified that the southern discharge consent would prescribe limits on

discharge rates as well as water quality parameters. The Applicant is not expecting any discharge conditions associated with discharge rates from the North Portal outfall (bar requiring discharge to the low water mark) as clarified by LD because it would be going into a tidal reach of the river.

- 4.1.37 The ExA further queried about the quantity of water and getting it from one side to the other and back again. In response, the method of installing the pipeline is a cofferdam, a trench which can fill with the tide (we are not seeking to exclude the tide) a wet trench; and that has been used previously and agreed with EA and MMO on other projects. In terms of the discharge the Applicant would get a permit for discharge with conditions relating to quality, such as suspended solids and other pollution control limits. The specifics of which will be discussed further with the relevant consenting authorities.
- 4.1.38 JCH clarified on the point of water supply volumes, the Applicant has sized the requirement on an expected conservative worst-case scenario. The system would be closed so that in theory there is no water usage once the TBM is operating; it is a recirculating system. In practice however, there would be some losses but the maximum requirement is what is needed at the beginning when you charge the system.
- 4.1.39 JCH confirmed that the Applicant has assumed the worst-case scenario of two machines working concurrently in terms of quantities. The Applicant has assumed one machine would be charged and in the two TBM scenario, three months later the process would be repeated to charge the second circuit where there would be some amount of water use.
- 4.1.40 JCH outlined in response to the ExA around the management of potential contamination of discharge due to proximate landfill sites, that:
- a. The mainline tunnel alignment does not pass underneath the East Tilbury landfill. Rather, it is adjacent to the west. As such the concern is east-west migration to bring contaminated water into the cycle.
 - b. The protection would be a cutoff to ensure that there is no path. This would be agreed, and is currently being discussed with the Environment Agency. The methodology has been largely agreed and would require continuous borehole monitoring.
- 4.1.41 IT in response to the comments made by Northumbrian Water noted the positive comments are welcomed and are reflective of the positive, collaborative relationship between the two parties. The draft agreement mentioned is to be returned on the day of ISH5.
- 4.1.42 LD sought to clarify concerns raised by Shorne Parish Council. LD explained that the discharge of runoff from areas of the compound that don't have the risk associated with chalk, would be collected and managed using vegetative systems that encourage infiltration to ground. Any contaminants that were in the runoff would therefore be treated, offering a safeguard in terms of pollution.

- 4.1.43 Regarding the potential for discharge to increase flood risk in receiving watercourses, it would be a condition of the Environment Agency Discharge consent that discharges from the southern tunnel entrance compound be restricted to green field runoff rates (in the order of 2 litres per second) which would reduce any impact on flood risk in the receiving catchment.
- 4.1.44 IT clarified that the level of detail of the proposed lagoons (in response to the concern of Shorne Parish Council) is that the detail will follow at detailed design. Furthermore, regarding Ms Lindley (Shorne Parish Council), regarding storage of materials, this will be confirmed in writing. This is Annex B.8.
- 4.1.45 **Flood risk management during construction:**
- 4.1.46 Section 16 of Part 6 of the Flood Risk Assessment (FRA) [REP1-171] submitted broadly covers construction phase flood risk but given that there are not at this stage detailed construction compound layouts (to be determined by the Contractors), there is a Project commitment to prepare detailed, site-specific FRAs. This would dovetail with the construction phase drainage plan.
- 4.1.47 Construction activities/temporary works would be carried out in accordance with the recommendations of a construction phase FRA prepared by the Contractor (secured as REAC commitment RDWE001) and a construction phase drainage plan will also be prepared that shall demonstrate how the Contractor would manage surface water runoff across the worksites, including details of how offsite impacts would be prevented (secured as REAC commitment RDWE006 within ES Appendix 2.2: CoCP [REP3-104]).
- 4.1.48 The northern tunnel entrance compound and Station Road compound to the north of the River Thames and the southern tunnel entrance compound and Milton compound to the south of the River Thames, which are partially sited within Flood Zones 2 and 3, would be laid out so that facilities at highest vulnerability to flooding, e.g. sleeping accommodation, medical and welfare and principal office facilities, are located in the lowest flood risk zone (Zone 1). Only low vulnerability and water compatible uses would be situated in the high-risk Flood Zone 3. (secured as REAC commitment RDWE022 [REP3-104]).
- 4.1.49 Flood protection would be provided around the North Portal to reduce the risk of inundation of the tunnel. The flood protection will comprise flood walls, bunds and targeted earthworks designed to protect during a 1 in 1,000-year River Thames extreme tide level event with climate change allowances up to 2130 and a freeboard (to cover residual uncertainties) of 1m (RDWE029). Measures are shown on Drawing No. 00180 of the Flood Risk Assessment (Part 9, Annex C) [APP-471]. The efficacy of the defences has been tested by hydraulic modelling of the West Tilbury main catchment, as well as in the scenario of a breach or failure of existing River Thames flood defences.
- 4.1.50 TW sought to respond to Gravesham Borough Council's example of future-proofing for an 'extreme weather event' as has just occurred in South Korea. TW noted that whilst the Applicant has considered higher rainfall events, the level of rainfall in the South Korea example goes beyond the level that would be modelled and built for.

- 4.1.51 In respect to the points raised by Thurrock Council regarding the detail provided for the temporary construction works drawings, IT explained that is a result of the stage of the current process; but is worth noting the construction drainage assessment is required through the REAC (within ES Appendix 2.2: CoCP [\[REP3-104\]](#)) and will be approved pursuant to Requirement 8 by the Secretary of State to ensure construction drainage matters will be addressed at the design stage.
- 4.1.52 Regarding Thurrock Council’s factual query on discharge of the north tunnel approach ramps drainage system, LD clarified that drainage from the ramps would be directed to the nearby detention basins, for attenuation and treatment prior to discharge.
- 4.1.53 **[Post Hearing Note]** The “separate project” referred to by JCH at 4.1.42 is the Lee Tunnel storm outfall at Beckton.

Item 4(c)

Item 4 (c) Dewatering:

- 4.1.54 FF provided an overview of the high level strategy for dewatering and other pertinent matters.
- 4.1.55 Dewatering is a term commonly used to describe removal of surface water or groundwater from a particular location such as an excavation during construction. Dewatering would typically comprise pumping water out from an excavation so that conditions are dry inside the excavation. Usually, the pumped water would then be discharged to surface water or ground. Dewatering would normally be subject to an abstraction licence and a discharge permit unless an exemption has been formally agreed with the Environment Agency.
- 4.1.56 No dewatering is proposed at the South Portal (of the main tunnel crossing of the Thames). This is because the base of the excavation would be above the groundwater table, as demonstrated by the hydrogeological conceptual site model (ES Appendix 14.5: Hydrogeological Risk Assessment, Figure 3 and Annex C Groundwater-level data summary – whole study area []).
- 4.1.57 For the proposed ground protection tunnel, volumes of groundwater removed (dewatering) would be limited by use of construction methods that reduce groundwater ingress and pumping. Project commitment RDWE018a (in ES Appendix 2.2: CoCP [\[REP3-104\]](#)) confirms that methods such as wet excavation and grout plug placement to form the shafts would be used. Also, the ground protection tunnel would be a lined tunnel with a specified maximum leakage rate compliant with the Project tunnelling specification.
- 4.1.58 The proposed tunnel methodology would use a “closed face” to minimise groundwater impact (as well as potential stability and settlement issues ingress), as stated in ES Chapter 2: Project Description [\[APP-140\]](#). As the TBM proceeds to excavate a tunnel, the tunnel would be concurrently lined with precast concrete segments. This means that the opportunity for groundwater ingress is small and the need for dewatering during tunnel boring is low.

- 4.1.59 Within the main tunnel, for the construction of cross passages, volumes of groundwater removed would be restricted. The Project commitment RDWE020 (in ES Appendix 2.2: CoCP [\[REP3-104\]](#)) states that techniques such as grouting or ground freezing would be used to reduce the requirement for dewatering.
- 4.1.60 The North Portal box structure and ramps would be constructed beneath the water table and at the greatest depths close to aquifers of sub-artesian head. Therefore, construction phase groundwater control measures would be required. The Project commitment GS021 (in ES Appendix 2.2: CoCP [\[REP3-104\]](#)) states that a deep barrier would be constructed around the excavation to reduce groundwater ingress. This will be deep enough and penetrate the more permeable geology. Additionally, the same commitment states that the need for any supplementary mitigation measures, such as grouting to form a low permeability plug below the excavation to reduce the risk of water inflow or reducing the footprint of the structure, would be informed by the results of modelling and consultation with the Environment Agency.
- 4.1.61 FF concluded by outlining that overall, the Applicant has made a commitment to reduce the ingress of groundwater during the construction works. Furthermore, the details of the groundwater modelling can be found in Annexes J and K of the Hydrogeological Risk Assessment.
- 4.1.62 IT acknowledged the point raised by the ExA regarding securing a commitment to the use of a closed face TBM. The Applicant will deliberate that point further and update when a decision has been made.
- 4.1.63 **Post hearing note:** – Noting the stage of design development, the scope of the assessments and the position of the PLA, the Applicant does not consider it appropriate to secure the machine type, however, in recognition of the ExA and Stakeholder concerns the Applicant will include a further REAC commitment as follows “Construction of the bored section of the highway bored tunnels Work No 4A(i) shall be undertaken using closed face tunnelling techniques.” Refer to A.2 for more information.
- 4.1.64 **Post-hearing written submissions:** These are contained within Annex B and include:
- a. Section B.2 – Update on workforce commuting figures (ISH5 Action Point 4)
 - b. Section B.3 – Response to comments made by the Port of London Authority
 - c. Section B.4 – Potential notification of commitment/ end of tunnelling works to the PLA
 - d. Section B.5 – Response to comments made by Thurrock Council
 - e. Section B.6 – Response to comments made by Gravesham Borough Council
 - f. Section B.7 – Response to comments made by Thames Crossing Action Group
 - g. Section B.8 – Response to comments made by Shorne Parish Council
 - h. Section B.9 – Response to comments made by Northumbrian Water
 - i. Section B.10 – Response to comments made by Environment Agency
 - j. Section B.11 – Position on water and electricity usage during tunnelling

5 Monitoring

Item 5(a) Monitoring

Item 5(a)(i)

Item 5(a)(i) The approach to monitoring, reporting and remediation.

- 5.1.1 IT at the request of the ExA spoke to generalities of monitoring. In summary, extensive monitoring, reporting and remediation relevant to tunnelling matters is covered by a range of application documents. To give three examples:
- The Code of Construction Practice, including the REAC [\[REP3-104\]](#)
 - The draft DCO [\[REP3-077\]](#), including the Requirements in Schedule 2 and the Protective Provisions for the PLA which we referred to earlier
 - The Site Waste Management Plan [\[APP-337\]](#)
- 5.1.2 We continue to discuss the nature of the Protective Provisions with the PLA on incidents.

Item 5(a)(ii)

Item 5(a) (ii) The approach to risk and management with particular regard to dealing with unexpected incidents.

- 5.1.3 TW explained the Applicant's approach to risk management for unexpected incidents. In relation to the emergency preparedness procedures the requirements for unexpected incidents is outlined in the CoCP [\[REP3-104\]](#).
- 5.1.4 This section sets out how Contractors will be required to be certified to international standards and these include requirements to include procedures to deal with unexpected incidents.

Excerpt from the CoCP:

6.9.4 Emergency preparedness procedures will include the following:

- Notification procedures for emergency services in the event of an incident*
- Procedures in the event of the discovery of unexploded ordnance*
- Flood emergency response procedures*
- Requirement to run emergency rescue drill from an underground location(s) including collaborative planning and participation by relevant rescue authorities*
- Emergency spill-response procedures to be developed with engagement with the Environment Agency and to take into account any specific requirements on incident response planning related to the worksite*
- The emergency phone number and method of notifying the relevant local authority, statutory bodies, contact numbers for National Highways and the Contractors' staff*
- Management and communication of diversions/alternative routes during unplanned events/emergencies.*

- 5.1.5 As explained by TW in engineering terms each function group would develop, monitor and act on controls required to manage risk. Furthermore, in response to the PLA, the Applicant will continue to have discussions on the nature of the Protective Provisions concerning construction risk.
- 5.1.6 IT accorded with the above response by TW regarding the PLA's and Port of Tilbury London Limited's concern on construction risk. As noted, the Applicant will continue to engage with the PLA on those matters.
- 5.1.7 TW responded to the concerns raised by the Emergency Services Group as to the specifics of the Emergency Preparedness Plan. TW noted that the Emergency Preparedness Plan is part of the Environmental Management Plan second iteration and secured by Requirement 4 Paragraph 2 which states:
"No part of the authorised development is to commence until a EMP (Second Iteration), substantially in accordance with the Code of Construction Practice, for that part has been submitted to and approved in writing by the Secretary of State."
- 5.1.8 Therefore, the requirement for the emergency preparedness to be secured in EMP2.
- 5.1.9 TW in response to the concern raised by the ExA regarding the reference to "substantially in accordance with", the Applicant's position was set out in its previous submissions [AS-089 and REP1-184]. [Post-hearing note: we refer to the responses provided to the London Borough of Havering on this point in the Applicant's responses to comments on the dDCO at Deadline 3 (Application Document 9.102) submitted at Deadline 4]. The Applicant considers that the phrase did provide assurance on the security of the emergency preparedness, but also provided a necessary degree of flexibility and reflects the fact that the CoCP itself is an outline document. TW noted that this reference to the requirement and that the preparation of emergency preparedness plans provided assurance that Essex Police would be involved in the ongoing process relating to the emergency preparedness plan (in addition to be consulted on the scope of EMP2). TW in response to the PLA, noted that the Applicant considers the PLA has a different role as custodian of the river and therefore, a different framework in relation to these matters is more appropriate, hence why Protective Provisions have been considered as the appropriate avenue for the PLA.
- 5.1.10 TW further submitted that the remediation portion of the Protective Provisions in respect of which the PLA expressed a concern, specifically paragraph 103, does not have a restriction on its broad applicability and does not preclude remedial works in connection with the tunnel. If the PLA interprets the paragraph differently the Applicant will engage with them further.
- 5.1.11 TW addressed TCAG's comments regarding the construction-related risks. Lower Thames Crossing is a pathfinder project with a view to the net zero target which will require new and different technologies. While that does pose a risk particularly with hydrogen, the Applicant and the CoCP will address the appropriateness of these methods, the Applicant will work with Contractors, stakeholders and government regulators to ensure the Project leaves a legacy on how to undertake construction the right way. The Applicant notes it is not disapplying any regulatory controls or permit requirements in connection with the use of hydrogen or electrical vehicles.

- 5.1.12 **Post-hearing written submissions:** These are contained within Annex C and include:
- a. Section C.2 – Response to comments made by the Emergency Services Steering Group
 - b. Section C.2.1 – Response to comments made by the Port of London Authority
 - c. Section C.4 – Response to comments made by the Thames Crossing Action Group

6 Item 6 – Unexploded Ordnance

6.1 Item 6(a) Unexploded Ordnance

Item 6(a)(i)

6(a) (i) Whether the approach to dealing with unexploded ordnance is sufficient:

- 6.1.1 As outlined by IT, the Applicant commissioned Zetica, a specialist in unexploded ordnance (UXO) assessments to carry out: UXO Desk Study and Risk Assessment [[APP-433](#)].
- 6.1.2 IT noted that the UXO Desk Study and Risk Assessment is presented as Appendix 10.10 of the ES [[APP-433](#)]. It presents the UXO hazard assessments, hazard zone plans and recommended risk mitigation techniques. That assessment concludes that the overwhelming majority of unexploded ordnance poses a "low risk", and that there are no examples of any "high" or "very high" risks identified. They do categorise some "moderate" risk. That assessment makes a number of recommendations which have informed how unexploded ordnance will be dealt with.
- 6.1.3 IT explained that the Contractors are to review, adopt and implement the recommendations of the Unexploded Ordnance (UXO) Desk Study and Risk Assessment [[APP-433](#)]. The Contractors are also to establish the need for complementary or additional surveys and risk assessments adopting CIRIA C681 Unexploded Ordnance (UXO) A guide for the construction industry (CIRIA, 2009).
- 6.1.4 ES Appendix 2.2: CoCP [[REP3-104](#)] Section 6.11 states:
- 6.11.1 The Contractors will carry out pre-construction risk assessments to determine the possibility of finding unexploded ordnance within the construction area. An emergency response procedure will be prepared and implemented by the Contractors to respond to the discovery of unexploded ordnance. This will include notifications to the relevant local authorities and emergency services.*
- 6.11.2 The Contractors will comply with the recommendations of the Appendix 10.10: Unexploded Ordnance Desk Study and Risk Assessment (Application Document 6.3).*
- 6.1.5 The CoCP Section 6.9 Emergency preparedness includes the requirement to include procedures in the event of the discovery of unexploded ordnance.
- 6.1.6 IT submitted in response to concerns raised by TCAG on the level of detail provided in the Emergency Preparedness Plan, that the response to UXO is provided for but the detail of which needs to be addressed by Contractors and is not appropriate to address at this preliminary stage of design. IT reassured TCAG that their concerns have been heard and the Applicant is aware of the risks and those risks have been assessed, characterised and the mitigation measures will be developed through stakeholder engagement. The Applicant will address TCAG's concerns further in writing.

- 6.1.7 IT further recognised the concern raised by PLA with respect to leaving UXO in-situ and the potential impact on PLA’s assets. The Applicant will continue to engage with the PLA on this matter.
- 6.1.8 **Post-hearing written submissions:** These are contained within Annex D and include:
- a. Section D.2 – Response to comments made by Thames Crossing Action Group.
 - b. Section D.3 – Response to comments from Thurrock Council
 - c. Section D.4 – Response to comments from Gravesham Borough Council
 - d. Section D.5 – Response to comments made by Port of London Authority
 - e. Section D.6 – Response to comments made by the Marine Management Organisation

7 Item 7 – Construction Compound Matters

7.1 Item 7(a) Construction Compound Matters

- 7.1.1 The ExA clarified that given the time constraints, agenda item 7 would be confined to the use of the River Thames for the purposes of materials handling.
- 7.1.2 IT explained that ES Appendix 2.2: Code of Construction Practice, First iteration of Environmental Management Plan – Annex B – Outline Materials Handling Plan [APP-338] contains an obligation to use port facilities in the North Portal area. IT noted that the Applicant has responded to Thurrock’s request for firmer, more ambitious commitments similar to the Silvertown DCO in Comments on LIRs Appendix H – Thurrock Council (Part 4 of 5) [REP2-065]. In short Silvertown was a project where **100% of which was at, on or adjacent to the river, committed to moving 55% of all materials by river.**, By contrast **only 13% of the Project is at, on or adjacent to the river and yet is committed to utilise port facilities for 35% of the Project’s bulk aggregates.** IT submitted that mandating a commitment for materials handling via the river beyond the “Baseline Commitment” outlined at 1.3.7 of the outline Materials Handling Plan [APP-338] would induce more construction traffic on the roads as construction vehicles would have to travel further to reach the relevant construction sites that are not proximate to the river. These sites make up a majority of the construction works. Therefore, the right balance has been struck for the purposes of the Project.
- 7.1.3 IT submitted that the appropriate approach is secured through the outline Materials Handling Plan [APP-338] where the Project shall utilise port facilities for at least 80% by weight of bulk aggregates imported to the North Portal construction area (the “Baseline Commitment”). The Applicant submitted that the “Baseline Commitment” in combination with the commitment to the consideration of multimodal transport of materials as outlined at 1.3.11 of the outline Materials Handling Plan [APP-338] provides ample scope to ensure the Project makes appropriate use of the port facilities and explores how to maximise a range of modes for the transportation of materials.
- 7.1.4 **Post-hearing written submissions:** These are contained within Annex E and include:
- a. Section E.2 – Response to comments made by Thurrock Council and the PLA on River Use
 - b. Section E.3 – Response to comments from Gravesham Borough Council

References

CIRIA (2009). CIRIA C681 Unexploded Ordnance (UXO) A guide for the construction industry. http://www.ciria.com/forms/pdf/books/digest_c681.pdf

Glossary

Term	Abbreviation	Explanation
A122		The new A122 trunk road to be constructed as part of the Lower Thames Crossing project, including links, as defined in Part 2, Schedule 5 (Classification of Roads) in the draft DCO (Application Document 3.1)
A122 Lower Thames Crossing	Project	A proposed new crossing of the Thames Estuary linking the county of Kent with the county of Essex, at or east of the existing Dartford Crossing.
A122 Lower Thames Crossing/M25 junction		New junction with north-facing slip roads on the M25 between M25 junctions 29 and 30, near North Ockendon.
A13/A1089/A122 Lower Thames Crossing junction		Alteration of the existing junction between the A13 and the A1089, and construction of a new junction between the A122 Lower Thames Crossing and the A13 and A1089, comprising the following link roads: <ul style="list-style-type: none"> • Improved A13 westbound to A122 Lower Thames Crossing southbound • Improved A13 westbound to A122 Lower Thames Crossing northbound • Improved A13 westbound to A1089 southbound • A122 Lower Thames Crossing southbound to improved A13 eastbound and Orsett Cock roundabout • A122 Lower Thames Crossing northbound to improved A13 eastbound and Orsett Cock roundabout • Orsett Cock roundabout to the improved A13 westbound • Improved A13 eastbound to Orsett Cock roundabout • Improved A1089 northbound to A122 Lower Thames Crossing northbound • Improved A1089 northbound to A122 Lower Thames Crossing southbound
A2		A major road in south-east England, connecting London with the English Channel port of Dover in Kent.
Application Document		In the context of the Project, a document submitted to the Planning Inspectorate as part of the application for development consent.
Construction		Activity on and/or offsite required to implement the Project. The construction phase is considered to commence with the first activity on site (e.g. creation of site access), and ends with demobilisation.
Design Manual for Roads and Bridges	DMRB	A comprehensive manual containing requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (National Highways, Transport Scotland, the Welsh Government or the Department for Regional Development (Northern Ireland)) is highway authority. For the A122 Lower Thames Crossing the Overseeing Organisation is National Highways.

Term	Abbreviation	Explanation
Development Consent Order	DCO	Means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP) under the Planning Act 2008.
Development Consent Order application	DCO application	The Project Application Documents, collectively known as the ‘DCO application’.
Environmental Statement	ES	A document produced to support an application for development consent that is subject to Environmental Impact Assessment (EIA), which sets out the likely impacts on the environment arising from the proposed development.
Highways England		Former name of National Highways.
M2 junction 1		The M2 will be widened from three lanes to four in both directions through M2 junction 1.
M2/A2/Lower Thames Crossing junction		New junction proposed as part of the Project to the east of Gravesend between the A2 and the new A122 Lower Thames Crossing with connections to the M2.
M25 junction 29		Improvement works to M25 junction 29 and to the M25 north of junction 29. The M25 through junction 29 will be widened from three lanes to four in both directions with hard shoulders.
National Highways		A UK government-owned company with responsibility for managing the motorways and major roads in England. Formerly known as Highways England.
National Planning Policy Framework	NPPF	A framework published in March 2012 by the UK’s Department of Communities and Local Government, consolidating previously issued documents called Planning Policy Statements (PPS) and Planning Practice Guidance Notes (PPG) for use in England. The NPPF was updated in February 2019 and again in July 2021 by the Ministry of Housing, Communities and Local Government.
National Policy Statement	NPS	Set out UK government policy on different types of national infrastructure development, including energy, transport, water and waste. There are 12 NPS, providing the framework within which Examining Authorities make their recommendations to the Secretary of State.
National Policy Statement for National Networks	NPSNN	Sets out the need for, and Government’s policies to deliver, development of Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. It provides planning guidance for promoters of NSIPs on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.
Nationally Significant Infrastructure Project	NSIP	Major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, major road projects etc that require a development consent under the Planning Act 2008.

Term	Abbreviation	Explanation
North Portal		The North Portal (northern tunnel entrance) would be located to the west of East Tilbury. Emergency access and vehicle turn-around facilities would be provided at the tunnel portal. The tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations.
Operation		Describes the operational phase of a completed development and is considered to commence at the end of the construction phase, after demobilisation.
Order Limits		The outermost extent of the Project, indicated on the Plans by a red line. This is the Limit of Land to be Acquired or Used (LLAU) by the Project. This is the area in which the DCO would apply.
Planning Act 2008		The primary legislation that establishes the legal framework for applying for, examining and determining Development Consent Order applications for Nationally Significant Infrastructure Projects.
Project road		The new A122 trunk road, the improved A2 trunk road, and the improved M25 and M2 special roads, as defined in Parts 1 and 2, Schedule 5 (Classification of Roads) in the draft DCO (Application Document 3.1).
Project route		The horizontal and vertical alignment taken by the Project road.
South Portal		The South Portal of the Project (southern tunnel entrance) would be located to the south-east of the village of Chalk. Emergency access and vehicle turn-around facilities would be provided at the tunnel portal. The tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations.
The tunnel		Proposed 4.25km (2.5 miles) road tunnel beneath the River Thames, comprising two bores, one for northbound traffic and one for southbound traffic. Cross-passages connecting each bore would be provided for emergency incident response and tunnel user evacuation. Tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations. Emergency access and vehicle turn-around facilities would also be provided at the tunnel portals.

Annexes

Annex A Post-hearing submissions on Agenda Item 3: Limits of deviation

A.1 Introduction

A.1.1 This section provides the post-hearing submission for agenda item 3 Limits of deviation, from Issue Specific Hearing 5 (ISH5) on the 7 September 2023 for the A122 Lower Thames Crossing (The Project).

A.2 Type of Tunnel Boring Machine(s) (ISH5 Action Point 1)

A.2.1 This section responds to ISH5 Action Points [\[EV-44a\]](#) Action 1.

Relevant considerations

A.2.2 Tunnelling can be undertaken using a variety of methods ranging from hand mining through to the use of sophisticated machinery. A useful first differentiator is to consider open and closed face techniques. Open face would include, for example, hand mining, progressive supported techniques such as sprayed concrete lining (SCL) and spheroidal graphite iron (SGI); use of hydraulic excavators with spray applied support (shotcrete) and drill and blast techniques. Open face Tunnel Boring Machines exist too, used for longer tunnels which justify their high capital cost and where the profile is constant. Whether used in hard or soft geology, they are only appropriate where ground water control is not necessary and the face is self-supporting. In soft ground they perform a dual function of both excavating the tunnel bore and erecting support via a segmental lining. In rock, different support may be installed such as rockbolts, mesh and shotcrete. The alternate designation of closed face would include the various classes of Tunnel Boring Machinery where the excavation face and ground water pressure are balanced. This pressure is maintained at an increased level by sealing between the machine shield and the segmental lining behind and where spoil is removed from the cutter face in a controlled manner (screw conveyor or slurry circuit with valves).

A.2.3 The primary consideration in technique selection is predominant geology (included whether above or below the water table). Where varying geological conditions are to be encountered it is commonplace to consider the most prevalent condition and then assess whether machine selection on this basis could be used in the face of the other (less prevalent) conditions.

A.2.4 In the case of the Lower Thames Crossing the prevalent geology is chalk with a moderate to high flint content. This would tend towards the common industry practice choice of a slurry type machine. This is a proven technology for this geology. That is not to say that other machine types, for example an Earth Pressure Balance Machine (EPBM) would not or could not work in this geology, but the Applicant considers a slurry type to be a better choice because chalk

easily becomes a pumpable medium when slurryfied and this also lubricates the process such that the flint content is less damaging to the TBM machinery.

A.2.5 Another consideration is the volume and source of any required process water to support the chosen method of tunnelling. An EPBM notionally requires no process water, although depending on exact machine specification and material handling method in many cases conditioning agents or foams may be added to improve the material handling characteristics. These may include water in the make up of the additive. A slurry type machine however requires water for the slurrification process. Once the circuit is charged it is a closed circuit and does not require a continuous water supply. In practice there are always some system losses and hence a constant top-up feed is required of small quantity. The design parameter therefore for water source and transfer is the fill from empty charging of the system design case and this has been used to size the LTC system accordingly. In the case of LTC the calculated maximum requirement is 59l/s however this rises to 69l/s when considering the other uses of water on the site (e.g. to supply the Slurry Treatment Plant). It is also acknowledged that there is value in supplying the site welfare separately from the TBM supplies and provision has been made for a small diameter water supply from Station Road. This will ensure the site welfare can be supplied early in the construction programme.

A.2.6 The key consideration in formulating a water supply strategy for construction of the LTC tunnels is to provide a resilient supply of water to the TBMs. In order to ensure adequate supply of water and to reduce risks relating to TBM operability, the Applicant has made a decision to provide a dual TBM supply from two separate sources of water, such that the operation of the TBMs and tunnel construction can continue should one of the supplies of water fail. The preferred water supply options are a raw water supply from Linford borehole and a potable water supply from the local water distribution network in Fort Road/Gun Hill.

Environmental Assessments on TBM Technology

A.2.7 The DCO Application has been presented on the basis that slurry type tunnelling machinery will be employed. This is because this is the appropriate “family” of tunnelling boring machinery for a predominantly chalk environment.

A.2.8 The Environmental Statement (ES) assumes slurry type machinery including provision for surface mounted support and ancillary equipment associated with a slurry methodology, for example a Slurry Treatment Plant. This detail is provided in Section B: A122 Lower Thames Crossing Tunnel (Paragraph 2.6.94-2.6.198) ES Chapter 2 – Project Description [[APP-140](#)] and in relation to the single tunnel boring machine within document 9.8 ES Addendum v3.0 clean [[REP3-124](#)].

A.2.9 Notwithstanding the consideration of a “slurry family” TBM in the assessments (and the likelihood of this), the Applicant considers that an EPBM could be used. If a EPBM was used the Applicant does not consider there would be any materially new or materially different environmental effects as compared with this scenario. For this reason, it is considered the ES is properly reflective of reasonable worst-case assumptions and is appropriate and proportionate.

Application to Project

A.2.10 The project is currently at the preliminary design stage. The delivery of the scheme is to be procured using a design and construct form of contract. The appointed contractor will therefore develop the detailed design and detailed construction methodology.

A.2.11 This informs the approach taken for the purposes of the DCO application. Whilst it is appropriate at this stage to define and constrain the final built asset within the scope of the Environmental Assessment, it would not be in the public interest to constrain the contractor’s methodology and temporary works any further. On the basis of the information provided above, the Applicant’s position is that it has struck the appropriate balance between flexibility and constraint for this stage of the process.

A.2.12 For these reasons, it is considered the dDCO should allow the use of either EPBM or Slurry type machines. It is noted that the PLA’s expert supported the position of the Applicant on this issue.

Further constraint

A.2.13 Nonetheless, in recognition of the comments from the ExA and Stakeholders, the Applicant is proposing to offer the following commitment: “*Construction of the bored section of the highway bored tunnels Work No 4A(i) shall be undertaken using closed face tunnelling techniques.*” The use of closed face has been the Applicant’s intention, but to provide comfort on managing constructions risks, this commitment is provided without limiting the Applicant’s flexibility in relation to TBM technology more generally.

A.2.14 It is proposed that this wording is included in the Deadline 5 submission of the Code of Construction Practice.

A.3 Response to comments made by the Port of London Authority and the Port of Tilbury London Limited (POTLL)

A.3.1 The Applicant has agreed to meet with the PLA specialist advisors (London Bridge Associates) to discuss the stability considerations during tunnelling ie the temporary condition. It is anticipated that these discussions will be fruitful since it is known that both parties share the same starting position, namely that a closed face machine of the slurry family is appropriate. The Applicant further notes that

provisions in the PLA's Protective Provisions have been inserted at Deadline 4 to address matters relating to construction risks.

A.3.2 The Port of Tilbury's support for the PLA position is noted.

A.4 Response to comments made by the Marine Management Organisation

A.4.1 The Marine Management Organisation set out that "the applicant would need to notify the MMO of their intention to carry out these exempt activity." On the query relating to exempted activities, the Applicant notes 2.1.17 and 2.1.13 of the Statement of Common Ground confirming the Applicant's position. These matters are listed as "Matters Agreed." The Applicant therefore accepts that due notice would be required pursuant to the Deemed Marine Licence and the operation of that exemption.

A.5 Respond to comments made by Shorne Parish Council

A.5.1 The Shorne Parish Council raised a concern regarding the upward LoD and grouting in connection with the Ground Protection Tunnel.

A.5.2 The Applicant has explained that the vertical limits of deviation are required for design and construction flexibility. Within those limits of deviation, the final design would be subject to review and this would ensure that the design as presented provides a sufficient factor of safety against the creation of environmental impacts to the marshes.

A.5.3 The Applicant has also explained that machine selection will be a function of detailed design and cannot be secured at this time. The Council's position that a methodology that did not require the construction of the ground protection tunnel is noted. However, the Applicant has explained that the dDCO [\[REP3-077\]](#) includes for the construction of the ground protection tunnel on a precautionary basis to ensure the Environmental Assessment is robust and appropriate.

A.5.4 The Applicant submits that any use of grout to improve the ground conditions would be in accordance with the REAC commitments (GS024) to not impact the North Kent Marshes. Any such grouting would be strictly monitored with grout quantity and pressures controlled to prevent such impact.

A.6 Response to comments made by Gravesham Borough Council

A.6.1 The Gravesham Borough Council position is noted and in particular their agreement with the Applicant's stated position on the ground protection tunnel.

A.6.2 The Applicant submits that any use of grout to improve the ground conditions would be in accordance with the REAC commitments (GS024) to not impact the

North Kent Marshes. Any such grouting would be strictly monitored and grouting pressures controlled to prevent such impact.

- A.6.3 With regard to the Metropolitan Police Firing Range (The Milton Range), the Applicant notes the current presence of the Public Right of Way to the North of the railway line and notes that public safety (and by extension the safety of the Applicants Works) is secured by the presence of a large earth bund running East-West along the Milton Range southern perimeter. This provides an absorption feature specifically to deal with any stray live fire that would otherwise escape the range. The Applicant considers no change to the current Met Police practices and safety controls in this regard are required.

A.7 Response to comments made by Thames Crossing Action Group

- A.7.1 The Thames Crossing Action Group raised a concern regarding “Tilbury Fields being raised” and raised “the impact that the potential water flow would have on the river”.
- A.7.2 The Applicant notes there is no possible or feasible connection between the Tilbury Fields landscape feature on the North side of the river Thames and the North Kent Marshes situated to the east of Coalhouse Fort and to the South of the river Thames.
- A.7.3 Rainfall runoff from the sloping topography of Tilbury Fields would be collected and managed, to discharge within the same catchment as it currently does and ultimately to the River Thames, as it currently does. No additional volumes of runoff would be generated compared to the baseline.
- A.7.4 There will be a construction and operational discharge point into the river Thames beside Bowater Sluice. This discharged will require an environmental permit from the Environment Agency which would serve to ensure that any discharge into the river Thames is appropriate.

Annex B Post-hearing submissions on Agenda Item 4: Tunnel Boring Methodology

B.1 Introduction

B.1.1 This section provides the post-hearing submission for agenda item 4 Tunnel Boring Methodology, from Issue Specific Hearing 5 (ISH5) on the 7 September 2023 for the A122 Lower Thames Crossing (The Project).

B.2 Update on workforce commuting figures

B.2.1 This responds to ISH5 Action Points [\[EV-44a\]](#) Action 4.

B.2.2 This responds to ExA Action Point 4 and provides details of the assessment undertaken by the Applicant to determine what construction traffic modelling phases would see an increase in the workforce, and the consequential impact of the change in workforce on the road network, in particular at the A1089 ASDA roundabout.

B.2.3 The Applicant has provided full details of how the construction scenario assessed in the application has been derived is set out within Chapter 8 of the Transport Assessment [\[REP3-112\]](#), [\[REP3-114\]](#) and [\[REP3-116\]](#).

B.2.4 Revised worker numbers were calculated to examine the changes that would occur in the event of the construction of the Project being undertaken with a single tunnel boring machine instead of two.

B.2.5 Table B.1 shows the change in workers, and the consequential change in trips, for each construction traffic modelling phase at the northern tunnel entrance compound (the only compound to the north of the River Thames that would be affected by a change to a single TBM). Positive numbers with red or yellow shading identify increases in the 1TBM scenario with a single TBM compared to two, (i.e. one TBM has more workers and trips compared to two TBM). Negative numbers with green shading identify decreases (i.e. one TBM has fewer workers and trips compared to two TBM).

Table B.1 Change in workers and trips

	Phase	1	2	3	4	5	6	7	8	9	10	11
Change in workers	Day	0	0	0	0	0	0	0	0	0	0	0
	Extended day	0	0	0	0	0	0	0	0	0	0	0
	24hr shift (per shift)	0	163	40	3	-75	-99	-154	-79	0	0	0
Absolute change in trips	AM origin	0	114	28	2	-52	-69	-108	-55	0	0	0
	AM destination	0	114	28	2	-52	-69	-108	-55	0	0	0
	IP origin	0	114	28	2	-52	-69	-108	-55	0	0	0
	IP destination	0	114	28	2	-52	-69	-108	-55	0	0	0
	PM origin	0	0	0	0	0	0	0	0	0	0	0
	PM destination	0	0	0	0	0	0	0	0	0	0	0
%age change	AM origin	0	107	11	1	-19	-22	-44	-32	0	0	0
	AM destination	0	27	6	1	-10	-14	-26	-17	0	0	0
	IP origin	0	107	11	1	-19	-22	-44	-32	0	0	0
	IP destination	0	57	10	1	-19	-20	-44	-29	0	0	0
	PM origin	0	0	0	0	0	0	0	0	0	0	0
	PM destination	0	0	0	0	0	0	0	0	0	0	0

- B.2.6 All phases apart from construction traffic modelling phase 2 show either a decrease, or a relatively small increase. The change in trips affects only the AM peak and interpeak. There would be no change in the PM peak as a result of shift changeover times not occurring in this time period.
- B.2.7 The Applicant has therefore undertaken an amended run of the LTAM for construction traffic modelling phase 2 to reflect the increase in staff trips.
- B.2.8 It should be noted that no other changes, such as to proposed traffic management measures or changes to the number of HGVs , were made to the model as part of this exercise.
- B.2.9 In construction traffic modelling phase 2, the increase in trips in the AM peak as a result of using a single TBM is shown in Plate B.1, which is an extract from the LTAM. To enable greater clarity, absolute changes less than 10 trips are hidden. Green lines indicate an increase in trips, and blue a decrease, where thicker lines indicate a larger change.

Plate B.1 Change in flow as a result of 1 TBM, AM peak, phase 2

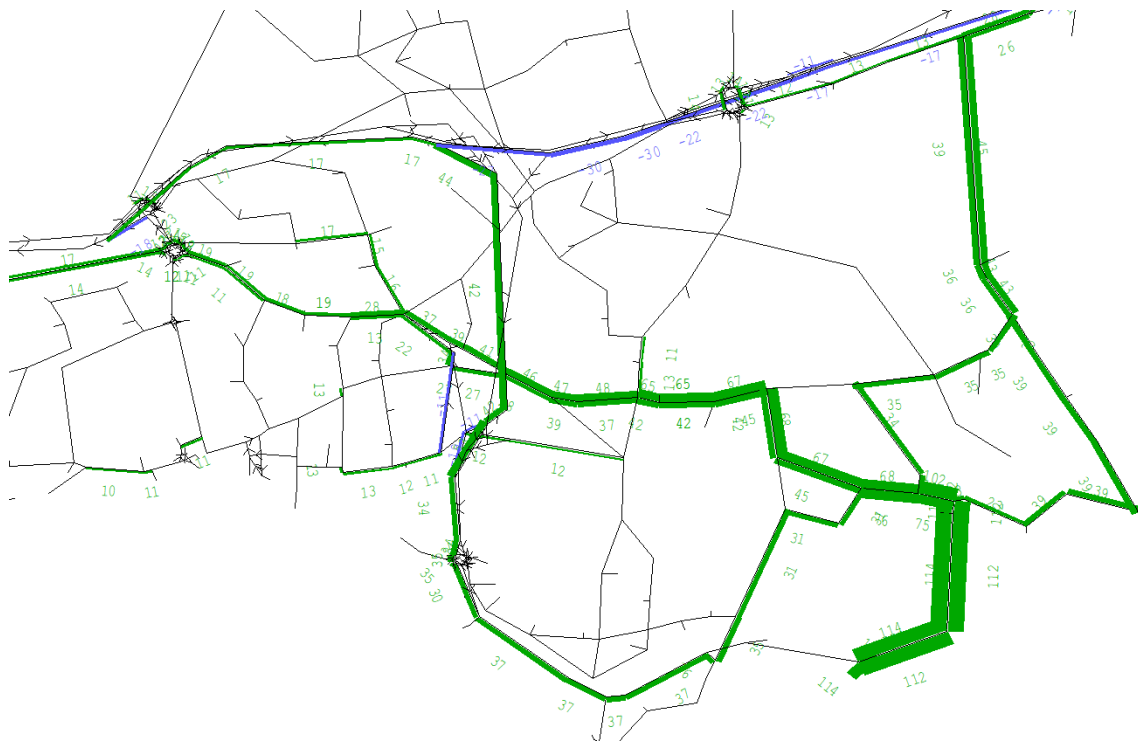
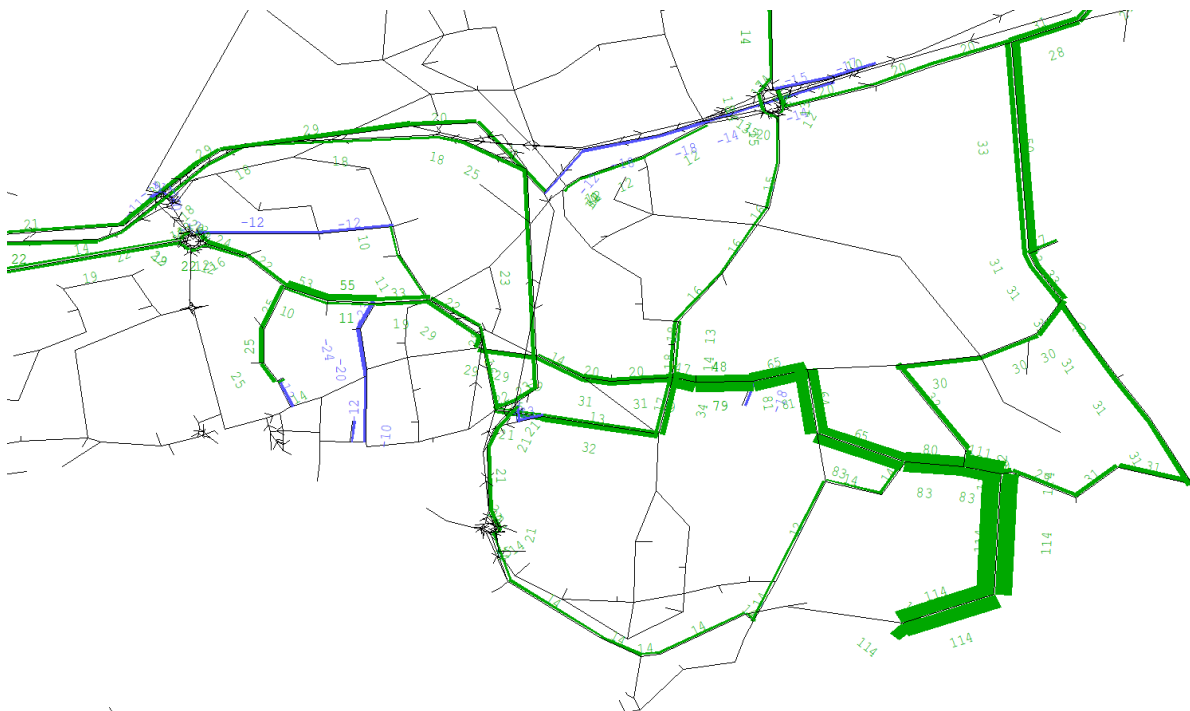


Plate B.2 Change in flow as a result of 1 TBM, Inter peak, phase 2



B.2.10 The plates above show that there would be an increase in flows at the Asda roundabout of approximately 35 PCUs in the AM peak and 22 PCUs in the inter peak. This would result in the total traffic at the Asda roundabout being at a similar level as already assessed for construction traffic modelling phase 3 within the DCO application.

- B.2.11 Given that other construction traffic modelling phases are forecast to have either a reduction or only a very small increase in trip generation as a result of a change to a single TBM, the Applicant considers that the impacts on the road network, including at the Asda roundabout would be similar, or better than, those presented in the DCO application documents.

B.3 Response to comments made by the Port of London Authority

- B.3.1 The Applicant welcomes the PLA's view that "the DCO should maintain complete flexibility, up to the point of it being a closed face machine, so any TBM with closed face and this method of supporting the ground, to me, would be suitable. It shouldn't necessarily be confined to a slurry family."
- B.3.2 The Applicant proposes to include an additional commitment within the Deadline 5 draft of the Code of Construction Practice (Chapter 7 Register of Environmental Actions and Commitments) which secures the use of a closed-face machine and therefore the Applicant's position aligns with the PLA's. The proposed wording is: Construction of the bored section of the highway bored tunnels Work No 4A(i) shall be undertaken using closed face tunnelling techniques.

B.4 Potential notification on commencement / end of tunnelling works to the PLA

- B.4.1 The Applicant notes the Port of London's representation regarding the commencement and end of tunnelling works and would be happy to work with the PLA to ensure that appropriate commitments are contained within the application to ensure that prior notice of works relevant to the PLA and its interest is given. The Applicant has inserted provisions requiring specific notification of both the commencement, and completion, of the tunnelling works as well as notification of a point of contact for ongoing coordination in the construction phase.

B.5 Response to comments made by Thurrock Council

- B.5.1 Thurrock Council noted its broad satisfaction with regard to the Projects approach to water resource management, however, raised a concern regarding some potential challenges with flood risk and drainage arising during tunnelling operations, in particular at the north portal side. The Applicant's position of the contractor preparing site specific flood risk assessments for temporary works was noted but Thurrock Council do not feel that the temporary works plans adequately show how features to manage flood risk and drainage, as well as water treatment, would be located within the compound.

- B.5.2 The Applicant confirms that, as a result of the stage in the design process the details sought are not yet available for inclusion in the works plans. However, robust controls on the management of flood risk and drainage during construction are secured through commitments RDWE001 and RDWE006 within the Register of Environmental Actions and Commitments. Both of the plans/assessments secured by these commitments are to be approved, pursuant to Requirement 8 of the DCO, by the Secretary of State, following consultation with the relevant planning authorities, which for the north portal works would include Thurrock Council. REAC Item RDWE006 also secures the necessary pollution control and water treatment systems necessary at the northern tunnel entrance construction compound.
- B.5.3 A query in terms of how the water would be collected discharged at the bottom of the north portal ramp during operation was also raised by TC, with a request for clarification as to whether drainage from the north portal ramp would be directly to the Thames or to the basins at the north portal junction.
- B.5.4 The Applicant confirms that operational drainage from the north portal approach ramps would be drained to the detention basins at the north portal junction, receiving treatment and attenuation prior to discharge into the receiving water environment.

B.6 Response to comments made by Gravesham Borough Council

- B.6.1 The representative for Gravesham Borough Council raised a query relating to pollution risks to the sensitive habitats located downstream of the proposed southern tunnel entrance construction compound drainage outfall, should an extreme weather event occur during the construction period. Further clarification as to whether there is any mechanism for improving the capacity of the lagoons to cater for extreme events was sought.
- B.6.2 The treatment and runoff attenuation arrangements at the southern tunnel is subject to detailed design, during this design phase, maximisation of storage capacity will be sought, within the constraints of the land available within the Order Limits. Robust controls on the management of drainage during construction is secured through commitment RDWE006 within the Register of Environmental Actions and Commitments. The construction phase drainage plan would be subject to approval, pursuant to Requirement 8 of the DCO, by the Secretary of State, following consultation with the relevant planning authorities. REAC Item RDWE006 also secures that the design for temporary surface water drainage works shall include climate change allowances up to the opening year in accordance with Flood risk assessments: climate change allowances (Environment Agency, 2022) as well as the necessary pollution control and water treatment systems necessary at the northern tunnel entrance construction compound.

- B.6.3 All such attenuation and treatment systems however have an upper limit of capacity that could be exceeded should an extreme storm event occur. In this instance the Contractor would take remedial actions as described in Section 6.9 of the Code of Construction Practice (CoCP) [REP1-157]. The next iteration of the CoCP (the EMP2) will require that Contractors will ensure that emergency preparedness procedures for each worksite are developed, appropriate to the anticipated hazards and specific layouts and the local road network. Section 6.10 of the CoCP describes the procedures that would be in place specifically for environmental incident control. Paragraph 6.10.4 states that in the event of an incident arising, National Highways will work with the Contractors, relevant statutory body and landowners to ensure that appropriate preventative and corrective action is taken.

B.7 Response to comments made by Thames Crossing Action Group

- B.7.1 The Applicant notes the concern highlighted by the Thames Crossing Action Group in relation to engagement with the community. In response, the Applicant would highlight Chapter 5 of the Code of Construction Practice (CoCP) [REP3-104] presents the approach to communication and community engagement. This includes a commitment for National Highways to develop a Communications Engagement Strategy and the contractors to develop Engagement and Communication Plans. Details of the content of the Engagement and Communication Plans are set out in Section 5.2. Community Liaison Groups will be developed to ensure that local residents are informed of construction activities.

B.8 Response to comments made by Shorne Parish Council

- B.8.1 Concerns were raised regarding the rainfall runoff generated in the southern tunnel entrance compound and its associated risks of pollution. The Council representative noted that no risk exists presently, as the land is fields in cultivation, and that introducing hardstanding and the parking and movements of vehicles and construction plant introduces a risk of pollution to the local aquifers.
- B.8.2 Runoff from these areas of hardstanding and parking would be collected and encouraged to infiltrate to ground via vegetated soakaways, for example, swales. These are a recognised form of Sustainable Drainage System and provide for removal of sediment and particle-bound pollutants via physical, chemical, and biological processes. This is secured through commitment RDWE006 within the Code of Construction Practice which states that that work site drainage systems would incorporate pollution control systems designed in line with Control of Water Pollution from Construction Sites C532 (CIRIA, 2001)

or as agreed with the Secretary of State. The risk of pollution of underlying local aquifers would therefore be negligible. The Applicant also notes that commitment RDWE002 secures that work site drainage systems would be regularly inspected and maintained to ensure they continue to operate to their design standard, safeguarding surface and groundwater quality.

- B.8.3 The second point linked to the drainage arrangements from the chalk storage areas within the southern tunnel entrance compound. The Parish Council claimed that the area that is proposed to accommodate the drainage treatment lagoons is prone to flooding in winter and that the arrangements remain vague.
- B.8.4 The Applicant notes these concerns and clarifies that, the treatment systems lagoons have been situated to take advantage of the sloping topography of the compound site in order to put in place a gravity based drainage system, rather than a less sustainable pumped regime. Whereas presently the area proposed to accommodate the attenuation and storage systems is prone to waterlogging in winter, as it represents a low spot on in the fields that are not served by formal drainage system, this regime would change and the risk of flooding in this area would be reduced by provision of the drainage systems that would serve the compound.
- B.8.5 Whilst the treatment arrangements are subject to detailed design, two parallel arrays of 5no. treatment lagoons, with average depth of 1.5m, are envisaged, with one array on-line and one undergoing cleaning/maintenance to assist in management of the overall system. In more extreme rainstorms both arrays could be filled to provide additional storage capacity.

Excavated material at South Portal

- B.8.6 At Issue Specific Hearing 5, Councillor Susan Lindley raised a question about the existence of chalk stockpiles to the east of the tunnel portal being left in situ for a long time and being gradually removed to landfill. Councillor Susan Lindley could not find anything further about the above in the submitted DCO documents and therefore asked for clarification on her point raised.
- B.8.7 Prior to the 2021 Community Impact Consultation the proposed Project earthworks strategy included a three-year post construction movement of surplus excavated material from the southern tunnel entrance compound to an off-site receiver site via the road network. As part of the design maturity and improved earthworks approach, the Applicant has significantly reduced surplus excavated materials while maximising their reuse within the design, resulting in an enhanced earthworks strategy. The position Councillor Susan Lindley is referring to has been superseded by an enhanced earthwork approach that removes the need for post-construction removal of surplus excavated materials. The outline earthworks strategy is detailed in 6.3 Environmental Statement - Appendix 2.2 - Code of Construction Practice, First iteration of Environmental Management Plan - Annex B - Outline Materials Handling Plan [[APP-338](#)].

- B.8.8 A significant part of the design development is the inclusion of Chalk Park. Chalk Park was introduced to the public as a change to the Project's South Portal design proposals in the Supplementary Consultation, which ran between January 2020 to March 2020. An 'Environmental Impacts Update' was included in the consultation material which presented an assessment of potential environmental effects associated with Chalk Park, relative to the conclusions of the Preliminary Environmental Information Report (PEIR).
- B.8.9 Table 7.1 in 6.3 Environmental Statement - Appendix 2.2 - Code of Construction Practice, First iteration of Environmental Management Plan - Annex B - Outline Materials Handling Plan [[APP-338](#)] clarifies that minimal excavated material will be leaving site at the South Portal. This means a reduction in HGV movements and associated impacts.
- B.8.10 The Applicant has set out an improved earthworks approach which means all activities can be managed within the construction period as set out in 6.1 Environmental Statement - Chapter 2 - Project Description [[APP-140](#)], Chapter 7 and Table 7.1 of 6.3 Environmental Statement - Appendix 2.2 - Code of Construction Practice, First iteration of Environmental Management Plan - Annex B - Outline Materials Handling Plan [[APP-338](#)].
- B.8.11 Additional Submission - 6.3 Environmental Statement - Appendix 2.1 - Construction Supporting Information [[AS-049](#)] shows indicative layouts of the South Portal compounds with areas designated for stockpiling within Order Limits.
- B.8.12 Best practice excavated material and soil handling would be implemented by the contractor throughout the construction of the Project. These are secured through commitments detailed in Deadline 1 Submission - 6.3 Environmental Statement Appendices Appendix 2.2 – Code of Construction Practice, First Iteration of Environmental Management Plan (Clean version) [[REP1-157](#)] and include the following:
- i. REAC Ref MW010 and MW016;
 - ii. REAC Ref AQ003 and AQ005;
 - iii. REAC Ref GS009, GS013 and GS029;
 - iv. REAC Ref LV008 and LV009; and
 - v. Section 7.3 of 6.3 Environmental Statement - Appendix 2.2 - Code of Construction Practice, First iteration of Environmental Management Plan - Annex B - Outline Materials Handling Plan [[APP-338](#)].

B.9 Response to comments made by Northumbrian Water

- B.9.1 Essex and Suffolk Waters point of view is that it can only supply the amount of water that it is entitled to abstract under its abstraction licence for the Linford

well, and it is heartened to see that the Applicant has recognised that in the REAC, in Appendix 2 of 15 document APP-336, in their commitment RDWE003, so from that point of view, Essex and Suffolk doesn't have a concern as to the quantity of water seeking to be taken from the Linford well. They noted that there have been productive discussions with the applicant as recently as late August in which concerns about the arrangements that are being negotiated in a separate agreement about water supply and water arrangements and timings and so on were helpfully discussed. They were reassured from what was said in the meetings that we are heading to a successful conclusion on matters that we're concerned about. On dewatering from the tunnel particularly, there are no concerns.

- B.9.2 We welcome the comments about the positive engagement which is reflective of our experience. The draft agreement to which was mentioned has subsequently since the hearing been returned to Essex and Suffolk Water for consideration and a further meeting has been arranged to discuss the agreement.

B.10 Response to comments made by Environment Agency

- B.10.1 The Applicant welcomes the Environment Agency comments on the extensive work carried out with the Applicant on the extent of the ground investigations and the Hydrogeological Risk Assessment, and that they are satisfied with what is being proposed in terms of dewatering mitigations.
- B.10.2 The Applicant acknowledges that dewatering will require permitting and that this will be dealt at the detailed design stage.
- B.10.3 The Examining Authority asked the Environment Agency view as to whether it was necessary to tie down the use of a closed face tunnel boring methodology. We acknowledge the Environment Agency reply to welcome the Applicant's decision to take this point away and their willingness to enter discussions with the Applicant should a different approach result in material changes to the hydrogeological risk assessment. The Applicant proposes to include a commitment which secures the use of a closed-face machine and therefore the Applicant's position aligns with the Environment Agency's representation. This would be included in the Deadline 5 version of the Code of Construction Practice. Draft wording of the commitment is 'Construction of the bored section of the highway bored tunnels Work No 4A(i) shall be undertaken using closed face tunnelling techniques.'. See Annex A.2 above for further commentary.

B.11 Position on water and electricity usage during tunnelling

- B.11.1 The Applicant would like to re-affirm that utility supplies to customers from the existing utility networks are not envisaged to be adversely impacted during the

construction and operation of the Project. Any impact to the network is expected to be in keeping with that experienced by those customers now whilst the utility network owners and operators undertake operation, maintenance and other improvement works.

- B.11.2 The Applicant has noted in the Environmental Statement Chapter 2 – Project Description [APP-140] the intent and measures within the application to achieve this with its overarching principle stated at paragraph 2.4.105:

“The proposals have sought to strike a balance between the needs of the Project and the asset owner by ensuring customer supply is maintained and that the utility network owner does not adopt an asset where its operation and maintenance would be less efficient or more onerous than at present.”

- B.11.3 The Applicant has developed its proposals via a prolonged and where required, extensive period of engagement with the utility network owners and operators, which will continue during the detailed design development and construction phase, as noted at paragraph 2.7.188 & 2.7.189 [APP-140].

“The appropriate treatment of the asset, whether it requires diversion or protection, has been determined with the relevant asset owner who has assessed the ability to operate and maintain their network during construction and operation of the new road. This has included a compliance check against industry standards, to minimise risk to their asset, their customers and to the Project workforce.

Trenches and chambers may need to be constructed so that utility assets such as cables and pipelines can be installed. This would be completed in close coordination with the respective utility providers to ensure that the works comply with their requirements. Disruption of existing services would be reduced by planning the construction works programme in liaison with the utility providers. This would enable the efficient diversion of utilities and reduce disruption to the many customers of these utility companies.”

- B.11.4 The disruption to utility networks will be appropriately managed with the owners and operators in accordance with the agreed Protective Provisions which are contained within Part 1, Part 2, Part 5, Part 6 and Part 7 of Schedule 14 of the draft Development Consent Order [REP3-077]. These Protective Provisions are in place to ensure the interests of those utility network owners and operators are protected. This risk will be assessed as part of the detailed design and construction proposals, as stated at paragraph 2.5.16 [[APP-140].

“The contractor would have the duty to identify hazards, assess risks and consider means to control the risk exposure. This would include consideration of potential hazards associated with safety and the performance and operation of other infrastructure, such as roads, railways and utility networks.”

- B.11.5 It is of note that the utility network owners and operators will be consulted before any works are completed that may affect their networks, with approval

from those companies being obtained following their own review period, to ensure that they are not carrying out their duties in accordance with their relevant regulatory authority (OFWAT, OFGEM, OFCOM). The application contains adequate provisions in which those detailed designs and programmes can be developed, as stated at paragraph 2.2.8 and paragraph 2.7.332(f) [APP-140]:

“2.2.8 Where the Project would require utilities assets to be diverted or protected, this has been designed to be compliant with industry codes of practice, standards, legislative requirements and the utilities providers’ specific standards and guidance.”

“2.7.332(f) Specific utilities works would require extended working hours to reduce risk and minimise disruption to the public, transport or utility networks. These works could include trenchless installation of cables and pipework and/or works within the boundaries of existing roads, railways and other constraints. These specific works are identified in Appendix 2.1: Construction Supporting Information (Application Document 6.3).”

- B.11.6 As regards residents within proximity to the utility supplies for the tunnel boring machine (TBM), the Applicant has developed sufficient proposals with UK Power Networks and Essex & Suffolk Water to ensure power and water (respectively) can be provided for the use of the TBM without having an impact on the existing water and electricity networks.
- B.11.7 As noted at paragraph 2.6.138(a) [APP-140], *“Work number MUT4 would require the installation of cables connected to the existing 132kV overhead powerline network and the Tilbury Substation to Work number MUT5. Work number MUT5 would require the installation of a 60MVA substation. These works are to provide electricity supply to the tunnel boring machinery.”*
- B.11.8 The Applicant would further note a response to Thurrock Council’s comments at item 2.1.267 contained within the Statement of Common Ground between the parties [REP3-092] concerning the impacts of electricity demands envisaged by the Applicant:
- “The Project requires power to enable its construction and operation. The legal powers to carry out works to supply energy for the construction and operation of the Project are sought and have been assessed within the DCO application. The anticipated demand has been discussed and secured with UK Power Networks (UKPN) who are the distribution network operator and have a statutory duty to manage the demands on those networks. The Project continues to liaise with UKPN to understand any conflicts or impacts with other developers’ proposals and any opportunities to release secured capacity back to the network. The Project contributes to the operation and maintenance of the electricity infrastructure via the payment of its electricity bill which has been considered as part of the Project costs.”*

- B.11.9 With regards to water supply and water resource management, as noted above, *the water supplied to the tunnel boring machinery will be groundwater abstracted from a Northumbrian Water borehole at Linford and provided through a pipeline to the site (Work No MUT6). Extraction rates would be agreed with Northumbrian Water prior to commencement of main tunnelling works and the supply of groundwater would be within the limits of the existing groundwater abstraction licence (ES Appendix 2.2 – Code of Construction Practice [\[REP1-157\]](#) REAC RDWE003).*
- B.11.10 This supply to the TBM via Work No MUT6 would be raw water. In the eventuality that this water supply would not be available, potable water can be supplied via a pipeline that forms part of the permanent water supply to the northern tunnel portal building via Work No MU29. In both instances, it is envisaged that there would be no impact to the existing potable water supply for residents and customers within the region.

Annex C Post-hearing submissions on Agenda Item 5: Monitoring

C.1 Introduction

- C.1.1 This section provides the post-hearing submission for agenda item 5 Monitoring, from Issue Specific Hearing 5 (ISH5) on the 7 September 2023 for the A122 Lower Thames Crossing (The Project).

C.2 Response to comments made by the Emergency Services Steering Group

- C.2.1 In response to ISH5 Action Point 5, the Applicant has provided commentary in respect of the Emergency Preparedness Plan within the Code of Construction Practice [REP1-157] for unexploded ordnance. This includes commitments and timings of evacuation plans, the authorities who authorities/services who should be notified/consulted in respect of the response procedures; and notification/consultation commitments for the emergency procedures with the authorities. The Applicant considers the response to Action Point 5, set out in Annex C of the Cover Letter and Submissions for Deadline 4 [Document Reference 9.74], provides necessary clarifications for the Group.

C.3 Response to comments made by the Port of London Authority

- C.3.1 The PLA stated that “seeking to address two main things. Firstly, to make sure that risks do not materialise, and secondly, that if they do, they are properly dealt with, and on the first, the applicant has mentioned today – and in the tunnel depth report – that the PLA can improve the tunnel design to resolve the fact that risks might materialise.” The Applicant has inserted provisions in the dDCO to manage these risks, and is awaiting comments from the PLA on these matters.

C.4 Response to comments made by the Thames Crossing Action Group

- C.4.1 Please see section 4.1.7.5. of the main note for a response to the points made by Thames Crossing Action Group.

Annex D Post-Hearing submission on Agenda Item 6: Unexploded Ordnance

D.1 Introduction

D.1.1 This section provides the post-hearing submission for agenda item 6 Unexploded Ordnance, from Issue Specific Hearing 5 (ISH5) on the 7 September 2023 for the A122 Lower Thames Crossing (The Project).

D.2 Response to comments made by Thames Crossing Action Group

D.2.1 At Issue Specific Hearing 5, Ms Blake indicated that the applicant did not acknowledge information that members of the community had presented about the potential location of UXO in South Ockendon.

D.2.2 On 8 September 2020, the Applicant received an email from the Thames Crossing Action Group outlining its concerns about potential UXO in South and North Ockendon. On 10 September, the applicant responded to the email indicating that a desktop assessment on UXO around the site in question had been carried out and it had been assessed as Low Risk. Several emails were exchanged on the topic culminating in Ms Blake issuing a Freedom of Information request for UXO assessments. Ahead of sharing the *Lower Thames Crossing – UXO Desk Study & Risk Assessment*, the Applicant emailed an extract of information relating to the area of concern, which was derived from the report to the Thames Crossing Action Group. On 25 November 2020 the full *Lower Thames Crossing – UXO Desk Study & Risk Assessment* was provided to Ms Blake following the FOI request.

D.2.3 The Applicant acknowledged TCAG feedback on this matter and, to the Applicant's knowledge, has responded to TCAG and Ms Blake's correspondence on this matter.

D.2.4 The *Lower Thames Crossing – UXO Desk Study & Risk Assessment* is a comprehensive assessment of potential risks and issues concerning unexploded ordnance in the area of relevance to the Lower Thames Crossing DCO Application. The *Lower Thames Crossing – UXO Desk Study & Risk Assessment* methodology is robust, conforms to industry standards and is recognised it adheres to relevant guidance.

D.3 Response to comments from Thurrock Council

D.3.1 The representation by Thurrock Council does not relate to Unexploded Ordnance so has not been addressed in this section.

D.4 Response to comments from Gravesham Borough Council

- D.4.1 The Applicant notes Gravesham Council’s representation regarding Unexploded Ordnance.
- D.4.2 In response to ISH5 Action Point 5, the Applicant has provided commentary in respect of the Emergency Preparedness Plan within the Code of Construction Practice [\[REP-157\]](#) for unexploded ordnance. This includes commitments and timings of evacuation plans, the authorities who authorities/services who should be notified/consulted in respect of the response procedures; and notification/consultation commitments for the emergency procedures with the authorities. The Applicant considers the response to Action Point 5, set out in Annex C of the Cover Letter and Submissions for Deadline 4 **[Document Reference 9.74]**, provides necessary clarifications for Gravesham Borough Council.

D.5 Response to comments made by Port of London Authority

- D.5.1 The PLA raised queries in relation to the management of UXO in the context of the future use of the river Thames. The Applicant has inserted provisions in the dDCO to manage these risks, and is awaiting comments from the PLA on these matters.

D.6 Response to comments made by the Marine Management Organisation

- D.6.1 In response to ISH5 Action Point 5, the Applicant has provided commentary in respect of the Emergency Preparedness Plan within the Code of Construction Practice [\[REP-157\]](#) for unexploded ordnance. This includes commitments and timings of evacuation plans, the authorities who authorities/services who should be notified/consulted in respect of the response procedures; and notification/consultation commitments for the emergency procedures with the authorities. The Applicant considers the response to Action Point 5, set out in Cover Letter and submissions for Deadline 4 **[Document Reference 9.74]**, provides necessary clarifications for the Marine Management Organisation.

Annex E Post-hearing submission on Agenda Item 7: Construction Compound Matters

E.1 Introduction

E.1.1 This section provides the post-hearing submission for agenda item 7 Construction Compound Matters, from Issue Specific Hearing 5 (ISH5) on the 7 September 2023 for the A122 Lower Thames Crossing (The Project).

E.2 Response to comments made by Thurrock Council and the PLA on River Use

- E.2.1 In reference to the concern raised about the adequacy of the Applicant's response to Thurrock Council regarding river use, the Applicant notes that this issue has been discussed during technical engagement sessions and through written correspondence in response to queries presented in the Local Impact Report (LiR). The Applicant has addressed these matters, and the responses can be found in the LiR, specifically in Section 9.54 Comments on LiRs Appendix H – Thurrock Council (Part 4 of 5) [REP2-065], under the item titled "Applicant Response to pages 237-239".
- E.2.2 Notwithstanding the proximity of the North Portal site to the river it has no integral jetty access within the Order Limits. The existing jetty is unsuitable and in any event is excluded from within the Order Limit by agreement with Port of Tilbury London Limited to allow the Freeport development plan to come forward unhindered.
- E.2.3 Deliveries by river therefore have to come into other existing jetty / wharf / Port facilities and complete the journey by road.
- E.2.4 The Applicant has committed to 80% by weight of bulk aggregate and has offered a "better than baseline" commitment as part of the outline Materials Handling Plan to encourage further use of the river.
- E.2.5 The Applicant considers this to be a significant commitment and does not consider widening this commitment to include other materials and plant to be either sensible or deliverable. Major Plant suppliers in proximity to the site in Essex and Greater London (for example) would have to move plant to the river by the road network, transport either up or down river as appropriate and then double handle to make the final movement to site from the arrival river facility by road. This is not considered to be beneficial to the environmental position.

- E.2.6 The situation is similar on the south bank of the river Thames in that the site has no direct access to jetty / wharf or Port Facilities. The southern compounds are not proximate to the river and for the same reasons as stated above Plant suppliers in Kent and the wider South East would have to move product by road to the river, transport and then double handle to site.
- E.2.7 The southern compounds are proximate to the Strategic Road Network and the A2 / M2 corridor in particular.
- E.2.8 Therefore the Applicant does not consider any further commitment to use of the river to be either sensible or deliverable.

E.3 Response to comments made by Gravesham Borough Council

- E.3.1 In response to the overarching comment that the Applicant's response to the concerns raised on matters related to material handling in the Gravesham Local Impact Report, the Applicant has engaged with Gravesham Borough Council in a meeting on 18th September 2023. Following this meeting Gravesham Borough Council has confirmed they will submit a written representation at deadline 4, explaining the specifics of their concerns regarding material handling. The Applicant is committed to ongoing engagement with Gravesham Borough Council, to jointly address these concerns.

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