Chapter Seventeen ◆ Water Resources and Flood Risk

INTRODUCTION

17.1 This chapter of the PEIR assesses the likely environmental effects of the Proposed Development with respect to water resources and flood risk. This chapter also describes the methods used to assess the effects, the baseline conditions existing at the Project Site and surrounding area, the mitigation measures required to prevent, reduce or offset any significant adverse effects, and the likely residual effects after these measures have been adopted.

17.2 This chapter covers matters relating to a number of different aspects of water resources and the water environment. These include:

- Flood risk management;
- Surface water drainage
- Foul drainage;
- Water resource management;
- Water quality and commitments to the water framework directive (WFD); and
- Maritime infrastructure.

17.3 The chapter considers water resources and flood risk at both the Kent Project Site which includes the main resort and access corridor, and the Essex Project Site at Port of Tilbury.

17.4 A flood risk assessment (FRA) covering both Kent and Essex Project Sites is being prepared in accordance with the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government (MHCLG), 2018) and consultation with the Environment Agency (EA). A FRA will accompany the ES as an Appendix. A drainage strategy for both the Kent and Essex Project Sites is also being prepared for the masterplan development, which provides information on how surface water from the Proposed Development will be managed to ensure existing surface water management and flood risk are not compromised. The drainage strategy will include proposals for the management of foul water from the development. In relation to water quality, a Water Framework Directive (WFD) assessment is being prepared. The WFD assessment will accompany the ES as an Appendix.

17.5 A separate assessment of the potential effects on groundwater resources and groundwater quality is provided in Chapter 18 Soils, hydrogeology and ground conditions.

A summary of existing conditions on groundwater will also be provided within this chapter, primarily to identify the links between groundwater and surface water effects. Aquatic ecological issues are also addressed separately in Chapter 12 Terrestrial and freshwater ecology and biodiversity and Chapter 13 Marine ecology and biodiversity.

METHODOLOGY AND DATA SOURCES

EIA Scoping

17.6 A formal request for a scoping opinion was submitted to the Secretary of State (SoS) in June 2020. The water resource-related responses that come out of the scoping process will be presented in the ES and will be covered in the scope of the assessment of water resources and flood risk and supporting the flood risk management and drainage strategies, and Water Framework Directive assessment.

17.7 Consultation has been undertaken with the key stakeholders during the previous scoping stage in 2014 for the Kent Project Site. Their comments can be found in Table 17.1. the responses obtained during this previous process have been used to inform the approach to date, as well as the ongoing consultation currently underway.

Table 17.1: 2014 scoping opinion comment and response.

Paragraph Number in the 2014 Scoping Opinion Report	Summary of scoping opinion comment	2020 Response
3.31	The Flood Risk Assessment which should be appended to the ES should include stakeholder consultation with EA, Thames Water, LPA, Southern Water, and HS1. The FRA should cover tidal flood risk as well as fluvial impacts including breaching and overtopping. Impact on local water courses should include the Ebbsfleet Stream and existing water management strategies.	Since the 2014 submission consultation has been undertaken with various stakeholders indicated. See section 17.8 for further details. Breach modelling has been undertaken and will be updated to include latest sea level rise scenarios. Impact on existing water courses will be considered. An FRA is being prepared which will be appended to the ES Water Resources and Flood Risk chapter and will include aspects requested in the comment.

Paragraph Number in the 2014 Scoping Opinion Report	Summary of scoping opinion comment	2020 Response
3.32	The impacts of raising flood defences, compensatory water storage and raising of ground levels should be fully considered with appropriate reference to other topics. The intention to include sustainable drainage systems including rainwater recycling, green roofs, swales and other open features is welcomed. The EIA will need to fully assess the impacts and opportunities for environmental enhancement associated with these elements.	The FRA will consider the impacts of raising defences on the development and surrounding area as well as the wider benefits of flood risk and stormwater management for environmental enhancement.
3.33	Potential impacts on the public sewer network should be addressed, including easements and vibration during construction works. Comments from DBC and GBC should be considered when assessing existing drainage arrangement and other infrastructure in the area.	The potential impacts on the public sewer network will be fully assessed in the water resources ES chapter. As identified in paragraphs 17.146 and 17.176, potential impacts including increase in sediment loads during construction, increased operational flows and capacity to manage them, and risk of leaks or breakage of temporary sewer systems will be assessed. The impact of vibration during construction works will be addressed within the Noise and Vibration ES Chapter.
3.34	This chapter should be cross-referenced with the Soil and Ground Conditions topic as groundwater is a potential pathway for discharge of pollutants to surface and coastal waters. Ecological surveys may inform baseline and potential monitoring of water quality. Buried cultural heritage assets should be considered as receptors for potential impacts on water quality. Impact of dredging on marine water	Potential and risk of release of pollutants into surface waters and sewerage systems will be assessed within the water resources EIA chapter and has been identified in this chapter as a potential impact. The Soil and Ground Conditions ES chapter will assess pollution and contamination risks associated with groundwater. The impact of dredging on marine

Paragraph Number in the 2014 Scoping Opinion Report	Summary of scoping opinion comment	2020 Response
	quality and disposal of material should also be addressed.	water quality will be assessed in this water resources ES chapter.
3.35	It should be made clear how the Water Framework Directive will be taken into account in the assessment.	Current water quality classifications as well as targets for future cycles have been considered in relation to sensitivities and potential impacts on receptors covered under the WFD (River Thames and River Ebbsfleet in previous WFD cycle).
3.36	Mitigation measures should be addressed, and reference made to other regimes such as pollution prevention. Ongoing monitoring should be addressed and agreed with relevant authorities to ensure that any mitigation measures are effective.	A programme of water quality monitoring has been agreed with the EA and is underway. Mitigation measures will be fully addressed within the ES chapter and will aim to reduce any potentially significant impacts to minor or negligible levels.

Consultation

17.8 Consultation is ongoing with the Environment Agency (EA), Essex County Council (ECC), Thurrock Council (TC), Kent County Council (KCC), Thames Water (TW), Southern Water (SW), Anglian Water (AW), Essex and Suffolk Water (ESW), Thames Clipper (TC), Port of Tilbury (PoT), Port of London Authority (PLA) and the Marine Management Organisation (MMO). Table 17.2 summarises the consultation carried out to date relevant to the water resources and flood risk chapter.

Table 17.2: List of consultation undertaken relevant to water resources and flood risk.

Stakeholder	Consultation date	Comment
Environment Agency	27/03/2020	Introductory call
Environment Agency	23/06/2020	Consultation with the EA with regard to flood risk for both the Kent and Essex Project Sites.
Environment Agency	09/07/2020	Consultation with the EA with regard to water quality and WFD.
Thames Water	03/04/2020	Discussion regarding supply of potable water to Kent Project Site.
Thames Clipper and Port of Tilbury	03/04/2020	Discussion regarding proposals at the Kent and Essex Project Sites.
Port of London Authority (PLA)	06/04/2020	Discussion regarding navigation aspects at the Kent and Essex Project Sites.
Southern Water	16/06/2020	Discussion regarding treatment of wastewater from Kent Project Site.
PLA	19/06/2020	Further discussions regarding marine strategy at Kent and Essex Project Sites.
Anglian Water	25/06/2020	Discussion regarding drainage at Essex Project Site.
Marine Management Organisation (MMO)	02/07/2020	Discussion regarding marine strategy and requirements at the Kent and Essex Project Sites.

Baseline study methodology

17.9 The baseline assessment covers the Project Site and surrounding areas that may impact the Proposed Development or be susceptible to impact as a result of the Proposed Development; this includes major water bodies (i.e. the River Thames and River Ebbsfleet) within a material distance of the Project Site, as deemed by the assessment author. The baseline review will take into account the following baseline scenarios:

- Existing baseline, or the assessment baseline (conditions in 2020 – when the assessment is made); and

- Future baseline (conditions in 2024 – the year of opening of Gate 1 and for the design life of the development).

17.10 It should be noted that the future baseline accounts for how existing baseline conditions

could change by the year of completion, in the absence of the Proposed Development, and is referred to as the 'Do Nothing' scenario.

17.11 The methodology adopted in this assessment involves the following:

- Review of international, national and local legislation, policies and guidelines in relation to water resources, water quality and flood risk;
- Establishment of baseline conditions on and around the Project Site through literature review and analysis of existing data obtained from the EA and TW Utilities Limited (TWUL), AW, SW and ESW;
- Identification of sensitive receptors through desk study and consultations with the EA as reported within the FRA for the Proposed Development, and with TW as reported in the drainage strategy for this Proposed Development;
- Identification of risks to water quality, water resources and flooding from Proposed Development and hence the likely effects, magnitude of change and significance of environmental effects during both the demolition/construction and operational phases;
- Development of mitigation strategies through consultation with the design team;
- Identification of opportunities for enhancement of surface water quality and surface water management through design and mitigation; and
- Identification of residual effects and identification of cumulative effects.

Assessment of effects

Receptor sensitivity

17.12 A qualitative assessment of receptor sensitivity is described in Table 17.3.

Table 17.3: Criteria for determining receptor sensitivity.

Sensitivity	Criteria
High	Water body of high amenity value, including areas of bathing and water sports are regularly practiced. Water body of good or high chemical or ecological status. Includes designated bathing waters, shellfish and salmonid fisheries. A source used for public water supply or designated as a source protection zone. Site of Special Scientific Interest (SSSI), Special Protection Area (SPA)/Special Area of Conservation (SAC), Ramsar site or highly sensitive aquatic ecosystem. Water bodies currently failing water quality objectives.

	Areas which are highly vulnerable. With reference to flood risk. These can include essential infrastructure, emergency services and basement dwellings.
Moderate	Water body of moderate amenity value including public parks, boating, non-contact sports, popular footpaths adjacent to water courses, or watercourses running through housing developments/town centres. Water body of moderate ecological status and/ or non - public water supply or cyprinid fishery. Water body of nature conservation importance at the regional level or a moderately sensitive aquatic ecosystem e.g. Site of Nature Conservation Interest (SNCI). Areas which are more vulnerable. With reference to flood risk, these can include hospitals, residential units, educational facilities and waste management sites.
Low	Water body of poor ecological status. A source in close proximity to a source protection zone or abstraction point. Water body of particular local social/cultural/educational interest. Water body of low amenity value with only casual access, e.g. along a road or bridge in a rural area. Areas which are less vulnerable. With reference to flood risk, these can include retail, commercial and general industrial units, agricultural/forestry sites and water/sewage treatment plants.
Negligible	Low sensitivity aquatic ecosystem. Water of poor ecological status. Water body of no amenity value, seldom used for amenity purposes, in a remote or inaccessible area. Areas that are considered to be water compatible. With reference to flood risk, these can include flood control infrastructure, docks/marinas, pumping stations and recreational/landscape areas.

Magnitude of change/impact

17.13 The qualitative criteria used to assess how far an effect deviates from the baseline condition, i.e. the magnitude of change are described in Table 17.4.

Table 17.4: Criteria for determining effect magnitude

Magnitude	Criteria
Large	Wholesale changes to the watercourse, alignment or hydrology. Significant changes to soil erosion or sedimentation patterns. Major changes to the water chemistry of surface run-off and groundwater. Changes to site resulting in an increase in discharge/run-off with flood/sewerage exceedance potential. A large increase to flood risk of water bodies and areas downstream. A large risk of flooding to site infrastructure and users, as determined by an on-site FRA in accordance with NPPF.
Medium	Some fundamental changes to the watercourse and hydrology. Moderate

	changes to soil erosion or sedimentation patterns. Moderate changes to the water chemistry of surface run-off and groundwater. Changes to site resulting in an increase in discharge/run-off within system capacity. A medium increase to flood risk of water bodies and areas downstream. A medium risk of flooding to site infrastructure and users, as determined by an onsite FRA in accordance with NPPF.
Small	Minor changes to the watercourse. Minor changes to soil erosion or sedimentation patterns. Minor changes to the water chemistry of surface run-off and groundwater. Changes to site resulting in slight increase in discharge/run-off well within drainage system capacity. A small increase to flood risk of water bodies and areas downstream. A small risk of flooding to site infrastructure and users, as determined by an onsite FRA in accordance with NPFF.
Negligible	No change to the watercourse, run-off and soil erosion and sedimentation patterns and water chemistry. Very minor to no change in discharge run-off and increased pressure on sewer capacity. No increased flood risk to water bodies and areas downstream. No risk of flooding to site infrastructure and users, as determined by an onsite FRA in accordance with NPPF.

Significance evaluation

17.14 The significance of a potential effect is derived by considering both the sensitivity of the feature and the magnitude of change, as demonstrated in Table 17.5.

Table 17.5: Matrix for determining effect significance

		Magnitude of change / impact			
		Large	**Medium**	**Small**	**Negligible**
Receptor value	**High**	Major	Major	Moderate/Minor	Negligible
	Moderate	Major	Moderate	Minor	Negligible
	Low	Moderate/Minor	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

17.15 Note that moderate and major effects are considered to be 'significant'. Where the determination falls in the category of 'moderate' or 'minor' the determination is based on the professional judgment of the assessor with justification provided in the assessment.

Surveys relevant to water resources and flood risk

- A CCTV drainage survey will be undertaken to examine condition of current drainage systems and the source of offsite flows into the system in the Kent Project Site. This will be undertaken before detailed design is finalised;

- A water quality survey on the Kent Project Site is proposed. This will comprise monitoring of water quality in the surface water bodies across the Kent Project Site as well as ground water. The monitoring will inform the baseline conditions as well as monitoring pre- during- and post-construction and will be reported on in the ES submitted as part of the DCO application.

Assessment limitations (technical deficiencies or lack of knowledge)

17.16 The water environment is well understood for the purpose of this assessment.

17.17 The understanding with regard to flood risk, foul water drainage and surface water drainage has been informed through a number of best practice modelling techniques, to produce the best accurately available baseline and future scenario.

RELEVANT LAW, POLICY AND GUIDANCE

17.18 The legislation, policy and guidance that has influenced the assessment is listed below.

Law

- The Water Resources Act (1991);
- The Water Resource Management Act (Amendment) (England and Wales) Regulations (2009);
- The Water Act (2014);
- The Environment Act (1995);
- The Environmental Protection Act (1990);
- Flood and Water Management Act (2010);
- The Anti-Pollution Works Regulations (1999);
- The Water Supply (Water Quality) Regulations (2016);
- The Control of Pollution (Oil Storage) (England) Regulations (2001);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations (2003);
- The Environmental Damage Regulations (2009);

- The Environmental Permitting (England and Wales) (Amendment (No. 2) Regulations (2016);

National policy and guidance

17.19 National Policy Statements (NPS) set out the need for and government's policies to deliver Nationally Significant Infrastructure Projects (NSIPs) in England. Chapter three of this scoping report explains that there is no NPS for business and commercial NSIP projects. However, to the extent that the Proposed Development includes transport and highways infrastructure regards will be had to relevant policy in the NPS for National Networks (NPS NN), including:

- Environmental and Social Impacts (NPS NN paragraphs 3.2 to 3.5).
- Climate Change Adaptation (NPS NN paragraphs 4.36 to 4.47).
- Pollution Control and other Environmental Protection Regimes (NPS NN paragraphs 4.48 to 4.56).
- Flood Risk (NPS NN paragraphs 5.90 to 5.115).
- Water Quality and Resources (NPS NN paragraphs 5.219 to 5.231).

17.20 To the extent that the Proposed Development includes marine works related to the port, regard will be had to relevant policy in the NPS for Ports (NPSP)

- Pollution Control and other Environmental Regimes (NPSP paragraphs 4.11.1 to 4.11.18).
- Climate Change Mitigation (NPSP paragraphs 4.12.1 to 4.12.10).
- Climate Change Adaptation (NPSP paragraphs 4.13.1 to 4.13.15).
- Flood Risk (NPSP paragraphs 5.2.1 to 5.2.28).
- Water Quality and Resources (NPSP paragraphs 5.6.1 to 5.6.12).

Other national policy and guidance

- National Planning Policy Framework (NPPF) (MHCLG, 2019);
- National Planning Practice Guidance – Water Supply, Wastewater and Water Quality (MHCLG, 2015);

- National Planning Practice Guidance – Flood Risk and Coastal Change (MHCLG, 2014);
- Future Water (2008);
- Making Space for Water;
- Water for Life (white paper) (2011); and
- CIRIA SuDS Manual C753, (2015).

National Planning Policy Framework (NPPF) (MHCLG, 2019)

17.21 The NPPF sets out the Government's planning policies for England and how they are expected to be applied. In terms of Water Resources and Flood Risk, the NPPF sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow, with a view to achieving sustainable development.

17.22 Footnote 50 to the NPPF states that a site-specific FRA is required for proposals of 1 hectare or greater in Flood Zone 1; and all proposals for new development in Flood Zones 2 and 3, or in an area within Flood Zone 1, which has critical drainage problems (as notified to the local planning authority by the EA); land identified in a strategic flood risk assessment as being at increased flood risk in future; and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

17.23 The principles of policy relevant to water resources and flood risk are provided in Section 14 'Meeting the challenge of climate change, flooding and coastal change' and Section 15 'Conserving and enhancing the natural environment'.

17.24 With reference to new development, Paragraph 149 of the NPPF states:

'*Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures4. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure...When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure'.*

17.25 In addition, Paragraph 155 of the NPPF states:

'*Inappropriate development in areas at risk of flooding should be avoided by directing*

development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.'

17.26 The NPPF further states that those proposing development are responsible for drainage designs which reduce flood risk to the development and elsewhere, preferably through the use of sustainable drainage systems (SuDS).

National Planning Practice Guidance (updated 2015)

17.27 To accompany the NPPF, the web-based National Planning Practice Guidance (PPG) provides additional technical guidance on flood risk and coastal change.

17.28 In terms of the general planning approach to development and flood risk, the Flood Risk and Coastal Change PPG sets out the following main steps to be followed:

- Assess flood risk;
- Avoid flood risk; and
- Manage and mitigate flood risk.

17.29 The guidelines also state that in plan-making, local planning authorities apply a sequential approach to site selection so that development is, as far as reasonably possible, located where the risk of flooding (from all sources) is lowest, taking account of climate change and the vulnerability of future uses to flood risk. In plan-making this involves applying the 'Sequential Test' to Local Plans and, if needed, the 'Exception Test' to Local Plans. Guidance on when and how should the 'Sequential' and 'Exception' Tests be applied to planning applications is also provided in the PPG.

17.30 In addition, the guidelines reiterate that local planning authorities and developers should seek flood risk management opportunities (e.g. safeguarding land), and to reduce the causes and impacts of flooding (e.g. through the use of sustainable drainage systems in developments).

17.31 Additionally, the guidelines note that when considering a major development, as defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015, SuDS should be provided unless demonstrated to be inappropriate.

17.32 Table 1 within section 25 Flood and Flood Risk Tables, defines the Flood Zones and the respective level of flood risk. Zone 1 depicts an area of low (<1 in 100 year) probability. In contrast, zone 3b represents a functional floodplain, where water has to flow or be stored in times of flooding.

17.33 The PPG also contains a section on water supply, wastewater and water quality. This guidance indicates that water supply is unlikely to be a consideration for most planning

applications as water supply is normally addressed through the Local Plan. With regards to water quality, the guidance states that it is only likely to be a significant planning concern when a proposal would:

- Involve physical modifications to a water body such as flood storage areas, channel diversions and dredging, removing natural barriers, construction of new locks, new culverts, major bridges, new barrages/dams, new weirs (including for hydropower) and removal of existing weirs; and/or

- Indirectly affect water bodies, for example:
    - As a result of new development such as the redevelopment of land that may be affected by contamination, mineral workings, water or wastewater treatment, waste management facilities and transport schemes including culverts and bridges; and

    - Through a lack of adequate infrastructure to deal with wastewater.

Local policy

Kent County Council

Kent County Council Drainage and Planning Policy (2019)

17.34 Kent County Council Drainage and Planning Policy – a Local Flood Risk Management Strategy Document sets out how Kent County Council (KCC), as Lead Local Flood Authority (LLFA) and statutory consultee, will review drainage strategies and surface water management provisions associated with applications for major development. It is consistent with the Non-Statutory Technical Standards for Sustainable Drainage (as published by Defra in March 2015) and sets out the policy requirements KCC has for sustainable drainage.

Dartford Borough Council

Dartford Development Policies Plan (2015)

17.35 The Dartford Development Policies Plan (December 2015) sets out the main planning policies that the authority will use to assess planning applications. Policy DP11: Sustainable Technology and Construction states:

'*Development should be well located, innovatively and sensitively designed and constructed, to tackle climate change, minimise flood risk and natural resource use and must aim to increase water efficiency. Reflecting water scarcity and development levels in the region, and to deliver the aims of Core Strategy policy CS25, all dwellings (Class C3) created in Dartford will be permitted only where they demonstrate delivery of the water efficiency requirement level of 110 litres per person per day*.'

Dartford Borough Council Core Strategy (2011)

17.36 This document sets out Dartford Borough Council's (DBC) long-term spatial strategy for the Borough to 2026 and acts as an implementation tool for those elements of the Sustainable Community Strategy which can be delivered through spatial planning.

17.37 Policy CS6: Thames Waterfront states:

'*The Council will promote the creation of a vibrant mixed-use riverfront, incorporating sustainable communities, new employment opportunities, leisure use of the river /riverside and use of the river for sustainable transport, by… Require that Planning applications for development in Flood Zones 2 and 3 are accompanied by a site-specific FRA to demonstrate that development is safe and will pass Part C of the Exception Test, where applicable. These sites to also be sequentially tested to direct 'more vulnerable' uses to the parts of the site at less risk of flooding, where possible…*'

17.38 Policy CS 24: Flood Risk states:

'To manage and mitigate flood risk the Council will:

a) Ensure that sites in Flood Zone 2 and 3a, shown to be acceptable for development following application of the Sequential Test and parts A and B of the Exception Test, demonstrate that part C of the Exception Test can be passed and that residual risk is managed through a Flood Risk Assessment (FRA) and an appropriate Flood Plan. Windfall sites will be subject to the same tests to assess whether they are appropriate for the development proposed.

b) Engage with the Environment Agency and Defra in the further stages of the Thames Estuary 2100 Project (TE 2100), and seek not to foreclose any medium or long-term options through proposals in this Plan. In particular, the Council will protect the Dartford Marshes from development, in the event that the area is required to implement flood protection proposals or compensation freshwater habitats.

c) Require the SUDS 'management train' to be applied, as appropriate, in all new development. In Water Source Protection Zones, SUDS will need to demonstrate that any surface water run-off infiltrating the ground will not lead to deterioration of groundwater quality.

d) Identify and implement a green infrastructure network through the safeguarding of existing areas of open space and a requirement for generous provision of green space and water bodies in new development (see Policy CS 14).

17.39 Policy CS 25: Water Management states:

'To manage the supply and quality of water and waste water / sewerage treatment capacity serving the community, to protect and enhance the quality of surface and ground

waters together with assisting in moving towards 'water neutrality' in the Thames Gateway, the Council will:

a) Work with the water utility providers and monitor development to ensure that new development and water services are co-ordinated and that the pace of development does not outstrip the water supply and waste water/ sewerage treatment capacity at any time. Where development is not capable of being adequately supplied, the Council will review the phasing of development and work with the utility providers and developers to address the capacity constraints at the earliest opportunity.

b) Require all new homes to achieve at least level 4 of the Code for Sustainable Homes in terms of water use (105 litres per person per day) in advance of mandatory requirements. Where it can be demonstrated that a development is unable to meet these standards, permission will only be granted if the applicant makes provision for compensatory water savings elsewhere in the Borough.

c) Sites of 500 units or more will be expected to act as exemplars. In addition to b above, they will be required to reduce dependence on potable water through rainwater harvesting, recycling of used water and reduction of water 'hungry' activity, and should be designed to enable later retrofitting to achieve the highest levels of the Code for Sustainable Homes in terms of water use.

d) Require all non-residential developments of 1,000sqm and above to meet the BREEAM 'excellent' standards of water efficiency.

e) Work with and encourage water utility providers and social landlords to fit existing homes and other buildings with more efficient devices and appliances; reduce leakage; and expand metering.'

Thurrock Council

Thurrock Council Local Plan (1997)

17.40 The Council are in the process of developing a new Local Plan for Thurrock, however this is in the early stages of development and is not anticipated to be adopted until 2021.

17.41 The Thurrock Local Plan (1997) has no Saved Policies that specifically relate to flood risk management. However, the following policy is considered relevant:

17.42 Policy BE 28: The Prevention of Water Pollution states:
'*Development proposals which the Council considers would be likely to lead to undesirable and unnecessary pollution will not be permitted*.'

Thurrock Council Core Strategy and Policies for the Management of Development (2011, updated 2018)

17.43 The Core Strategy and Policies for Management of Development sets out the Council's vision for development in the Borough and policies against which planning application for the development and use of land and buildings will be considered.

17.44 Strategic Spatial Objective 18 sets out the Council's aim 'to reduce and manage the risk of flooding to and from development through its location, layout and design'. The Strategic Spatial Objective is supported by Core Strategic Thematic Policy (CSTP) 27 and Development Management Policy 15.

17.45 CSTP25 Addressing Climate Change: Paragraph 5.157 states that the Thurrock Climate Change Evidence Base seeks to:

- Ensure that new development incorporates energy and water efficiency into design;
- Ensure new build development incorporate climate change 'resistant' features to minimise vulnerability;
- Ensure that new vulnerable development is not at risk of flooding; and
- Reduce flood risk at existing development.

17.46 CSTP27 Management and Reduction of Flood Risk states:

- The Council will ensure that, where necessary, new development throughout the Borough contains space for water including naturalisation and environmental enhancement;
- Developers will be required to contribute towards flood risk management infrastructure where appropriate;
- Planning applications received for sites within Flood Zone 3 will be treated in accordance with PPS25, this policy and Policy PMD15.

17.47 CSTP27 emphasises the importance of guidelines contained within the Thames Estuary 2100 (TE2100) study and points to TE2100 'recommended actions' (A5.3 – A5.9) for achieving the desired level of flood protection. It places responsibility for the desired outcome on all stakeholders including developers.

17.48 The policy recognises that for the West Thurrock area, drainage infrastructure will require upgrading as sea level rises and rainfall intensity increases over the next 100 years. Mitigation measures are expected to include improved outfalls and drainage channels, additional pumping capacity, additional flood storage and new or improved local flood

defences.

17.49 CSTP28 River Thames: sub-clause III states that development proposals will be required to undertake appropriate level of flood risk assessment as set out by PPS25 and take account of the need for flood mitigation measures and to accommodate any necessary flood defence measures.

17.50 Policy PMD2 Design & Layout: sub-clause 1.viii (Landscape) indicates that all new development will be required to contribute to multiple uses and/or eco-system services, including amenity, recreation, flood alleviation and sustainable urban drainage systems (SuDS).

17.51 PMD15 Flood Risk Assessment reiterates the requirements of policy CSTP28 regarding flood risk from the Thames River. This includes the following points:

- Sites not covered by the Thurrock Sequential Test will be required to provide a site-specific Sequential Test to demonstrate compliance with NPPF or any successor to be provided by the applicant. To reflect the nature of Thurrock's defended floodplain, particular reference should be made to the hazard rating for each site where covered by the Thurrock Strategic Flood Risk Assessment;

- Only those applications classified under the 'minor development' or 'changes of use' categories will be exempt from applying the Sequential Test, but will still be expected to meet the requirements for Flood Risk Assessments and flood risk reduction as set out in NPPF and the associated Design and Sustainability SPD;

- Development proposals subject to the Exception Test in Thurrock must show that the following criteria have been met (in addition to FRA requirements outlined in NPPF):

    - To assist with part a) of the Exception Test, reference should be made to the main assessment criteria outlined in the Thurrock Sustainability Appraisal and any opportunities to reduce the overall flood risk posed to the community, including schemes to make space for water;

    - The FRA must demonstrate that the development will be 'safe', without increasing flood risk elsewhere, and where possible will reduce flood risk overall.

- Developers may be required to provide developer contributions towards the improvement of emergency planning services and flood defence measures within Thurrock as part of flood management mitigation;

- Developments will be expected to incorporate Sustainable Drainage Systems (SuDS) to reduce the risk of surface water flooding, both to the site in question and to the surrounding area. Where the potential for surface water flooding has been identified, site specific Flood Risk Assessments should ensure that suitable SuDS

techniques are incorporated as part of the development.

Other relevant guidance

Pollution Prevention Guidance Notes (now withdrawn)

17.52 The former EA Pollution Prevention Guidance (PPG) notes provide advice on statutory responsibilities and good environmental practice. Whilst this guidance was withdrawn and as of December 2015 will no longer by updated by the EA, it is still considered good practice. The guidance notes of particular relevance to the Proposed Development include:

- PPG1: General Guide to the Prevention of Pollution, which provides an introduction to pollution prevention and the pollution prevention guidance notes;
- PPG2: Above Ground Oil Storage Tanks, which provides guidance to those responsible for the storage of oil on construction sites. The document provides guidance on location, bunding, protection and operation of oil stored in addition to maintenance and brief guidance on dealing with spills;
- PPG3: Use and Design of Oil Separators in Surface Water Drainage Systems, which provides guidance on when oil separators are appropriate and what size and type of separators is required;
- PPG5: Works In, Near or Liable to Affect Watercourses which provides guidance on general precautions to take when working in the vicinity of a watercourse, along with more specific measures to prevent contamination and to minimise and adverse impacts;
- PPG6: Working at Construction or Demolition sites. This document mirrors much of PPG5 but with particular emphasis on the situations likely to occur at demolition and construction sites;
- PPG7: Refuelling Activities. This provides information on the correct delivery, storage and dispensing of fuel to help reduce the risk of pollution; and
- PPG21: Pollution Incident Response Planning. This provides guidance to those developing site-specific pollution incident response plans to prevent and mitigate damage to the environment caused by accidents such as spillages and fires.

Construction Industry Research and Information Association Guidance

17.53 The Construction industry Research and Information Association (CIRIA) carries out research activities and provides guidance for developers and contractors. The guidance with specific relevance to water resources and flood risk are:

- Guidance C532 – Control of Water Pollution from Construction Sites. This brings together the Environment Agency guidance but goes into much more detail with regard to sources of water on construction sites, pollutants and pathways, in addition to providing guidance on planning for the type and location of suitable control measures; and

- Guidance C753 – The SuDS Manual. This provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS to facilitate their best effective implementation within developments.

BASELINE CONDITIONS

Current baseline

Existing land use

17.54 Chapter five of this PEIR provides a full description of the current Project Site use. A summary is provided below with focus on water-related land-use within and around the Project Site.

Kent Project Site

17.55 For the Kent Project Site, land-use is principally open, low-lying land with former cement kiln dust (CKD) tips and other brownfield former industrial land. The Peninsula part of the Project Site is both a 'historic' and 'authorised' landfill site. The main product of this landfill waste is CKD. Land disposal of CKD creates highly alkaline conditions. This can lead to absorption of metals including barium, beryllium, cadmium, chromium and lead in groundwater. Accordingly, mobilisation of contaminants will need to be avoided.

17.56 A number of drains, filtration systems, aeration lagoons and other features are also present. Much of the Peninsula has re-vegetated naturally but areas of bare ground remain. Other parts of the Kent Project Site on the Swanscombe Peninsula include the existing Manor Way, Northfleet and Kent Kraft industrial estates.

17.57 The HS1 railway crosses the Peninsula on a south-east to north-westerly alignment. The southern section is in cutting and the remainder in a tunnel. A pumping station that serves to lower ground water adjacent to the tunnel is located to the north-east of the tunnel portal.

17.58 The Swanscombe Peninsula supports extensive areas of marshland including Black Duck Marsh, Botany Marsh and a marsh around the HS1 tunnel portal. Broadness Marsh at the northern tip of the Peninsula was historically a saltmarsh, but now has a raised terrain as a result of CKD tipping and the deposition of river dredging's. Broadness and Botany Marshes are bordered in part by industrial uses.

17.59 The Kent Project Site extends south to the A2(T) road. The A2(T) / A2260 junction (referred to here as Ebbsfleet Junction) allows eastbound and westbound traffic to leave and join the A2(T) at the southern end of the Kent Project Site.

17.60 East of the Kent Project Site, adjacent to Thames Way (A226) is Sawyer's Lake, a lake of approximately 11.5 ha which is used for recreation. The linear Castle Hill Lake, approximately 5.8 ha in area situated north of the A2(T) adjacent to the access road part of the Kent Project Site is also used for recreation.

Essex Project Site

17.61 The north of the Essex Project Site comprises level hard-surfaced land used currently for vehicle storage. The Essex Project Site is bounded by railways on its northern and western sides, and a drainage channel to the east.

17.62 The Essex Project Site also includes the Tilbury Ferry Terminal and the eastern half of the floating landing stage which juts out into the River Thames.

17.63 Tilbury Docks lies approximately 400 m to the west of the Essex Project Site boundary. Approximately 250 m east of the boundary lies Tilbury Fort, which has a surrounding water-filled moat.

Existing site levels

Kent Project Site

17.64 The Peninsula has a variable topography because of historical CKD tipping activities and the deposition of dredging's from the River Thames. Two raised areas of tipped material rise to over 12-13 m above ordnance datum (AOD). A large part of the north of the Peninsula has been raised from an assumed original height of 2-3 m AOD to approximately 8.75 m AOD. Where it meets the River Thames, the Peninsula is surrounded by flood defence embankments and terraces that rise to approximately six metres AOD. Small areas of remnant salt marsh are located at the base of the flood defences.

Essex Project Site

17.65 The Essex Project Site is generally flat with elevations of Made Ground ranging from 1-3 m AOD.

Existing surface water drainage

17.66 A full description and drawings of the existing drainage infrastructure will be provided in the drainage strategy that will support the DCO application and be appended to the ES. For the purposes of this PEIR, a brief summary is provided below.

Kent Project Site

17.67 There is no surface water drainage network owned by SW within the Kent Project Site.

17.68 Two marsh habitats exist within the Swanscombe Peninsula: Botany Marsh and Black Duck Marsh. These marshes are not subject to protective environmental designations. However, the EA advises that any new proposed surface water drainage strategy should ensure that these sites retain their existing hydrological flow regime and do not become adversely affected. The location of the marshes and other drainage features can be seen in Figure 17-1.

17.69 Establishing the existing (baseline) hydrological regime at the two marshes is challenging. Review of historic maps, aerial photography and records from site visits are used to map out the location of the drains. Walkover surveys combined with CCTV survey will be undertaken to establish inflows to the marshes. Surface water discharge consents to the marshes are currently being retrieved from the EA's database.

17.70 The proposed Access Corridor lies within a Groundwater Nitrate Vulnerable Zone in which runoff with a high nitrate content must be restricted. The majority of the Peninsula lies within the 'total catchment' Groundwater Source Protection Zone (SPZ) 3. SPZs are identified as areas in which drinking water is supplied from and therefore require additional protection from contamination.

17.71 An EA designated Main River open channel runs through the centre of the Peninsula part of the Kent Project Site, flowing from south to north. The source of water flowing into the main channel is mainly from dewatering operations at Eastern Quarry, located 2 km southwest of the Kent Project Site and the HS1 tunnel located adjacent to the Kent Project Site. Other sources of water are currently under investigation. The drainage ditches that intersect Botany Marsh drain into a tributary to the main channel, located along the north of the landfill. The landfill in the centre of the Peninsula is believed to cover a previous ditch network. The old connections into the main channel can be seen along the main channel. However, now that the area has been infilled, the internal drains no longer operate. At the downstream point of the main open channel, the remainder of the watercourse is culverted. The inlet of the culvert has a diameter of 1.6 m. The culvert discharges into the River Thames immediately north of the existing northern jetty on the west side of the Peninsula. This culvert is believed to be currently silted. Approximately 20 m east of the inlet to the culvert, an additional outfall has been created from the main river channel to drain excessively high-water levels to the pump house. This water is then pumped to the west side of the Peninsula where it discharges into the River Thames.

17.72 Network Rail has an EA consent to pump surface water runoff from the HS1 tunnel into the main River Thames channel via the main ditch. In February 2014, flooding was close to occurring in the HS1 tunnel due to the main channel almost at capacity, preventing pumping water out of the tunnel. This occurred due to a log jamming the tidal flap at the culvert outfall. In response to this, two water level monitors were installed, to ensure that

water levels could be monitored as they rise and fall.

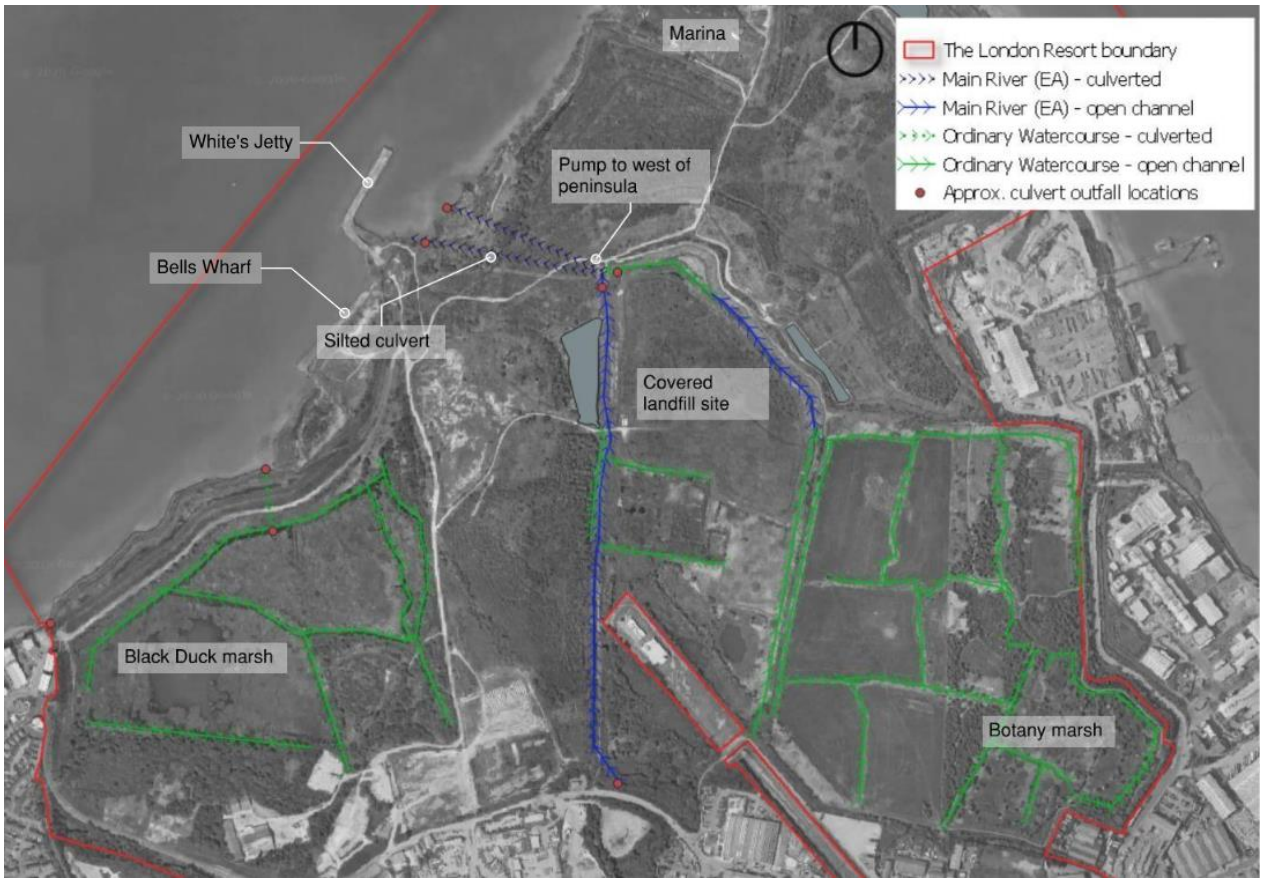
17.73 There are no culvert outfalls into the marina area in the north-west of the Kent Project Site and there are no hydraulic structures, such as sluices, within the drainage ditches controlling water levels. There is no known active management of the ditch network, with culverts allowing water to pass between the ditches into the main river channel.

17.74 The ditch network in Black Duck Marsh drains predominantly towards the west and it is believed to discharge through a culvert south of the southern jetty on the west side of the Peninsula.

17.75 Based on a literature review and site visit, the Kent Project Site drainage paths can be seen in Figure 17-1. This will be investigated further or confirmed during walkovers and a CCTV survey.

17.76 The developing Surface Water Management Plan identifies that there are known problems of surcharging and overloaded sewers at a number of locations within and around the Kent Project Site, this will be presented in the ES.

Figure 17.1: Existing ditches within Swanscombe Peninsula on Kent Project Site and outfall locations



Essex Project Site

17.77 On the Essex Project Site, there is no surface water drainage network owned by AW. It is anticipated that any existing network is privately owned. Information is currently being sought and set out in the ES.

Existing foul water drainage

Kent Project Site

17.78 There is a very limited sewer network on the Kent Project Site. A disused wastewater treatment works is located in the centre the Project Site approximately 580 m south-east of Bell Wharf. This disused treatment plant is connected to the residential area to the south of the Kent Project Site via a foul sewer and previously discharged treated sewage effluent to the River Thames via a culvert on the north-west face of the Peninsula.

17.79 On the Kent Project Site there is a limited foul sewer network owned by SW, which collects foul water from the industrial users along Manor Way, and discharges to the sewage treatment plant at Northfleet. There is also a disused foul sewer which bisects the Kent Project Site and connects to the disused wastewater treatment works.

Essex Project Site

17.80 Existing foul water drainage within the Essex Project Site is owned by Tilbury Docks, and discharges to an AW foul water treatment facility.

Surface water features

17.81 Surface water features exist within and in close proximity to the Project Site boundary. The nearest surface water features are:

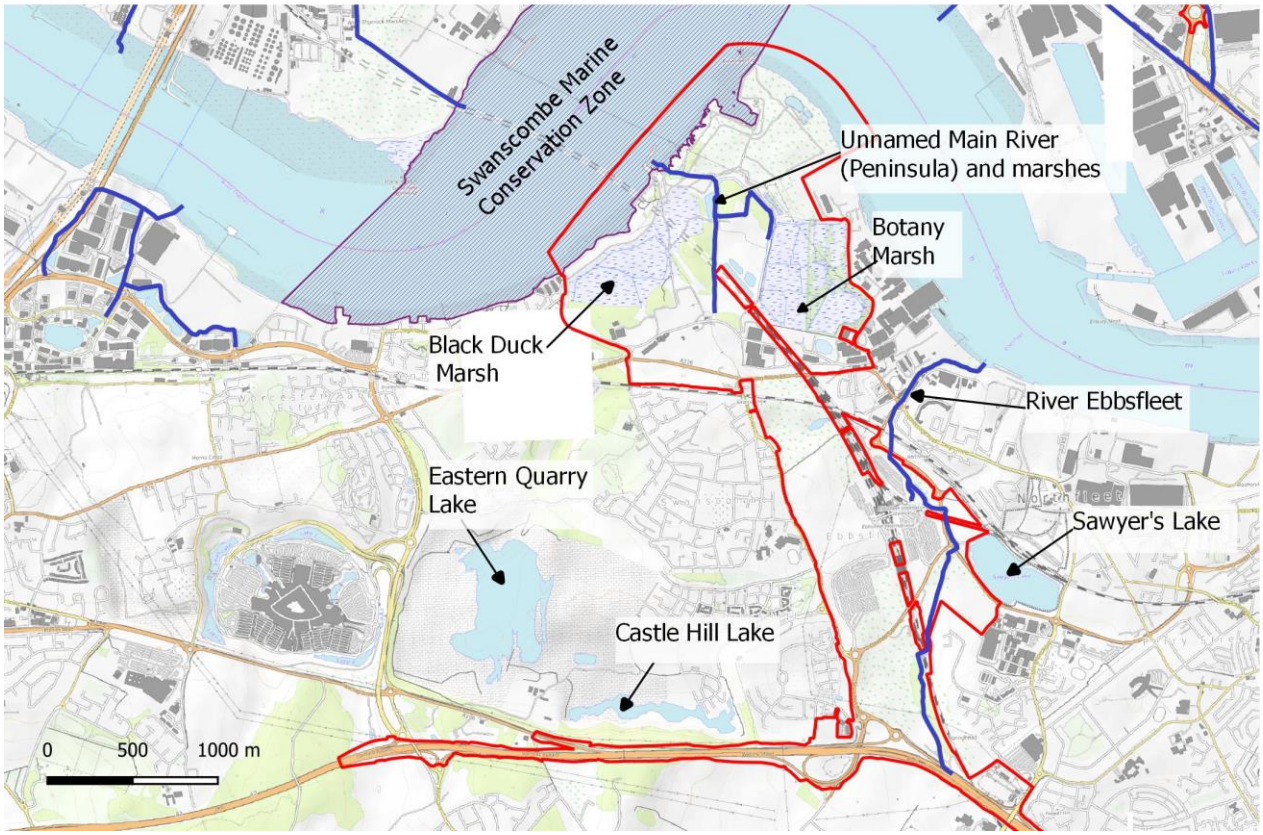
Kent Project Site

- River Thames – borders the Kent Project Site to the north;
- Unnamed Main River (as defined by the EA) on the west of the Peninsula (Unnamed Main River (Peninsula)) including Black Duck Marsh and Botany Marsh;
- River Ebbsfleet – located to the south east of the Peninsula running through part of the Kent Project Site from north of the A2(T) past Northfleet Station and into the River Thames;
- Sawyer's Lake – 11.5 ha lake east of the Kent Project Site adjacent to Thames Way (A226);
- Castle Hill Lake – 5.8 ha linear lake located north of the A2(T); and

- Eastern Quarry – lake inside Ebbsfleet Garden City development site.

17.82 These features can be seen in Figure 17.2.

Figure 17.2: Surface water features – Kent Project Site



17.83 It is proposed that Eastern Quarry lake is not included in the assessment as this lies within a separate development masterplan – Ebbsfleet Garden City – which is currently under development and is not proposed to remain in its current form as a result of that masterplan.

Essex Project Site

- River Thames – borders the Essex Project Site to the south;

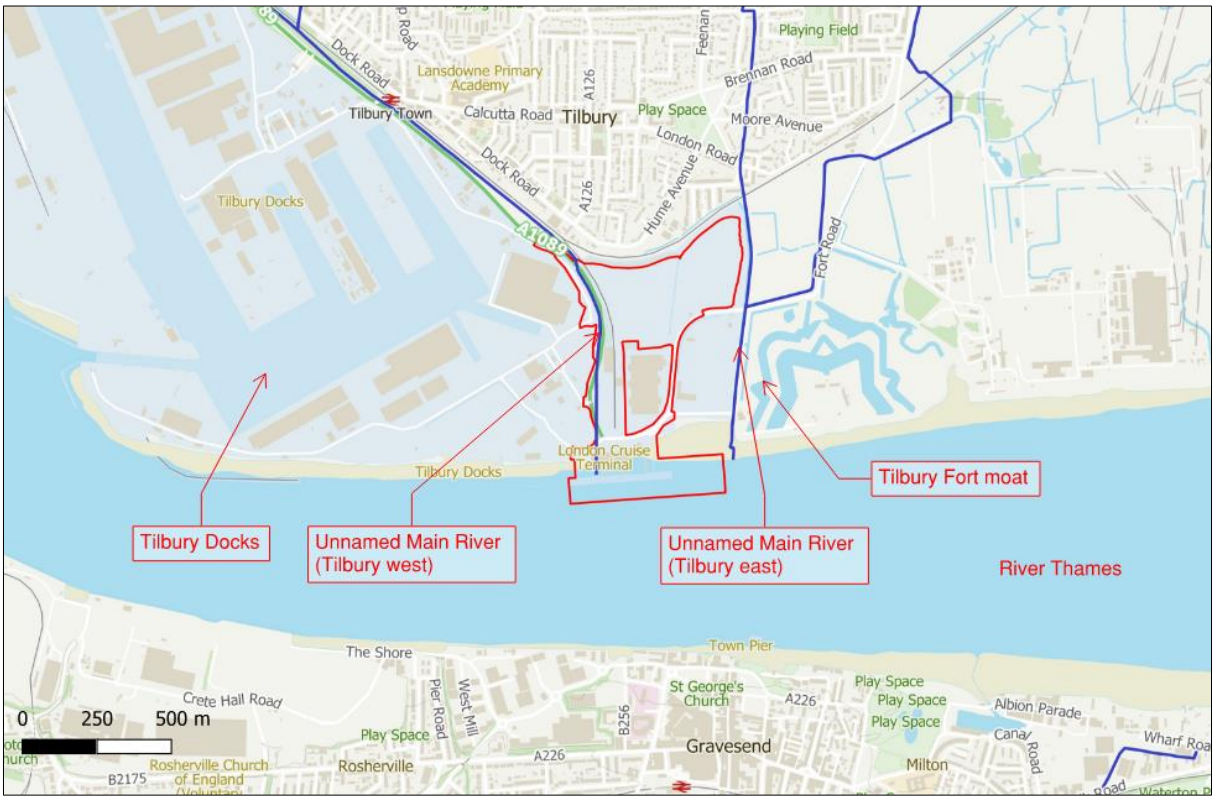
- Two unnamed Main Rivers (as defined by the EA) running north to south where they meet the River Thames – one within the western part of the Essex Project Site boundary (Unnamed Main River (Tilbury west)), and one just outside the eastern boundary (Unnamed Main River (Tilbury east));

- Tilbury Docks – approximately 400 m west of the Essex Project Site boundary; and

- Tilbury Fort moat – water-filled moat approximately 250 m east of the Essex Project Site boundary.

17.84 These features can be seen in Figure 17.3.

Figure 17.3: Surface water features – Essex Project Site.



17.85 It is proposed that neither Tilbury Docks nor Tilbury Fort moat waters are included as receptors in the water resources assessment as there is no hydrological link between surface water on the Essex Project Site and these surface water bodies are far enough away that impacts from air borne dust and debris would be negligible.

Water quality

River Thames

17.86 Surface water drainage within the Peninsula of the Kent Project Site currently discharges into the River Thames through drainage channels and the unnamed main river to the west of the Peninsula. Surface water draining into the River Ebbsfleet to the south east of the Peninsula also discharges into the River Thames. There is potential for on-site activities to influence the water quality of these water bodies through connections and proximity both during construction and connections during the operational phase of the development.

17.87 The European WFD was transposed into national law through the Water Environment

WFD (England and Wales) Regulations 2003 (Statutory Instrument 2003 No. 3242). The aim of this Directive is to provide an integrated, Europe-wide approach to the management of water resources, particularly water quality. As part of the Directive, River Basin Management Plans have been established. These are updated with each new WFD Cycle. Cycle 1 began in 2009 and ran to 2015, Cycle 2 began in 2015 and runs to 2021.

17.88 The River Thames falls within the Thames River Basin District. The associated River Basin Management Plan establishes a number of requirements that must be met to comply with the WFD.

17.89 The River Thames, at this location near the Project Site, is transitional water and is classified as heavily modified under the WFD and has an obligation to achieve 'good ecological potential'. By definition, artificial and heavily modified water bodies are not able to achieve natural conditions. Instead the classification and objectives for these water bodies, and the biology and habitat structure they provide an environment for, are measured against ecological potential rather than status.

17.90 In Cycle 2 of the ecological status of the River Thames at this location is classified as 'moderate'. The chemical status of the River Thames at this location is classified as 'fail'. The overall water body classification for the River Thames at this location is 'moderate'.

Figure 17.4: Location of the Project Site in relation to surrounding areas north and south of the River Thames (© Crown Copyright and database rights 2020, from Google Earth accessed: 19/06/2020).

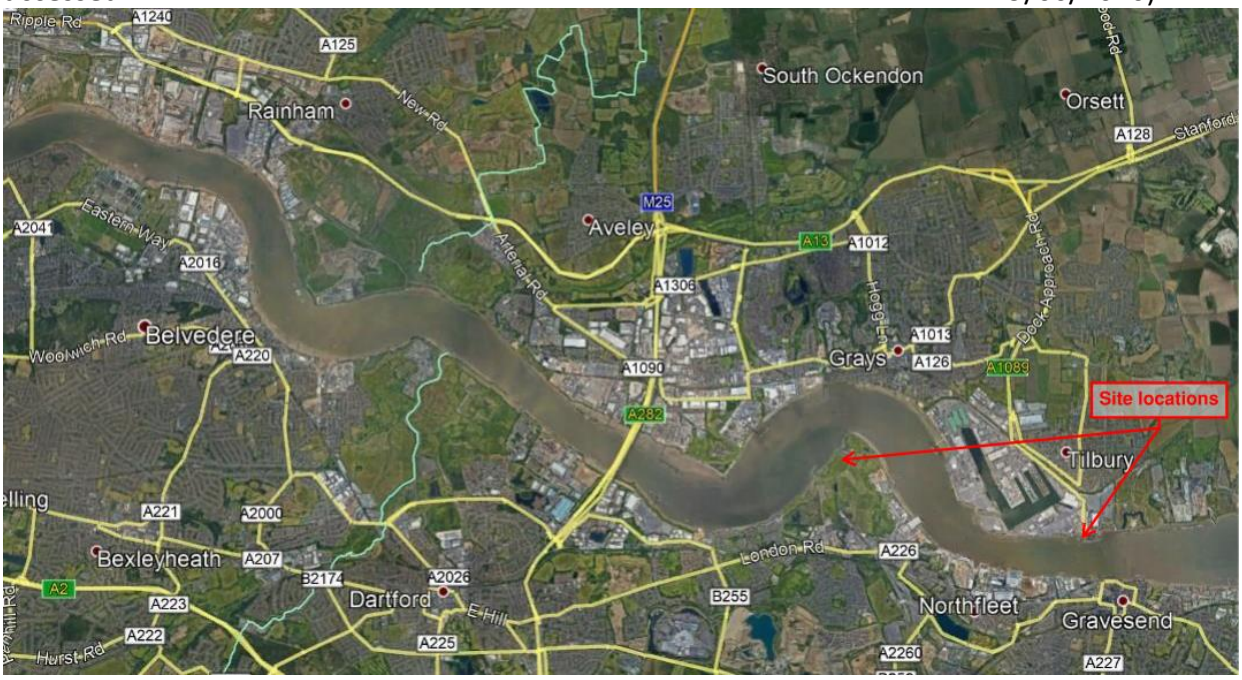


Table 17.6: WFD classification of the Middle River Thames (EA Catchment Data Explorer, accessed: 19/06/2020).

Classification Item	2013	2014	2015	2016
Overall Water Body	Moderate	Moderate	Moderate	Moderate
Ecological	Moderate	Moderate	Moderate	Moderate
Chemical	Fail	Fail	Good	Fail

River Ebbsfleet

17.91 The River Ebbsfleet was included in Cycle 1 of the Thames River Basin District River Basin Management Plan but was not included in Cycle 2 following review of the waterbodies to continue forward into that cycle. Therefore, no recent water body classifications for the River Ebbsfleet are available. The River Ebbsfleet was also classified as heavily modified under the Directive. In Cycle 1 it was classified as having 'moderate ecological potential' and was expected to maintain this status into 2015. Classification of chemical quality for the river was not deemed a requirement.

Statutory designations

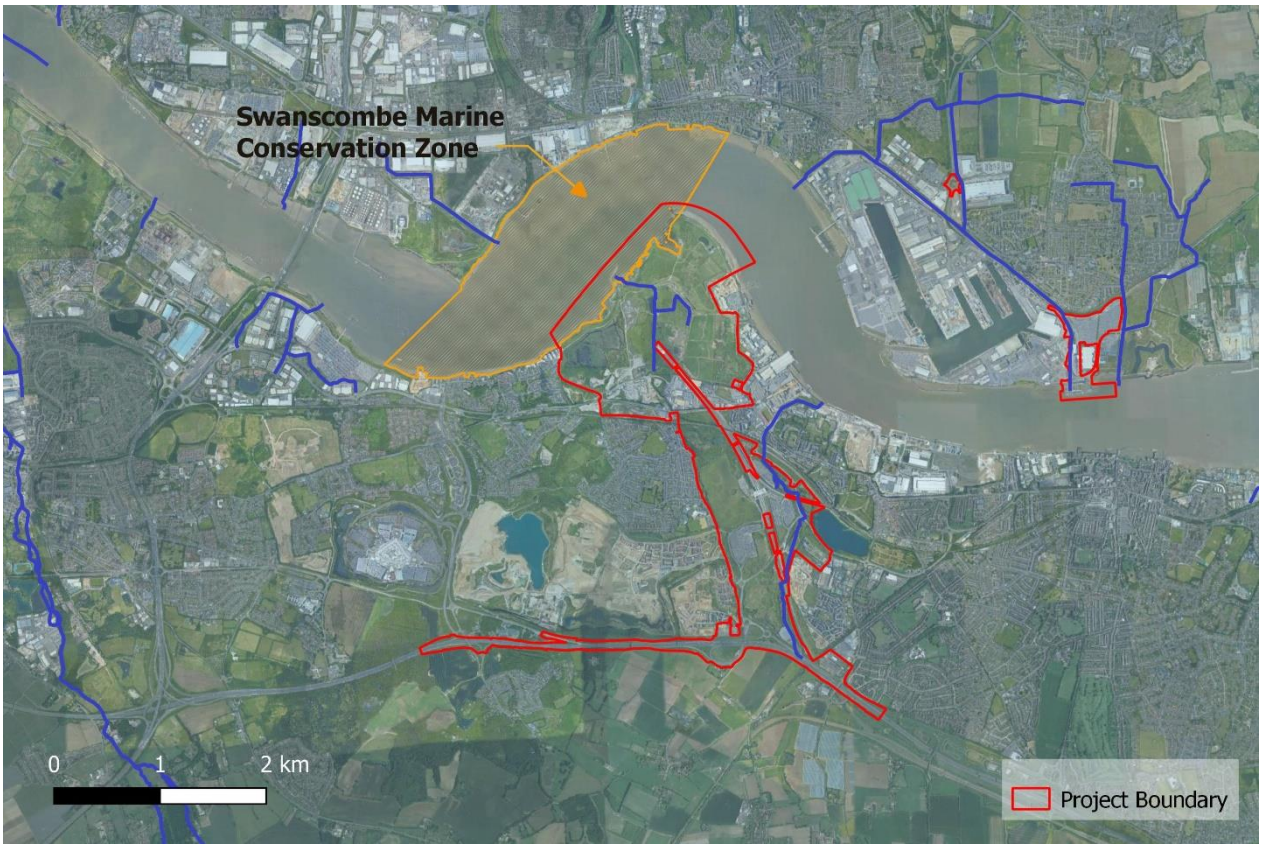
17.92 Swanscombe Marine Conservation Zone (MCZ) is a 3 km^2 area of the River Thames bordering and including part of the Kent Project Site on the western side of Swanscombe Peninsula. The area comprising the MCZ can be seen in Figure 17-5.

17.93 It was designated in May 2019 for the marine habitat and aquatic ecological assets within it, namely i) intertidal mud; and ii) tentacled lagoon worm (*Alkmaria romijni).* There is a requirement for the MC to be maintained in favourable condition.

17.94 The seabed of Swanscombe MCZ is composed largely of shells, pebbles, sands and mud. The tentacled lagoon worms are found in the intertidal and subtidal soft sediments. This small worm is scarce throughout the UK and lives within a tube made of mud in sheltered lagoons and estuaries. They are very vulnerable to changes to the habitats in which they live.

17.95 Intertidal mud supports the tentacled lagoon worm and is a highly productive ecosystem that provides important feeding grounds for wading and migratory birds.

Figure 17.5: Location of Swanscombe Marine Conservation Zone.



17.96 While not a designated habitat, Black Duck Marsh and Botany Marsh lying on either side of the designated Main River (Peninsula) into which they drain are potentially sensitive habitats at the Kent Project Site. Water quality sampling and monitoring will take place on water from these marshes to understand the water conditions within them and to capture data on any impacts on water quality as construction progresses.

17.97 Water quality surveys are not proposed to be undertaken within the Essex Project Site as no sensitive habitats have been identified within the Site location.

17.98 Initial water quality surveys will provide additional baseline data which will be reported within the ES.

Groundwater

Kent Project Site

17.99 Issues associated with ground contamination, mobilisation of ground contaminants and hydrogeology are covered in Chapter 18 Soils, hydrogeology and ground conditions. A summary of ground conditions and groundwater is provided here for context.

17.100 The Swanscombe Peninsula (Kent Project Site) is an approximately triangular area of land

in a meander of the River Thames, comprising predominantly low-lying marshland, landfills, business parks and commercial land, amongst other less dominant land uses.

17.101 The general topography is variable across the Kent Project Site, with low-lying, undulating land towards the north due to natural marshland and historical landfilling. Substantial chalk spines are present in the centre of the Kent Project Site, upon which roads and railway lines run, approximately 16-20 m above the surrounding ground.

17.102 Made Ground varies across the Peninsula, with predominantly cement kiln dust (CKD) towards the north, while towards the south it comprises compressed chalk, clay, sand and gravels which have been used to backfill pits and quarries, together with a mixture of domestic and commercial wastes within landfilled areas.

17.103 Alluvium covers a large portion of the Swanscombe Peninsula north of Manor Way, and these deposits are predominantly silty clay and clayey silt, with some coarser grained units. Historical borehole records indicate two prominent layers of peat across the Peninsula, at approximately -4 m and -8 m AOD. Head deposits are anticipated across small pockets of the Peninsula, formed from the Chalk bedrock. Both the Alluvium and the Head deposits beneath the Peninsula are classified as Secondary 'A' aquifers by the EA, defined as permeable layers capable of supporting water supplies at a local rather than strategic scale

17.104 The BGS Hydrogeological Maps suggest that regional groundwater flow in the area is north, towards the River Thames, although abstractions associated with the number of quarries in the vicinity of the development will have an impact on flow direction locally.

Essex Project Site

17.105 The anticipated geology is a heterogeneous composition of Made Ground (including ash, concrete, brick, timber, flint), typically between about 1 and 3m, underlain by a natural geological sequence comprising about 15m of Alluvium (very soft to firm clays, peats and sands) over a relatively limited thickness (approximately 2 to 5m) of River Terrace Gravels. Beneath these is the Upper Chalk at about 18 to 24m bgl.

17.106 Part of the Essex Project Site extends onto the shore of the River Thames. This area is underlain by tidal deposits. BGS borehole records indicate this to include about 12 to 20m of alluvial clays and peats, over River Terrace Gravels, with Chalk present at about 22 to 23m bgl.

17.107 Perched groundwater is likely to be present above low permeability bands in both the Made Ground and the Alluvium. Environment Agency Aquifer maps show the Essex Project Site to be underlain by a Secondary (Undifferentiated) Aquifer in superficial Alluvium and River Terrace Gravel deposits. The Upper Chalk bedrock is classified as a Principal Aquifer (defined as rock with high intergranular and / or fracture permeability). This stratum may support water supply and / or river base flow – although it is unlikely to be utilised for potable water supply in the vicinity due to its proximity to the River Thames.

Groundwater levels across the Essex Project Site will be influenced by its proximity to the River Thames and associated tidal flows.

17.108 There are limited records of groundwater strikes on BGS borehole records. However, where recorded / encountered shallow groundwater ingress was generally at approximately 1 to 2m bgl in Made Ground or Alluvium. A deeper groundwater body was recorded at the top of River Terrace Deposits at approximately 16 to 17m bgl, rising to between 8 and 9m bgl, indicating sub-artesian pressures due to confinement by the overlying Alluvium. This deeper body is likely to be in continuity with the Chalk.

Water supply and existing demand

Kent Project Site

17.109 There is currently only a very limited potable water network within the Kent Project Site. In contrast there is an extensive potable network within adjacent developed areas such as Greenhithe, Swanscombe and Ebbsfleet.

17.110 The Kent Project Site is in the supply area for both Thames Water and Southern Water for its potable water network. The majority of the Kent Project Site is located within the London Water Resource Zone (WRZ) of the Thames Water Supply Area. The majority of Thames Water's water supply is derived from surface water abstraction from the River Thames (including the Lower Thames) and the remainder is derived from groundwater abstraction.

17.111 TW's current Water Resource Management Plan (WRMP) was published in 2019 (also known as Thames Water WRMP19) and covers the period from 2019 through to 2100. It highlights the growing deficit in the supply demand balance of the London WRZ.

17.112 It forecasts a growing deficit on a dry year annual average increasing from -24 Ml/d in 2020 to increasing to -195 Ml/d in 2030 and -362 Ml/d in 2045. The increased deficit in the long-term is driven primarily by increases in demand and headroom.

17.113 The existing daily water demand for the Kent Project Site has been calculated based on an assumption of existing land use, which is a mix of mainly industrial, with some retail/commercial, and considers building footprint for each type. This lies between 30 – 40 m^3/day. These figures have derived from using industry benchmarks from a range of sources including Waste Resources Action Plan (WRAP), the EA, CIRIA, and the International Sustainability Alliance.

Essex Project Site

17.114 The Essex Project Site is served by ESW who supply potable water, and by AW for foul water treatment.

17.115 Due to the current land use which comprises a car park and several small commercial

buildings, the existing daily water demand for the Essex Project Site is considered low. This will be confirmed with the Port of Tilbury.

On-site flood risk

17.116 Assessments are in progress to determine the existing flood mechanism and flood risk for the Project Site.

17.117 An FRA will be appended to the ES identifying flood risk from fluvial, tidal, surface water, sewer, artificial and groundwater sources. The assessment will consider the frequency and impact of flooding from these different sources.

Kent Project Site

17.118 The Kent Project Site is located across all three of the EA's Flood Zones. The northern part of the Swanscombe Peninsula is located within Flood Zone 2 with a large band across the centre of the Peninsula located within Flood Zone 3. The Access Corridor is located almost entirely within Flood Zone 1.

17.119 The Swanscombe Peninsula has existing flood defences which range in crest level from 6.2m AOD along the western shore of the Peninsula to 8.8m AOD along the northern shore. This flood defence level provides the Kent Project Site protection from flooding from tidal sources, which are considered to be the principal risk of flooding to the Kent Project Site, up to the present day 1 in 1000-year (0.1% chance of happening in a year) flood level.

17.120 These flood defences generally comprise earth berms constructed largely around the perimeter of the Peninsula, with cement kiln dust cores. At the existing Jetty location, the flood defences are concrete flood walls with flood gates for access.

17.121 Whilst the Kent Project Site currently receives protection from a storm surge up to the 1 in 1000-year flood event, climate change is predicted to result in sea level rise and therefore an increased risk of tidal flooding to the Kent Project Site. From the data provided by the EA, it is anticipated that the current flood defence will not be sufficient to provide the required 1 in 1000-year protection for the lifetime of the project.

17.122 The River Ebbsfleet flows through the Access Corridor of the Kent Project Site in a broadly northerly direction, discharging into the River Thames. The River Ebbsfleet is a groundwater fed system and therefore poses a particular risk of flooding in periods of intense rainfall when ground water levels are high.

17.123 As a result of the existing flood defences on the Kent Project Site, the level of flood risk from rivers and the sea is deemed to presently be low, with an increase in risk in the future with the increase of flood risk associated with climate change.

Essex Project Site

17.124 The Essex Project Site is located entirely within Flood Zone 3, and benefitting from defences.

17.125 The Essex Project Site has existing flood defences which range in crest level from 6.48m AOD to 6.71m AOD. The defences in this location are predominantly flood walls with flood gates for access. The existing flood defences are tied into the terminal buildings at the Jetty.

17.126 The flood defences at the Essex Project Site provide protection from tidal sources up to the present day 1 in 1000-year flood level.

17.127 However as at the Kent Project Site, the impacts of climate change make it likely that the flood defences will not be sufficient to provide the required 1 in 1000-year protection for the lifetime of the Proposed Development.

17.128 The Essex Project Site is situated within reclaimed marsh land with low ground elevations, typically between 1-3m AOD. There is a network of drains which drain the area using a combination of gravity and pumps to outflow into the Thames. There is a risk of flooding from this drainage network should the pumps fail or should the rainfall intensity or volume exceed the pumping capacity for drainage.

17.129 The Essex Project Site is also at risk from artificial sources of flooding from the Tilbury Flood Storage Area (FSA) and the Tilbury Docks. A breach of either would cause inundation of either part or all of the Essex Project Site. Due to the level of maintenance at both locations the risk is considered low but is residual.

Marine infrastructure

Kent Project Site

17.130 The Kent Project Site includes some existing pieces of marine infrastructure.

- Bell Wharf lies midway down the western side of the Swanscombe Peninsula. It was previously used by a local cement works.

- White's Jetty extends out the northern part of Bell Wharf. It is currently in poor condition.

- On the most northern tip of Swanscombe Peninsula is a gangway leading out to Broadness Point Light;

- Located between the navigation channel and Bell Wharf is St Clements anchorage. The area of the anchorage extends approximately 400 m into the river from the land and runs from the end of White's Jetty upstream to approximately 750 m.

17.131 Figure 17.6 shows the relative location of Bell Wharf with White's Jetty.

Figure 17.6: Bell Wharf and White's Jetty.

Essex Project Site

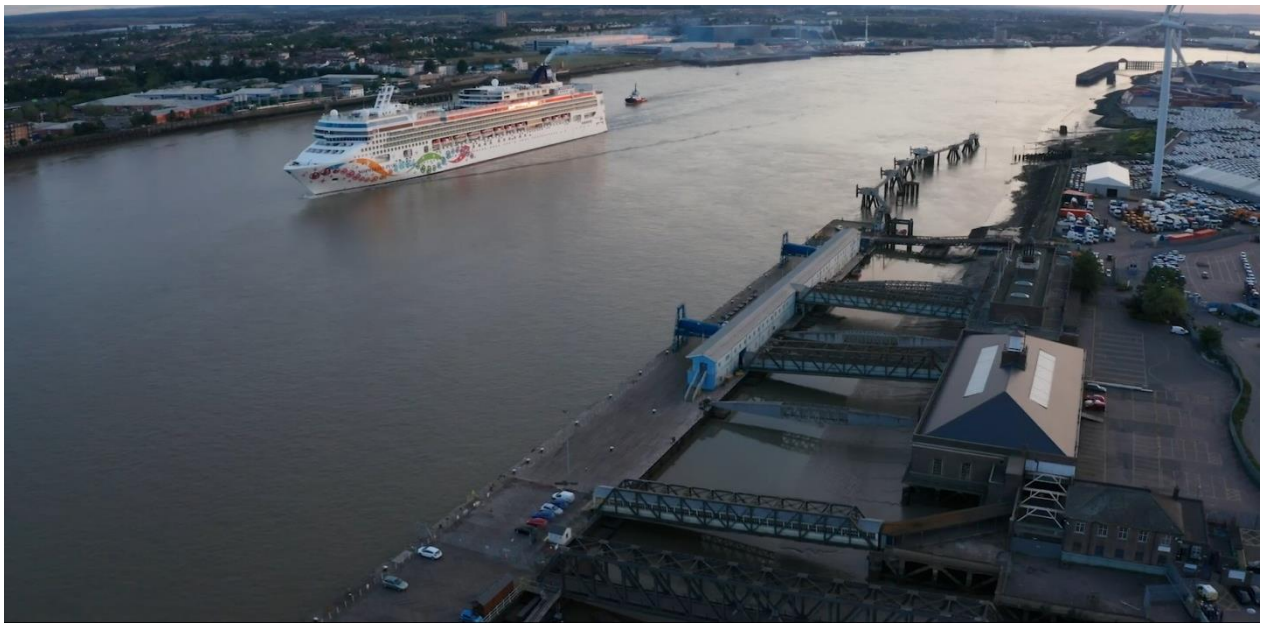
17.132 The Essex Project Site includes the following:

Tilbury Landing Stage which is currently used as a berthing area for:

- the London Cruise Terminal;
- ferry landing that operates between Tilbury and Gravesend across the River Thames;
- Tilbury Ro-Ro which includes a series of dolphins that run upstream from the end of the Tilbury Landing Stage.

Downstream of Tilbury Docks is a buried cable that runs across the River Thames.

Figure 17.7: Photograph of existing Landing Stage and Ro-Ro facility at the Essex project site (screenshot taken from https://www.forthports.co.uk/our-ports/tilbury-london/).



Future baseline

17.133 The future baseline is the baseline expected on the Project Site in the future without the Proposed Development coming forward.

17.134 The future baseline is likely to be similar in terms of sensitivity to that of the current baseline.

River Thames and surface water features

17.135 The River Thames will need to continue to work towards achieving the requirements of the WFD. Once the requirements are met, they will need to be maintained. The River Thames will therefore retain its classification as highly sensitive.

17.136 According to the EA Catchment Management tool, the Middle River Thames is expected to reach its objective of 'good' by the year 2027.

Table 17.7: Objectives for the River Thames (Middle) which must be achieved (EA Catchment Management tool. Accessed 30/06/20).

Classification Item	Status	Year	Reasons
Supporting elements (Surface Water)	Good	2027	Disproportionate burdens
Mitigation Measures Assessment	Good	2027	Disproportionate burdens
Dissolved oxygen	Good	2027	Disproportionate burdens
Specific pollutants	High	2027	Cause of adverse impact unknown
Zinc	High	2027	Cause of adverse impact unknown

17.137 Other surface water features identified are also expected to remain in a similar condition to their current status and will therefore retain their sensitivities.

Water supply

Kent Project Site

17.138 The London WRZ has a growing deficit and it is proposed that substantial demand management programme is required to maintain a surplus to headroom through AMP7 (2020-2025).

17.139 The WRMP (2020-2100) highlights a growing water supply deficit. It estimates that whilst London will be in a water surplus in 2019/20, demand will exceed supply from the beginning of 2020 – this deficit is created by increased population, exacerbated by climate change and exports to neighbouring water companies. There are a number of strategies outlined which include substantial demand management in the short term and a number of options for resource management in the medium-long term. However, with the potential impacts from climate change, and the expected increases to population, the sensitivity of water supply is likely to remain high.

Essex Project Site

17.140 Essex and Suffolk Water's WRMP was published in August 2019 and covers the period 2019 through to 2060. It predicts a surplus in water can be maintained through this period, with dry year annual average increasing from 13 Ml/d in 2020 through to 21 Ml/d in 2030 and 39 Ml/d in 2045. This indicates an increasing surplus over this period.

Flood Risk

17.141 Flood risk will still need to be managed through the implementation of the principles of NPPF. The guidance 4 published by the EA in February 2016 and updated in March 2020 to support the NPPF contains sensitivity ranges that are recommended to be applied to peak rainfall intensities, peak river flows, sea level rise, offshore wind speeds and extreme wave heights. The general trend is for each parameter to increase in the future, which in turn increases the risk of flooding to any site. The recommended allowances for peak rainfall intensity are given in Table 17.8.

Table 17.8: Recommended climate change allowances for peak rainfall intensity.

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End	+10%	+20%	+40%

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Central	+5%	+10%	+20%

17.142 Sea levels are also likely to rise in the future. The recommended allowances for sea level rise as provided in the NPPF are given in Table 17.9.

Table 17.9: Sea level allowance for each epoch in millimetres (mm) per year for the south east.

Allowance Category	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (m)
Higher central	5.7	8.7	11.6	13.1	1.2
Upper end	6.9	11.3	15.8	18.2	1.6

17.143 Flood risk could increase in the future with climate change, and the FRA and drainage strategy should make an allowance for increases in peak rainfall intensity and sea level rise, in line with a conservative scenario. The flood risk assessment will set out these allowances in more detail.

POTENTIAL SIGNIFICANT ENVIRONMENTAL EFFECTS OF THE PROPOSAL

Identified receptors and their sensitivity

17.144 Potential receptors have been identified through the assessment of baseline conditions. Sensitivities have been applied as indicated in Table 17.9.

Table 17.9: List of sensitive receptors and sensitivities.

Receptor		Sensitivity	Justification
Kent Project Site			
River Thames	Water quality	High	Failing to meet the quality standards (ecological status) of the Water Framework Directive. Marine Conservation Zone (MCZ) in River Thames adjacent to Swanscombe Peninsula
Unnamed Main River (Peninsula)	Water quality	High	Designated Main River by EA running through Peninsula within Kent Project Site boundary

Receptor		Sensitivity	Justification
including marshes			
River Ebbsfleet	Water quality	High	Achieving only 'moderate' ecological potential in Cycle 1 of WFD.
Sawyer's Lake	Water quality	High	Water body of aesthetical and recreational value
Castle Hill Lake	Water quality	High	Water body of aesthetical and recreational value
Water services infrastructure (surface water)	Capacity	High	On site drainage infrastructure should be appropriately sized. Existing network and sewerage will need to be protected from sediment during construction.
Water services infrastructure (supply)		High	The region is under serious water stress. The WRMP has identified a growing water supply deficit.
Water services infrastructure (foul treatment)		Moderate	Sewage Treatment Works are being upgraded across London to be able to deal with population growth and reduce pollution incidents to the River Thames.
Site users		High	Demolition and construction site workers and site users during operation.
Essex Project Site			
River Thames	Water quality	High	Failing to meet the quality standards (ecological status) of the Water Framework Directive.
Unnamed Main River (Tilbury west)	Water quality	High	Designated Main River by EA running through Essex Project Site boundary.
Unnamed Main River (Tilbury east)	Water quality	High	Designated Main River by EA running adjacent to eastern boundary of Essex Project Site.
Water services infrastructure (surface water)	Capacity	High	On site drainage infrastructure should be appropriately sized. Existing network and sewerage will need to be protected from sediment during construction.
Water services infrastructure (supply)		High	The WRMP has identified a growing water supply deficit.
Water services infrastructure (foul treatment)		Moderate	Water services infrastructure needs to be able to deal with population growth and reduce pollution incidents to the River Thames.

Receptor	Sensitivity	Justification
Site users	High	Demolition and construction site workers and site users during operation.

17.145 For this stage of the PIER assessment and EIA process, effects have been identified either as potentially significant (moderate or major effect) or not significant (minor or negligible effect). As details on drainage, flood risk design and construction activities are further progressed a more accurate consideration of effects will be possible in line with the assessment methodology set out in this chapter with magnitudes of impact and effect significances defined in detail.

Demolition and construction effects

17.146 The demolition and construction effects will vary each year depending on the length of the construction programme and approach to phasing.

17.147 The risks to the water environment during demolition and construction include:

- Increased water demand from construction site uses;
- Increase in sediment loads caused by site run-off containing elevated suspended sediment levels. This can result from land clearance, excavation, dewatering of excavation, stockpiling, bunding, wheel washing and movement of materials to and from the Project Site;
- The release of hydrocarbons and oils into the on-site drainage system due to a large number of vehicles accessing the Project Site, leakage from oil/fuel storage tanks and accidental spillages;
- Accidental leaks and use of hazardous materials, particularly concrete and cement products, which can be contained in uncontrolled wash-down water and surface water run-off;
- Dust and debris caused by poor management of the Project Site;
- Leaks or breakage of temporary sewerage system infiltrating groundwater and/or migrating to surface waters;
- Potential for direct pollution and or disturbance of sediment in the River Thames as a result of the marine infrastructure works; and
- Flood risk associated with basement excavations.

17.148 These effects can be identified as temporary (construction activities) or permanent (loss of habitat).

Increased water demand

17.149 Processes during site preparation, excavation and construction phase of the Proposed Development which may require significant volumes of water supply including sanitary facilities for site staff, and water supply for wheel washing and washing down of construction areas.

Kent Project Site

17.150 The magnitude of change on strategic water supplies is expected to be low. This could result in a significant adverse temporary and short-term effect on strategic water supplies.

Essex Project Site

17.151 Effects are considered to be the same as those on the Kent Project Site, potentially resulting in a significant adverse temporary and short-term effect on strategic water supplies.

Increased sediment loads

17.152 Site run-off containing elevated suspended sediment levels can result from land clearance, excavation, dewatering of excavation, stockpiling, bunding, wheel washing and movement of materials to and from the Project Site. Run-off with high sediment loads can have adverse effects on water bodies through increasing turbidity (thus reducing light penetration and reducing plant growth), and by smothering vegetation and bed substrates (thus effecting on animal communities through the destruction of feeding areas, refuges and breeding/spawning areas). Indirect adverse effects can also be associated with suspended sediments that have inorganic or organic contaminants (e.g. heavy metals and pesticides respectively). Sediment can additionally cause issues within runoff channels through clogging and blockages resulting in reduced flow capacity

Kent Project Site

17.153 The River Thames, River Ebbsfleet and designated Main River (Peninsula) could be influenced by increased sediment loads filtering into surface water drainage as the current site drainage is discharged into the River Thames, potentially through the River Ebbsfleet and Main River (Peninsula). There is potential for a large magnitude of impact on these receptors. When considering the receptor sensitivity, the overall significant effect is considered to be significant adverse for water quality for the River Thames, River Ebbsfleet and Main River (Peninsula) in the absence of further mitigation. Sediment loads could additionally block and clog the existing surface water drainage and sewer network on the Kent Project Site. In the absence of mitigation, the magnitude of change is potentially up to large and the effect significant adverse on these water bodies.

Essex Project Site

17.154 Effects are considered to be the same as those on the Kent Project Site with site drainage into the River Thames and Main River (Tilbury west), resulting in a likely significance adverse effect on the River Thames and Main River (Tilbury west) in the absence of mitigation.

Hydrocarbons and oils

17.155 The release of hydrocarbons and oils into the on-site drainage system is a common form of pollution where there is vehicle traffic. There is a risk such pollution will increase during construction with greater numbers of vehicles accessing the Project Site due to trackout. This increase will likely include a significant number of heavy vehicles. Increased vehicle movements result in a greater likelihood of leakage from oil/fuel storage tanks and accidental spillages. Oils and fuels that are washed from surfaces into the on-site drainage system are likely to discharge to the drains.

17.156 Hydrocarbons form a film on the surface of the water body, deplete oxygen levels and can be toxic to freshwater fish. Even at very low concentrations the film can negatively affect the visual appearance of the water body. The effect would be temporary, and water quality within the affected water body would improve over time as pollutants disperse and are treated by natural processes.

Kent Project Site

17.157 Water body receptors including the River Thames, River Ebbsfleet and the Main River (Peninsula) could be influenced by increased hydrocarbons and oils getting into surface water drainage as stormwater and run-off drain through these channels and into the River Thames. There is potential for a large magnitude of impact on these water bodies. When considering the receptor sensitivity, the overall effect is considered to be significant adverse for water quality in these water bodies, in the absence of further mitigation.

Essex Project Site

17.158 The same effects described for the Kent Project Site are expected at the Essex Project Site with impacts from hydrocarbons and oils on the Main River (Tilbury west) considered significant adverse.

Accidental leaks of and use of hazardous materials

17.159 The use of concrete and cement products on-site can present a pollution risk because of the potential for uncontrolled release of wash-down and surface water run-off if these activities are not carried out in designated areas; wastewater may enter a water body and adversely affect the combined sewer and aquatic environment. Concrete products are highly alkaline and corrosive; fish can be physically damaged, and their gills blocked, and both vegetation and the bed of the water body can be smothered.

17.160 During demolition and construction there is an elevated risk of potential leaks or accidental spillage of hazardous chemicals infiltrating to groundwater or migrating to surface water bodies. However, it is only when large quantities of hazardous substances are spilled, or the spillage is directly into the water body, that a significant risk of acute toxicity will arise in the receiving water body. The magnitude of any change will depend on the scale and nature of any potential incident and thus is difficult to predict.

17.161 For the most part, effects are likely to be temporary. Water quality within the affected water body will improve over time as pollutants are dispersed and diluted.

Kent Project Site

17.162 Surface water features on the Kent Project Site including the River Thames, River Ebbsfleet and Main River (Peninsula) could be influenced by accidental leaks of hazardous materials getting into surface water drainage. There is potential for a large magnitude of impact on these water bodies. When considering the receptor sensitivity, the overall significant effect is considered to be significant adverse for water quality in these water bodies, in the absence of further mitigation.

Essex Project Site

17.163 The same effects described for the Kent Project Site are expected at the Essex Project Site with potential impacts from accidental leaks of and use of hazardous materials on the Main River (Tilbury west) considered significant adverse.

Dust and debris

17.164 Demolition and construction activities located on the Project Site have the potential to release dust and debris that may be blown into adjacent water bodies. Increased dust levels in water bodies may reduce the levels of light reaching aquatic plant and animal species. Debris blown into water bodies can decrease the recreational and aesthetic quality of the water body. Effects will however be temporary; water quality within the affected water body will improve over time as dust and debris settle or are trapped by vegetation. Sediment/debris can additionally cause issues within combined sewer networks through clogging/blocking, a reduction in flow capacity and premature operation.

Kent Project Site

17.165 Considering the adjacent proximity of the River Thames, River Ebbsfleet, Main River (Peninsula) as well as Sawyer's Lake and Castle Hill Lake, the magnitude of change without mitigation could be up to large with a significant adverse effect on these water bodies.
Essex Project Site

17.166 The same effects described for the Kent Project Site are expected at the Essex Project Site

with impacts from dust and debris on the Main River (Tilbury west) considered significant adverse.

Leak and breakage of the temporary sewerage system

17.167 Leaks and breakages of sewers from the temporary toilet facilities on-site during demolition/construction works may result in crude sewage infiltrating groundwater or being washed into the site drainage system. Sewage contains high levels of nutrients, organic matter, coliforms and suspended solids. These can result in nutrient enrichment and eutrophication, smothering of bottom-dwelling organisms and plants, and significantly reduced oxygen levels. The effect would be temporary as water quality within the affected water body would improve over time as organic matter is dispersed and treated by natural processes.

Kent Project Site

17.168 The River Thames, River Ebbsfleet and Main River (Peninsula) could be influenced by leakage or breakage of the temporary sewerage system, with sewage migrating into surface water drainage and potentially these surface water bodies. There is potential for a large magnitude of impact on these water bodies. When considering the receptor sensitivity, the overall significant effect is considered to be significant adverse for water quality in the River Thames, River Ebbsfleet and Main River (Peninsula), in the absence of further mitigation.

Essex Project Site

17.169 The same effects described for the Kent Project Site are expected at the Essex Project Site with impacts from leak and breakage of the temporary sewerage system on the Main River (Tilbury west) considered to be significant adverse.

Dewatering of excavations

17.170 The dewatering of excavations, especially from any basement excavations, may need to be discharged to the local sewer network or to adjacent rivers under formal agreement with the sewerage undertaker or the EA. In the case of sewerage infrastructure, the volume will minimise the flow capacity temporarily.

Kent Project Site

17.171 The magnitude of change on the capacity of the combined sewer network, in the event that flows are not managed appropriately, is considered to be large. The potential effect is potentially significant if flows are not managed correctly.

Essex Project Site

17.172 The magnitude of change on the capacity of the combined sewer network, in the event

that flows are not managed appropriately, is considered to be large. The potential effect is potentially significant if flows are not managed correctly.

Direct pollution and/or disturbance of sediment in the River Thames as a result of marine infrastructure works

17.173 Pollution control is a key element of all river works and the construction methodology at the London Resort will be fundamental to ensure that the risks in this regard are minimised. The proposed construction methodology has been identified with the following three principle objectives:

- Minimise the risks associated with pollution control during the works;
- Enhance buildability and maximise the quality of permanent works; and
- Allow the works to be carried out as safely as possible.

Kent and Essex Project Sites

17.174 Without the implementation of the appropriate controls and mitigation measures, and further controls specified as supplementary mitigation, the effect to water quality in the River Thames could be significant.

Flood risk to demolition/construction workers and construction plant

Kent and Essex Project Sites

17.175 Measures should be taken to protect construction workers from surface water flooding and the residual tidal and fluvial flood risks to the Project Site, in addition to water ingress from any excavations on-site. The magnitude of change on the construction workers and plant is likely to be small and the significance of effect is considered to be moderate adverse in significance, without further mitigation.

Potential operational effects of the development and their significance

17.176 This section considers the potential effects that the Proposed Development will have on the water environment once operational.

17.177 The effects of the Proposed Development on the water environment during operation include:

- Pollutants contained within surface water run-off contaminating water bodies through overflows/leaks to the sewer system/mobilising contaminants to groundwater;
- On-site and off-site flood risk;

- Impact on River Thames through river movements between Essex Project Site and Kent Project Site;

- Effect on the marine environment from frequent river movement between the Essex and Kent Project Sites.

- Water services infrastructure may not be able to maintain the increased water demand or place additional strain on availability of water supply in surrounding areas; and

- Sewerage infrastructure may not have enough capacity to receive foul discharges to the network and wastewater treatment works.

17.178 Specific effects related to groundwater contamination are addressed in detail in Chapter 18 Soils, hydrogeology and ground conditions.

Pollutants contained in surface water

17.179 Pollutant interceptors should be proposed within the areas with vehicle access, in order to remove hydrocarbon pollutants from road run off and should be located at the discharge from each catchment. Siltation controls may also be installed required.

Kent and Essex Project Sites

17.180 The magnitude of change will depend on the activities present and their occurrence. The effect is considered permanent, although certain activities such as accidental spillages would be temporary. It is envisaged that operational effects on all water bodies will be negligible due to the commitments that will be made in the Drainage Strategy for water quality treatment prior to discharge. The overall significant effect is not envisaged to be significant across all receptors.

Changes to flood risk

Kent and Essex Project Sites

17.181 The flood design mitigation which will be detailed in the FRA should mitigate primary flood risk from fluvial and tidal influences. With these commitments, the magnitude of change and effect significance should be non-significant to site users.

Water demand

Kent and Essex Project Sites

17.182 As the water use and population on both the Kent and Essex Project Sites will increase as a result of the Proposed Development, without appropriate potable water demand

management the magnitude of change on strategic water supply in both the Kent and Essex Project Sites could be significant. Measures and calculations relating to potable water demand will be set out in more detail at subsequent design stages.

Foul water drainage

Kent and Essex Project Sites

17.183 Foul water authorities in all local authorities have a duty to connect the Proposed Development to foul water infrastructure where available. Where new foul connections are poorly timed or made to areas with limited capacity, the building of new developments can cause complications as pollution can accumulate in another location along the sewerage catchment. Abstraction locations can be affected, and the local sewer network can discharge prematurely, or the wastewater treatment works that serve the area may not meet the required limits that prevent pollution in that location.

17.184 There will be a significant increase in foul water drainage volumes from the Project Site, with an increased development density and population on-site. Details of foul drainage and connections are being developed, however the effect significance to the sewer networks at both the Kent and Essex Project Sites could be significant without water demand measures. Continued engagement will be required with foul water authorities, including on any network improvements required.

PROPOSED MITIGATION

17.185 The contractor will develop a Construction Environmental Management Plan (CEMP), which will be secured by a requirement in the draft DCO, to cover both the demolition and construction site works for the Project Site. It will include mitigation measures to protect the water environment. This will set out how construction activities will be undertaken in accordance with good practice guidance, including the Pollution Prevention Guidelines (PPG) formerly published by the EA (and now available in the National Archives), particularly 'PPG1 General guide to the prevention of water pollution', 'PPG2 Above ground oil storage tanks', 'PPG5 Works in, near or liable to affect watercourses', and 'PPG6 Working at construction and demolition sites', and other good construction guidance such as CIRIA 'Guidance C532 - Control of water pollution from construction sites'.

Demolition and construction mitigation

17.186 Measures relating to water resources and flood risk that should be included in the draft CEMP include:

Water demand

- Selection and specification of water efficient equipment;

- Implementation of staff-based initiatives such as turning off taps, plant and equipment when not in use both onsite and within site offices;

- Use of recycling water systems such as wheel washes, site toilets handwash; and

- Use of a rainwater harvesting system for use in equipment and vehicle washing.

Management of sediment loads

- Keep gradients of soil as shallow as possible to prevent large amounts of earth being washed away during periods of heavy rainfall. Areas which are exposed should be reseeded or surfaced as soon as practicable.

- Enforce tight control of site boundaries including minimal land clearance and restrictions on the use of machinery adjacent to water bodies. Where possible, do not locate stockpiles within 10 m of water bodies or drainage lines.

- Wheel wash facilities should be provided at all entry and exits points. Water from wheel wash facilities must not be discharged into water bodies or the on-site surface water sewerage network.

- Capture run off from site in perimeter cut off ditches, settlement lagoons and/or settlement tanks where possible. Any dewatering required from site excavations should be pumped into a settlement tank or lagoon and not discharge direct to a water body or the on-site surface water sewerage network.

- Sediment should be removed from water pumped during any extractions required. Sediment should be removed prior to discharges to the surface water network through the use of a baffle tank system or equivalent.

- Sediment/soils encountered during construction activities such as boring and other earthworks could be contaminated. This has an associated risk of mobilising pollutants, which could be released to surface waterbodies. This could be a significant risk within the marine environment around the construction of new marine infrastructure and as such would need to be taken into account.

- In order to reduce the impacts to the marine bed floating equipment should be utilised where possible, such as float top barges with drilling rigs attached.

- Measures should be included to manage the re-suspension of sediments into the water column and potential migration into the wider environment.

- CEMP to include dust suppression measures such as dampening, and wheel washing.

Release of hydrocarbons and oils

- Incorporation of interceptors where appropriate into the site drainage system at high risk areas, such as parking, unloading and refuelling areas, to remove hydrocarbons and oils from surface water prior to discharge.

- Other measures including drip trays under equipment such as generators, and wheel washing facilities should also be implemented to minimise the risk of pollutants infiltrating groundwater or the surface water drainage network.

Leaks and spillages of hazardous materials

- Provision of storage facilities and tanks and conduct refuelling of machinery within bunded areas, which should not be located within 10 m of water bodies or drainage lines.

- Storage and bunded areas to be constructed of impervious floors and walls with the capacity for the contents of the storage tank and an additional ten per cent safety margin.

- As a remedial measure, spill containment equipment such as absorbent materials should be stored on-site.

- Mixing of construction materials, such as cement, will be conducted in designated areas located away from water bodies and drainage lines.

Maintenance of temporary sewerage systems

- Provision and maintenance of temporary septic tank, cesspit and/or sewerage connection for disposal of sewage from the toilet facilities to reduce the likelihood of crude sewage infiltrating groundwater or migrating towards water bodies.

- Any temporary toilet facilities will be positioned at least 10 m away from the banks of water bodies/the on-site culvert.

Wind-blown dust and debris

- Damping down to suppress the creation of dust.

- Implement good site practice, perimeter fences and tight control of materials and waste to minimise the risk of debris entering water bodies.

Dewatering of excavations

- Capture run-off from the Project Site in perimeter cut off ditches, settlement lagoons and/or settlement tanks where possible. Any dewatering required from site

excavations should be pumped into a settlement tank or lagoon and not discharge direct to a water body or the on-site surface water sewerage network.

- Sediment should be removed from pumped water during any extractions required. Sediment should be removed prior to discharges to the surface water network through the use of a baffle tank system or equivalent.

- If there is a requirement for discharge to the combined sewer, this should be throttled to a flow rate that is agreed with the water authority prior to commencement of work.

Flood risk to site workers and downstream areas during construction

- Contractor to prepare a flood emergency and contingency plan including arrangements to make safe any static plant, move any mobile plant, and to evacuate site operatives in a flood risk emergency.

- Construction workers should be made aware of risks associated with excess surface water caused by overland flows and standing water. For example, risks to deep excavations and damage to plant.

- Construction workers should be made aware of risks associated with working near to and over water.

- To minimise any risk from groundwater flooding during excavation of the Project Site, cut levels should be limited to at least 0.5 m above the groundwater level. Where this is not possible, dewatering and other groundwater control measures should be employed. Any such groundwater control measures will also require pollution control measures in accordance with EA guidance.

Operational Mitigation

17.187 The following commitments, which will be made through the FRA and drainage strategies which will accompany the DCO application, are considered to form embedded mitigation. The subsequent assessment assumes that the design measures specified in these documents are implemented. These strategies are currently being progressed and will be developed further as more information becomes available and further stakeholder engagement is undertaken ahead of the DCO application.

On-site flood risk

17.188 As part of the proposals for the Kent Project Site, the flood defences are to be improved.

17.189 The Kent Project Site will be protected from tidal flooding up to the 1 in 1000-year flood event, allowing for climate change up to the end of the design life of the project. The required protection will be based on the latest TE2100 Plan.

17.190 Where new or raised flood, defences are required to meet the latest TE2100 Plan, the design will ensure that future raising is possible if required in the future.

17.191 Improvements to the flood defences at the Kent Project Site may include realignment of the existing defences, particularly in the following areas: Black Duck Marsh, the ferry terminal, and Botany Marsh, allowing for a continuous passive defence system (i.e. avoiding the need for flood gates) where possible.

17.192 Flood defence design proposals at the Essex Project Site will be subject to consultation with the EA. The EA have indicated that a new alignment of flood defences are currently proposed in this location as part of a wider Tilbury waterfront area for defence improvement by the EA. The Proposed Development will work closely with the EA to ensure that the masterplan design aligns with the prospective improvements.

17.193 Hydraulic flood modelling will be carried out, including modelling of breach scenarios at the Kent and Essex Project Sites in order to assess the flood hazard to users of the site and surrounding area and ensure that an appropriate Flood Evacuation and Management Plan (FEMP) is implemented. The FEMP would be developed as part of the detailed design phase.

17.194 If proposals for the access corridor near the River Ebbsfleet require land raising within the 1 in 100year flood extent, appropriate flood compensation will be provided within the Kent Project Site boundary.

17.195 The Proposed Development will be designed to ensure that it is at a low risk from all sources of flooding and will not increase the risk to surrounding areas. A full FRA will be provided as an Appendix to the ES Report.

17.196 The risk of sewer flooding will be mitigated with an appropriately designed foul water network discussed within the water resources section of the ES chapter.

17.197 Flood risk mitigation from groundwater is currently not considered to be required for either the Kent or Essex Project Site.

17.198 Flood risk mitigation from artificial sources is not required for the Kent Project Site, however at the Essex Project site consideration of the Tilbury Flood Storage Area breach extent and the Tilbury Docks Breach extent will be used to inform the Proposed Development and FEMP.

17.199 Flood risk from surface water will be mitigated with an appropriately designed surface water drainage strategy which is considered in the surface water management section of this Chapter. A full Surface Water Drainage Strategy will be provided as an Appendix to the ES chapter.

Surface water drainage

17.200 The proposed surface water drainage design has been prepared in accordance with the drainage hierarchy identified in the NPPF Planning Practice Guidance, the guidance in the C753 SuDS Manual (CIRIA, 2015), the guidance in the Kent County Council (KCC) Drainage and Planning Policy (KCC, December 2019) and advice provided during consultations with the EA. Consultations with KCC, TC and as the Lead Local Flood Authorities (LLFA) are due to commence.

Kent Project Site

17.201 Based on consultation with the EA to date, the strategy for the surface water drainage will meet the following criteria:

- discharge to the River Thames does not have to be controlled or attenuated to match or reduce the existing run off rates due to the tidal nature of the River Thames;
- the 1 in 2 year rainfall event is to be contained within the stormwater network pipes on site and not surcharge the network;
- the 1 in 30 year rainfall event is to be contained within the stormwater network allowing for surcharging of the network, but with no flooding on the surface;
- the 1 in 100 year rainfall event is designed to flood the surface of the Project Site but will have no impact off-site.

17.202 Surface water storage for the Proposed Development will be designed to mitigate the Project Site from surface water flooding during periods of high tide, when the surface water drainage network is not able to drain via gravity into the River Thames. Storage on-site will be provided for this tide lock scenario. The tide locked scenario will be designed for the combined probability of either:

- a 1 in 5 year (with allowance for climate change) rainfall event coinciding with the 1 in 200 year tidal event; or
- a 1 in 100 year (with allowance for climate change) rainfall event coinciding with the Mean High Water Spring tidal level.

17.203 The chosen design criteria will be based on an assessment of the combined probability and consultation with the EA.

17.204 The drainage strategy will aim to ensure that the Botany Marsh East and Black Duck Marsh retain their existing hydrological flow regime and are not adversely affected. The discharge rates to these areas will be restricted to existing discharge rates where possible. Modifications to the overland catchment areas and attenuation measures are being

investigated to reduce the impact from an increase in impermeable area and therefore runoff due to the new development.

17.205 It will be demonstrated that the proposed surface water drainage strategy does not increase flooding to the Project Site or other sites due to the increase in impermeable areas, during a tide lock scenario.

17.206 Sustainable Drainage Systems (SuDS) will be incorporated across the Project Site to manage surface water flows and minimise the risk of pollution to the water environment. SuDS are used to mimic more natural processes to convey surface water away from a development.

17.207 Due to concerns over the contaminated ground conditions, infiltration systems will be avoided in areas susceptible to contamination as these systems could mobilise pollutants. Filtration systems that offer most of the above benefits and treat water before discharge are proposed within the Kent Project Site.

17.208 The surface water strategy will also include opportunities for biodiversity enhancements such as the improved design and management of wetland areas and increase in inter-tidal habitats, as well as the opportunity to combine strategies with water use within the Proposed Development to ensure the Project Site remains resilient to future changes in climate variability and change.

17.209 Appropriate SuDS will be incorporated as part of the access corridor proposals to treat and convey runoff from the new access road, before discharge via infiltration if appropriate or to the existing highways drainage or River Ebbsfleet.

Essex Project Site

17.210 As Lead Local Flood Authority, discussions with TC and ECC will be undertaken to establish the basis of design for the surface water drainage system at the Essex Project Site.

Potable water, Wastewater and Foul water drainage

17.211 To reduce the impact on water supply in the local area it is currently proposed that two existing groundwater boreholes will be reinstated, treated at Southfleet water treatment works and supplied to the Kent Project Site. This would provide supply potable water to the Kent Project Site without reducing supply from the existing network. See Figure 17.8 for the indicative proposed strategy.

17.212 Borehole and upgrade works would be required to supply the Main Resort and Ebbsfleet Garden City. Consultation with Thames Water is currently ongoing to establish the strategy.

17.213 Consultation with ESW has not yet commenced to establish the strategy for water supply at the Essex Project Site.

17.214 In order to help reduce demand/capacity requirement, the following will be considered:

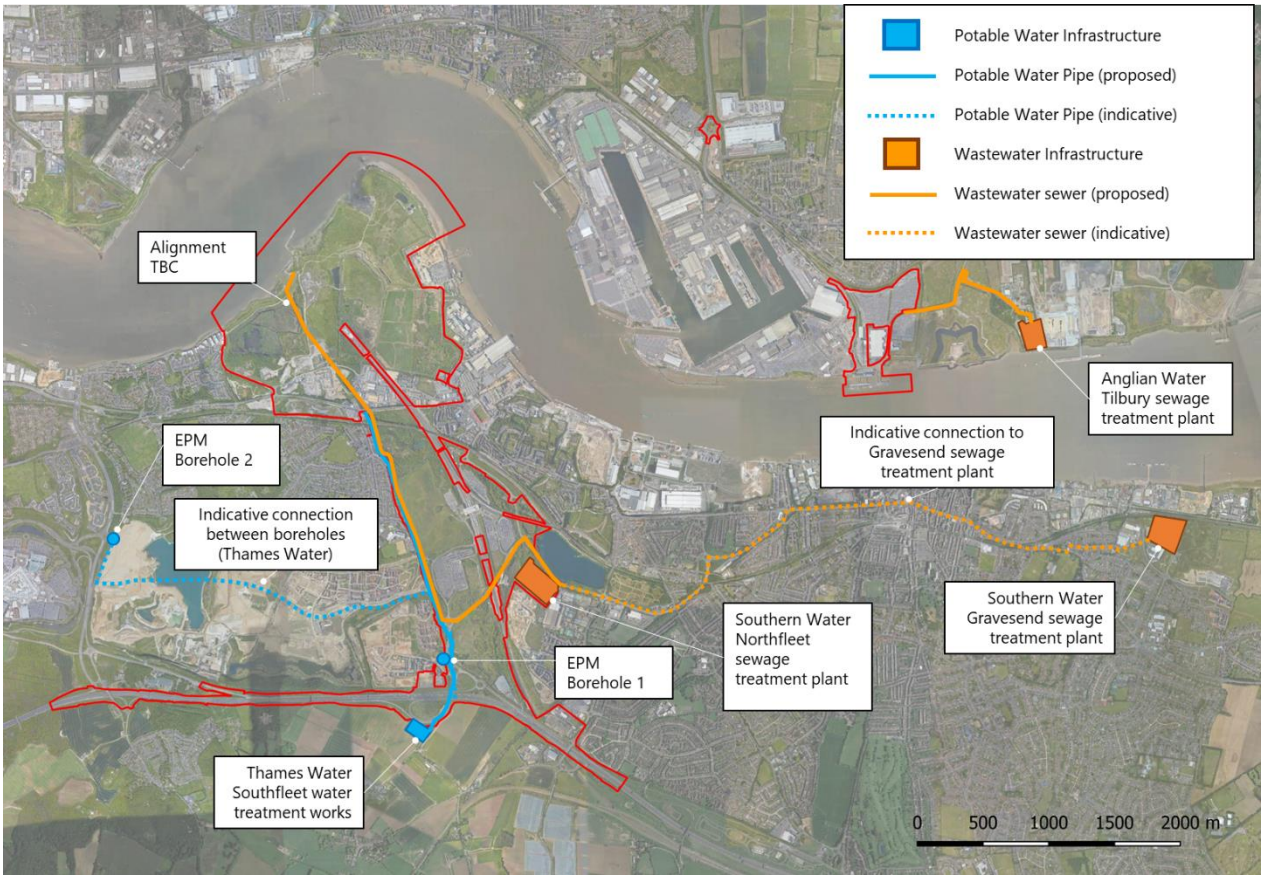
- adoption of Demand Reduction Measures to minimise water demands, such as low flow taps and toilets, and;

- identification and adoption as appropriate of non-potable water sources. This may include consideration of rainwater harvesting, grey water recycling. Uses of non-potable water may include irrigation, cooling and non-leisure water bodies.

17.215 Although confirmation of the wastewater and foul drainage strategy has not been confirmed with SW, it is the intention that the Kent Project Site will connect to the rising main connecting Northfleet and Gravesend and treatment undertaken by SW.

17.216 Anglian Water would treat the foul water generated by the Essex Project Site via the existing sewer network.

Figure 17.8: Proposed water supply and treatment for the Project Site.



Marine Infrastructure

17.217 It is proposed to retain White's Jetty in its existing condition in the Kent Project Site. Bell Wharf may be rebuilt/refurbished to locate the new facility required for the Proposed

Development. This would include a quay side for mooring barges as well as incorporating a ro-ro ramp between Bell Wharf and White's Jetty.

17.218 A new ferry terminal will extend out into the Thames immediately upstream of Bell Wharf, connected to the new/refurbished Bell Wharf.

17.219 At the Essex Project Site, a new Thames Clippers ferry terminal is proposed and a maintenance area downstream of the landing stage.

17.220 Tilbury Docks is likely to be used for logistics and transfer of goods and waste with potential to use the roll-on/roll-of (ro-ro) facility.

17.221 The design of future marine infrastructure shall be undertaken to reduce the potential for significant impacts to the marine environment.

17.222 It is proposed that a Navigation Risk Assessment for the Project Site is undertaken to assess the impacts of any increases in river traffic and to ensure that any impact is managed appropriately, this will be reported in the ES.

RESIDUAL ENVIRONMENTAL EFFECTS

17.223 Through the embedded mitigation the implementation of supplementary mitigation measures, it is hoped that the significance of the majority of potential effects can be reduced so they are not considered significant (i.e. minor or negligible).

17.224 The residual environmental effects will be determined in detail as part of the ongoing consultation and assessment process and reported on within the ES chapter.

CUMULATIVE AND IN-COMBINATION EFFECTS

17.225 The cumulative and in-combination effects will be further identified as part of the ongoing consultation process and reported on in full within the ES report, as part of the DCO submission.

17.226 The assessment will assess both the interactive cumulative effects resulting from a combination of impacts from this development as well as interproject cumulative effects which will consider the combined impact of the proposal with surrounding development.

17.227 If any potential effects are identified as part of the assessment, mitigation measures will be identified to reduce the significant impact to acceptable levels.

CLIMATE CHANGE

17.228 The construction period is planned to last until 2024 for Gate 1 and 2029 for Gate 2. Climate forecasts show that as a result of climate change, the south-east of England is likely to experience slightly wetter winters and drier summers. Whilst there are not likely to be significant changes to precipitation levels in the timeframe of the construction of this development, climate change is also likely to result in more extreme weather events, such as extended periods of heavy rain which are becoming more frequent and could result in flash flooding.

17.229 Based on the current climate forecasts during the construction period there is not a need for specific adaptation measures to reduce the risk from climatic effects during construction. There may be an increased risk of extreme weather events, and prudence must be made during construction to be aware of local forecasts and allow flexibility in the approach to construction work as appropriate at the time, however specifying adaptation measures at this stage is not deemed necessary.

SUMMARY AND CONCLUSIONS

17.230 The assessment will consider the impact of the following water elements:

- Flood risk management;
- Surface water drainage
- Foul drainage;
- Water resource management;
- Water quality and commitments to the water framework directive (WFD); and
- Maritime infrastructure.

17.231 It is expected that significant impacts will arise from both operation, and demolition and construction phases of the project's lifespan without appropriate mitigation measures. A full assessment of effects will be included in the ES. Impacts are likely to include:

Demolition and Construction

- Increased water demand from construction site uses;
- Increase in sediment loads caused by site run-off containing elevated suspended sediment levels. This can result from land clearance, excavation, dewatering of excavation, stockpiling, bunding, wheel washing and movement of materials to and

from the Project Site;

- The release of hydrocarbons and oils into the on-site drainage system due to a large number of vehicles accessing the Project Site, leakage from oil/fuel storage tanks and accidental spillages;

- Accidental leaks and use of hazardous materials, particularly concrete and cement products, which can be contained in uncontrolled wash-down water and surface water run-off;

- Dust and debris caused by poor management of the Project Site;

- Leaks or breakage of temporary sewerage system infiltrating groundwater and/or migrating to surface waters;

- Potential for direct pollution and or disturbance of sediment in the River Thames as a result of the marine infrastructure works; and

- Flood risk associated with basement excavations.

Operation

- Pollutants contained within surface water run-off contaminating water bodies through overflows/leaks to the sewer system/mobilising contaminants to groundwater;

- Changes to on-site and off-site flood risk;

- Impact on River Thames through river movements between Essex Project Site and Kent Project Site;

- Effect on the marine environment from frequent river movement between the Essex and Kent Project Sites.

- Water services infrastructure may not be able to maintain the increased water demand or place additional strain on availability of water supply in surrounding areas; and

- Sewerage infrastructure may not have enough capacity to receive foul discharges to the network and wastewater treatment works.

17.232 Appropriate mitigation measures will be identified which will aim to reduce impacts so they are not considered significant.

17.233 The summary and conclusion will be completed as part of the final ES report with the DCO submission.