

Southwark Integrated Waste Management Facility

Old Kent Road, Bermondsey, London

Veolia ES Southwark

Environmental Statement

Chapter 10
Hydrology & Flood Risk

Chapter 10 Contents

10	Hydrology & Flood Risk.....	10-3
10.1	Introduction.....	10-3
10.2	Legislation and Planning Context.....	10-3
10.3	Assessment Methodology.....	10-5
10.4	Baseline Conditions.....	10-7
10.5	Incorporated Enhancement and Mitigation.....	10-10
10.6	Identification and Evaluation of Key Impacts.....	10-12
10.7	Mitigation.....	10-15
10.8	Residual Impact.....	10-15
10.9	Conclusions.....	10-15
10.10	References.....	10-16

Chapter 10 Drawings

Figure 10.1:	Conceptual Drainage Strategy
Figure 10.2:	Environment Agency Flood Map

Chapter 10 Appendices (See Volume 2)

Appendix 10.1:	Flood Risk Assessment
----------------	-----------------------

10 Hydrology & Flood Risk

10.1 Introduction

- 10.1.1 This Environmental Statement (ES) chapter assesses the hydrological impacts associated with the development of the Old Kent Road IWMF site, located in Bermondsey, London, within the administrative boundary of Southwark Council.
- 10.1.2 Full details of the development proposed are presented in Chapter 4 which sets the basis against which this assessment has been conducted.
- 10.1.3 The aim of this assessment is to determine whether the proposed development may affect the hydrology, surface water drainage, flooding and water quality of the site and surrounds, or whether these factors may impact upon the development.
- 10.1.4 The chapter describes the policy context and the methods used to identify the baseline conditions at the application site and within the surrounding area. It identifies and reviews key water resources and sensitivities, and then addresses the direct and indirect impacts of the development on these resources. The chapter also examines the potential for flood risk in accordance with Government guidance and the requirements of the Environment Agency (EA). The need for water resources mitigation measures is addressed and any residual impacts are identified.

10.2 Legislation and Planning Context

- 10.2.1 A detailed review of the development plan documents and planning context in relation to the development proposals is provided in Chapter 3.
- 10.2.2 This section summarises those policies that are directly relevant to hydrology and flood risk issues.

European Policy & Legislation

The EU Water Framework Directive (2000)

- 10.2.3 The EU Water Framework Directive (2000) has been a major driving factor in EU and UK planning policy. The directive aims to generate a more integrated approach to water management, ensuring that the links with ecology are increased. It strives to ensure that water quality is improved and that developments will not have a detrimental impact upon this. The directive has been transposed into English law as 'The Water Environment Regulations (England and Wales), 2003'.

National Policy & Legislation

Securing the Future - UK Government Sustainable Development Strategy (2005)

- 10.2.4 National planning policy regarding the water environment is outlined in the UK Government strategy document "*Securing the Future - UK Government Sustainable Development Strategy*" which acknowledges the importance of an integrated approach to water management to ensure that ecosystems are protected rather than damaged. This is necessary to enable human wellbeing, and to support life and the biological resources upon which we depend. In addition this document outlines that any exploitation of these resources should be within acceptable sustainable environmental limits.

The Water Resources Act (1991)

- 10.2.5 The Water Resources Act (1991) as amended by the Environment Act (1995) provides for the protection of the water environment through controls on abstractions, impoundment and discharges.

The Land Drainage Act (1991)

- 10.2.6 The Land Drainage Act (1991) places the responsibility for the maintenance of ordinary watercourses on the adjacent landowner and provides scope for local authorities to ensure that maintenance works are undertaken. In addition, it ensures that any channel works cannot be undertaken without prior authorisation.

The Water Act (2003)

- 10.2.7 The Water Act (2003) provides modifications on abstraction licensing and regulation along with statutory water company water resource management plans, competition for non household customers and provision for block grants for flood defence works.

Planning Policy Statement 25 (PPS25): Development and Flood Risk (2006)

- 10.2.8 Relevant national planning policy is contained within Planning Policy Statement 25 (PPS25): Development and Flood Risk. This aims to ensure that flooding is considered at all stages of the planning process and that proposed developments are not likely to be at risk of flooding or lead to increased flood risk elsewhere in the surrounding catchment.

Regional Policy

The London Plan, Spatial Development Strategy for Greater London (Consolidated with Alterations since 2004), February 2008

- 10.2.9 The proposed development site falls within the administrative areas of the London Borough of Southwark. This plan sets out the regulatory framework for London and is reviewed in detail in Chapter 3.
- 10.2.10 Relevant policies from the London Plan with regard to hydrology and flood risk issues comprise:
- Policy 2A.1: Sustainable Criteria
 - Policy 4.A.3: Sustainable Design and Construction.
 - Policy 4A.12: Flooding
 - Policy 4A.13: Flood Risk Management
 - Policy 4A.14: Sustainable Drainage
 - Policy 4.A.23: Criteria for Selection of Sites for Waste Management and Disposal.

Local Policy

The Southwark Plan, July 2007

- 10.2.11 The Southwark Plan was adopted in July 2007. It provides a framework for all land use and development in Southwark. Please see Chapter 3 for a detailed review.
- 10.2.12 Relevant policies from the Southwark Plan with regard to hydrology and flood risk issues include:
- SP11: Amenity and Environmental Quality
 - SP12: Pollution

- Policy 3.1: Environmental Effects
- Policy 3.9: Water

10.3 Assessment Methodology

Introduction

- 10.3.1 The hydrological site conditions, water quality and flooding were determined by consulting maps and other published information regarding topography, soils, geology and hydrology. In addition the EA were consulted regarding the flood risk and the water quality of the nearby water courses and features and the methodology of the Flood Risk Assessment (FRA). A site walk over and investigation works were undertaken to ascertain the current site conditions and establish the baseline water quality.

Relevant Guidance

- 10.3.2 As a matter of best practice, this assessment has been undertaken based on the relevant guidance on hydrology and flooding assessment. This includes:
- Planning Policy Statement 25 (PPS25): Development and Flood Risk.
 - Land Drainage Act 1991.
 - Water Resources Act 1991.

Consultations

- 10.3.3 As detailed in Chapter 1, a formal scoping exercise has been undertaken to inform the scope of the Environmental Assessment. The formal Scoping response is included at Appendix 1.2. The exercise highlighted the following issues relevant to hydrology and flooding impacts:
- The type of facility will indicate the appropriate Flood Risk Vulnerability Classification adopted for the development and the subsequent interpretation within PPS25. This will dictate the level of Flood Risk Assessment required;
 - Reference should be made to Southwark's Strategic Flood Risk Assessment (SFRA) which includes flood defence breach assessments;
 - The FRA should incorporate a surface water drainage strategy. Supporting calculations should demonstrate the suitability of the solution with a reduction in surface water runoff rates and volumes using SUDs solutions in accordance with the London Plan.
 - Opportunities to enhance wildlife habitat via enlargement or appropriate management of existing habitats is encouraged. It is noted that the masterplan indicate a green corridor area and that this may be a suitable location for the development SUDs solution and habitat enhancement/creation.
 - The EA can provide information on flood water levels, flood defence levels and the condition of these defences.

Information Sources

- 10.3.4 Information sources used to complete this assessment include:
- Landmark Envirocheck Report. 31st August 2007. Reference number: 22642931_1_1;
 - Ordnance Survey Maps;
 - Topographical Survey;
 - Environment Agency Flood Maps;
 - Data provided by the Environment Agency;
 - Soil Survey of England and Wales, Soil Maps;

- Strategic Flood Risk Assessment (SFRA) – London Borough of Southwark (2008);
- Strategic Flood Risk Assessment (SFRA) - Thames Gateway (2005);
- A Flood Risk Assessment completed by RPS in June 2008 in accordance with PPS25 (See Appendix 10.1). This assesses the flood risk to the site and surrounds, surface water drainage issues and provides conceptual mitigation for these issues;
- Further information sourced during walkovers of the site and surrounds completed by RPS in November 2007.

Methodology

- 10.3.5 The assessment comprises two main elements, namely Water Quality and Flood Risk (incorporating a drainage assessment for the surface water runoff), the methodology utilised for the assessment of these elements is outlined below and further detail is provided within the associated Technical Appendix 10.1.

Water Quality Assessment

- 10.3.6 A qualitative assessment of potential impacts on local surface water quality has been undertaken and relates primarily to the proposed changes to the surface water drainage regime. The potential impact of soil contaminants on local watercourses is considered in Chapter 11 Hydrogeology & Ground Conditions.

Flood Risk Assessment

- 10.3.7 A detailed Flood Risk Assessment has been undertaken for the application site and is located in the Technical Appendix. This assessment has been undertaken in accordance with PPS25, and is required by the Environment Agency. The key components of the FRA were as follows:

- A review of the modelled 200-year and 100-year tidal flood levels for the River Thames, as provided by the EA;
- Assessment of the level of defence provided by the flood defences along the River Thames now and in the future. The 200-year and 1000-year tidal events have been assessed as the guideline standard for purposes of development. A development design life of 60 years has been assumed;
- Consideration of the consequences to the development arising from an extreme event or a breach within the defences. The 1000-year tidal events have been assessed as the guideline standard for purposes of development;
- Outline for a flood mitigation strategy and flood management plan, including safe access/egress;
- A hydrological assessment of the surface water flows for the existing (pre-development) and proposed (post-development) site; and
- A conceptual outline of a surface water drainage strategy for the development, which incorporates appropriate mitigation measures and includes provision for Sustainable Urban Drainage Systems (SUDS).

Significance Criteria

- 10.3.8 The assessment of the potential effects of the development on the hydrology, water quality and flood risk to the site, surrounding areas and relevant receptors has been undertaken using a phased approach. The first phase assessed the predictions of the magnitude of these potential impacts without the inclusion of any mitigating measures that may already be incorporated or that are required. As such, this phase considers the 'worst-case' scenario for the construction and operational stages and is intended to identify the potential magnitude of any likely impacts. The second assessment phase incorporates the necessary mitigation measures to address these impacts and the significance of these impacts. The potential impacts before and after mitigation along with the residual effects have been assessed using the criteria outlined in Table 10.1.

Table 10.1 - Significance Criteria

Significance of impact		Description
Negligible		No appreciable impact on humans, aquatic flora and fauna, or surface water resources. Any minor effects are reversible.
Minor	Adverse	Temporary and minor detrimental effect to local watercourses. Moderate local flooding adjacent to the site. Moderate local scale reduction in surface water quality, reversible with time. Reversible detrimental effects on aquatic flora or fauna.
	Beneficial	Minor reduction in risk to humans, animals or plant health. Minor localised improvement to the quality of surface water resources or minor reduction in flood risk.
Moderate	Adverse	Moderate detrimental effect to local watercourses. Severe temporary flooding or change to flow characteristics of watercourses. Severe temporary reduction in the quality of surface water resources. Severe temporary impact on aquatic flora and fauna.
	Beneficial	Moderate reduction in risk to humans or aquatic fauna and flora. Moderate localised improvement to the quality of surface water resources or minor reduction in flood risk.
Substantial	Adverse	Severe detrimental affect to local watercourses. Permanent flooding or change to flow characteristics of watercourses. Permanent reduction in the quality of surface water resource. Permanent adverse impact on aquatic flora or fauna.
	Beneficial	Major reduction in risk to humans or aquatic fauna and flora. Significant localised / moderate to significant regionalised improvement to quality of surface water resources. Moderate to significant localised/regionalised reduction in flood risk.

Cumulative Impacts

10.3.9 No proposed new developments have been identified that have the potential to impact cumulatively with the proposal.

10.4 Baseline Conditions

Surface Water

10.4.1 The site is currently predominantly brownfield and is part of a former gasworks that operated from the 1890s to the 1960s. As such the site has previously been developed and would be considered 'brownfield'. Consequently significant areas of hardstanding occupy much of the site.

10.4.2 The site currently drains via the internal surface water drainage system to external Thames Water combined systems located along the eastern and southern boundaries. The internal drainage system consists of gullies and gratings discharging into the private system prior to entering the public system. No existing attenuation storage is located within the site.

Surface Water Quality

10.4.3 No suitable sampling points were found for undertaking water quality on the site, or within the surrounding area as all surface water drainage systems are formalised and below-ground (ie pipes).

10.4.4 During the site walkover potential sources of surface water contamination were observed:

- Runoff generated by building roofs is considered to be clean.
- Routine vehicular contamination from car parking areas including fall out of exhaust particles, particles from wear and tear of tyres, oil and petrol leaks.

- Heavy vehicular contamination from a bunded workyard area from re-fuelling, oil storage and accidental spillage.
- Contamination associated with the timber yard from on-site storage of treated timber and storage of treatment solutions.

10.4.5 In the lack of any water quality data, the quality of water within the receptor (Thames Water infrastructure) is considered to be Low to Moderate.

Flood Defences

10.4.6 Advice from the EA indicates that the defences along the Thames to the north of the site are all raised, man-made and privately owned but regularly inspected by the EA. The defences to the north of the site are at a level of 5.28mAOD and those to the east are at a level of 5.18mAOD. The defences are rated by the EA as 'Grade 2 - Good' with the exception of 5 stretches totalling 393m, between Bermondsey and Deptford, which are rated as 'Grade 3 - Fair'.

10.4.7 Currently, the flood defences offer protection from tidal flooding from events up to 0.1% annual probability until 2030. After 2030, the standard of protection will decrease over time, although there is a current EA project studying protection options to manage flood risk up to 2100.

10.4.8 The site is situated west of the Thames Barrier, which offers protection from tidal surge events.

Flood Data

EA Flood Map

10.4.9 The FRA demonstrates that the Application Site is within Flood Risk Zone 3 as shown by the EA indicative Flood Maps. These flood maps ignore the presence of the significant flood defences along the River Thames and the operation of the Thames Barrier.

Tidal Flood Levels

10.4.10 The site is located 2km to the south and west of the River Thames. The site is located within defended floodplain adjacent to the River Thames.

10.4.11 Advice from the EA (provided in Technical Appendix 10.1) indicates the following modeled tidal levels apply to the Thames, close to the site.

Table 10.2 Modelled Flood Levels for the River Thames

Annual Probability	Present Day	2052 Allowing for climate change	2102 Allowing for climate change
10%	4.99	5.07	5.04
5%	5.04	5.09	5.05
2%	5.09	5.11	5.06
1%	5.12	5.12	5.07
0.5%	5.14	5.13	5.08
0.1%	5.18	5.15	5.09

10.4.12 The levels are lower in scenarios allowing for climate change because the model takes the Thames Barrier into account, which will be closed more frequently in the future to protect against rising sea levels.

Strategic Flood Risk Assessment, London Borough of Southwark

- 10.4.13 A Strategic Flood Risk Assessment (SFRA) has been prepared for the London Borough of Southwark (Feb 2008). A summary of the key flood risk content is provided below, further detail is provided within the Technical Appendix 10.1.
- 10.4.14 As part of the SFRA a strategic level breach assessment was undertaken for the Borough. In relation to the area of the Application Site the assessment concludes that:
- The site is considered predominantly at 'Significant' flood risk;
 - The site is not located in functional floodplain (Zone 3b)
 - The site access and adjacent Old Kent Rd area are considered at 'Moderate' to 'Low' flood risk;
 - The site is not located in the Rapid Zone of Inundation and flood warning time in the event of a breach is in the order of 6-12 hours; and
 - The spot flood depths given in the vicinity of the site vary between 810mm and 1760mm. These are given as depths only rather than as flood levels (m AOD).
- 10.4.15 The SFRA includes recommended planning and development control measures to be adopted in various PPS25 flood zones and for different development vulnerability. The relevant recommendations for the Application Site are outlined below.
- Less vulnerable development located in Flood Zone 3a with a significant to medium flood hazard rating is possible after consideration of the Sequential Test and Exception Test.
 - Flood resilient design techniques should be incorporated into any development to mitigate the potential flood damage.
 - Site specific emergency evacuation procedures will be required including co-ordination with the EA, emergency services and LPA.
 - Basements must be flood resistant and have internal access to a higher floor located 300mm above the Q200 plus climate change flood level. No sleeping accommodation.
 - Sustainable urban drainage systems (SUDS) to be utilised to reduce site runoff potential.
 - The Development form shall not impact on off-site or on-site overland flow paths.

Flood Risk

200 and 1000 Year Recurrence Interval

- 10.4.16 The site is protected by the River Thames flood defences and Thames Barrier for events up to and including a 1 in 1000 year flood event.
- 10.4.17 The flood risk to the site during a design flood event is therefore considered negligible.

Extreme Event–Breach

- 10.4.18 In the unlikely event of a breach of the River Thames flood defences the site could be subject to shallow to significant depths of inundation dependent upon the location and extent of the breach, the prevailing tidal conditions and the emergency response.
- 10.4.19 The site would not be considered to be in the Zone of Rapid Inundation and flood warning times in the order of 6 to 12 hours would be available. There is significant intervening topography between the development and any potential breach locations and this is likely to reduce the flood risk to the development and increase flood warning time.
- 10.4.20 The site access road and adjacent Old Kent Rd are located in a moderate to low flood hazard area and in the event of a breach, in excess of 12 hours flood warning time would be available for the Old Kent Rd area and suitable emergency access and egress to/from the site could be sought from this location.

10.4.21 The flood risk to the site during a breach flood event is therefore considered negligible to substantial adverse.

Surface Water Flooding

10.4.22 The land use and the topography of the surrounding land indicate that there would be limited potential for overland flow from off-site sources. The perimeter of the site in all areas except the north-eastern corner has been built up above the adjacent land through the use of retaining walls, whilst the land adjacent to the north-eastern corner is generally lower. The potential for off-site flows into the site is therefore limited.

10.4.23 The risk of surface water flooding to the site is considered minor adverse.

Groundwater Flood Risk

10.4.24 The development site is not thought to be at risk of groundwater flooding due to the slowly permeable underlying material.

10.4.25 The suitability of the site soils for infiltration is expected to be limited.

10.5 Incorporated Enhancement and Mitigation

10.5.1 The following section highlights those elements which have been incorporated within the design of the development to reduce any potential for adverse impacts on flood risk and water quality both for the development and the surrounding environment.

Construction

Surface Water Runoff

10.5.2 The surface water runoff during the construction phase will be managed through a temporary drainage network strategy, whilst the operational strategy is being constructed. The early phasing of the operational surface water drainage strategy and additional temporary construction measures will ensure that the surface runoff is controlled and discharged so as not to increase the overall runoff.

Water Quality

10.5.3 The early phasing of the operational surface water quality elements in addition to temporary water quality measures will minimise the risk of the pollutants entering the surface water receptors. The temporary mitigation measures will be incorporated into a Construction Management Plan, be based on the Code of Construction Practice (CoCP) and be applied across the development.

10.5.4 The CoCP will be developed from best practice advice (incorporating but not limited to CIRIA reports, Control of Water Pollution from Construction Sites (Reference 11) and The SUDS manual (Reference 12) to incorporate the following specific mitigation measures for the protection of the surface water features:

- Management of construction works so as to comply with the necessary standards and consent conditions as identified by the EA and Southwark Borough Council;
- All construction workers will be briefed on the importance of the water quality, location of the surface water infrastructure and the location and use of the accidental spill kits as part of the site induction;
- The construction drainage network will incorporate measures (e.g. potentially an interceptor) to prevent the discharge of hydrocarbons to surface or ground water systems;
- Any areas where there is increased risk of hydrocarbon/chemical spillage and hazardous substance stores additional precautions will be taken. These will include bunding (in accordance with the EA Pollution Prevention Guidance), impermeable bases, suitable drainage systems and sited away from any open drainage channels;

- Any stockpiled material will be stored within enclosed areas to enable the runoff to be stored and treated where required;
 - Any concrete works will be carefully controlled and where required any concrete tankers will be washed out in controlled areas;
 - All plant and machinery will be maintained in a good condition and any maintenance required will be undertaken within safe areas; and
 - Wheel washers and dust suppression measures will be used to prevent the migration of pollutants.
- 10.5.5 The sanitary and domestic waters will be discharged to the public sewer or a temporary holding tank located and constructed in accordance with EA guidance and best practice, should the foul connection to the public sewer be completed and operational within this stage then its use will be considered.

Flood Risk

- 10.5.6 A Flood Management Plan will be prepared for the construction works this will be similar in nature to that described in Section 10.5.12 for the Operational development.

Operation

Surface Water Runoff

- 10.5.7 The surface water runoff during the operational phase will be controlled and managed through a surface water management strategy (detailed in the FRA, Technical Appendix 10.1). Key to this strategy is the capture and control of the surface water generated within the development through the use of features such as positive drainage and intercept swales and kerbs which discharge to an attenuation storage area(s) for example. The system will be designed to manage rainfall events up to the 1 in 100 year event (1% chance of occurring in any year) including an allowance for climate change with the controlled discharge to the surrounding Thames Water system utilising existing or new connections. A net reduction of at least 20% in the baseline discharges from the site will be achieved. This reduction in flows will reduce flood risk for offsite areas. The final details of the drainage strategy and points of discharge will be agreed with Thames Water as part of the detailed design.

Water Quality

- 10.5.8 The development will contain two principal land drainage networks, consisting of separate foul water and surface water systems.
- 10.5.9 The 'clean' uncontaminated roof water will be discharged untreated to the surface water management system and thus discharged to the Thames Water systems. The surface water from potentially contaminated areas (e.g. access roads, yard and parking areas) will be discharged to this same system via mitigatory measures such as interceptors and/or silt traps.
- 10.5.10 An emergency stop valve/slucice or stop log will be incorporated within the surface drainage outfall arrangement(s) to allow discharge to the surface water sewer to be closed off in the case of an emergency, such as an accidental spillage.
- 10.5.11 The foul waters will be discharged through the sewer system to be constructed as part of the development to the surrounding Thames Water system. Where required, pre-treatment and trade waste agreements will be in place as required by Thames Water. Where feasible, water re-use (grey water) will be incorporated within the development to reduce the demands placed upon the public water supply network.

Flood Risk

- 10.5.12 The development buildings will have their lowest level located at a typical level of 4.13m AOD with some adjacent road and yard areas at lower levels. This is generally above the 4.0m AOD upper breach flood level limit set within the London Borough of Southwark SFRA.

10.5.13 The following flood resilience and mitigation measures may be required for the development. This would be confirmed at the detailed design stage:

- The proposed ground floor slab levels will be located a minimum of 150mm above the existing ground levels.
- The development built form will be constructed from flood compatible and resilient materials (e.g. concrete). The proposed development would incorporate flood resistant finishings as part of the design.
- Critical infrastructure including power supply, gas and telecommunications will be located as high as practicable and preferably above the extreme flood level. Freeboards of greater than 300mm should be achieved if practicable. Infrastructure should incorporate shut down and isolation facilities where practical to limit leakage or ruptures etc during a flood event.
- Non-return valves will be incorporated upstream of the public sewerage/surface water system to prevent the backflow of surface water and sewage into the development during surcharge or blockage conditions.
- A Flood Management Plan will be prepared for the development. This will include elements such as:
 - Site Maintenance and Inspection Plan
 - Signing up to the EA Flood Warning System
 - Emergency Evacuation Plan
 - Provision of safe access routes and designated meeting point for evacuation of the building and access for the emergency services
 - Designated Flood Safety Officer
 - Site Shutdown and Recommissioning Plan (incl. materials protection, key infrastructure protection etc)

10.6 Identification and Evaluation of Key Impacts

10.6.1 Specific impacts identified from the proposed development, taking into account the incorporated mitigation measures, are discussed as occurring either during the construction or the operational phase of the development in the following section.

Construction Phase

Surface Water Runoff

10.6.2 The construction phase could potentially lead to ponding of water on site, accidental runoff and increased runoff rates as the impermeable areas are increased. This could lead to minor to moderate adverse impacts on the local water levels and surface water flooding.

10.6.3 The potential impacts of the construction phase on the surface water runoff regime are reduced to **minor adverse to negligible** with the inclusion of the Enhancement and Mitigation Proposals incorporated into the scheme.

Water Quality

10.6.4 Should no mitigation be incorporated and the runoff waters be allowed to preferentially flow offsite then the construction phase of the development could potentially impact the water quality of the surrounding surface water features through a potential increase in fine sediments; hydrocarbons and other chemical loads; the introduction of cement; accidental spills and/or other wastes discharged from the site to the River Thames.

Fine/Suspended Sediments

- 10.6.5 The construction of the development could potentially lead to an increase in the volumes of fine materials that are conveyed in suspension by the receiving water, through increased sediment mobilisation during rainfall/site wash down events. This could be caused due to changes in land use; incorporation of stockpiles; excavations; areas of bare earth surface; machine/plant washing and increased mud and/or dust on the site access roads.
- 10.6.6 The potential increase in sediment loads could affect both flora and fauna through reduced light concentrations, smothering of plants and if organic matter is contained with the materials, then by reducing oxygen levels within the water through an increased biochemical oxygen demand (BOD). The overall impact on the River Thames is considered to be negligible to minor adverse.

Hydrocarbons and Chemicals

- 10.6.7 The construction phase of the development will lead to an increased presence and use of plant and other vehicles across the site. Their presence combined with the potential for incorrect storage and accidental spillage of both hydrocarbons and chemicals used as part of the construction process increases the potential for hydrocarbons/chemicals to reach the surface water receptors.
- 10.6.8 Hydrocarbons/chemicals could potentially reach the surface water receptors through accidental spills where they could potentially have long-term adverse impacts on the water quality and thus the ecology which can be supported. Whilst the baseline water quality of the River Thames has been assessed as moderate the impacts of any potential discharge of hydrocarbons/chemicals would be dependant upon the type and quantity discharged. The overall impact on the River Thames is considered to be negligible to minor adverse.

Concrete and Cement Products

- 10.6.9 The construction phase could potentially give scope for concrete and/or cement products to be released to the water environment. As they are highly alkaline they could potentially have adverse short term effects on the water quality and as such the flora and fauna. The potential for impacts are increased where on site concrete mixing occurs as the potential for contaminated water increases. The overall impact on the River Thames is considered to be negligible to minor adverse.

Effluent Discharge

- 10.6.10 The construction of the site will produce various forms of liquid waste. Should this water reach the surface water receptors untreated then the impacts could potentially be considered to be negligible to minor adverse on the River Thames.
- 10.6.11 With the incorporation of the Enhancement and Mitigation Proposals the potential impacts of the construction phase of the development on the water environment would be considered to be **negligible to minor adverse**. In the unlikely event of a significant spill the potential impacts would be considered to be **negligible to minor adverse** dependant upon the volumes spill and mitigation/reduction activities undertaken.

Fluvial/Tidal Flood Risk

- 10.6.12 The FRA (Technical Appendix 10.1) demonstrates that there is no fluvial/tidal flood risk to the site during the construction phase for both the 1 in 100-year or the 1 in 1000-year flood event. As such the impact of fluvial flooding can be considered to be **negligible**.
- 10.6.13 In the unlikely event of a breach of the River Thames flood defences the site could be subject to shallow to significant depths of inundation dependent upon the location and extent of the breach, the prevailing tidal conditions and the emergency response.
- 10.6.14 The potential impacts of flooding during the construction phase are reduced to **minor adverse to negligible** with the inclusion of the Enhancement and Mitigation Proposals incorporated into the scheme.

Operation

Surface Water Runoff

- 10.6.15 The operational phase will lead to a marginal reduction in the impermeable areas across the site, thus leading to an decrease in the volume of surface water runoff. These impacts could be considered to be **negligible**.
- 10.6.16 With the incorporation of the Enhancement and Mitigation Proposals the potential impacts of the operational development on surface water on and off site would be considered to be **negligible to moderate beneficial**.

Water Quality

- 10.6.17 There is potential for the operational phase of the development to impact upon the water quality of the surrounding surface water features. The operational causes are likely to be significantly different than those experienced during the construction phases. As a result of the development there is potential for an increase in hydrocarbons and other chemical loads; accidental spills and/or other wastes discharged to the surface water receptors.

Fine/Suspended Sediments

- 10.6.18 The increased number of vehicle movements will result in there being a higher potential for fine materials to be transported onto the site and thus into the drainage network. Should this water reach the surface water receptors untreated then the impacts could potentially be considered to be negligible to minor adverse on the River Thames.

Hydrocarbons and Chemicals

- 10.6.19 The operational phase of the development will lead to an increased presence of vehicles across the site. Their presence increases the potential for hydrocarbons/chemicals to reach the surface water receptors.
- 10.6.20 Should hydrocarbons/chemicals reach the surface water receptors they could potentially have long-term adverse impacts on the water quality and thus the ecology which can be supported. Whilst the baseline water quality of the River Thames has been assessed as moderate the impacts of any potential discharge of hydrocarbons/chemicals would be dependant upon the type and quantity discharged. The overall impact on the River Thames is considered to be negligible to minor adverse.

Effluent Discharge

- 10.6.21 The operation of the site will produce various forms of liquid waste. Should this water reach the River Thames untreated then the overall impact on the River Thames is considered to be negligible to minor adverse.
- 10.6.22 With the incorporation of the Enhancement and Mitigation Proposals the potential impacts of the operational phase of the development on the water environment would be considered to be negligible. In the unlikely event of a significant spill the potential impacts would be considered to be negligible to minor adverse dependant upon the volumes spilt and mitigation/reduction activities undertaken.

Fluvial/Tidal Flood Risk

- 10.6.23 The FRA (Technical Appendix 10.1) demonstrates that there is no fluvial/tidal flood risk to the site during the operation phase for both the 1 in 100-year or the 1 in 1000-year flood event. As such the impact of fluvial flooding can be considered to be **negligible**.
- 10.6.24 In the unlikely event of a breach of the River Thames flood defences the site could be subject to negligible to shallow depths of inundation dependent upon the location and extent of the breach, the prevailing tidal conditions and the emergency response.

10.6.25 The potential impacts of flooding during the operation phase are reduced to **minor adverse** to **negligible** with the inclusion of the Enhancement and Mitigation Proposals incorporated into the scheme.

10.7 Mitigation

10.7.1 The assessment of potential impacts set out in Section 10.6 takes account of mitigation measures incorporated into the design. On this basis therefore, no further mitigation measures are considered necessary and none are proposed.

10.8 Residual Impact

10.8.1 Residual impacts, their magnitude and significance are summarised in the table below.

Table 10.2: Summary of Residual Impacts

Resource	Phase	Residual Effect	Sensitivity of Receptor	Magnitude of Impact	Duration	Nature	Significance	Geographical Level of Importance of Issue				
								I	N	R	D	L
Hydrology & Flooding	Construction	Fluvial/Tidal Flooding (from River Thames breach)	Low	Minor	Temporary	Adverse	Minor/No Significance				*	
		Increased Area of Hardstanding - Increase in Surface Water Flooding (on adjacent land)	Moderate	Low	Temporary	Adverse	No Significance					*
		Water Quality – Impacts on receiving water	Low	Minor	Temporary	Adverse	Minor/No Significance					*
		Water Quality, Sedimentation and Erosion – increase in fine sediments, hydrocarbons and other chemical loads	Low	Minor	Temporary	Adverse	No Significance					*
	Operation	Fluvial/Tidal Flooding (from River Thames breach)	Low	Minor	Temporary	Adverse	Minor/No Significance				*	
		Increased Area of Hardstanding - Increase in Surface Water Flooding (on adjacent land)	Moderate	Moderate	Permanent	Adverse	No Significance					*
		Water Quality – Impacts on receiving water	Low	Minor	Temporary	Adverse	Minor/No Significance					*
		Water Quality, Sedimentation and Erosion – increase in fine sediments, hydrocarbons and other chemical loads; accidental spills and/or normal operations, spill or fire event.	Low	Minor	Temporary	Adverse	Minor/No Significance					*

Key: I: International N: National R: Regional D: District L: Local

10.9 Conclusions

10.9.1 The construction and operation of the proposed development could have negligible to moderate impacts on the surrounding surface water environment (in terms of water quality, surface water runoff and flood risk)

should suitable mitigation not be incorporated. However with the mitigation outlined in the Enhancement and Mitigation Proposals section the impacts upon the water environment can be considered to be minor adverse to minor beneficial. As such no degradation of the surface water features can reasonably be expected to occur.

10.10 References

1. UK Government (2005); 'Securing the Future - UK Government Sustainable Development Strategy', UK Government;
2. European Commission (2000); 'Water Framework Directive', European Commission;
3. UK Government (2003) Water Environment (Water Framework Directive) (England and Wales) Regulations, HMSO;
4. UK Government (1991) 'Water Resources Act' HMSO;
5. UK Government (1995) 'Environment Act' HMSO;
6. UK Government (1991) 'Land Drainage Act' HMSO;
7. UK Government (2003) 'Water Act'; HMSO
8. Communities and Local Government (2006); 'Planning Policy Statement 25', HMSO.
9. The London Plan, Spatial Development Strategy for Greater London (Consolidated with Alterations since 2004), February 2008
10. The Southwark Plan, July 2007
11. CIRIA (2001); 'Control of water pollution from construction sites' Report C532, CIRIA;
12. CIRIA (2007); 'Control of water pollution from construction sites' Report C697, CIRIA.