10 Water Environment

10.1 Introduction

10.1.1 This Chapter assesses the potential for significant water environment impacts resulting from the K3 Proposed Development and the WKN Proposed Development.

10.2 Regulatory and Policy Framework

10.2.1 The main legislative drivers for assessing and managing risks to human health and the environment, including controlled waters, groundwater and land contamination are:

English/UK Legislation

- Coast Protection Act 1949 [Ref 10.2];
- Environment Act 1995 [Ref 10.3];
- Environmental Damage and Liability (Prevention and Remediation) Regulations 2015 [Ref 10.4];
- Environmental Protection (Duty of Care) Regulations 1991 (as amended 2003) [Ref 10.5];
- Floods and Water Management Act 2010 [Ref 10.6];
- Land Drainage Act 1991 [Ref 10.7];
- The Environmental Permitting (England and Wales) Regulations 2010 (as amended 2016) [Ref 10.8];
- The Groundwater (Water Framework Directive) (England) Direction 2016 [Ref 10.9];
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 [Ref 10.10]; and
- Water Resources Act 1991 [Ref 10.11].

National Planning Policies

National Policy Statements (NPS) [Ref 10.12]

10.2.2 Planning policy on renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to hydrology and flood risk, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of

Energy and Climate Change (DECC), 2011a) and the NPS for Renewable Energy Infrastructure EN-3 (DECC, 2011b).

10.2.3 The key test set out within EN-1 is to ensure that flood risk from all sources of flooding is considered at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new energy infrastructure is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and, where possible, by reducing flood risk overall.

10.2.4 Paragraph 4.8.6 (NPS EN-1) specifically identifies that applicants should have regard to climate change and should assess the resilience of their project to climate change.

National Planning Policy Framework (NPPF) [Ref 10.14]

10.2.5 Paragraphs 148 to 169 of the NPPF outline the development requirements in terms of flood risk, water quality and resources and the impact of climate change, stipulating that a site-specific Flood Risk Assessment (FRA) is required for proposals for new development in Flood Zones 2 and 3 and for any proposal for developments on 1 ha or greater in Flood Zone 1

10.2.6 The NPPF requires the application of a sequential risk-based approach to determining the suitability of land for development in flood risk areas, and that flood risk assessment should be carried out to the appropriate degree, at all levels of the planning process.

10.2.7 Footnote 50 of the NPPF states that a site-specific FRA is required for all proposals for new development in Flood Zones 2 and 3 and for any proposal of 1 hectare or greater in Flood Zone 1. An FRA should consider vulnerability to flooding from other sources as well as from river and tidal flooding, and the potential for any increased risk of flooding elsewhere resulting from a development.

10.2.8 On 6th March 2014 the Department for Communities and Local Government (DCLG) launched Planning Practice Guidance ID7 as a web-based resource. The Planning Practice Guidance ID7 (DCLG, 2014) for Flood Risk and Coastal Change (Ref: 19.5) provides additional guidance for the implementation of the NPPF in relation to development and flood risk.

Planning Practice Guidance, online [Ref 10.15].

10.2.9 PPG ID7 Flood Risk and Coastal Change provides guidance to ensure the effective implementation of the NPPF planning policy for development in areas at risk of flooding.

Environment Agency - Flood risk assessments: climate change allowances [Ref 10.16]

10.2.10 In February 2017 the EA updated advice on climate change allowances to support NPPF. New guidance requires that flood risk assessments and strategic flood risk

assessments consider, where appropriate, increases in rainfall intensity, peak river flows and sea level rise.

10.2.11 Table 10.1 below identifies the range of increase per epoch for peak rainfall intensity. An Assessment should assess both the central and upper end allowances to understand the range of impact.

Applies across all of England	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

Table 10.1: Peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

10.2.12 Table 10-2 outlines the anticipated sea level rise associated with climate change per defined epoch. The EA expect sea level rise to increase the rate of coastal erosion.

Area of England	1990 to 2025	2026 to 2055	2056 to 2085	2086 to 2115	Cumulative rise 1990 to 2115 / metres (m)
East, east midlands, London, south east	4 mm/yr. (140 mm)	8.5 mm/yr. (255 mm)	12 mm/yr. (360 mm)	15 mm/yr. (450 mm)	1.21 m
South West	3.5 mm/yr. (122.5 mm)	8 mm/yr. (240 mm)	11.5 mm/yr. (345 mm)	14.5 mm/yr. (435 mm)	1.14 m
North west, north east	2.5 mm/yr. (87.5 mm)	7 mm/yr. (210 mm)	10 mm/yr. (300 mm)	13 mm/yr. (390 mm)	0.99 m

Table 10-2: sea level allowance for each epoch (mm) per year (use 1990 baseline)

10.2.13 The climate change guidance notes that the allowances provided have been derived from national scale research. There may be cases where local evidence supports the use of other local climate change allowances. With specific reference to changes to extreme rainfall, LIT 5707 [Ref 10.17] notes that UK Climate Projections 2009 (UKCP09) provides useful information on change to rainfall across the UK.

Local Planning Policies

10.2.14 The relevant development plans at the local level comprises Kent Mineral and Waste Local Plan 2013-2030 (2016) and Swale Local Plan (Bearing Fruits 2031 (2017) [Ref 10.19].

10.2.15 Policy DM10 requires development proposals to avoid inappropriate development in areas at risk of flooding or where development would increase flood risk elsewhere.

Kent Mineral and Waste Local Plan 2013 – 2030 (2016) [Ref 10.18]

10.2.16 The document sets out the overarching strategy and planning policies for mineral extraction, importation and recycling, and the waste management of all waste streams that are generated or managed in Kent. The plan identifies and sets out the long-term spatial vision and strategic objectives for Kent's mineral and waste. It provides the strategy for minerals and waste planning that identifies how the objectives will be achieved in the plan period and the Development Management (DM) policies that will be used when the County Council makes decisions on planning applications.

10.2.17 The policy relevant to hydrology and flood risk is outlined below:

Policy DM 10 – Water Environment

Planning permission will be granted for minerals or waste development where it does not:

- *result in the deterioration of physical state, water quality or ecological status of any water resource and waterbody, including rivers, streams, lakes and ponds;*
- *have an unacceptable impact on groundwater Source Protection Zones; and*
- *exacerbate flood risk in areas prone to flooding and elsewhere, both now and in the future.*

All minerals and waste proposals must include measures to ensure the achievement of both no deterioration and improved ecological status of all waterbodies within the site and/or hydrologically connected to the site. A hydrogeological assessment may be required to demonstrate the effects of the proposed development on the water environment and how these may be mitigated to an acceptable level.

Swale Borough Council's Development Plan

10.2.18 The Swale Borough Council Development Plan 'Bearing Fruits' [Ref 10.19] sets out the Council's vision to transform the Borough's economic, social and environmental prospects.

10.2.19 The policies relevant to hydrology and flood risk are outlined below:

Policy ST 1 – Delivering Sustainable Development in Swale:

10. Meet the challenge of climate change, flooding and coastal change through:

- *a promotion of sustainable design and construction, the expansion of renewable energy, the efficient use of natural resources and the management of emissions;*

- *applying planning policies to manage flood risk and coastal change.*

Policy DM 21 – Water, flooding and drainage:

When considering water related, flooding and drainage implication of development, development proposals will:

- *Accord with national planning policy and planning practice guidance;*
- *Avoid inappropriate development in areas at risk of flooding and where development would increase flood risk elsewhere;*
- *Provide site specific flood risk assessments, as required, carried out to the satisfaction of the Environment Agency and, if relevant, the Internal Drainage Board. These will where necessary, include details of new flood alleviation and flood defence measures to be installed and maintained by the developer;*
- *Include where possible, sustainable drainage systems to restrict runoff to an appropriate discharge rate, maintain or improve the quality of the receiving watercourse, to enhance biodiversity and amenity and increase the potential for greywater recycling. Drainage strategies (including surface water management schemes) for major developments should be carried out to the satisfaction of the Lead Local Flood Authority;*
- *Integrate drainage measures within the planning and design of the project to ensure that the most sustainable option can be delivered especially where exceptionally development is to be permitted in an area of flood risk;*
- *Within areas at risk of flooding, submit a suitable flood warning and emergency plan that has been approved by the relevant emergency planning regime and, where appropriate, the emergency services;*
- *Where necessary, demonstrate that adequate water supply and wastewater connection and treatment infrastructure is in place before construction commences and that these details have been approved by the appropriate water company and funded by the development where appropriate;*
- *Ensure future unconstrained access to the existing and future sewerage and water supply infrastructure for maintenance and up-sizing purposes;*
- *Make efficient use of water resources and protect yield of local public water supplies. For new residential development, all homes to be designed to achieve a minimum water efficiency of 110 litres per person per day, in line with the Government's Housing Optional Technical Standard for water efficiency; and*

- *Protect water quality, including safe guarding ground water source protection zones from pollution, to the satisfaction of the Environment Agency.*

10.3 Methodology

Scoping and Consultation

10.3.1 The formal scoping exercise, including PINS formal Scoping Opinion, is set out in Chapter 3 and the accompanying appendices.

10.3.2 Table 10.3 summarises the additional consultation undertaken directly with relevant statutory and non-statutory consultees outside of the formal scoping process with PINS in relation to water resources and hydrology and outlines how and where this has been addressed in subsequent chapters of the ES.

Consultee	Nature of consultation	How/ Where Addressed
Environment Agency	Data request	Data utilised to inform Baseline Conditions.

Table 10.3: Consultation undertaken to date for Hydrology and Flood Risk

10.3.1 As identified in Chapter 2 the application for the K3 Proposed Development seeks Development Consent for the construction and operation of the Wheelabrator Kemsley Generating Station ('K3') with a 75MW generating capacity and 657,000tpa waste throughput.

10.3.2 Whilst Development Consent is sought for construction, in accordance with the Planning Act 2008, the works proposed remain as consented by the planning permission dated 6 March 2012 granted by Kent County Council (together with subsequent material and non-material variations thereto). There will be no physical additional construction works to K3. The physical elements of the facility will remain as permitted under the existing Town and Country Planning permission. The effects of the construction and operation of K3 as consented were fully assessed as part of Environmental Impact Assessment undertaken, submitted and approved as part of existing planning consent (see Document 3.3 submitted with the application). Construction of the plant in accordance with the extant permission began in July 2016 and is expected to be completed with the facility fully operational by late 2019.

10.3.3 All relevant planning conditions have been discharged. The practical effect of the K3 Proposed Development will not result in any external physical works to K3 as consented.

10.3.4 The practical effect of the DCO application is therefore to permit K3 to operate at an upgraded capacity of up to 75MW (an additional 25.1 MWe) and to process an additional 107,000 tonnes of waste per annum beyond that possible under the existing Town and Country Planning permission. This will note alter the drainage regime as part of K3 as consented and with respect to the water environment there are no additional impacts identified as a consequence beyond those assessed

within the 2010 ES (see Document 3.3 submitted with the application).No likely significant effects were identified pursuant to the mitigation measures set out therein and secured by planning condition. All relevant planning conditions have been discharged

10.3.5 This chapter therefore focuses on the WKN Proposed Development except with regard to cumulative effects.

Establishing Baseline Conditions

WKN Proposed Development

10.3.6 For the assessment of the WKN Proposed Development the baseline for the assessments is K3 constructed and operating in accordance with its planning permission. This is considered appropriate as there can be little doubt that this will be the situation at the point where the WKN Proposed Development would be under construction or operational.

10.3.7 The effect of the K3 Proposed Development and WKN Proposed Developments in combination is addressed as part of the cumulative effect's assessments. In a wider context there are a number of cumulative developments within the zone of influence of the K3 and WKN Sites, a significant number of which have planning permission.

Scope of Assessment

10.3.8 The assessment methodology is based on guidance provided within the Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Impact Assessment (2004) [Ref 10.20] and the Design Manual for Roads and Bridges (DMRB), Volume 11, Part 10, (November 2009) [Ref 10.21]. Whilst the DMRB is not specific to the assessment of hydrology and flood risk, in the absence of any topic specific guidance the DMRB provides an accepted approach to the assessment of development impacts.

Study Area

10.3.9 A 500m buffer for the WKN Proposed Developments has been selected for data collection purposes to identify any existing assets or infrastructure that might affect or be affected by the WKN Proposed Development. A 500m radius is considered appropriate for data collection taking into account the nature of the development and the likely zone of influence on hydrological receptors. Given the landscape surrounding the WKN Proposed Development and ongoing anthropogenic activities it will be difficult to ascertain the exact source of any impacts on water quality beyond 500m.

10.3.10 Determination of the baseline conditions at the WKN Proposed Development has been established through a review of literature and data from publicly available sources including the EA [Ref 10.22], British Geological Survey (BGS) [Ref 10.23], Swale Borough Council (SBC) and Kent County Council (KCC).

10.3.11 Data was obtained from the following sources:

- British Geological Survey (BGS) 1:50,000 geological mapping [Ref 10.23];
- BGS Geoindex Onshore [http://mapapps2.bgs.ac.uk/geoindex/home.html] [Ref 10.23];
- BGS Aquifer Designation Maps [Ref 10.23];
- Environment Agency (EA) Flood Hazard Mapping [Ref 10.22];
- EA website (2017) [www.environment-agency.gov.uk] [Ref 10.22];
- EA North Kent Rivers Catchment Flood Management Plan (2009) [Ref 10.24] Landmark Information Group, Envirocheck 173688989_1_1 (18 July 2018) [Ref 10.25];
- Kent County Council (KCC): Strategic Flood Risk Assessment (2013) [Ref 10.26];
- Medway Estuary and Swale Shoreline Management Plans (2010) [Ref 10.27];
- Met Office: Climate data (2018) (www.metoffice.gov.uk) [Ref 10.28];
- Ordnance Survey (OS) Landranger 1:50,000 Sheet 178: Thames Estuary [Ref 10.29];
- River Basin Management Plan Thames River Basin District (2015) [Ref 10.30];
- RPS, 2010. Development of a Sustainable Energy Plant. Kemsley Paper Mill, Sittingbourne, Kent. Environmental Statement [Ref 10.31]; and
- The Centre for Ecology and Hydrology (CEH) [www.ceh.ac.uk] [Ref 10.31].

10.3.12 In addition to the above site-specific hydrological data has been obtained via consultation with the EA, Lead Local Flood Authority (LLFA), Lower Medway Internal Drainage Board (IDB) and site reconnaissance. An environmental data request was submitted to the EA with the responses attached within the supporting FRA (Appendix 10.1).

Significance Criteria

10.3.13 The baseline characterisation set out above enables the identification of the nature of potential impacts. The assessment considers the potential impacts to environmental receptors and the pathways by which the receptors may be affected. The following terms have the following meanings in this section:

- Source: increase in low permeable surfacing, potential surface water contaminant sources, ground/channel disturbance;

- Pathway: the mechanism by which the source may affect a receptor i.e. run-off; and

- Receptor: identified features that may be affected, based on the sensitivity of the site.

10.3.14 This includes consideration of the probability of harm occurring, considering potential sources of flooding, including changes in surface water runoff / quality characteristics and receptor that may be affected by changes to baseline conditions.

10.3.15 The potential impacts likely to occur due to the WKN Proposed Development have been determined in consideration of the sensitivity of the hydrological and flood risk key attributes that may be affected and the magnitude of the predicted impacts.

Determining the sensitivity of the receptor

10.3.16 The sensitivity or value of a hydrological receptor or attribute is largely determined by its quality, rarity and scale. The determination of value or sensitivity considers the scale at which the attribute is important. This can be defined as being at a local level (the Site), district level (Swale District), County level (Kent), regional level (South East of England), national level (United Kingdom) or international level (Europe).

10.3.17 For the purpose of this ES, 'flood risk' is defined as the risk associated with permanent removal of or increase in low permeability surfacing leading to an alteration in pre-development surface water run-off rates or a derogation of floodplain storage. The 'temporary' flood risk is the risk associated with the temporary removal or alteration in permeable surfacing leading to a temporary increase in surface water run-off or derogation of floodplain storage (for example during construction).

10.3.18 The definitions set out in Table 10.4 below have been followed in the consideration of sensitivity for this project. This table considers guidance provided in Table 2.1 A4.3 of the Design Manual for Roads and Bridges (DMRB) (Highways Agency et al., 2009) [Ref 10.21].

Sensitivity	Typical Descriptors
Very High	Receptor is high value or of critical importance to the local, regional or national economy. Receptor is highly vulnerable to impacts that may arise from the project and recoverability is long term or not possible. Surface water: WFD Current Overall Status of High. Flood risk: Land within Flood Zone 3 or more than one hundred residential properties protected from flooding by flood defence infrastructure or by natural floodplain storage.
High	Receptor is of moderate value with reasonable contribution to the local, regional or national economy. Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly. Surface water: WFD Current Overall Status of Good.

Sensitivity	Typical Descriptors
	Flood risk: Land within Flood Zone 3 and/or 2 or between one and one hundred residential properties or industrial premises protected from flooding by flood defence infrastructure or by natural floodplain storage.
Medium	Receptor is of minor value with small levels of contribution to the local, regional or national economy. Receptor is somewhat vulnerable to impacts that may arise from the project and has moderate to high levels of recoverability. Surface water: WFD Current Overall Status of Moderate. Flood risk: Flood plain within Flood Zone 2 and/or 1 or limited constraints and a low probability of flooding of residential and industrial properties.
Low	Receptor is of low value with little contribution to the local, regional or national economy. Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability. Surface water: WFD Current Overall Status of Poor. Flood risk: Flood plain within Flood Zone 2 and/or 1 or limited constraints and a very low probability of flooding of residential and industrial properties.
Negligible	Receptor is of negligible value with no contribution to the local, regional or national economy. Receptor is not vulnerable to impacts that may arise from the project and/or has high recoverability. Surface water: WFD Current Overall Status of Bad. Flood risk: Area outside flood plain (Flood Zone 1) or flood plain with very low probability of flooding industrial properties.

Table 10.4: Definition of terms relating to the sensitivity of hydrological receptors

Magnitude of Impact

10.3.19 The magnitude of any predicted impact is dependent on its size, duration, timing (e.g. seasonality) and frequency (permanent, seasonal etc.). A qualitative appraisal of the likely magnitude of the predicted impact is provided within this assessment, considering the measures proposed to be adopted as part of the development to control such impacts. The magnitude of the predicted impact has been described using the criteria outlined in Table 10.5 below. This table considers guidance provided in Table 2.1, A4.4 of DMRB (Highways Agency et al., 2009) [Ref 10.21].

Magnitude	Typical Descriptors
High	Total loss of ability to carry on activities. Impact is of extended temporal or physical extent and of long-term duration (i.e., approximately 50 years duration).
	Significant observable degradation in water resource quality and/or increase in flood risk (i.e., approximately 50 years duration).
Medium	Loss or alteration to significant portions of key components of current activity. Impact is of moderate temporal or physical extent and of medium-term duration (i.e., less than 20 years).
	Observable degradation in water resource quality and/or increase in flood risk (i.e., less than 20 years).

Magnitude	Typical Descriptors
Low	Minor shift away from baseline, leading to a reduction in level of activity that may be undertaken. Impact is of limited temporal or physical extent and of short-term duration (i.e., less than two years).
	Degradation in water resource quality and/or slight increase in flood risk (i.e., up to two years).
Negligible	Very slight change from baseline condition. Physical extent of impact is negligible and of short-term duration (i.e., less than two years).
	No observable degradation in water resource quality and/or flood risk (i.e., less than 2 years).
No change	No change from baseline conditions.

Table 10.5: Definition of terms relating to the magnitude of an impact upon hydrology and flood risk

10.3.20 Impact magnitude must consider the impact duration. The following definitions have been used in the assessment:

- Temporal scale;
- Short term: A period of months, up to one year;
- Medium term: A period of more than one year, up to five years;
- Long term: A period of greater than five years;
- Direct or indirect effect: whether the receptor will be affected directly or indirectly;
- Reversible/irreversible effect: effects can be reversed by mitigation measures or by natural environmental recovery within reasonable timescales (5-10 years following cessation of construction);
- Temporary or permanent: effects may occur over the life time of the project or may occur for a limited period of time e.g. whilst a specific activity is taking place;
- Adverse or beneficial: whether the nature of the effect increases or decreases potential contamination risks to sensitive receptors; and
- Geographical scale: whether the effect would be experienced at the local, regional or national level.

Significance of Effects

10.3.21 The significance of predicted effects has been determined using publicly available environmental data to consider the sensitivity of the receptor and the magnitude of each impact. Table 10.6 below is used to inform the evaluation of the significance of effects. The Table is based on guidance provided within the DMRB (Highways Agency et al, 2008) [Ref 10.21].

Sensitivity	Magnitude of Impact				
	No Change	Negligible	Low	Medium	High
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Substantial
High	No change	Minor	Minor or Moderate	Moderate or Substantial	Substantial or Very Substantial
Very high	No change	Minor	Moderate or Substantial	Substantial or Very Substantial	Very Substantial

Table 10.6: Matrix for determining significance of effect from magnitude of impact and sensitivity.

10.3.22 For consistency between disciplines the overall significance of an effect is expressed as Negligible, Minor, Moderate, Major or Substantial based on the definitions below:

- **Very Substantial:** Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.

- **Substantial**: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.

- **Moderate**: These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.

- **Minor**: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.

- **Negligible**: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

10.3.23 For the purpose of this assessment any effect that is moderate, substantial or very substantial is significant. Any effect that is minor or below is not significant.

Assessment of Effects

WKN Proposed Development construction and operation assessment of effects

Design Parameters

10.3.24 This section presents the basis of assessment in relation to the WKN Proposed Development during its construction and operation on the water environment.

10.3.25 The assessment is based on the physical characteristics of the WKN Proposed Development described in Chapter 2 section 2.7.

10.3.26 The assessment developed a base scheme design to provide enough information for which consideration of a realistic worst-case scenario, based on the maximum scale of the elements, was undertaken. As a result, no effects of greater significance than those assessed are likely.

Base Scheme Design	Dimensions / Realistic Worst-Case Scenario
Waste to energy facility	2 ha represents the maximum impermeable area of the WKN Site (Work No.2) required and would result in the largest possible area of disturbance and therefore, the greatest potential impact on water resources and flood risk.
Temporary construction access road	C.1.07 ha represents the maximum area for construction access works (Work No. 5) and would result in the maximum area of disturbance and therefore, the greatest potential impact on water resources and flood risk.
Temporary construction compound	C.1.0 ha represents the maximum dimensions of the laydown area (Work No. 6) and would result in the maximum area of disturbance and therefore, the greatest potential impact on water resources and flood risk.

Table 10.7: Proposed engineering design assumptions.

10.3.27 The study area for the WKN Proposed Development comprises the waste-to-energy plant, associated infrastructure/works and surrounding areas as appropriate. The study area also includes any surface water features and resources elsewhere, which could be potentially affected within the confines of the defined study area via hydrological connectivity. A detailed baseline study has been undertaken to establish the current conditions of the water environment. Information has been drawn from a variety of sources as detailed in 10.3.11.

10.3.28 The assessment of impacts on water resources has been undertaken using a source-pathway-receptor model and a risk-based assessment. This is based on combining assessments of both the likelihood and consequence of any potential impact in line with the IEMA guidance. This approach embraces principles of the WFD.

10.3.29 The evaluation of the significance of potential effects on the water environment will be in accordance with the EIA methodology. Criteria such as the EA's water

quality ratings and ecological designations have been drawn upon in order to define the sensitivity of the water environment.

10.3.30 Flood risk will be assessed in line with the NPPF (DCLG, 2018) [Ref 10.14] and associated Planning Practice Guidance ID7 (Online) [Ref 10.15] as well as local planning policy. The assessment has included a desk study of maps and published information, consultation with the EA and local water authorities and a walkover survey.

10.3.31 An FRA has been prepared (Appendix 10.1), to consider changes to hard stand/low permeable surfacing footprint which may affect the surface water run-off regime. Since the WKN Proposed Development footprint exceeds 1 ha an FRA is required in line with the NPPF (DCLG, 2018) [Ref 10.14], the government's spatial planning policy on assessing the appropriateness of developments in the context of flood risk. The FRA has looked at the vulnerability to flooding from other sources as well as from river and sea flooding and the potential to increase flooding risk elsewhere.

10.3.32 As noted in 10.3.3 The Design Manual for Roads and Bridges (DMRB) [Ref 10.21] has been used as it is considered to be the most appropriate methodology as it is designed for assessing the effects of the WKN Proposed Development. The assessment methodology is based on guidance provided in the DMRB, Volume 11, Part 10 [Ref 10.21].

10.3.33 The assessment of potential effects on water resources takes account of the impacts from the WKN Proposed Development on the prevailing hydrological, surface water drainage, flooding and water quality environments.

10.3.34 The list below sets out the main documents used, where appropriate, to inform the impact assessment including the identification of sensitivity or value of receptors and the magnitude of impacts;

European

- Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23, October 2000) [Ref 10.1];

National

- National Planning Policy Framework (2018) [Ref 10.14];
- Overarching National Policy Statement for Renewable Energy Infrastructure (EN-1) (2011) [Ref 10.12]
- National Policy Statement for Renewable Energy Infrastructure (EN-3) (2011) [Ref 10.13]
- Planning Practice Guidance ID7 Flood Risk and Coastal Change, online (http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/) [Ref 10.15]; and

- Water Environment (Water Framework Directive) (England and Wales) Regulations (2017), which transport the Water Directive 200/60/EC into UK law [Ref 10.10].

Guidance

- Environment Agency (updated February 2017) Flood risk assessments: climate change allowances [Ref 10.16];
- National SuDS Working Group, Interim Code of Practice for Sustainable Drainage Systems, 2004 [Ref **Error! Reference source not found.**];
- CIRIA C532 Control of Water Pollution from Construction Sites, 2001 [Ref 10.37];
- CIRIA 753 The SUDS Manual, 2015 [Ref 10.35]; and
- CIRIA Report C741 Environmental Good Practice on Site, 2010 [Ref 10.36].

Limitations and Assumptions

10.3.35 The assessment is based on the WKN Proposed Development maximum design parameter plans and assumes the greatest footprint.

10.3.36 The assessment is primarily based on publicly available data obtained from the EA, local authorities (LAs) and commercial data supply companies, as well as additional information supplied from stakeholders during the scoping and consultation stages.

10.3.37 However, the assessment is limited by a lack of:

- Flow data for watercourses and drainage channels; and
- Water quality data for specific ordinary watercourses in close proximity to the WKN Proposed Development.

10.3.38 Overall a moderate to high level of certainty has been applied to the assessment. Where available catchment data regarding water quality has been used to inform the assessment, with an engineering site walkover undertaken to identify surface watercourses within the Applicant's land ownership.

10.3.39 The information accessible and provided by consultees in order to complete the assessment is considered sufficient to establish the baseline. Therefore, there are no data limitations that would affect the conclusions of this assessment.

10.4 Baseline Conditions

WKN Proposed Development

10.4.1 The baseline data sets have been collated to inform the assessment of the potential environmental effects for the WKN Proposed Development. Current baseline conditions were ascertained through a desk-based assessment utilising publicly available data including OS mapping, EA data and utility plans. This provided an insight into surface water features and the existing land use of the hydrological features within the immediate vicinity of the WKN Proposed Development.

10.4.2 The WKN Proposed Development site is presently being utilised as the construction laydown area for the K3 Proposed Development comprising low permeable surfacing with an average elevation of c.6.30m AOD.

10.4.3 The nearest watercourses to the WKN Proposed Development are a series of land drain networks and the Swale Estuary, which lie to the north and east respectively. OS data and information obtained from a site visit by an RPS hydrologist notes a culverted drain beneath the construction access road. The drain flows south to north and converges with a number of other drainage networks and then flows east into The Swale, the watercourse that separates the Kent mainland from the Isle of Sheppey.

10.4.4 The tidally dominated Swale is approximately 100m to the east at the closest orientation to the WKN Proposed Development and has been classified by the EA as the main risk of flooding. No fluvial flood risk sources have been have identified and therefore has not been assessed further within this report.

10.4.5 Responsibility for ordinary watercourses which discharge into the Swale fall under the jurisdiction of Kent County Council as the LLFA and IDB under the Water and Flood Management Act 2010 [Ref 10.6] and Land Drainage Act 1991[Ref 10.7]. The IDB and LLFA are required to exercise general supervision over all matter relating to water level management within their districts.

10.4.6 Further descriptions of the key hydrological and flood risk characteristics within the study areas are set out below.

<u>Flood Risk and Flood Defences</u>

10.4.7 Potential sources of flooding for the WKN Proposed Development have been assessed in detail within the associated FRA (Appendix 10.1) and the sources are summarised below

<u>Fluvial and Tidal Flooding</u>

10.4.8 The EA notes The Swale as the only source of flooding within the WKN Proposed Development site area, therefore, the risk of flooding is determined to be tidally dominant.

10.4.9 The EA flood map for planners and Swale Borough Council SFRA (2010) [Ref 10.37] indicates that the majority of the WKN Proposed Development lies within Flood Zone 2, land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year. A small localised area within the eastern extent of the WKN Site is located within Flood Zone 3 ('High Probability'). The area around the western extent of the WKN Site is within Flood Zone 1 defined as having a 'low probability' (less than 1 in 1,000 years) annually of flooding.

10.4.10 However, subsequent to the publication of the EA flood maps a ground profiling exercise has been undertaken, raising the ground level to 6.30 m AOD, c.0.30 m above the worst-case flood event. This results in the land being equivalent to Flood Zone 1 and therefore sequentially appropriate.

10.4.11 Data supplied by the EA (Appendix 10.2) extracted from the North Kent coast modelling and mapping study (JBA Consulting August 2013) indicates that during all modelled tidal flood scenarios the WKN Proposed Development would remain flood free.

10.4.12 The construction access road and laydown area are located within Flood Zone 3 (FZ3) and has a 'high' probability of tidal flooding. The southern extent of the access road is located within Flood Zone 1 (FZ1) with less than 1 in 1,000 annual probability of flooding from river or sea in any year.

10.4.13 EA defended modelled outputs show that the WKN Site access roads and laydown area are assessed to remain flood free for a present day 0.5% (1 in 200 year event) and 0.5% event occurring in 2070. The area is assessed to be at risk of residual flooding from the overtopping of flood defences, which are assumed to remain at current crest levels, in 2115. The laydown area and construction access is only required up to 2024 from which point the land will be restored.

10.4.14 Model outputs record that the undefended 0.5% AEP 2115 event tidal levels would reach 6.02 m AOD within the construction road boundary. Level data records that the construction road slopes from 5.37m AOD within the southern extent (Node 8 within EA modelled node location map) to 2.78 m AOD heading north (Node 2 within EA modelled node location map).

10.4.15 A comparison against level data associated with the WKN Proposed Development and EA model outputs (Table 10.8 below) indicates the construction access road is potentially at risk of flooding to depths ranging from 3.24 m within the northern extent reducing to 0.65 m at the southern extent.

node	Topography (m AOD)	0.5% AEP 2115 Modelled Tidal Flood Levels (m AOD)		Max Flood Depth (m)
		Undefended Levels	*Defended - Still Water*	
2	-	6.01	5.42	
3	-	6.01	5.42	
5	2.78	6.01	5.43	3.23
6	6.30	6.02	5.52	Null
8	6.30	0.00	0.00	Null

Flood Defence Details

10.4.16 Existing flood defences located c. 50 m to the east of the WKN Site are made up of raised walls and embankments. As identified in 10.4.13 flood defences afford Kemsley with protection against present day tidal events with up to a 1 in 1,000 year event probability. Model outputs (Table 10.8) also demonstrate that the defences reduce the impact of flooding from events including climate change.

10.4.17 The EA indicate that no improvements of existing flood defences are being presently considered.

Groundwater Flooding

10.4.18 Full details of the ground conditions of the development area can be found in Chapter 9: Ground Conditions. Publicly available ground investigation reports submitted as part of the adjacent Kemsley 3 application in 2009, 2011 and 2016 note a shallow water table within the underlying superficial deposits (Alluvium – clay Silty, Peaty and sandy), which may be in hydraulic continuity with nearby watercourses and may therefore fluctuate with the tide. The superficial soils are underlain by a bedrock geology comprising Eocene-aged London Clay, a negligibly permeable non-aquifer.

10.4.19 The EA has confirmed that they have no record of groundwater flooding within the WKN Site.

Surface Water Flood Risk

10.4.20 Surface water flood mapping produced by the EA indicates that the majority of the WKN Site is at 'very low' risk with a chance of flooding each year of less than 1 in 1,000 (0.1%). Localised areas within the WKN Site are defined as being at 'low risk' between 1 in 1000 (0.1%) and 1 in 100 (1%) chance of surface water flooding each year.

10.4.21 An increase in impermeable area associated with the WKN Proposed Development would increase the potential risk of uncontrolled surface water flood risk within the development area and to adjacent sites.

Flooding from Infrastructure/Sewer Failure

10.4.22 No potential sources of flooding from artificial drainage systems, sewers, ponds or reservoirs have been identified and none have been reported.

Historical Flood Events

10.4.23 The EA records show a flood event occurred in February 1953, which affected the WKN Site. During the event tidal defences were overtopped and breached at Sheerness and all along the western border of the Isle of Sheppey, either side of

the Swale near Sittingbourne at Warden and around the Isle of Harty. No records for either the level or depth of flooding have been made available.

10.4.24 Since this flood event flood defences have been put in place and the site of the WKN Proposed Development has been elevated, raising the land to c.6.30m AOD.

Current Flood Risk

10.4.25 The WKN Proposed Development by virtue of current elevations is located above the worst-case flood event scenario considered at low risk of flooding situated within Flood Zone 1.

10.4.26 The construction access track is situated within Flood Zone 1, 2 and 3 and is therefore at 'low to high' risk of flooding from The Swale. EA flood model outputs indicated that the southern extent of the construction access road is located within the worst-case undefended 2115 0.5% AEP flood event extents and would be subject to flood depths ranging from 3.24 m within the northern extent to 0.65 m within the middle to southern extent.

10.4.27 The main risk of flood is associated with surface water ponding in localised low-lying areas of the WKN Site.

Surface Water Resources

Surface Watercourses

10.4.28 As previously mentioned in 10.4.3, the nearest watercourses to the WKN Proposed Development include a series of unnamed surface water drainage networks, which lie to the north and south of the WKN Proposed Development. OS data and information obtained from a site visit by an RPS hydrologist notes a culverted drain beneath the WKN Proposed Development's construction access road on the northwest edge of the WKN Site (Work No.2). The drain flows south to north and converges with a number of other drainage networks and then flows east into The Swale, the watercourse that separates the Kent mainland from the Isle of Sheppey.

10.4.29 The Milton Creek flows in an easterly direction approximately 550 m to the southeast of the WKN Site and is a tributary of The Swale. A number of unnamed ditches and ponds are present within the 500 m study area of the WKN Site and are tributaries of The Swale.

Surface Water Quality

10.4.30 No water quality data is available for the WKN Site or the surrounding area within the catchment data explorer or the Envirocheck report (2018) [Ref 10.25].

Groundwater Water Abstraction

10.4.31 The Envirocheck report (2018) [Ref 10.25] indicates that there is one active licensed surface water abstractions within the 500 m study area of the WKN Proposed Development (Table 10.9).

Name of Holder	Licence Number	Grid Reference	Distance from Site (m)	Permitted Annual Yield (m3/year)
DS Smith Paper Limited	9/40/02/0114/A/SR	592380 166680	140	79,555,000

Table 10.9: Surface water abstraction licence within a 500 m search area of the Site.

Discharge Consents

10.4.32 The Envirocheck report (2018) [Ref 10.25] indicates that there are four active discharge consents within the 500m study area of the WKN Proposed Development (Table 10.10).

Name of Holder	Permit Number	Grid Reference	Distance from Site (m)	Purpose	Start Date
Clugston Group Ltd	Epreb3792ny	592332, 166832	22	Trade Effluent Discharge-Site Drainage	August 2016
Grovehurst Energy Ltd	K00025	592000, 166640	28	Trade Discharges - Cooling Water	December 1971
Southern Water Services Ltd (K)	A06000	592200, 166150	485	Public Sewage: Storm Sewage Overflow	December 2017
Southern Water Services Ltd (K)	A06000	592200, 166150	485	Sewage Discharges - Pumping Station - Water Company	December 2017

Table 10.10: Surface Water Discharge Consents within a 500 m search area of the WKN Proposed Development site.

Environment Agency Pollution Incidents to Controlled Waters

10.4.33 The Envirocheck report (2018) [Ref 10.25] provides records for a number of pollution incidents to controlled Waters within the 500 m study area of the WKN Site (Table 10.11).

Location	Distance from Site (m)	Grid Reference	Pollutant Description	Incident Reference	Date
Kemsley Paper Mill	84	592400, 166800	Organic Wastes: Other	197020	October 1997
Kemsley Paper Mill	193	591960, 166430	Chemicals - Detergents/Surfactant	197146	March 1998
Kemsley Paper Mill	255	592250, 167100	General Biodegradable : Other Biological / Non Sewage	3972	March 1999

Location	Distance from Site (m)	Grid Reference	Pollutant Description	Incident Reference	Date
Kemsley Paper Mill	256	592200, 167095	Other Pollutant	2167	December 1999
Kemsley Paper Mill	261	592200, 167100	Other Pollutant	2166	March 1999
-	264	592170, 167095	Other	197304	August 1998
-	269	592170, 167100	Other	197305	August 1998
Fly Ash Sluice	282	592500, 166600	Oils - Waste Oil	CD/047/93	March 1993
Grovehurst Energy	286	592400, 167100	Unknown Sewage	197053	December 1997
Kemsley Mill	308	591700, 166700	Contaminated Water : Fire Fighting Run Off	198970	December 1998
-	345	592200, 167195	Organic Wastes: Other	CD/047/93	March 1993
Kemsley Final Effluent	359	592200, 167200	Chemicals - Paints / Dyes	CD/140/92	July 1992
Kemsley Paper Mill	437	592700, 167200	General Biodegradable : Other Sewage & Sewerage Material	1560	May 1999
Old effluent discharge pipe adjacent to sludge production	438	592200, 166200	General Biodegradable: Biological / Non-Sewage Microbiological Effluent	3855	December 1999
Grovehurst Energy	444	592160, 166180	Organic Wastes: Other	198363	September 1998
Grovehurst Energy	449	592160, 166175	General Organic Wastes: Other	198362	November 1998

Table 10.11: Pollution incidents within a 500 m search area of the WKN Site.

Environment Agency Substantiated Pollution Incidents

10.4.34 The Envirocheck report (2018) [Ref 10.25] indicates that one Category 2 (significant incident) substantiated pollution incident has occurred within the 500 m study area of the WKN Proposed Development (Table 10.12).

Pollutant	Distance from Site (m)	Grid Reference	Pollutant Description	Incident Identification	Date
Suspended solids	227	592198, 167065	Contamination of water	341901	August 2005

Table 10.12: Pollution incidents within a 500 m search area of the WKN Site.

Designated Environmentally Sensitive Area

10.4.35 The WKN Site is not located within the extents of a designated area.

10.4.36 The adjacent Swale however forms a SSSI, a National Nature Reserve, a Ramsar site, RSPB Reserve, SPA, and a Marine Conservation Zone (MCZ).

Sensitive Receptors

10.4.37 The sensitive receptors listed in Table 10.13 below have the potential to be affected by effects arising from the WKN Proposed Development. The assessment in this Chapter has considered the effects of the WKN Proposed Development upon the identified sensitive receptors. The sensitivity status is based on distance of receptor to the WKN Proposed Development and specific designations (SSSI, Ramsar or WFD status).

Receptor	Importance/sensitivity/vulnerability to change
The Swale	High
Milton Creek	Medium
Groundwater resources	High
Site staff	High
Existing site drainage	Medium

Table 10.13: Potentially affected sensitive receptors.

Future baseline

K3 Proposed Development

10.4.38 Following the submission of the K3 Proposed Development ES in 2010 new EIA Regulations were released in 2017 placing a greater emphasis on EIA's taking into account the potential future impact of climate change. In this respect the likely future baseline conditions of the K3 Site in the absence of the K3 Proposed Development are considered below.

Climate change

10.4.39 The EA have assessed the K3 Site as being situated in Flood Zone 1, 2 and 3, however due to land elevation the K3 Site now identifies as Flood Zone 1, and therefore considered to be at low risk of flooding from all sources. This would remain the case for EA modelled period 2115 (Appendix 10.2).

10.4.40 The construction access road is shown to be situated within Flood Zone 1, 2 and 3 and therefore at 'low to high' risk of flooding from The Swale. The existing

Kemsley access road has its own surface water drainage system with two retention ponds which treats the surface water before discharging to local watercourses.

WKN Proposed Development

10.4.41 The likely future baseline conditions of the WKN Proposed Development site in the absence of the WKN Proposed Development are considered below.

Proposed Development

10.4.42 In the absence of the WKN Proposed Development, the current K3 Proposed Development construction laydown area would be restored to grassland and/or scrubland similar to that prior to use as a laydown area.

Climate change

10.4.43 The EA have assessed the WKN Site as being situated in Flood Zone 2, however due to land elevation the WKN Site now identifies as Flood Zone 1, and therefore considered to be at low risk of flooding from all sources. This would remain the case for EA modelled period 2115 (Appendix 10.2).

10.4.44 The construction access road is shown to be situated within Flood Zone 1, 2 and 3 and therefore at 'low to high' risk of flooding from The Swale, whilst the laydown area is assessed to be located within Flood Zone 2 and 3 at 'medium to high' risk of flooding. The existing Kemsley access road (Work No.4) has its own surface water drainage system with two retention ponds which treats the surface water before discharging to local watercourses.

10.5 Standard Mitigation Measures

WKN Proposed Development Mitigation Measures

10.5.1 In relation to Hydrology and Flood Risk, potential impacts to the water environment will be avoided where practicable through implementation of a number of industry standard mitigation measures, and careful consideration of the drainage design, construction techniques and operational best practice of the WKN Proposed Development. The construction mitigation measures are outlined below and featured in the draft Construction Environmental Management Plan (CEMP) provided as Appendix 2.1 of this ES.

Mitigation from Construction and Decommissioning Effects

10.5.2 Standard construction and decommissioning measures would reduce any potential adverse impacts associated with the WKN Proposed Development through careful consideration of the hydrological environment, construction techniques and materials.

10.5.3 Table 10.14 below presents a list of general industry guideline and best practice measures to be incorporated into the construction and future decommissioning phases of the WKN Proposed Development.

Standard construction mitigation measures to be adopted during the construction of the WKN Proposed Development
Construction and Future Decommissioning
Best practice measures All construction work would be undertaken in accordance with the Construction Method Statement and good practice documentation including: • CIRIA – SuDS Manual [Ref 10.35]; • Prevent surface water being affected during earthwork operations. No discharge to surface watercourses will occur without permission from the EA (SuDS Manual) [Ref 10.35]; • Environment Agency, Pollution Prevention Guidance Note 6 (PPG6): Pollution Prevention Guidelines – Working at Construction and Demolition Sites [Ref 10.38]; • Environment Agency, Pollution Prevention Guidance Note 5 (PPG5): – Working in, near or liable to affect watercourses [Ref 10.39]; • CIRIA (C741) Environmental good practice on site guide [Ref 10.36]; • Prevent surface water being affected during earthwork operations. No discharge to surface watercourses will occur without permission from the EA (SuDS Manual); • Wheel washers and dust suppression measures to be used as appropriate to prevent the migration of pollutants (SuDS Manual); • Regular cleaning of roads of any construction waste and dirt to be carried out (SuDS Manual); and • A construction method statement to be submitted for approval by the responsible authority (SuDS Manual).
Water Quality monitoring Water quality monitoring will be carried out throughout the construction phase to ensure no discharge of pollutants or increase in suspended sediments occurs. Pollution prevention measures Refuelling of machinery would be undertaken within designated areas where spillages can be easily contained. Machinery would be routinely checked to ensure it is in good working condition. Any tanks and associated pipe work containing substances included in List 1 of the Groundwater Directive would be double skinned and be provided with intermediate leak detection equipment. The following specific mitigation measures for the protection of surface water during construction activities would be implemented: • Management of construction works to comply with the necessary standards and consent conditions as identified by the EA; • A briefing highlighting the importance of water quality, the location of watercourses and pollution prevention included within the site induction; • Areas with prevalent run-off to be identified and drainage actively managed, e.g. through bunding and/or temporary drainage; • Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) to be bunded and carefully sited to minimise the risk of hazardous substances entering the drainage system or the local watercourses. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage. Bunds used to store fuel, oil etc. to have a 110% capacity; • Disturbance to areas close to watercourses reduced to the minimum necessary for the work; • Excavated material to be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and any spillage into the watercourses; • Construction materials to be managed in such a way as to effectively minimise the risk posed to the aquatic environment; • All plant machinery and vehicles to be maintained in a good condition to reduce the risk of fuel leaks;

Standard construction mitigation measures to be adopted during the construction of the WKN Proposed Development
• Drainage works to be constructed to relevant statutory guidance and approved via the LLFA prior to the commencement of construction; and • Consultation with the EA to be ongoing throughout the construction period to promote best practice and to implement proposed mitigation measures.
A Decommissioning Environmental Management Plan would be produced and agreed with the relevant authorities prior to decommissioning works. The Decommissioning Environmental Management Plan would consider in detail all potential environmental risks on the site and contain guidance on how risks can be removed or mitigated. This would include details of how surface water drainage should be managed on the WKN Proposed Development site during the decommissioning. The plan would also consider how the attenuation pond should be managed and whether there would be environmental benefits from retaining this feature. Decommissioning practices to incorporate measures to prevent pollution and increased flood risk, to include emergency spill response procedures, and clean up and remediation of contaminated soils.

Table 10.14: Standard decommissioning and construction management measures adopted.

Mitigation from Completed Development Effects

Standard mitigation measures adopted as part of the WKN Proposed Development
Operation and Maintenance
Operational practices to incorporate measures to prevent pollution and increased flood risk, to include: • Emergency spill response procedures; • Clean up and remediation of contaminated water run-off; • Operational drainage gullies to prevent run-off from site; • Drainage strategy (Appendix 10.2), including surface water management plan, maintenance and/or monitoring procedures of drains and gullies; and • Operational management plan (including site storage procedures).

Table 10.15: Standard Operational and Management measures adopted.

10.6 Predicted Effects

10.6.1 A range of potential impacts on water resources & hydrology have been identified which may occur during the construction and operation of the WKN Proposed Development. The impacts have been assessed based on a realistic worst case WKN Proposed Development design as outlined in Table 10.7 of this chapter and described in more detail in Chapter 2 and incorporate standard mitigation measures set out in Table 10.14 and Table 10.15 of this Chapter.

Construction Effects

10.6.2 The effects of the WKN Proposed Development have been assessed in relation to hydrology and flood risk within the defined study area. The identified potential environmental impacts arising from the construction of the WKN Proposed Development are listed below.

10.6.3 The temporary impacts of the WKN Proposed Development occur during the construction phase. These impacts are mainly due to the increase in less permeable areas of the WKN Proposed Development. The temporary impacts assessed within this chapter are as follows:

- Impacts which may affect temporary (construction) flood risk;
- The impact of construction on surface water resources; and
- The impact of construction on on-site drainage network.

10.6.4 A description of the significance of impacts upon hydrology and flood risk receptors caused by each identified impact is given below.

Impact of construction on temporary flood risk

10.6.5 The WKN Site has been assessed as being at 'low' risk of Tidal flooding from the Swale due to the WKN Proposed Development site level of c.6.3m AOD.

10.6.6 As outlined in the current baseline conditions, the WKN Site is currently entirely hardstanding. A temporary increase in less permeable area may occur due to the construction compounds potentially increasing the temporary flood risk to the surrounding area.

10.6.7 Any increase in permanent low permeability surfacing within the development area (asphalt pavement, concrete pavement and building area etc.) will increase site specific run-off rates, increasing the surface water flood risk within the WKN Site and to adjacent land area.

10.6.8 The WKN Site access road (Work No.4) is existing development and only minor construction works are anticipated within these areas generating a negligible change in current flood risk baseline with additional runoff directed to proposed on site drainage. The construction access road and laydown area (Work No. 5&6) have been identified to be at risk of tidal flooding, in the absence of flood defences and including climate change. Appropriate flood mitigation techniques to manage the risk posed to stored equipment will be implemented in line with measures outlined in Table 10.14.

10.6.9 The construction laydown area would comprise a gravel surfacing placed on geotextile membrane with any runoff directed to an onsite settlement pond, accordance with guidance outlined in Table 10.14.

Sensitivity of receptor

10.6.10 The land adjoining the WKN Proposed Development consists of industrial units (Kemsley Paper Mill throughout) therefore sensitive receptors include staff and workers within these units. These receptors are of low vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**.

Magnitude of impact

10.6.11 Impacts on flood risk would arise from any temporary change in less permeable areas, in turn changing run-off rates/characteristics over areas affected during construction. The excavation of foundations associated with the development is likely to change the natural hydrological characteristics of the WKN Site. Impacts on flood risk from the temporary change in run-off characteristics are predicted to affect the local surrounding receptors, be of short to medium term duration and intermittent occurrence. The magnitude is therefore considered to be **medium adverse**.

10.6.12 The construction methodologies will ensure that offsite surface water flows during construction are not increased during development. Design mitigation measures will be implemented to reduce the flood risk caused by the construction phase. This includes a suitable drainage network which will be constructed to discharge any surface water falling on the WKN Site to an attenuation pond prior to out falling into the Swale.

10.6.13 The impact is predicted to be of local spatial extent, short term duration, intermittent and reversibility. With the above construction engineering methods adopted as part of the project it is predicted that the impact will not affect surrounding local receptors directly. The magnitude is therefore, considered to be **low adverse**.

Significance of effect

10.6.14 The overall significance of effect on flood risk without the incorporation of any management measures is assessed as moderate adverse, which is deemed significant.

10.6.15 However, the overall significance of the effect on flood risk based on the situation which includes the integration of construction measures adopted in Table 10.14 and Table 10.15 is assessed as minor adverse, which is not significant.

<u>The impact of construction on surface water resources.</u>

10.6.16 During construction, there is a potential risk of accumulation of standing water on the WKN Site and accidental discharges of untreated run-off whilst the development and the operational surface water drainage system are being constructed. The Swale forms a SSSI and a SPA, Ramsar site and a Marine Conservation Zone (MCZ).

10.6.17 The sensitivity of watercourses is dependent on the nature of the specific watercourse. There are a number of potential pollutants which could arise during construction, and hence which may affect the water quality of receiving watercourses. These are outlined below:

- Fine particulate materials (e.g. silts and clays);
- Cement;
- Oil and chemicals (from plant machinery and processes); and

- Other wastes such as wood, plastics, sewage and rubble.

10.6.18 These pollutants may be present as a result of normal site activities, incorrect storage of oils and chemicals and/or accidental spillage. The significance of the incident would be dependent on the nature of the pollutant, on the mitigation measures adopted and their timing and effectiveness, and on the sensitivity of the receiving watercourse.

Sensitivity of receptor

10.6.19 Surface water resources (including The Swale) are considered to be highly vulnerable and high value. The sensitivity of the receptor is therefore, considered to be **high**.

Magnitude of impact

10.6.20 Activities associated with machinery during the construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil etc. that could affect nearby watercourses and tidal bodies. This could cause a direct loss, disturbance or other effects on aquatic habitats and species of nature conservation value. Based on the distance to the Swale SSSI the magnitude of impact has been assessed as **high**.

10.6.21 The construction process would include measures to intercept run-off and ensure that discharges from the WKN Site are controlled in quality and volume, as well as water quality monitoring carried out throughout the construction phase to ensure no discharge of pollutants or increase in suspended sediment occurs as set out in Table 10.14. The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. The magnitude is therefore, considered to be **low** adverse.

Significance of effect

10.6.22 The level of effect in relation to run-off from construction sites and spillages without the incorporation of management measures would be major adverse, which is significant. The significance of effects in relation to run-off from construction sites and spillages, including the integration of construction measures adopted in Table 10.14 would be of **minor** adverse, which is not significant.

<u>The impact of construction on on-site drainage network</u>

Sensitivity of receptor

10.6.23 On-site drains are considered to be of moderate vulnerability, moderate to high recoverability and minor value. The sensitivity of the receptor is therefore, considered to be **medium**.

Magnitude of impact

10.6.24 The construction of the development may remove / disrupt the on-site drainage network within the WKN Site boundary, in turn increasing the flood risk to the site and the surrounding receptors. The effect with the incorporation of standard

construction methods is predicted to be of local spatial extent with a minor shift away from the hydrological baseline of the local receptors, short term duration and intermittent occurrence. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be **low** adverse.

10.6.25 Construction methodologies incorporated into the development design would look to limit the disruption of the on-site drainage network and/or include temporary construction drainage within the WKN Site boundary. The impact is predicted to have a negligible impact on surrounding receptors, short term duration, intermittent and reversible with construction drainage to be incorporated into the design. The magnitude is therefore, considered to be **low** adverse.

Significance of effect

10.6.26 The significance of effect on on-site drainage networks without any construction mitigation methods is assessed **minor** and deemed not significant.

10.6.27 The significance of effects on on-site drainage networks which includes the integration of construction measures adopted in Table 10.14 is considered to be **negligible**, which is not significant.

Operational Effects

10.6.28 The effects of the operation of the WKN Proposed Development has been assessed in relation to hydrology and flood risk within the defined study area. The environmental impacts arising from the operation and maintenance of the WKN Proposed Development are listed below and have been assessed.

10.6.29 Operational, longer term and permanent impacts are those which would occur as a result of the WKN Proposed Development operation. The longer-term impacts assessed within this chapter are as follows:

- Impact of operation on flood risk;
- Impact of operation on surface watercourses; and
- Impact on water resources.

10.6.30 A description of the significance of impacts upon hydrology and flood risk receptors caused by each identified impact is given below.

<u>Impact of operation on flood risk</u>

10.6.31 Due to the existing level of the WKN Site of c.6.30m AOD and the development being effectively in Flood Zone 1, there is a low risk of tidal flooding.

10.6.32 No increase in permanent area of low permeability surfaces is anticipated. Site operational and maintenance works could lead to an increase in flood risk.

The access road is existing development, but no significant operational works are anticipated and therefore **no change** in current flood risk baseline is expected.

Sensitivity of receptor

10.6.33 The land adjoining the WKN Proposed Development consists of industrial units (Kemsley Paper Mill etc.) therefore sensitive receptors includes staff and workers within these units. These receptors are considered to be of low vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**.

Magnitude of Impact

10.6.34 Uncontrolled offsite flows during operation could lead to an increase in flood risk. The impact is predicted to be of local spatial extent affecting the WKN Site and local receptors, short to medium term duration with potential to cause significant proportional damage to key components surrounding units and intermittent occurrence.

10.6.35 However, operational activities would incorporate appropriate drainage solutions in the design of the development, with any disruption to on-site drainage being restored to the existing surface water drainage regime as set out in Table 10.15 and Appendix 10.2; therefore any increase in surface water runoff (flooding) would be managed.

10.6.36 The WKN Proposed Development will discharge clean surface water via a new site dedicated pipe out falling through a headwall utilised by K3 Proposed Development. Surface water flows will be discharged into the Swale Estuary.

10.6.37 The WKN Proposed Development has been subject to an FRA (Appendix 10.1) in order to meet the requirements of planning policy and best practice. As the WKN Proposed Development will direct flows into The Swale, via Applicant owned land, the EA and Medway IDB have not stipulated a requirement to reduce existing run-off rates. However, sufficient attenuation storage should be provided taking into account tide locking events.

10.6.38 Therefore the impact of the WKN Proposed Development subject to the implementation of the standard mitigation measures set out in Table 10.15 and Appendix 10.2 is predicted to be of local spatial extent, short term duration, intermittent and highly reversible. With the operational measures proposed, it is predicted that the impact will not affect surrounding local receptors directly. The impact of the WKN Proposed Development is therefore considered to be **negligible**.

Significance of effect

10.6.39 The significance of effect of the WKN Proposed Development on flood risk is therefore **minor** and not significant.

<u>Impact of operation on surface water quality</u>

10.6.40 During the operation of the WKN Proposed Development, there are a number of potential pollutants, which may give rise to water quality effects on the

surrounding surface watercourses, detailed within Chapter 2: Site description and proposed development. These include:

- Fine particulate materials (e.g. silts and clays);
- Hydrocarbons;
- Oils and chemicals (from plant machinery and processes); and
- Process waste water.

10.6.41 The WKN Site will recycle processed water (i.e. water used in the steam process of the waste-to-energy facility) or water used for cleaning internal areas of the facility (i.e. dirty water) back into the facility. As a consequence, no process or 'dirty' water will be discharged into the Swale Estuary.

10.6.42 A new surface water outfall is to be constructed next to the K3 Proposed Development outfall to discharge into the Swale. A variation of the existing MMO licence (ref: L/2017/00482/2) has been sought to permit the discharge of surface water from the WKN Site. This has been subject to MCZ and WFD assessment as appropriate and concluded no likely significant water quality effects.

Sensitivity of receptor

10.6.43 These pollutants may be present as a result of normal operations, traffic and emergency or accidental spillage. Surface water resources are considered to be moderately vulnerable, slow recoverability and medium value. The significance of any such incident would be dependent on the nature of the pollutant, on the operational measures adopted and their timing and effectiveness, and on the sensitivity of the receiving watercourse (The Swale). The sensitivity of the receptor is therefore, considered to be **high**.

Magnitude of Impact

10.6.44 Pollution arising from accidental spillages on site such as road traffic accidents could result in a range of impacts on watercourses from negligible to high. Activities associated with machinery during the operation could lead to an increase in turbid run-off and spillages/leaks of fuel, oil etc. that could affect nearby watercourses and tidal bodies. Based on the distance to the Swale SSSI the magnitude of impact has been assessed as **high**.

10.6.45 The provision of operational measures, including on-site drainage networks, as outlined in Table 10.15 would reduce the range of potential impacts to **low** adverse.

Significance of effect

10.6.46 The provision of permanent operational measures as outlined in Table 10.15 would reduce the range of potential effects should they occur to **minor** adverse, which is not significant.

Decommissioning Development Effects

10.6.47 Decommissioning impacts are those which would occur as a result of the decommissioning of the WKN Proposed Development and associated infrastructure. The decommissioning impacts assessed within this chapter are as follows:

- Impact of decommissioning on flood risk; and
- Impact of decommissioning on surface watercourses.

10.6.48 The decommissioning impacts have been determined to be similar and no worse than construction impacts in relation to hydrology and flood risk, and therefore are at worse **minor** adverse and unlikely to be significant subject to implementation of standard construction practice and the Decommissioning Environmental Management Plan (DEMP) as set out in Table 10.14.

Description of impact	Sensitivity of receptor	Magnitude of change	Duration	Nature	Degree of effect	Level of certainty
Construction and Decommissioning Phase						
Temporary flood risk	High.	Low.	Short term	Impacts which may affect temporary flood risk.	Minor adverse	High
Surface watercourses	High.	Negligible.	Short term	The impact of construction on surface water resources.	Minor adverse.	Medium
Drainage network	Medium.	Negligible.	Short term	The impact of construction on-site drainage network.	Negligible adverse.	Medium
Completed Development Effects (Operation and Maintenance Phase						
Temporary flood risk	High.	Negligible.	Long term (life of development)	Impact of operation on flood risk	Minor Adverse.	High
Surface watercourses	High.	Negligible.	Short term	Impact of operation on surface watercourses.	Minor adverse.	Medium
Water resources	High.	High.	Short term	Impact of hot water discharge to the Swale	Minor adverse.	Medium

Table 10.16 Summary of potential environmental effects, mitigation and monitoring.

10.7 Mitigation

10.7.1 As part of the development process and in line with industry standard guideline, a number of further development specific mitigation measures will be incorporated, where practicable, to reduce further the potential for impacts on water resources & hydrology.

Water Quality / Flood Risk Mitigation

10.7.2 Temporary drainage mitigation techniques including, but not limited to, run-off interceptor channels would be installed prior to the construction of the formal drainage to ensure that discharges from the WKN Proposed Development are controlled in quality and volume. This may include the use of settling tanks and / or ponds to remove sediment, temporary interceptors and hydraulic brakes.

10.7.3 Construction material and / or spoil within construction compounds will be positioned away from drainage systems or surface watercourses / field drainage and no hazardous substances will be stored within proximity of the drainage network.

10.7.4 An outline drainage strategy forms part of the application (Appendix 10.2) and the detailed drainage strategy will be finalised by the contractor and agreed with the EA and LLFA. The strategy will incorporate the use of appropriate SuDS techniques, interceptors and separators as required, treating surface water run-off generated from the WKN Proposed Development, prior to either infiltrating into the underlying geology, where appropriate, or discharging into the Swale Estuary at an agreed rate.

10.7.5 Any area at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will be bunded and carefully sited to minimise the risk of hazardous substances entering the drainage system or the local watercourses. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any potential leakage / spillage event.

10.7.6 Table 10.17 sets out the further mitigation to be incorporated into the construction of the WKN Proposed Development Table 10.18 sets out the further mitigation measures as part of the operation of the WKN Proposed Development. No additional mitigation measures are needed for the decommissioning phase of the development

Mitigation from Construction Effects

Mitigation measures adopted as part of the WKN Proposed Development	Justification
Construction	
Surface Water Management Strategy	To address the NPS, NPPF, EA and LLFA surface water run-off requirements.

Mitigation measures adopted as part of the WKN Proposed Development	Justification
The WKN Proposed Developments would result in the construction of low permeability surfacing, increasing the rate of surface water run-off from the WKN Site. A surface water management plan would be present which will ensure that any increase in surface water run-off would be handled on-site and a run-off rate to the surrounding water environment (Swale Estuary) is maintained at the agreed upon rate. This would highlight potential contaminants and suspended sediment originating from the WKN Site, which may affect the receiving watercourse. Monitoring would be carried out during the construction phase and continue throughout the lifetime of the WKN Proposed Development. **Flood Management Plan** This plan is applicable throughout the construction phase and should include flood-warning measures for safe site evacuation.	

Table 10.17: Decommissioning and Construction mitigation measures adopted

Mitigation from Completed Development Effects

Mitigation measures adopted as part of the WKN Proposed Development	Justification
Operation	
Drainage maintenance plan This plan is applicable throughout the lifetime of the development for the drainage within the WKN Proposed Development, and any connections to the surface water, or foul sewer and trade waste networks. **Flood management plan** This plan is applicable throughout the lifetime of the development and should include flood-warning measures. This plan applies to the WKN Site on a regional basis. **Emergency spillage management plan** This plan is applicable throughout the lifetime of the development and should include emergency measures. This plan applies to the WKN Site on a regional basis. **Water quality monitoring strategy** Ongoing water quality monitoring should be undertaken throughout the lifetime of the development. This will apply to the drainage	To reduce the risk of surface water pollution and to maintain the drainage network in order that flood risk does not increase temporarily.

Mitigation measures adopted as part of the WKN Proposed Development	Justification
ditches within and surrounding the WKN Site. **Flood Evacuation Plan** A flood evacuation plan will be developed for the construction and operational phases of the WKN Proposed Development, with staff training provided, to ensure in the event of the plan be activated staff are aware of the procedures upon receipt of the flood warning, together with evacuation routes. The flood evacuation plan should be practiced regularly.	

Table 10.18: Operational and Decommissioning designed-in mitigation measures adopted.

10.8 Residual Effects

10.8.1 Residual effects are those that are predicted to remain after implementation of the measures outlined in Table 10.14 and Table 10.15 and Table 10.17 and Table 10.18 above. With reference to the assessment set out in this Chapter and the significance matrix present in Table 10.6 no significant residual effects on the water environment are envisaged to occur as a result of the WKN Proposed Development subject to the mitigation measures set out herein.

10.9 Cumulative Effects

10.9.1 This section considers the inter-project cumulative effects of the WKN Proposed Development on water resources & hydrology in conjunction with other projects / developments.

10.9.2 A review of approved and proposed developments within a 500 m search area from the WKN Proposed Development has been undertaken.

10.9.3 The potential for cumulative effects resulting from the K3 Proposed Development and WKN Proposed Development in combination with other schemes that are operational / constructed, consented or for which planning permissions are currently being sought, has been considered.

10.9.4 The WKN Proposed Development will not result in any changes to the layout or surface water drainage of K3 and therefore there is no potential cumulative effect. A surface water management strategy was submitted to support the K3 Proposed Development application (see Document 3.3). The strategy identifies appropriate management techniques whereby surface water runoff is managed in accordance with national and local policies, guidance and standards.

10.9.5 Similarly, a surface water management strategy has been submitted to support the WKN Proposed Development (Appendix 10.2). The strategy identifies

appropriate management techniques whereby surface water runoff is managed in accordance with national and local policies, guidance and standards.

10.9.6 In accordance with the NPS and/or NPPF and Planning Practice Guidance ID7 – Flood Risk and Coastal Change, any new development is required to attenuate surface water run-off, where practicable, to the greenfield run-off rate and provide appropriate management techniques to treat potentially contaminated run-off prior to discharge into the local drainage network.

10.9.7 Any works undertaken within 8 m of a watercourse and / or flood defence will require consent from either the EA, LLFA or IDB depending on whether the waterbody is designated a Main River or Ordinary watercourse. For the consent to be provided the developer is required to demonstrate that the risk of flooding during the lifetime of the development could be mitigated to a level acceptable to the EA, LLFA and / or IDB's. Therefore, the cumulative impacts on water resources & hydrology are predicted to not be significant.

10.9.8 Therefore, it has been determined that no significant cumulative effects on water resources & hydrology receptors are likely.

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