K4 KEMSLEY SITE CONDITION REPORT & BASELINE ASSESSMENT – EPR/BJ3951G

E.ON CHP Limited

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K4 Kemsley Site Condition Report & Baseline Assessment
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REPORT

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1 INTRODUCTION

1.1 Background

1.1.1 This IED baseline report and site condition report (SCR) is prepared to inform the Environmental Permit Variation Application for E.ON CHP Limited at Kemsley Paper Mill, Kemsley, Sittingbourne, ME10 2SG Kent. (environmental permit reference EPR/BJ7395IG)

1.1.2 The National Grid Reference for the facility is ~ NGR TQ 91992 66312.

1.1.3 E.ON UK CHP Limited is looking to vary environmental permit (reference EPR/BJ7395IG) to incorporate a new gas-fired CHP plant (K4), boiler plant and additional land in the permitted site boundary. The new CHP plant shall supply electricity and steam to the adjacent existing Kemsley Paper Mill, operated by DS Smith. The new plant will be located on the K4 site (Assessment Site) within the existing Kemsley Paper Mill complex.

1.1.4 This SCR and baseline report establish the condition of the land which is to be included in the permit boundary at the point of varying the permit and is informed by site investigations carried out for the development consent order application in April 2018.

1.1.5 The land to be included in the permitted area is currently included in the DS Smith Paper Mill installation boundary (permit reference EPR/BJ7468IC) and is denoted as K4 (Assessment Site).

1.1.6 DS Smith are in the process of surrendering this area of the permit prior to the construction and commissioning of K4 CHP.

1.2 Objective

1.2.1 Article 22(2) of Directive 2010/75/EU on Industrial Emissions (Industrial Emissions Directive or "IED") relates to the provision of a Baseline Report, stating:

"Where the activity involves the use, production or release of relevant hazardous substances and having regard to the possibility of soil and groundwater contamination at the site of the installation, the operator shall prepare and submit to the competent authority a baseline report before starting operation of an installation"

1.2.2 The content and approach for delivery of a Baseline Report is described in European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions (2014/C136/03), dated 6 May 2014 ("Communication 2014/C136/03"). The objective of this report is to deliver the eight-stage approach described in Communication 2014/C136/03 that includes:

- Stage 1 - Identify which hazardous substances are used, produced or released at the installation:
- Stage 2 - Identify which of the hazardous substances from Stage 1 are capable of contaminating soil or groundwater.;
- Stage 3 – Identify the actual possibility for soil or groundwater contamination posed by the activities on site.;
- Stage 4 – Evaluation of Site History and potential for relevant hazardous substances to be present in soils and groundwater;

- Stage 5 – Evaluation of Environmental Setting to determine the fate of potential emissions of relevant hazardous substances;
- Stage 6 – Use the results of stages 3, 4 and 5 to undertake a pollution risk assessment to assess risks posed by, current and future site activities;
- Stage 7 – Site Investigation (including sampling strategy)
- Stage 8 – Produce a baseline report for the installation that quantifies the state of soil and groundwater pollution by relevant hazardous substances

1.2.3 This IED Baseline and SCR Report therefore provides the information required for Stage 1 -6, that includes the development of a Conceptual Site Model (CSM) and delivery of a site-specific assessment of pollution potential for the substances used, produced or emitted as part of the permitted operations on the proposed facility. The site-specific pollution potential is determined from a desk-based evaluation of proposed operations and qualitative assessment of associated risk.

1.3 Historical Reporting & Limitations

1.3.1 The qualitative assessment presented herein is based on an understanding of the E.ON UK CHP Limited site and its setting as defined in the following historical reporting:

- Desk Study and Preliminary Risk Assessment K4 CHP Development, Kemsley Paper Mill On Behalf Of DS Smith Paper Ltd, Ref. JER1201 prepared by RPS, dated March 2018 (RPS, 2018) (Ref. 1);
- The Kemsley Mill K4 Combined Heat and Power Generating Station Development Consent Order Report, Environmental Statement, Chapter 8 - Ground Conditions prepared by DHA Environment and RPS, dated April 2018 (RPS, 2018a) (Ref. 2);
- Desk Study Report, reference No. R18-12883/ds prepared by Ashdown Site Investigation, dated 20th April 2018 (Ashdown, 2018) (Ref. 3);
- Factual Report on the Ground Investigation, reference No. R18-12883/fr prepared by Ashdown Site Investigation, dated 15th June 2018 (Ashdown, 2018a) (Ref. 4);
- Interpretative Geotechnical and Ground Contamination Risk Assessment Report, reference No. R18-12883/int prepared by Ashdown Site Investigation, dated 15th June 2018 (Ashdown, 2018b) (Ref. 5);
- Quarterly Monitoring Report Proposed CHP Plant, Kemsley Mill, Kemsley, prepared by Ashdown Site Investigation, R18-12883/QR1 dated 7th September 2018 (Ashdown, 2018d) (Ref. 6);
- Quarterly Monitoring Report Proposed CHP Plant, Kemsley Mill, Kemsley, prepared by Ashdown Site Investigation, R18-12883/QR2, dated 11th December 2018 (Ashdown, 2018e) (Ref. 7);
- Ground Investigation Interpretative Report, New Southern Boundary Road, Kemsley Paper Mill, prepared by RPS, reference No. JER1612, dated December 2018 (RPS, 2018b) (Ref.8);
- Quarterly Monitoring Report Proposed CHP Plant, Kemsley Mill, Kemsley, prepared by Ashdown Site Investigation, R18-12883/QR3, dated 5th March 2019 (Ashdown, 2019) (Ref. 9).

- WTI Kemsley Generating Station, Power Upgrade: Preliminary Environmental Information Report (PIER) for Chapter 8: Hydrogeology, Ground Conditions and Contamination, JER6933, March 2017 (RPS 2017b) (Ref. 10).

These reports should be read in conjunction with this report.

1.4 Report Structure

1.4.1 The subsequent report structure is as follows:

- Section 2: Assessment of Site-Specific Pollution Potential - This section identifies all substances used, produced or emitted on the Assessment Site and those considered to be Relevant Hazardous Substances under the IED. This section provides the qualitative risk assessment for soil and groundwater. As such this section delivers Stage 1, Stage 2 and Stage 3 of the Baseline Report.
- Section 3: Site History - Provides summary of current and historical land-use on the Assessment Site and its surrounds that may affect baseline soil or groundwater quality on the site. As such this section delivers Stage 4 of the Baseline Report.
- Section 4: Environmental Setting - Describes the environmental setting of the Assessment Site and its sensitivity, from which the conceptual hydrogeological model for the site is developed. The understanding of site activities and the hydrogeological model underpins the risk assessment of site-specific pollution potential.
- Section 5: Baseline Quality Assessment - This defines the understanding of soil and groundwater quality on the site, in relation the RHS identified in Section 2 on the basis of historical intrusive investigations undertaken on the site. This section also includes the update of controlled water risk assessments undertaken in support of previous planning submissions for the Assessment Site. This section determines whether there is sufficient information available to quantify the state of soil and groundwater pollution by RHS on the basis of Stages 1-6. This section also provides recommendations for additional baseline monitoring that may be required.
- Section 6: Conclusions.

2 ASSESSMENT OF SITE – SPECIFIC POLLUTION POTENTIAL

2.1.1 European Commission Guidance concerning baseline reports (Communication 2014/C136/03)[1] describes the requirements of Stage 1 to 3 of the baseline report:

- Identification of hazardous substances used, produced or emitted on the facility;
- Identify which substances constitute RHSs capable of contaminating soil or groundwater; and
- Identify the possibility for soil or groundwater contamination at the site of the installation.

2.1.2 The evaluation of the possibility of contamination occurring in relation to RHS has been termed an assessment of "site-specific pollution potential". A qualitative, desk based, approach has been used to determine site- specific pollution potential. This approach involves the following steps:

- Summary of all potentially hazardous substances used, produced, emitted on the proposed Facility (Substance Inventory) and the associated processes, storage, use and handling thereof;
- Determination of which substances constitute RHSs as defined by IED;
- Identification of possible release scenarios and associated mitigation measures incorporated in to design and or operational measures (e.g. through EMS) developed for the facility;
- Consideration of Conceptual Site Model (CSM) to determine whether a plausible pollutant linkage exists that could connect the contamination source to soil or groundwater receptors; and
- Assessment of site-specific pollution potential using a qualitative risk matrix approach.

2.1.3 Key information regarding Historical and current land use can be found in in the Desk Study and Preliminary Risk Assessment in ***Appendix A*****.**

2.1.4 The site-specific pollution potential is dependent on the CSM developed on for the facility using the concept of Pollutant (Source-Pathway-Receptor) Linkages, which in turn is dependent on the conceptual hydrogeology and ground model of the system. An active Pollutant Linkage enables known or potential contamination sources to be linked with a specific environmental receptor via a plausible transport pathway.

2.1.5 The pollutant linkages defined for the K4 CHP Facility are therefore dependent on the nature of potential release scenarios associated with each RHS and the nature of any pollution prevention measures or mitigation measures implemented on the site (e.g. through facility design / engineering, nature of on-site containment, emergency response measures, routine inspection / maintenance protocols etc.).

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0506(01)&from=EN

2.2 Risk Matrix for Determining Site-specific Pollution Potential

2.2.1 Following identification of the RHSs, a risk matrix approach has been developed that considers the likelihood of an accidental release occurring and the likelihood of the soil or groundwater receptor being affected.

Likelihood of Accidental Release / Emission Occurring

2.2.2 By consideration of the processes each RHS are used in (in terms of storage / handling / use) and the measures implemented on the K4 site to minimise the potential of a release to occur (during routine use or by accidental emission) the likelihood of a release that could potentially affect a receptor is assessed:

- *Highly Likely*: A process involving the RHS that is not controlled and the RHS could be readily be lost to ground / air / water without mitigation. Nature of handling / storage of the RHS and absence of mitigation measures makes the potential for an accidental emission / release probable;
- *Likely*: The process involving the RHS or the manner of RHS handling / storage is likely to result in a loss to ground, air or water. However, the activities involving the RHS include mitigation measures and/or are undertaken in an engineered / designed facility. The condition of equipment and infrastructure (e.g. storage tanks) is poor, cannot be verified or is poorly maintained. There are no control measures and/or associated staff training to mitigate an accidental release.
- *Unlikely*: Owing to the nature of the process and/or characteristics of the RHS release scenarios are considered improbable. The process does not involve the RHS being exposed or used in a high-risk manner (e.g. storage of small quantities in bunded or sealed areas) and there are measures to prevent release including in by design (e.g. secondary / tertiary containment, sealed drainage, impermeable membranes). The quantities used are small and manageable. Site records demonstrate the absence of an accidental releases occurring. The condition of equipment and infrastructure (e.g. storage tanks) is good and well maintained. There are robust control measures and/or associated staff training to mitigate accidental release; and
- *Very Unlikely*: As for “unlikely” but the probability of release is considered to be lower.

Likelihood of Receptor being Affected

2.2.3 For a named receptor (i.e. soil or groundwater), the likelihood of an accidental release, once it has occurred, to affect the receptor is determined. The receptor likelihood classes used in this qualitative assessment are as follows:

- *Highly Likely*: A direct, active pollutant linkage exists. A large quantity of the RHS is used in a mobile form relevant to the receptor. There is an absence of mitigation measures to control the release or emergency response should accidental emission occur. There is an absence of any other attenuation measures that may mitigate the release before the receptor is affected.
- *Likely*: An active pollutant linkage exists. The quantity of used product or manner of its use may render pollution prevention measures ineffective. The condition or implementation of pollution prevention control measures is poor or cannot be verified. There are historical incidences of accidental releases that affect the receptor.
- *Unlikely*: A possible pollutant linkage exists but is either complex / indirect or has characteristics likely to mitigate any releases. The quantity of material release is likely to be

small or of a form unlikely to be allow the receptor to be reached. Requires secondary process to present before receptor can be affected (e.g. solid going into solution);

- *Very Unlikely*: Although a theoretical pathway to a receptor can be envisaged it is considered extremely unlikely to be active, although cannot be discounted entirely

2.2.4 These two key elements of the risk assessment are combined using the risk matrix presented in Table 2.1 below:

Table 2.1: Risk Matrix for Determining Site-specific Pollution Potential

		Likelihood of Receptor Being Affected by Release			
		Highly Likely	**Likely**	**Unlikely**	**Very Unlikely**
Likelihood of Release Occurring	**Highly Likely**	Extremely High	High	High	Moderate
	Likely	High	High	Moderate	Low
	Unlikely	High	Moderate	Low	Extremely Low
	Very Unlikely	Moderate	Low	Extremely Low	Negligible

2.2.5 Where no plausible linkages have been identified that can connect a contaminant source with a named receptor a risk classification of negligible is applied. The receptors to considered are:

- Near surface **soils** principally in landscaped areas that are not covered by permanent hardstanding (*Soil – Landscaped*);
- **Soils** that form the unsaturated zone principally in areas covered by permanent hardstanding and/or structures on the K4 site (*Soil- Subsurface*);
- Discontinuous **shallow perched water** lying above the cohesive London Clay Formation as described in *Section 0*;
- Sections of the London Clay Formation that is designated by the EA an Unproductive Strata as described in *Section 0*
- Laterally extensive **deep groundwater** in the granular Secondary A aquifer that comprises the Lambeth Group and underlying Thanet Sands, defined by the EA as a Secondary A Aquifer as described in *Section 0*

2.2.6 The risk matrix approach does not consider the magnitude or severity of any affect that may occur should the release scenario and associated pollutant linkage be realised. It is assumed that the process for the identification of RHS should provide an adequate assessment of whether the quantities of the substance used on the K4 Facility have the potential to result in measurable impact on the receptors in question. However, for any RHS where site-specific pollution risk is determined to be greater than low, it may be prudent in due course to evaluate the possible magnitude of that impact should it be realised. This evaluation has not been directly undertaken as part of the assessment presented herein.

2.3 Site Location

2.3.1 The boundary of the K4 CHP development area (Assessment Site) is shown in the hatched area in Drawing EN010090-000252-4.4 - Works Plans - Key Plan. The general location of the K4 Site is shown in Drawing EN010090-000242-4.1 - Context Site Location Plan.

2.3.2 The site is located within the south-eastern corner of the Kemsley Paper Mill facility and comprises a large area of hardstand bounded to the north by the existing CHP plant and to the west, south and east by infrastructure associated with Kemsley Paper Mill.

2.3.3 The site has recently been the subject of desktop studies and ground investigation works undertaken by Ashdown Site Investigation Ltd in 2018 in relation to the K4 CHP development, as denoted within the drawings included in ***Appendix A.***

2.4 Proposed Operations and Layout of the K4 site

Surface Land Cover

2.4.1 The general land cover across the proposed installation area includes concrete hardstand which was noted to generally be intact with localised areas of surface rutting and shallow potholes.

2.4.2 The currently laid concrete hardstand is to be removed prior to construction work commencing for the K4 site.

Project Description

2.4.3 The new development will incorporate a new gas-fired CHP plant (K4), boiler plant, emergency generator, water treatment plant and additional land in the permitted site boundary. The new CHP plant shall supply electricity and steam to the adjacent existing Kemsley Paper Mill, operated by D S Smith.

2.4.4 The new CHP plant shall be a replacement for the current CHP plant (K1) in operation at the site. Once K4 is fully commissioned, K1 will be decommissioned and rendered inoperable before being dismantled later with the exception of six ancillary package boilers from K1 which will be retained and replaced or upgraded to provide back up steam in the event of a planned or unplanned temporary shutdown of K3 or K4. It will be situated adjacent to the E-ON CHP facility, and will be fully integrated with remaining E-ON CHP supply equipment.

2.4.5 The detailed design of the CHP is still being finalised, but it will comprise the following:

- A gas turbine producing in the region of 52 to 57MW of electrical power;
- A Heat Recovery Steam Generator, producing in the region of 105 to 110 MWt of steam;
- A steam turbine, producing in the region of 16MW of electrical power.

2.4.6 K4 will be a combined heat and power plant (CHP) burning natural gas to generate electricity. This process generates excess heat which rather than wasted is then used to heat water and create high pressured steam which is fed though a second turbine to generate further electricity thereby maximising electricity generation.

2.4.7 The steam is also produced for supply to the paper making process and is contained and de-pressurise prior to use.

2.4.8 The main elements of the E.ON CHP facility will comprise:

- fuel and other raw material delivery, handling and storage;
- combustion;
- power and steam generation;
- water treatment plant – this will produce de-ionised water for steam production

Surface Water Drainage System

2.4.9 The surface water drainage system for the proposed facility is shown in the Site Drainage Strategy Layout Drawing Number 14892 / 02 Rev. A, March 2019.

2.4.10 The site drainage has been designed to accommodate surface water from a hundred-year storm event plus climate change.

2.4.11 Currently the site drainage has an unrestricted discharge into the Swale, and the site discharge is only limited by the capacity of the existing on-site system.

2.4.12 Drainage of the development site is via a single surface water system, which will utilise existing drainage outfalls, which conveys to an isolated drainage network within the applicant's ownership. Water is then discharged via the current outfall into the Swale.

2.5 Hazardous Materials Inventory

2.5.1 The substances that will be used at the facility are described in the Summary Table in ***Appendix B.*** These substances are listed below, with their associated Chemical Abstracts Service (CAS) Number where applicable. Safety data sheets are included in ***Appendix C.***

2.5.2 Raw materials used on the facility include:

- Anti-freeze and corrosion inhibitor such as ANTIFROGEN N containing Monoethylene glycol (1,2-ethane diol) with corrosion inhibitors [CAS no. 107-21-1];
- Bearing Oil [No CAS no.- mixture];
- Gas Turbine Compressor Cleaner such as TURBOTECT 2020 [CAS No's. 024938-91-8 / 000112-34-5 / 005131-66-8 / 068439-46-3];
- Diesel [CAS No. 68334-30-5] ;
- Lubricating Oil - Highly refined mineral oil (C15 - C50)[No CAS no.- mixture];
- Natural Gas [CAS No. 8006-14-2];
- Neutralising agent such as STEAMATE NA0880 [CAS No. 141-43-5 / 109-55-7];
- Phosphate based corrosion inhibitor such as OPTISPERSE HP3100 [CAS No. 1310-73-2];
- Water [CAS No 7732-18-5]; and
- Water Treatment Chemicals

- Sodium Bisulphite [CAS No. 7631-90-5];
- Sodium Hydroxide [CAS No. 1310-73-2];
- Sulphuric Acid [CAS No. 7664-93-9];

Stage 1: Hazardous Substances

2.5.3 The IED relates to contamination risk associated with "hazardous substances" used on the Facility. Hazardous substances are defined as substances or mixtures defined in Article 3 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on Classification, Labelling and Packaging of substances and mixtures (the "CLP Regulations"). The CLP Regulations replace the Chemicals (Hazard Information and Packaging for Supply) regulations ("CHIP"). Substances hazardous to the environment as defined by the CLP Regulations relate to "Environmental Hazards" which in turn relates to aquatic toxicity as defined as follows (EU, 2013):

- Aquatic Acute 1 – H400: Very toxic to the aquatic life (Risk phrase R50);
- Aquatic Chronic 1 – H410: Very toxic to the aquatic life with long-lasting effects (Risk phrase R50/53);
- Aquatic Chronic 2 – H411: Toxic to the aquatic life with long-lasting effects (Risk phrase R51/53);
- Aquatic Chronic 3 – H412: Harmful to aquatic life with long-lasting effects (Risk phrase R52/53);
- Aquatic Chronic 4 – H413: May cause long lasting harmful effects to aquatic life (Risk phrase R52, R53).

2.5.4 The determination of whether a substance is a hazardous substance is largely determined using the substance CAS Number and European Chemicals Agency (ECHA) database (https://echa.europa.eu/). Those substances that are designated hazardous substances or potentially contain hazardous substances defined by the ECHA database are presented in the Summary Table provided in ***Appendix B*** and include the following:

- Anti-freeze and corrosion inhibitor such as ANTIFROGEN N containing Monoethylene glycol (Ethane -1,2-diol) with corrosion inhibitor
- Gas Turbine Compressor Cleaner such as TURBOTECT 2020
- Diesel
- Neutralising agent such as STEAMATE NA0880
- Phosphate based corrosion inhibitor such as OPTISPERSE HP3100
- Sodium Bisulphite
- Sodium Hydroxide (Caustic Soda)
- Sulphuric Acid

Stage 2: Relevant Hazardous Substances

2.5.5 On the basis of Hazardous Substances identified above, those considered to be RHS must be defined. Those hazardous substances that are incapable of contaminating soil or groundwater can be disregarded for further consideration although a justified reason for exclusion must be provided.

2.5.6 As defined in Communication 2014/C136/03, RHSs (Article 3(18) and Article 22(2), first subparagraph) are those substances or mixtures defined within CLP Regulation which, as a result of their hazardousness, mobility, persistence and biodegradability (as well as other characteristics), are capable of contaminating soil or groundwater and are used, produced and/or released by the installation. The assessment of RHSs used, produced or emitted on the facility is presented on the Summary Table in ***Appendix B*** and are considered to be:

- Gas Turbine Compressor Cleaner such as TURBOTECT 2020
- Diesel
- Sodium Bisulphite
- Sodium Hydroxide (Caustic Soda)
- Sulphuric Acid

2.5.7 The ancillary bearing and lubricating oils used on the facility are not considered to be RHS as they will be used in very small quantities on the site, stored and used in internal areas on new, concrete hard-standing and subject to routine spill response measures.

2.5.8 Waste oil will be produced at the facility, but this is removed by the service and maintenance contractor and as such not stored at the site therefore not considered to be a RHS.

2.5.9 The anti-freeze and corrosion inhibitor, the natural gas, the phosphate based corrosion inhibitor and the neutralising agent have not been assessed as RHS due to the amounts stored on site or their storage infrastructure and location means that there is no obvious source-pathway-receptor linkage.

2.5.10 The principal contaminants of concern (COC) associated with sources of RHS used on the E.ON CHP UK Limited site are summarised in table 2.2 below

Table 2.2: Contaminants of Concern Associated with RHS

Relevant Hazardous Substance	Principal Contaminants of Concern
Gas Turbine Compressor Cleaner such as TURBOTECT 2020	Ethoxylated fatty alcohols 2-(2-butoxyethoxy)ethanol 3-butoxypropan-2-ol Ethoxylated branched oxoalcohols
Diesel	Petroleum Hydrocarbons including PAHs and BTEX compounds
Sodium Bisulphite	Sodium Bisulphite
Sodium Hydroxide (Caustic Soda)	Sodium Hydroxide
Sulphuric Acid	Sulphuric Acid

2.6 Stage 3: Site-specific Pollution Potential Associated with RHS

Potential Release Scenarios

2.6.1 Potential release scenarios for the RHS used on the E.ON CHP UK Limited site are summarised in below:

- Accidental release to ground or surface water via drainage system. This is applicable to all the RHS stored on site, however, all RHS are stored in buildings or internal chemical stores. An accidental release may occur by a variety of processes: during filling (connection or overfill) and/or product transfer for use; or the loss of primary containment as a result of accident and/or tank failure due to condition; and
- Accidental release of ancillary substances during their use, transport and/or storage on the facility. Principally associated with ancillary lubricating / bearing oils in small quantities both internally and externally. Typically stored in internal chemical stores;
- Fugitive emissions caused by flooding or fire/firewaters.

Pathways and Associated Pollution Prevention Measures

2.6.2 The general pollution prevention and/or mitigation measures associated with processes and RHS used, produced or emitted on the Facility are described in Summary Table in ***Appendix B*** and described below.

2.6.3 No underground storage tanks are proposed for the Facility.

2.6.4 The water treatment chemicals are stored within a bunded building, in the site chemical store which itself is bunded or within tanks with secondary containment. Buildings have impermeable floors and spillage kits. A hard, impermeable surface will underlie all chemical storage areas to prevent fugitive emissions to groundwater should spills/ leaks occur.

2.6.5 All chemicals will be subject to appropriate storage and handling practices which are described and enforced through the site's Environmental Management System.

2.6.6 All oils are stored within double skinned tanks in a bunded area which are designed to meet the requirements of the Oil Storage Regulations (i.e bunds contain 110% volume of tank). The bunds in a building with impermeable floors and spillage kits.

2.6.7 Diesel is stored in a dedicated 1,500 litre tank within the emergency generator container. The container itself will act as secondary impermeable containment.

2.6.8 The site has a spillage procedure to ensure that any risk from spillages is minimised and they are cleaned up as soon as detected. Emergency spill kits will be available across the site

2.6.9 All process areas are located on hardstanding impermeable surfaces and all bunds provided for chemical and fuel storage tanks will be manually inspected to ensure they remain empty. All liquid reagent storage tanks will be bunded to 110% of the capacity of the storage tank. Bunds will be constructed to appropriate standards and lined with materials that are impervious to the content of the material they hold.

2.6.10 A release to ground in external areas could potentially enter the surface water drainage system shown in Drawing 14892/02. The effects of such a release are minimised by the presence of an oil water interceptor installed on that drainage system that will be subject to routine servicing / maintenance. An isolation valve will be fitted to the drainage system to capture and leaks or spills.

Assessment of Site-specific Pollution Risk

2.6.11 The assessment of site-specific Pollution Risk associated with each RHS identified for the proposed facility is summarised in table 2.3 below:

Table 2.3: Assessment of Site-specific Pollution Potential

Relevant Hazardous Substance	Release Scenario	Receptor*	Mitigations / Pollution Prevention Measures / Risk Notes	Likelihood of Release	Likelihood of Receptor being Affected	Pollution Potential
Gas Turbine Compressor Cleaner such as TURBOTECT 2020	Accidental release to ground: during filling (connection or tank overfill) and/or product transfer for use; Loss of primary containment as a result of accident and/or tank failure due to condition / impact	Soils – Subsurface	GT wash skid stored in 1000 litre purpose-built container which is stored on a purpose-built stand with secondary containment. All materials stored within buildings with impermeable surfacing and sealed drainage. Outside areas have new concrete hardstanding. Management systems are in place with procedures for regular inspection and service/maintenance of infrastructure. Deliveries are overseen by trained staff. Spill kits are located around the site and emergency spill response procedures are in place at the site.	Unlikely	Unlikely	Low
		Groundwater - Shallow				
		Groundwater - Deep				
Diesel	Accidental release to ground: during filling (connection or tank overfill) and/or product transfer for use; Loss of primary containment as a result of accident and/or tank failure due to condition / impact	Soils – Subsurface	Diesel is stored in a dedicated tank within the emergency diesel generator container. The container will act as secondary containment and has impermeable surfacing and sealed drainage. Outside areas have new concrete hardstanding. Management systems are in place with procedures for regular inspection and service/maintenance of infrastructure. Deliveries are overseen by trained staff. Spill kits are located around the site and emergency spill response procedures are in place at the site.	Unlikely	Unlikely	Low
		Groundwater - Shallow				
		Groundwater - Deep				
		Groundwater - Shallow				
		Groundwater - Deep				
		Surface Water				
		Groundwater - Shallow				
		Groundwater - Deep				

WTP Chemicals (Sodium Bisulphite, Sodium Hydroxide and Sulphuric Acid)	Accidental release to ground: during filling (connection or tank overfill) and/or product transfer for use; Loss of primary containment as a result of accident and/or tank failure due to condition / impact	Soils – Subsurface	All materials stored within buildings with impermeable surfacing and sealed drainage. Outside areas have new concrete hardstanding. Management systems are in place with procedures for regular inspection and service/maintenance of infrastructure. Deliveries are overseen by trained staff. Spill kits are located around the site and emergency spill response procedures are in place at the site.	Unlikely	Unlikely	Low
		Groundwater - Shallow				
		Groundwater - Deep	Deep groundwater protected by Alluvium / London Clay Formation	Unlikely	Unlikely	Low

* Receptors considered typically include IED receptors: Soils, shallow perched Groundwater and deep Groundwater

** Included consideration of Surface Water receptor for Neutralising agent (Dimethylaminopropylamine (DMAPA), Ethanolamine) as it is particularly toxic to aquatic environments

2.6.12 As operational areas on the site are generally situated within covered structures and/or in areas of new hardstanding (concrete), the is little potential for any RHS used at the facility affecting shallow surface soils in landscaped areas.

2.6.13 The pathway to subsurface soils and shallow groundwater underlying the operational facility is dependent on: the integrity / condition of either the surface hardstanding; the nature of any primary, secondary or tertiary containment measures included in design; and the operational / emergency measures implemented on the operational facility as part of its IMS.

2.6.14 The location of storage tanks for oils and chemicals being within buildings with impermeable surfacing and sealed drainage will effectively limit their potential risk to groundwater and soil.

2.6.15 Deep groundwater within the Secondary A granular aquifer underlying the facility will be afforded further protection by the presence of the low permeability London Clay Formation (and alluvium) which hydraulically separates the shallow and deep-water bodies identified on the site (See *Section 4.1*).

2.6.16 The perched water beneath the site is likely to be discontinuous i.e. there isn't likely to be a continuous water body that would transmit any contamination, and given the distance to the Swale, it is likely that any contamination migration would be retarded over the water flow path.

2.6.17 The site-specific pollution potential associated with the RHS has been determined as low.

3 SITE HISTORY

3.1 Introduction

3.1.1 Stage 4 of producing a Baseline Report requires the history of the site and its immediate surroundings to be considered.

3.2 Land-use on the K4 Site

Current Land Use

3.2.1 The Assessment Site comprises a large area of concrete hardstanding and is generally used for paper storage with a vehicle weighbridge, truck wash area and hazardous waste storage area also present. A vehicle refuelling area is located on the southern portion, with fuel being stored in a bunded above ground storage tank.

3.2.2 A concrete wall extends in a north-easterly direction off the southwestern corner of the Assessment Site and acts as a boundary between the Kemsley Paper Mill Site's haulage route and the waste paper storage area.

3.2.3 The potential for recent release of hazardous substances to ground on the Assessment Site as a result of current land-use is therefore considered to be low.

3.2.4 A network of surface water drains is present around the perimeter of the Site.

Historical Land-use

3.2.5 The historical land-use across the Assessment Site can be determined from the summary Table 3.1 of the Desk Study and Preliminary Risk Assessment K4 CHP Development, Kemsley Paper Mill (RPS, 2018). This report is comprehensive of the Ordnance Survey maps that detail the Site history and is provided within the Envirocheck Report included within Appendix 3 of the Desk Study and Preliminary Risk Assessment K4 CHP Development, Kemsley Paper Mill (RPS, 2018) which is included as ***Appendix A***. The main points are summarised below.

3.2.6 The Ordnance Survey maps show that prior to development of the paper mill in the late 1930s the Site comprised undeveloped agricultural land. A Brick Works was recorded to be present in 1898 adjacent to the southern Site boundary and was recorded to have become disused by 1909 with all associated buildings no longer present.

3.2.7 The paper mill was constructed adjacent to the western boundary of the Site in the 1930s with numerous buildings associated with the mill having been constructed in the southern part of the Site. The remainder of the Site typically comprised areas of open land, traversed by railway lines with several small tanks recorded to be present.

3.2.8 The layout of the paper mill remains broadly the same, with a few minor changes in layout, until c. 2006. The map dated 2006 shows that buildings at the location of the current K1 CHP plant, adjacent to the development site to the north, had been demolished, with a number of new buildings being constructed, as shown in Figure 8.0 (Chapter 8.1). Minor changes to the layout at the location of the Assessment Site have been recorded.

3.3 Surrounding Land-use on the K4 Site

Current Overview

3.3.1 The Kemsley Mill site currently comprises an active paper mill and associated infrastructure, including access, car parks, an Effluent Treatment Plant (ETP), sludge combustor, gas fired CHP plant and administration buildings. The adjacent Kemsley Generating Station (GS) is currently under construction. To the north-east and east of the site are Kemsley Marshes with the main mill complex occupying land to the north, west and south-west and west.

3.3.2 An outfall and three large settlement lagoons are located just to the south of the site together with the railway head for the Sittingbourne and Kemsley Light Railway.

3.3.3 The nearest surface water body to the Assessment Site is the Milton Creek, a secondary river tributary of the river Swale, situated approximately 300m to the south-east at its closest point.

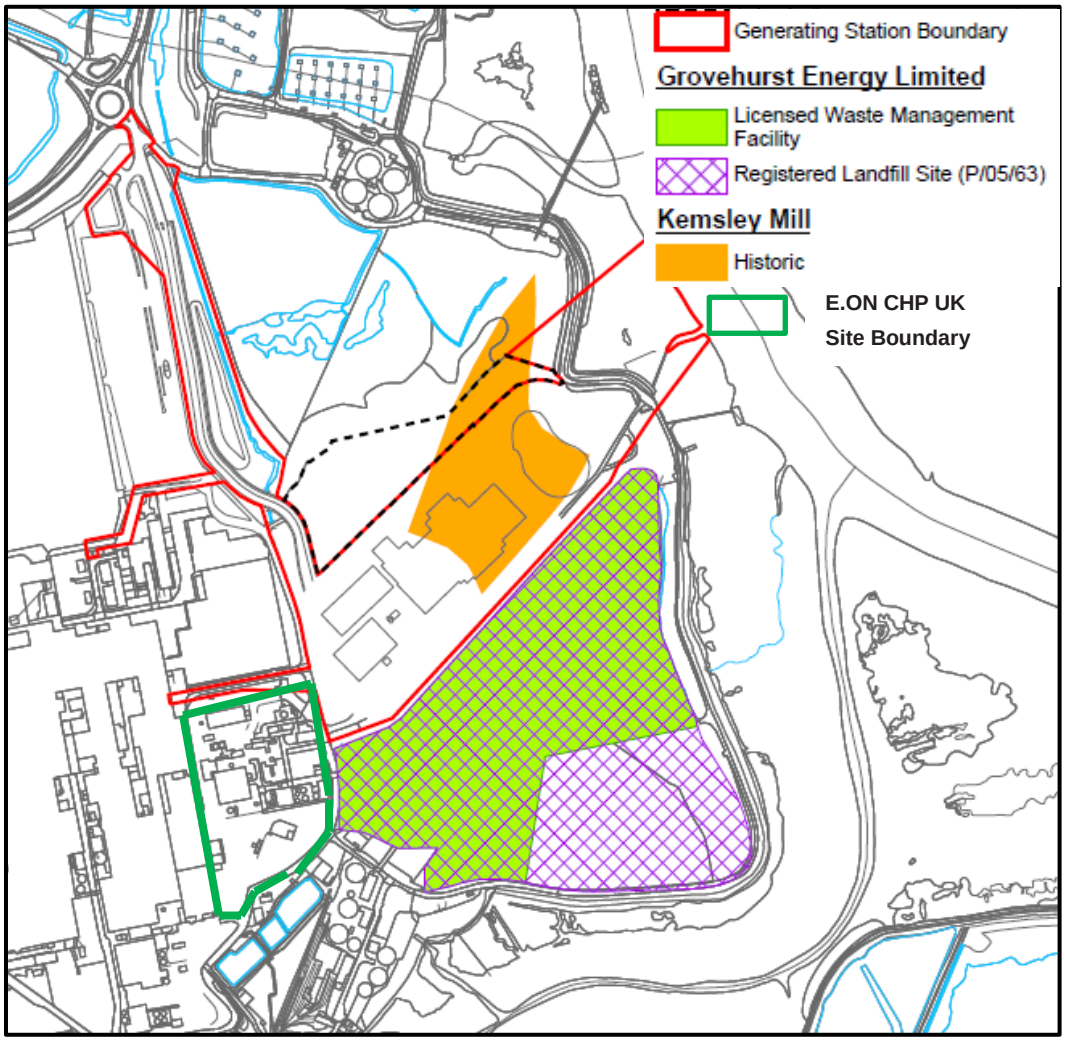
3.3.4 Land-filling activities are particularly important historical and current land-use activity on the Kemsley Mill. The Landfill Sites located within 1 km of the Assessment Site are detailed in Table 3.1. A summary of current and historical landfills, land-filling activities and waste management facilities in the vicinity of the site is outlined in table 3.1 below:

Table 3.1: Summary of Registered Historical and Active Landfill Site

Distance from the Proposed Site	Location & License Holder	Status	Waste Type
Active Landfills			
198 m east	Grovehurst Energy Ltd Kemsley Mill Extension, Kemsley, Sittingbourne	Operational	Bio sludge, dewatered effluent, sludge cake
203 m east	New Thames Paper Co Ltd	Record superseded	Construction demolition, inert, paper making wastes, wet fly ash
Historical Landfills			
0 m (Onsite)	Kemsley Mill, Bowaters UK	Historic Issued 01/12/1977 (last input date 31/12/1993)	Waste and liquid sludge
119 m north east	Kemsley Paper Mill	Historic Data not supplied	Deposited waste included inert waste
259 m north	Kemsley Marshes, Paper Mill	Historic (last recorded waste 31/12/1973)	Deposited waste included inert waste
366 m south east	Milton Creek Works	Historic Data not supplied	Not recorded
411 m north	Kemsley Marshes, Paper Mill	Historic (last recorded waste 31/12/1973)	Deposited waste included inert waste

672 m south	Church Marshes, Kent County Council	Historic First Input 31/12/1961 Last input 31/12/1991	Inert, industrial, commercial, household
858 m south	Gypsy Site	Historic issued 01/12/1984 Surrendered 31/12/1993	Inert

Figure 3.1: Landfill Sites and Waste Management Facilities (taken from RPS, 2017b) (Ref. 11).



Water Discharges and Abstraction Licenses

3.3.5 There are two groundwater abstraction licences within 1 km of the Site, operated by Wienerberger Limited (licence number 08/114) and Blue Circle Industries Ltd (licence number 2/0225/G) respectively, located 922 m to the south of the Assessment Site.

3.3.6 There is one active surface water abstraction licence by DS Smith Paper Limited under licence no. 9/40/02/0114/A/SR from a point along the River Swale located 372 m east of the Assessment Site. This is used for non-evaporative cooling at the neighbouring paper mill and has a maximum daily volume of 265,123 m^3.

3.3.7 There are records of 15 discharge consents located within 500 m of the Site. The details of which are provided in Table 3.2 below.

Table 3.2: Discharge Consents

Address & permit number	Distance from the Assessment Site	Discharge Type	Receiving Water Body	Comments
UK Paper House Kemsley- Aa3808	0 m south-east	Trade Discharge - Process Water	Saline Estuary	Issued 22/06/1992 Revoked 31/03/1997
Kemsley Paper Mill - K00025	3 m north-east	Trade Discharges - Cooling Water	Saline Estuary	Issued 1971
UK Paper House - Bj8558	153 m south-east	Trade effluent	Saline Estuary	Issued 25/04/2002 Revoked 25/04/2002
Kemsley Sewage Pumping Station, Kemsley, Kent A06000	203 m south east	Public Sewage: Storm Sewage Overflow	Saline Estuary	Issued 05/11/1992
Kemsley Paper Mills, IWADE, Kent K02134	163 m south	Sewage Discharges - Unspecified - Water Company	Saline Estuary	Issued 09/11/1989 Revoked 05/11/1992
Domestic Property (Single)(including farm house) - P09543	222 m west	Trade Effluent Discharge-Site Drainage	Saline Estuary	Issued 19/12/2000 Revoked 27/05/2013
Kemsley Paper Mill - P05604	247 m south-east	Trade Discharge - Process Water	The Swale	Issued 15/12/1994 Revoked 22/05/2002

Kemsley Paper Mill - P05604	284 m north-east	Trade Discharge - Process Water	The Swale	Issued 15/12/1994 Revoked 22/05/2002
Kemsley Paper Mill - K02135	308 m south-west	Trade Discharge - Process Water	Saline Estuary	Issued 01/12/1971 Revoked 01/01/1995
Kemsley Paper Mill - K00024	371 m north-east	Trade Discharge - Process Water	Saline Estuary	Issued 14/01/1985 Revoked 31/12/1994
Kemsley Paper Mill - Epreb3792ny	385 m north-east	Trade Effluent Discharge-Site Drainage	The Swale	Issued 23/08/2016
Premises at Knauf Drywall, Ridham Dock, Sittingbourne, Kent P20365	417 m north	Sewage Discharges - Final/Treated Effluent - Not Water Company	A Tributary of The River Swale	Issued 02/02/2005 Revoked 26/05/2009
Premises at Knauf Drywall, Ridham Dock, Sittingbourne, Kent - P20068	417 m north	Trade Effluent Discharge-Site Drainage	A Tributary of The River Swale	Issued 14/01/2004 Revoked 19/10/2006
Countrystyle Recycling Ltd Ridham Dock Road, Iwade, Nr Sittingbourne, K – P21638	435 m north	Sewage Discharges - Final/Treated Effluent - Not Water Company	The Swale Estuary	Issued 30/01/2008
Wood Pulping Plant, Employing Neutral Sulphite Process K02095	463 m north east	Trade Effluent	Freshwater River	Issued 01/10/1969 Revoked 25/11/1994

Statutory Designated Sites within 2km

3.3.8 A search was undertaken to obtain details of any nature conservation designations for the site and surrounding area. Statutory designation sites within a 2km search radius around the proposed site installation boundary are summarised in Table 3.3 below.

Table 3.3: Statutory Designated Sites

Site Name	Designation	Distance from the Proposed Site
Milton Creek	Local Wildlife Sites	0.25km - south east
The Swale	Special Protection Area (SPA)	0.25km - east

The Swale	Ramsar Site	0.25km - east
The Swale	Sites of Special Scientific Interest (SSSI)	0.25km - east
Elmley Island	National Nature Reserve	0.9km - north east

3.3.9 In addition, one Scheduled Monument 'Castle Rough' a medieval moated site is located approximately 1000 m south west.

Environmental Permitted Facilities

3.3.10 The following tables contain information taken from the Envirocheck report obtained for the Assessment Site and summarises both historical and registered installations and other Waste Facility applications, made to the Environment Agency (EA) located within 300 m of the Assessment Site. Table 3.4 below includes details of register status for each facility (Active, Superseded, Revoked, Modification, Variation, Transfer or Not yet authorised).

3.3.11 Distances given in this table are measured from the centre of the Assessment Site. It should be noted that we are aware of permitted activities that are not included in this information and so this additional information is provided in Table 3.5 below. These environmental permits listed will have superseded the IPPC authorisations listed.

3.3.12 Additional twenty-nine entries relating to the industrial activities listed in the table have been recorded within 500 m of the Assessment Site, twenty-eight of which 312 m to the south-west and one 457 m to the north-west.

Table 3.4: Summary of Registered Permitted Sites

Permit Holder	Location	Process	Environmental Regime	Status	Distance from the Proposed Site
Integrated Pollution Control Authorisations					
M-real New Thames Ltd	New Thames Mill, Sittingbourne,Kent	Paper and pulp manufacturing	IPC Authorisation	Issued 24/11/1998 Superseded	132 m south
M-real New Thames Ltd	UK Paper House, Kemsley Kemsley, Sittingbourne	Paper and pulp manufacturing	IPC Authorisation	Issued 03/06/1996 Superseded	139 m south
UK Paper Plc	UK Paper, Recycled Fibre Plant, Kemsley, Sittingbourne	Paper and Pulp manufacturing processes	IPC Authorisation	Issued 21/10/1998 Not yet authorised	145 m south

Permit Holder	Location	Process	Environmental Regime	Status	Distance from the Proposed Site
M-Real New Thames Ltd	UK Paper House, Kemsley, Sittingbourne	Paper and Pulp manufacturing process	IPC Authorisation	Issued 21/06/2001 Revoked	170 m south
E.ON UK CHP Ltd	Ridham Avenue	Combustion Processes	IPC Authorisation	Issued 24/11/1998 Superseded	170 m south
E.ON UKCHP Ltd	Ridham Avenue	Combustion Processes	IPC Authorisation	Issued 30/06/1997 Superseded	170 m south
E.ON UK CHP Ltd	Ridham Avenue	Combustion Processes	IPC Authorisation	Issued 13/03/1995 Superseded	170 m south
Grovehurst Energy Ltd	UK Paper House, Kemsley, Sittingbourne	Combustion Processes	IPC Authorisation	Issued 22/06/1992 Revoked	170 m south
St Regis Paper Co Ltd	Kemsley Paper Mill	Paper and Pulp manufacturing process	IPC Authorisation	Issued 24/11/1998 Revoked	305 m south west
St Regis Paper Co Ltd	Kemsley Paper Mill	Paper and Pulp manufacturing process	IPC Authorisation	Issued 03/06/1996 Superseded	310 m south west
St Regis Paper Co Ltd	Kemsley Paper Mill	Paper and Pulp manufacturing process	IPC Authorisation	Issued 13/03/1998 Superseded	311 m south west
M-Real New Thames Ltd	UK Paper,Ridham Avenue	Paper and Pulp manufacturing processes	IPC Authorisation	Issued 21/06/2001 Revoked	353 m south west
M-Real New Thames Ltd	UK Paper,Ridham Avenue	Paper and Pulp manufacturing processes	IPC Authorisation	Issued 28/10/1998 Superseded	353 m south west
M-Real New Thames Ltd	UK Paper,Ridham Avenue	Paper and Pulp manufacturing processes	IPC Authorisation	Issued 24/11/1998 Superseded	353 m south west
M-Real New Thames Ltd	UK Paper,Ridham Avenue	Paper and Pulp manufacturing processes	IPC Authorisation	Issued 22/01/1996 Revoked	353 m south west

Permit Holder	Location	Process	Environmental Regime	Status	Distance from the Proposed Site
Integrated Pollution Prevention and Control Authorisations					
K3 CHP Operations Limited	Kemsley Sustainable Energy Plant	Associated process	IPPC Authorisation	Issued 05/08/2016 Effective	54 m east
WTI UK Ltd	Kemsley Sustainable Energy Plant	Incineration of non-hazardous waste in an incineration or co-incineration plant with a capacity > 3 tonnes/hour	IPPC Authorisation	Issued 12/08/2014 Superseded by variation	54 m east
K3 CHP Operations Limited	Kemsley Sustainable Energy Plant	Associated process	IPPC Authorisation	Issued Date not supplied Valid	54 m east
M-Real New Thames Limited	Kemsley and Sittingbourne Paper Mills	Paper, Pulp and Board	IPPC Authorisation	Issued 01/02/2014 Superseded by variation	86 m south
M-Real New Thames Limited	Kemsley and Sittingbourne Paper Mills	Paper, Pulp and Board	IPPC Authorisation	Issued 28/05/2002 Superseded by variation	86 m south
M-Real New Thames Limited	Kemsley and Sittingbourne Paper Mills	Paper, Pulp and Board	IPPC Authorisation	Issued 01/12/2008 Superseded by variation	120 m south west
St Regis Paper Company L	New Thames Paper Mill, Ridham Avenue	Paper, Pulp and Board	IPPC Authorisation	Issued 30/01/2009 Superseded by variation	132 m south west
Ds Smith Paper Limited	New Thames Paper Mill, UK Paper, Ridham Avenue	Paper, Pulp and Board	IPPC Authorisation	Issued 05/11/2012 Superseded by variation	143 m south west
M-Real UK Services Ltd	Kemsley and Sittingbourne Paper Mills	Paper, Pulp and Board	IPPC Authorisation	Issued 01/03/2008 Superseded by variation	163 m south west
M-Real New Thames Limited	New Thames Paper Mill, UK Paper, Ridham Avenue	Paper, Pulp and Board	IPPC Authorisation	Issued 28/05/2002 Superseded by variation	149 m south west

Permit Holder	Location	Process	Environmental Regime	Status	Distance from the Proposed Site
M-Real New Thames Limited	New Thames Paper Mill, UK Paper, Ridham Avenue	Paper, Pulp and Board	IPPC Authorisation	Issued 01/02/2004 Superseded by variation	165 m south west
Ds Smith Paper Limited	Kemsley Paper Mill Effluent Treatment Plant, UK Paper House, Kemsley Mill,Kemsley	Associated process	IPPC Authorisation	Issued 05/11/2012 Superseded by variation	170 m south
St Regis Paper Company Ltd	Kemsley Paper Mill Effluent Treatment Plant, UK Paper House, Kemsley Mill,	Associated process	IPPC Authorisation	Issued 26/01/2009 Superseded by variation	170 m south
St Regis Paper Company Ltd	Kemsley Paper Mill Effluent Treatment Plant, UK Paper House, Kemsley Mill	Associated process	IPPC Authorisation	Issued 19/01/2009 Effective	170 m south
Grovehurst Energy Limited	Kemsley Paper Mill Effluent Treatment Plant, UK Paper House, Kemsley Mill	Associated process	IPPC Authorisation	Issued 06/07/2006 Superseded by variation	170 m south
Grovehurst Energy Limited	Kemsley Paper Mill Effluent Treatment Plant, UK Paper House, Kemsley Mill	Associated process	IPPC Authorisation	Issued 28/05/2002 Superseded by variation	170 m south
M-Real New Thames Ltd	UK Paper House, Kemsley	Paper, Pulp and Board	IPPC Authorisation	Issued 28/05/2002 Superseded by variation	170 m south
Grovehurst Energy Limited	Kemsley Paper Mill Effluent Treatment Plant	Associated process	IPPC Authorisation	Issued 25/04/2002 Superseded by variation	170 m south
St Regis Paper Company Ltd	Kemsley Paper Mill Effluent Treatment Plant	Associated process	IPPC Authorisation	Issued Not Supplied	170 m south

Permit Holder	Location	Process	Environmental Regime	Status	Distance from the Proposed Site
				Valid	
M-Real UK Services Ltd	Kemsley and Sittingbourne Paper Mills, New Thames Mill, Ridham Avenue	Paper, Pulp and Board	IPPC Authorisation	Issued 01/03/2008 Superseded by variation	181 m south
St Regis Paper Company Ltd	New Thames Paper Mill, UK Paper, Ridham Avenue	Paper, Pulp and Board	IPPC Authorisation	Issued 30/01/2009 Effective	188 m west
M-Real UK Services Ltd	New Thames Mill, UK Paper, Ridham Avenue	Paper, Pulp and Board	IPPC Authorisation	Issued 01/12/2008 Superseded by variation	261 m south west
Ds Smith Paper Limited	Kemsley Paper Mill	Associated process	IPPC Authorisation	Issued 06/01/2014 Superseded by variation	261 m south west
Ds Smith Paper Limited	Kemsley Paper Mill	Associated process	IPPC Authorisation	Issued 05/11/2012 Superseded by variation	261 m south west
Waste Permits (previously Waste Management Licences)					
D S Smith Paper Ltd	Kemsley Mill Landfill	Industrial Waste Landfill	Waste Management Licence	Issued 18/04/1994	On site (East)
D S Smith Paper Limited	Kemsley Paper Mill	Physical Treatment Facilities	Waste Management Licence	Issued 05/12/2004 Modified 05/12/2016	17 m south
DS Smith Paper Limited	Kemsley Mill Landfill	Industrial Waste Landfill (factory curtilage) >= 75000 tonnes.	Waste Management Licence	Issued 18/04/1994 Modified 06/08/2015	336 m south east
D S Smith Paper Ltd	Kemsley Mill Landfill	Industrial Waste Landfill	Waste Management Licence	Issued 18/04/1994 Modified 28/04/2017	196 m east

Permit Holder	Location	Process	Environmental Regime	Status	Distance from the Proposed Site
Countrystyle Recycling Limited	Kemsley Park Business Park Ridham Dock Road, Iwade, Sittingbourne	Physical Treatment Facility	Waste Management Licence	Issued 21/12/2016	387 m north

Table 3.5: Additional Environmental Permits

Permit Holder	Location	Process	Environmental Regime	Status / Permit Number	Distance from the Proposed Site (km)
WTI UK Ltd	Kemsley IBA Recycling Facility Ridham Avenue Kemsley Sittingbourne Kent ME10 2TD	Incinerator Bottom Ash (IBA) Recovery. Activities AR1 to AR6, controlled under this permit, are directly associated activities to the scheduled activity operated by K3 CHP Operations Limited under permit EPR/JP3135DK.	A(1) Installation	Active - QP3236DR	Adjacent – 0.0
DS Smith Paper Limited	Kemsley Mill Effluent Treatment Plant, Kemsley Mill, Kemsley, Sittingbourne, ME10 2SG	Associated Process – Effluent Treatment Plant Disposal of > 50 t/d non-hazardous waste involving biological treatment	A(1) Installation	Active - YP3635GC	0.2
DS Smith Paper Limited	Kemsley Paper Mill, Sittingbourne, Kent, ME10 2TD	Paper, Pulp and Board; Producing Paper/Board >20t/d. Disposal of > 50 t/d non-hazardous waste (> 100 t/d if only AD) involving Biological Treatment. Associated Process Paper, Pulp and Board. Producing Pulp from Timber etc.	A(1) Installation	Active – BJ7468IC	0.3
K3 CHP Operations Limited	Kemsley Sustainable Energy Plant, Kemsley, Kent, ME10 2TD	The Incineration of Non-Hazardous Waste in an Incineration or Co-Incineration Plant with a Capacity exceeding 3 tonnes per hour. Associated Process	A(1) Installation	Active - EPR/JP3135DK (originally issued as EPR/SP3431KJ)	0.3

3.4 Pollution History

Pollution Incidents

3.4.1 The Envirocheck report (RPS, 2018) (Ref. 1) indicates there are there are 26 records of pollution incidents to controlled waters within 1km of the site, 11 of which within 250m. They are identified within Table 3.6 below.

Table 3.6: Summary of Pollution Incidents to Controlled Waters

Location	Approximate Distance	Pollutant	Incident Severity	Incident Date	Incident Reference
Kemsley Paper Mill, Sittingbourne	50 m north	Chemicals - Detergents/Surfactant	Category 3 -Minor	25th March 1998	197146
Kemsley Paper Mill, Sittingbourne	59 m north west	Contaminated Water : Fire Fighting Run Off	Category 2 - Significant Incident	10th May 1999	2414
Kemsley Mill	119 m north	Chemicals - Unknown	Category 3 - Minor Incident	21st August 1992	CD/172/92
Grovehurst Energy, Kemsley Mill	153 m south east	Organic Wastes: Other Suspected Paper Sludge Leachate Entering Swale	Category 2 - Significant Incident	29th September 1998	198363
Grovehurst Energy, Kemsley Mill	157 m south east	Organic Wastes: Other Effluent Treatment Plant Producing Bulking in Final Settlement Tank	Category 2 - Significant Incident	3rd November 1998	198362
Old Effluent Discharge Pipe Adjacent to Sludge Production	162 m south east	General Biodegradable : Biological / Non-Sewage Microbiological Effluent	Category 2 - Significant Incident	17th December 1999	3855
Milton Creek, Kemsley	168 m south	Organic Wastes: Other Discharge of Untreated Paper Mill Effluent	Category 3 - Minor Incident	31st August 1998	197300
Kemsley Papermill	175 m south east	Miscellaneous - Inert Suspended Solids	Category 3 - Minor Incident	5th February 1998	298021
Grovehurst Energy, Sittingbourne	179 m south east	Organic Wastes: Other	Category 3 - Minor Incident	7th November 1998	198373
Kemsley Grovehurst Effluent Plant	182 m south east	Sewage - Treated Effluent	Category 3 - Minor Incident	6th December 1997	197052
Kemsley Paper Mill, Sittingbourne	193 m north	General Biodegradable : Other Sewage & Sewerage Material	Category 3 - Minor Incident	29th May 1999	1560
Not Available	308 m north east	Organic Wastes: Other Biological Bulking Problem with Effluent Plant	Category 3 - Minor Incident	30th August 1998	197304

Location	Approximate Distance	Pollutant	Incident Severity	Incident Date	Incident Reference
Not Available	310 m north east	Organic Wastes: Other Solid Bulking on Treatment Plant	Category 3 - Minor Incident	31st August 1998	197305
Kemsley Mill, Sittingbourne, Kent	336 m north east	Other Pollutant Not Supplied	Category 2 - Significant Incident	21st March 1999	2167
Kemsleymill, Sittingbourne, Kent	338 m north east	Other Pollutant	Category 2 - Significant Incident	21st March 1999	2166
Not Available	369 m north east	Other Pollutant	Category 2 - Significant Incident	30th December 1998	198970
Kemsley Final Effluent	371 m north east	Chemicals - Paints / Dyes	Category 3 - Minor Incident	21st July 1992	CD/140/92
Kemsley Mill Landfill	377 m south east	Miscellaneous - Fire water / Foam	Category 3 - Minor Incident	17th August 1998	197284
Kemsley Paper Mill, Kemsley	386 m north east	General Biodegradable : Other Biological / Non-Sewage	Category 3 - Minor Incident	12th December 1999	3972
Kemsley, Sittingbourne	387 m north west	Miscellaneous - Fire water / Foam	Category 3 - Minor Incident	1st June 1997	297210
Kemsley Mill, Kemsley, Sittingbourne	434 m north east	Organic Wastes: Other	Category 2 - Significant Incident	27th October 1997	197020
Fly Ash Sluice, Discharge to Swale	465 m east	Oil - Fly Ash Sluice	Category 3 - Minor Incident	16th March 1993	CD/047/93
Grovehurst Energy, Kemsley Mill	531 m north-east	Unknown Sewage	Category 3 - Minor Incident	3rd December 1997	197053
Sittingbourne	636 m south west	Miscellaneous - Unknown Dyke at Back of His House Is Blue and Smelly	Category 3 - Minor Incident	26th July 1992	CD/159/92
Newman Drive	714 m south west	Oils - Other Oil	Category 3 - Minor Incident	31st January 1998	298020
Newman Drive	714 m south west	Oils - Other Oil	Category 3 - Minor Incident	31st January 1998	298020

3.4.2 The same Envirocheck report notes one prosecution relating to authorised process for illegally disposing of foul-smelling paper waste on 21th July 1997 at their premises, Kemsley, Sittingbourne, Kent, approximately 253 m south west.

3.5 Potential for the Release of Hazardous Substances

3.5.1 The following have been identified as potential historical on-site sources of contamination:

- Localised areas of tank storage (inorganic and organic contamination); and,
- The historical presence of tramways across the Site (inorganic and organic contamination);

3.5.2 A number of potential sources of contamination associated with the historical development of the surrounding land have been identified, including:

- Areas of landfill / waste disposal to the east of the Site;
- Infilled lakes 100-400m east (ground gas);
- Infilled dock area around the present-day lagoons 60m northeast (ground gas);
- The infilled pond 600m northwest (ground gas);
- The infilled lake 300m west (ground gas);
- Sub-stations (c.1980s) and 'tanks' 100-150m southwest (inorganic and organic contamination, asbestos);
- The railway extending south-westward from the southern site boundary (organic, inorganic contamination);
- The former area of 'sludge beds' on the eastern boundary – later 'refuse or slag heap' (organic contamination, ground gas);
- The filter beds and filter tanks 100m southeast (organic contamination and ground gas); and,
- Sub-stations and 100-150m southwest (organic contamination and PCBs).

3.5.3 Whilst there are a number of other offsite potential historical contaminative uses (tanks, railway cuttings, works), given their distance and history the majority are considered unlikely to have led to contamination of the Site. The presence of a disused landfill to the east of the Site has the potential to impact the Site.

3.5.4 Historical land-use undertaken on or near the Assessment Site has had the potential to result in the contamination of soils and groundwater thereon. In particular - landfills, land-filling activities and waste management activities, could introduce a variety of hazardous substance to soils and groundwater on the site. The potential for RHS used on the site to be present in soils and groundwater is summarised in Table 3.7 below.

Table 3.7: Contaminants of Concern Associated with RHS and Historical Land-use

Relevant Hazardous Substance	Principal Contaminants of Concern	Assessment of Current & Historical Land-use
Waste storage and associated contaminated run-off	Ammonia, chloride, sulphate, heavy metals, VOCs, SVOCs and hydrocarbons, BOD, COD and TOC. Highly varied chemical composition depending on nature of the waste input	Historic landfill activities in the surrounding may have the potential to have introduced the same contaminants of concern associated with waste and leachate generation on the site. Most recently the site has been used for hazardous waste storage and there is a risk of contaminated run-off.
Lubricating oil Diesel	Petroleum Hydrocarbons including PAHs and BTEX compounds	The extended history of industrial activities on the Kemsley Mill site could have resulted in the introduction of low concentrations of petroleum hydrocarbons to soils and groundwater. However, no source for significant quantities of petroleum hydrocarbons has been identified.

3.5.5 The actual quality present on the site has been characterised through multiple phases of intrusive investigation undertaken on the site as described in section 5.

3.6 Surface Water Drainage

3.6.1 Clean water from the building roof and vehicle parking areas for the new area included in the permit boundary will not connect into the existing surface water drainage system for discharge via the current W1 emissions point into the Swale. This new connection shall pass through an interceptor and grit trap prior to discharge into the DS Smith ETP which will then discharge into the Swale.

3.6.2 The site drainage has been designed to accommodate surface water from the 100-year storm event plus climate change.

3.6.3 No further assessment of surface water emissions has been carried out as the additional volumes will be of clean water only.

3.7 Process Water Drainage

3.7.1 Process effluent is separated complete from surface water drainage and will be discharged into the K1-system (tie point). We have designed a collection basin (effluent pit) for process effluents.

3.7.2 The emissions will then drain to the DS Smith effluent treatment plant.

3.7.3 Following treatment in the DS Smith effluent treatment plant, treated effluent will discharge to the Swale.

4 CONDITION OF THE LAND AT PERMIT APPLICATION

4.1 Environmental Setting

Hydrology

4.1.1 The Assessment Site is approximately 650m at its closest point from The Swale, flowing to the north-east. The Swale is a 13 miles estuary that separates the Isle of Sheppey from the mainland of north Kent. The Swale's eastern end joins the River Thames estuary three miles west of Whitstable, while its western end flows into the River Medway at Sheerness.

4.1.2 The Swale is tidal with tides flooding from both end and meeting about halfway close to the outfall of Milton Creek. Milton Creek is a secondary river which is located approximately 300m to the south-east of the Assessment Site southern boundary, flowing in a north - northeast direction to meet the Swale.

4.1.3 There are no surface water bodies within the boundaries of the Assessment Site. Three concrete lined water lagoons are situated beyond the southern boundary of the Assessment Site, two of which are empty.

4.1.4 The EA published Flood Risk maps show that the Assessment Site does not lie within a Flood Zone, with the closest Flood Zone 2 (land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1 - 0.1%), or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5 - 0.1%) in any year) located approximately 100m to the south.

Geology

4.1.5 A review of readily available information including the BGS website and the published BGS Chatham 272 Solid and Drift edition has been undertaken, alongside the BGS web-based viewer.

4.1.6 Published records by the British Geological Survey (BGS) indicate no superficial deposits are recorded beneath the Assessment Site, although superficial Alluvium, associated with the Swale Estuary, is recorded to lie adjacent to the southern and eastern boundaries of the Assessment Site.

4.1.7 The solid geology beneath the Assessment Site comprises the London Clay Formation overlying sands of the Lambeth Group. The boundary between the London Clay Formation and the Lambeth Group is recorded to lie along the southern and eastern boundaries of the Assessment Site. The Thanet Sands are recorded to underlie the Lambeth Group, with the Seaford Chalk Formation lying at depth below the Thanet Sands. Table 4.1 summarises the BGS descriptions of the published geology.

Table 4.1: Published Geological Information

Age	Formation	Description of Lithology	Approximate Regional Thickness, Recorded by BGS
Eocene	London Clay Formation	The London Clay mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.	Up to 150m
Palaeocene	Lambeth Group	Vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.	Up to 39m
Palaeocene	Thanet Sand Formation	Glauconite-coated, nodular flint at base, overlain by pale yellow-brown, fine-grained sand that can be clayey and glauconitic. Rare calcareous or siliceous sandstones.	Up to 30m
Late Cretaceous	White Chalk Subgroup Seaford Chalk	Firm white Chalk with conspicuous semi-continuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large.	55 – 60m

Hydrogeology

4.1.8 The London Clay Formation is classified by the EA as 'unproductive' strata that can be considered a non-aquifer with negligible permeability and therefore not considered a groundwater resource.

4.1.9 The Lambeth Group and underlying Thanet Sands are defined by the EA as a Secondary A Aquifer meaning they contain permeable layers capable of supporting water supply at a local scale and in some cases form an important source of base flow to river.

4.1.10 The Upper Cretaceous Chalk, laying at depth beneath the Thanet Sands, is classified by the EA as a Principal Aquifer.

4.1.11 Ashdown Factual Report on the Ground Investigation (Ref. 4) (Ashdown, 2018a) states that '*surface run off and perched groundwater was recorded within the service inspection pits excavated by others prior to commencing the boreholes, locally filling the pits to ground level during heavy precipitation.*

4.1.12 *Groundwater was also recorded at various levels within the cable percussion boreholes during the drilling works. On completing the installation of the deep groundwater monitoring standpipes, groundwater was recorded at depths of between 7.0m and 7.9m bgl.'*

4.1.13 This seems in line with the findings on the recent intrusive works undertaken by RPS (Ref. 8) (RPS, 2018b) immediately to the south of the Assessment Site, that suggested the presence of 2 separate groundwater bodies; a shallow perched water body within the London Clay / shallow Lambeth Group (the ground investigation did not consistently encounter groundwater strikes across the Assessment Site at shallow depth, indicating that shallow perched water is likely to be discontinuous in nature) and a deeper groundwater body within the Lambeth Group.

4.1.14 Downward potential for groundwater flow from the Made Ground through the intervening London Clay is unlikely to be a significant transport pathway owing to the London Clay low permeability. Lateral groundwater flow will therefore dominate in the Made Ground, where saturated higher permeability pathways are present.

4.1.15 It is likely that the regional groundwater flow direction is to the north-east towards the Swale, with a very shallow gradient. It is also considered likely that the surface watercourses (The Swale and Milton Creek) are in hydraulic continuity with groundwater in the Lambeth Group underlying the site.

4.1.16 The principal receptor of laterally flowing groundwater in the shallow Made Ground or deeper aquifer unit is The Swale. This tidal estuary is of high ecological value being designated as a Special Protection Area (SPA) under the EC Birds Directive (74/409/EEC), Site of Special Scientific Interest (SSSI) under the Wildlife and Countryside Act 1981 (As amended) and a Ramsar Site under the Ramsar Convention (1971).

4.1.17 With regards to the bedrock, the underlying Secondary (A) aquifer (Lambeth Group and Thanet Sands) is designated by the EA as having high leaching potential (soil vulnerability category H1) which means they readily transmit liquid discharges.

4.1.18 The Seaford Chalk Formation is anticipated to underlie the Lambeth Group and Thanet Beds is classified as a Principal Aquifer.

4.1.19 The site does not lie within a groundwater Source Protection Zone (SPZ) and no potable abstractions are identified within 1 km of the Assessment Site.

5 BASELINE QUALITY ASSESSMENT

5.1 Site Reconnaissance

5.1.1 A site reconnaissance survey was undertaken on 12th October 2017 by an RPS Consultant, the findings of which are included within the Desktop Study (Ref. 1) (RPS, 2018). The main findings of the site reconnaissance survey are detailed below and denoted in the photographic report of the above-mentioned report, included within ***Appendix A.*** Given the fact that no major operation change has occurred in the past two years, it is reasonable to assume that the following is still valid:

- The south-western corner of the Assessment Site is used as a waste paper storage area. This area is demarcated by a concrete wall which extends in a north-easterly direction off the southwestern corner and acts as a boundary between the Kemsley Paper Mill Site's haulage route and the waste paper storage area.
- The main haulage route extends across the southern half of the Assessment Site, broadly following the southern perimeter, adjacent to which there are a 'truck wash' area, a vehicle parking area and a vehicle fuelling area. The Kemsley Paper Mill haulage route extends around the south-eastern perimeter of the Assessment Site, and northward along its eastern boundary.
- Adjoining the haulage route, located in the southwestern corner of the Assessment Site, are 2no. one-storey office buildings and a canteen.
- An electrical substation is present on the western boundary.
- A vehicle weighbridge is located in the centre of the Assessment Site. Adjacent to the weighbridge there are waste paper storage areas, demarcated and partitioned from the rest of the Assessment Site by walls.
- A waste storage area and a 'Hazardous Storage Area' is present on the eastern half of the Assessment Site.

5.2 Summary of Historical Intrusive Investigations

5.2.1 The environmental setting and baseline quality of soils and groundwater across the Assessment Site has been described in reports identified in Section 5.

5.2.2 The main reports relating to the Assessment Site is the 'Interpretative Geotechnical and Ground Contamination Risk Assessment Report', reference No. R18-12883/int prepared by Ashdown Site Investigation, dated 15th June 2018 (Ashdown, 2018b) (Ref. 5). This is included as ***Appendix D.***

5.2.3 Ashdown Site Investigation undertook intrusive ground investigation works at the Assessment Site in May 2018 for DS Smith. The investigation works comprised:

- 12 boreholes designated BH1 to BH10, GWBH1 and GWBH2, were drilled to depths of between 18.00m and 35.00m below ground level using cable percussion drilling techniques;
- 6 dynamic sampler boreholes designated SBH1 to SBH6 were drilled to a depth of 4.00m below ground level;
- 5 boreholes were installed within the shallow soils to a depth of 4.00 m and three 3 deep groundwater monitoring standpipes were installed to a depth of either 18m or 20m; and
- 7 trial pits designated TP1 to TP7. The depth of excavation of these trial pits is unknown.

5.2.4 The findings of the ground investigation works are summarised within the Ashdown Site Investigation Factual Report (*Ashdown, 2018a*) (Ref.4) and Interpretative Geotechnical and Ground Contamination Risk Assessment Report (*Ashdown, 2018b*) (Ref. 5).

5.2.5 Table 5.1 summarises the encountered ground conditions. The exploratory hole logs are included in ***Appendix E****.*

Table 5.1: Encountered Ground Conditions

Age	Unit / Formation	Description	Depth to base of Strata (m)
Surfacing	-	Concrete/reinforced Concrete	0.1m to 0.6m
Made Ground/Reworked ground	-	Generally comprising gravelly sandy silty clay with horizons of sandy silty clayey gravel. Gravel included variable quantities of brick, concrete, plastic, metal, flint, slate, shell fragments, ceramic tiles, crystalline rock, carbonaceous material, charcoal-like material, ash-like material and clinker-like material.	1.0 - 4.2
Eocene	London Clay Formation (part of Thames Group)	Stiff to becoming very stiff with depth clay.	5.6 – 8.2
Palaeocene	Lambeth Group	Generally medium dense to dense orange-brown, gravelly, silty, clayey sand.	10.5 – 12.5
		Typically dense to very dense, dark grey, clayey, silty sands interlaminated/bedded with very stiff sandy clays.	Not Proven (>35)

5.2.6 The ground investigations undertaken in the K4 area locations are shown in the Site Plan within ***Appendix E.***

5.2.7 The soil samples collected during these intrusive investigations has been subject to a suite of analyses that typically includes the following:

- Heavy metals including As, Ba, Be, B, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn;
- Total cyanide and total sulphate;
- Speciated petroleum hydrocarbons (TPH CWG);
- BTEX and MTBE;
- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile organic compounds (VOCs); and
- Asbestos

5.2.8 The groundwater samples collected during these intrusive investigations has been subject to a suite of analyses that typically includes the following:

- Heavy metals including As, B, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn;
- Phenols;
- Speciated petroleum hydrocarbons (TPH CWG);
- BTEX and MTBE;
- Polycyclic aromatic hydrocarbons (PAHs); and
- Volatile organic compounds (VOCs).

5.2.9 This general suite reflects the historical operations undertaken on or near the K4 site. The analytical suite does include the majority of RHS identified in **Appendix B.**

5.3 Baseline Soil and Groundwater Reference Data

Introduction

5.3.1 The following section summarises the laboratory chemical analysis undertaken on soil and groundwater samples collected during the Ashdown Site Investigation Ltd following completion of their ground investigation in October 2018 (Ashdown, 2018a) (Ref. 4), (Ashdown, 2018d) (Ref. 6), (Ashdown, 2018e) (Ref. 7), (Ashdown, 2019) (Ref. 9).

5.3.2 The analytical dataset presented in this section does define the general baseline soil quality that can be expected in shallow soils (principally Made Ground) and the general baseline groundwater quality across the Assessment Site.

Baseline Soil Quality

5.3.3 Samples of made ground were tested for potential contaminants identified by the Ashdown contamination risk assessment (Ashdown, 2018) (Ref. 3). The testing included heavy metals, polycyclic aromatic hydrocarbon (PAH) compounds, cyanide, total concentrations of petroleum hydrocarbons (with the results speciated by equivalent carbon weight fractions) and BTEX compounds. The samples were also screened for asbestos.

5.3.4 In addition, deeper samples from the boreholes, comprising either made ground or London Clay Formation soils were also tested for concentrations of petroleum hydrocarbons (with the results speciated by aromatic and aliphatic equivalent carbon weight fractions), BTEX compounds and volatile organic compounds (VOCs).

5.3.5 Ashdown has compared the laboratory test results for heavy metals and PAH compounds to generic soil screening values (SSVs), where the SSVs comprise the 'Suitable For Use Levels' (S4UL) derived by LQM (LQM, 2015) (Ref. 11) c. In lieu of an S4UL screening value for lead, the Category 4 Screening Level (C4SL) was used, as published within SP10109. Similarly, for barium the Soil Generic Assessment Criteria (GAC), as published within the CL:AIRE document[10], has been used. The SSVs selected for the assessment are for those calculated using the generic "Commercial" land use[11] with the amendments discussed within the LQM/CIEH report.

5.3.6 These sections provide a summary of the soil analytical results for inorganic and organic compounds, included within Table 5.2 and Table 5.4. Full laboratory analysis reports are included within ***Appendix F.***

5.4 Made Ground

Metals

5.4.1 None of the samples recorded concentrations of any heavy metal above its generic SSV and the concentrations of heavy metals within the made ground would be considered to be very low.

Table 5.2: Summary of Soil Analytical Results for Heavy Metals

Determinand	Unit	No. Samples Analysed	Concentration Range (min – max) (mg/kg)	SSV (mg/kg)	Limit of detection	Exceedances
Heavy Metals						
Arsenic	mg/kg	6	6 to 28	640	< 2	0
Barium	mg/kg	6	72 to 254	22,000	< 2	0
Beryllium	mg/kg	5	<LOD to 2.6	12	< 0.5	0
Water Soluble Boron	mg/kg	6	<LOD to 2.4	24,000	< 1	0
Cadmium	mg/kg	6	<LOD to 0.8	190	< 0.2	0
Chromium	mg/kg	6	21 to 31	8,600[2]	< 2	0
Hexavalent Chromium	mg/kg	6	<LOD	33	< 2	0
Copper	mg/kg	6	12 to 99	68,000	< 4	0
Lead	mg/kg	6	14 to 55	2,300[3]	< 3	0
Mercury	mg/kg	6	<LOD	1100	< 1	0
Nickel	mg/kg	6	11 to 44	980	< 3	0
Selenium	mg/kg	6	<LOD	12,000	< 3	0
Vanadium	mg/kg	6	37 to 81	9,000	< 2	0
Zinc	mg/kg	6	43 to 131	730,000	< 3	0

Cyanide

5.4.2 Six samples of made ground were tested for concentrations of total cyanide. None of the samples recorded concentrations of cyanide above the limit of detection of the test.

Asbestos

5.4.3 The six samples of the made ground were screened for the presence of asbestos. The sample from SBH1 (0.2 m bgl) recorded the presence of amosite as a bundle of fibres.

Polycyclic Aromatic Hydrocarbons (PAH) Compounds

5.4.4 The six samples of the made ground were screened for the presence of PAH compounds.

Table 5.3: Summary of Soil Analytical Results for PAH Compounds

Determinand	Unit	No. Samples Analysed	Concentration Range (min – max) (mg/kg)	SSV (mg/kg)	Limit of detection	Exceedances
PAH						
Naphthalene	mg/kg	6	<LOD to 1.35	190	< 0.1	0
Acenaphthylene	mg/kg	6	<LOD	83000	< 0.1	0
Acenaphthene	mg/kg	6	<LOD	84000	< 0.1	0
Fluorene	mg/kg	6	<LOD	63000	< 0.1	0
Phenanthrene	mg/kg	6	<LOD to 0.39	22000	< 0.1	0
Anthracene	mg/kg	6	<LOD	520000	< 0.1	0
Fluoranthene	mg/kg	6	<LOD to 0.38	23000	< 0.1	0
Pyrene	mg/kg	6	<LOD to 0.36	54000	< 0.1	0
Benz(a)anthracene	mg/kg	6	<LOD to 0.16	170	< 0.1	0
Chrysene	mg/kg	6	<LOD to 0.17	350	< 0.1	0
Benzo(b)fluoranthene	mg/kg	6	<LOD to 0.18	44	< 0.1	0
Benzo(k)fluoranthene	mg/kg	6	<LOD	1200	< 0.1	0
Benzo(a)pyrene	mg/kg	6	<LOD to 0.13	35	< 0.1	0
Indeno(123-cd)pyrene	mg/kg	6	<LOD	500	< 0.1	0
Dibenz(ah)anthracene	mg/kg	6	<LOD	3.5	< 0.1	0
Benzo(ghi)perylene	mg/kg	6	<LOD	3900	< 0.1	0

5.4.5 None of the samples recorded concentrations of any PAH above its generic SSV and the concentrations of PAH within the made ground would be considered to be low.

5.5 Made Ground and Shallow Natural Ground

5.5.1 Shallow and deep samples of made ground and of the shallow London Clay Formation soils, were tested for concentrations of petroleum hydrocarbons.

Table 5.4: Summary of Soil Analytical Results for TPH

Determinand	Unit	No. Samples Analysed	Concentration Range (min – max) (mg/kg)	Limit of detection
TPH				
Aliphatic >C5 - C6	mg/kg	6	<LOD to 0.03	<0.01
Aliphatic >C6 - C8	mg/kg	6	<LOD	< 0.05
Aliphatic >C8 - C10	mg/kg	6	<LOD	< 2
Aliphatic >C10 - C12	mg/kg	6	<LOD	< 2
Aliphatic >C12 - C16	mg/kg	6	<LOD	< 3
Aliphatic >C16 - C35	mg/kg	6	<LOD to 27	< 10
Aliphatic >C35 - C44	mg/kg	6	<LOD	< 10
Aromatic >C5 - C7	mg/kg	6	<LOD	< 0.01
Aromatic >C7 - C8	mg/kg	6	<LOD	< 0.01
Aromatic >C8 - C10	mg/kg	6	<LOD	< 2
Aromatic >C10 - C12	mg/kg	6	<LOD	< 2
Aromatic >C12 - C16	mg/kg	6	<LOD to 3	< 2
Aromatic >C16 - C21	mg/kg	6	<LOD to 10	< 3
Aromatic >C21 - C35	mg/kg	6	<LOD to 104	< 10
Aromatic >C35 - C44	mg/kg	6	<LOD	< 10
Total >C5 - C44	mg/kg	6	<LOD	< 60
BTEX				
Benzene	mg/kg	12	<LOD	<2
Toluene	mg/kg	12	<LOD to 9	<5
Ethylbenzene	mg/kg	12	<LOD to 5	<2
m, p-Xylene[1]	mg/kg	12	<LOD to 7	<2
o-Xylene	mg/kg	12	<LOD to 3	<2
MTBE	mg/kg	12	<LOD	<5

5.5.2 Ashdown derived the SSVs for petroleum hydrocarbon equivalent carbon weight fractions and BTEX compounds calculated for 1% organic content. They are included in Table 5.5 and Table 5.6 below:

Table 5.5: Ashdown Soil Screening Values for petroleum hydrocarbon equivalent carbon weight fractions

Petroleum Hydrocarbon Fraction	SSV (mg/kg)	Petroleum Hydrocarbon Fraction	SSV (mg/kg)
Aliphatic EC 5-6	3200	Aromatic EC 5-7	26000
Aliphatic EC >6-8	7800	Aromatic EC >7-8	56000
Aliphatic EC >8-10	2000	Aromatic EC >8-10	3500
Aliphatic EC >10-12	9700	Aromatic EC >10-12	16000
Aliphatic EC >12-16	59000	Aromatic EC >12-16	36000
Aliphatic EC >16-35	1600000	Aromatic EC >16-21	28000
Aliphatic EC >35-44	1600000	Aromatic EC >21-35	28000
		Aromatic EC >35-44	28000

Table 5.6: Ashdown Soil Screening Values for BTEX compounds

BTEX Compound	SSV (mg/kg)
Benzene	27
Toluene	56000
Ethylbenzene	6600
m, p-Xylene[1]	6200
o-Xylene	5900

5.5.3 None of the samples recorded significantly elevated concentrations of petroleum hydrocarbons or BTEX compounds and where they were recorded they were significantly below their SSVs.

Volatile Organic Compounds (VOCs)

5.5.4 Only the sample from SBH2 at 2.5m recorded a detectable concentration of any VOC of just 12µg/kg of p-isopropyltoluene. Given the very low concentration (marginally above the limit of detection for the compound) and in the absence of any other detectable concentrations of VOC in this sample, there is not considered to be a significant risk from VOC contamination.

Conclusions

5.5.5 In general terms available soil quality dataset is characterised by low levels of organic and inorganic contamination in soils, although asbestos has been identified at one location (amosite fibres in SBH1).

5.5.6 Soil quality is largely characterised by the absence of VOCs and PAH, with a few localised exceptions for TPH. Ashdown therefore recommended that designers consult with the proposed water supply company to ascertain if further laboratory testing and assessment specific to proposed routes of services is required.

5.5.7 No hot spots indicative of gross soil contamination was identified by Ashdown during the investigation works and no requirement for site remediation in advance on the construction was identified on the basis of observed soil quality.

5.5.8 DS Smith shall be removing the concrete hardstanding prior to development of the K4 site. If any contamination is found, it will be dealt with at the time of removing the concrete.

5.5.9 Some additional baseline samples shall be taken by Civils Limited upon removal of the concrete hardstanding. These shall be tested for relevant species. The results of these shall be used to update the baseline assessment and site condition report following construction and commissioning of the new site.

5.6 Baseline Land Quality

5.6.1 Sections 5.1 – 5.5 above detail the current understanding of the site condition at the time of permit application. Prior to construction of the K4 CHP, further land preparation works shall be undertaken to remove the current hardstanding and layer of made ground below this hardstanding.

5.6.2 The current hardstanding shall be crushed and used as a base layer for a new hardstanding surface which will form the base for the new development.

5.6.3 As such, further improvement of the baseline conditions shall be made prior to the new development.

5.6.4 The site condition report shall be updated once the site has been developed and commissioned to reflect the changes.

5.7 Baseline Groundwater Quality

5.7.1 A summary of the chemical quality of deep groundwater across the Assessment Site has been provided in the Quarterly Monitoring Reports by Ashdown (Ashdown, September 2018, December 2018, March 2019) (Ref. 6,Ref. 7, Ref. 9). Full laboratory analysis reports are included within ***Appendix F.***

5.7.2 The groundwater samples were collected from the three deep monitoring wells BH8, GWBH1 and GWBH2 and tested for a range of heavy metals, sulphate, nitrate, cyanide, speciated polycyclic aromatic hydrocarbon (PAH) compounds, petroleum hydrocarbons speciated by aromatic and aliphatic weight fractions and a range of volatile organic compounds (VOC).

5.7.3 Table 5.7 below summarises the results of the groundwater analysis for inorganic contaminants and compares them against available relevant screening criteria.

5.7.4 Due to the fact that the site does not lie within a Source Protection Zone and that no potable abstractions are recorded within 1 km of the Assessment, groundwater chemical data provided by Ashdown have been screened by RPS against Environmental Quality Standards (EQS) to identify potential exceedances. Given the close proximity of the Swale Estuary, which represents the principal surface water receptor, saline EQS values have been used to screen the groundwater chemical concentrations.

Metals

5.7.5 Three exceedances for nickel were recorded in GWBH2 during the three monitoring rounds with a maximum concentration of 51 µg/l exceeding the screening value of 30 µg/l during the second round.

Table 5.7: Summary of Groundwater Analytical Results for Heavy Metals

Determinand	Unit	No. Samples Analysed	Concentration Range (min – max) (µg/l)	Screening Value – EQS (saltwater) (µg/l)	Limit of detection	Exceedances
Heavy Metals						
Arsenic	ug/l	9	<5	25	< 5	0
Boron	ug/l	9	72 to 1910	7,000	< 5	0
Cadmium	ug/l	9	<LOD to 1.2	2.5	< 0.4	0
Chromium	ug/l	9	<LOD	15	< 5	0
Chromium	ug/l	9	<LOD	-	< 20	0
Copper	ug/l	9	<LOD	5	< 5	0
Lead	ug/l	9	<LOD	25	< 5	0
Mercury	ug/l	9	<LOD	0.3	< 0.05	0
Nickel	ug/l	9	6 to 51	30	< 5	**3**
Selenium	ug/l	9	<LOD	10	< 5	0
Zinc	ug/l	9	<LOD to 12	40	< 2	0
Total Phenols	ug/l	9	<LOD	-	< 10	0

Organic Contaminants

5.7.6 The groundwater samples collected by Ashdown during two monitoring events undertaken in 2018 and one monitoring event undertaken in 2019 show concentrations of PAH, TPH, BTEX and VOCs all below the laboratory limit of detection.

Conclusions

5.7.7 In general terms available deep groundwater quality dataset is characterised by low inorganic and very low organic levels of contamination, although three exceedances have been identified for nickel in GWBH2.

5.7.8 Groundwater quality is characterised by the absence of TPH, BTEX, PAH and VOCs.

5.7.9 The water quality dataset summarised in this section therefore define the baseline water quality expected in deep groundwater hosted in the Lambeth Group Sands across the Assessment Site.

5.7.10 No data are available of the shallow perched water underlying the site.

5.8 Baseline Gas Assessment

5.8.1 The ground investigation Factual Report on the Ground Investigation, reference No. R18-12883/fr prepared by Ashdown Site Investigation, dated 15th June 2018 - Ashdown, 2018b comprised the installation of 5 no. gas monitoring wells (SBH1, SBH2, SBH3, SBH4 and SB6) to a depth of 4.0 m below ground level (mbgl) in order to provide indicative information on the ground gas generation potential associated with the underlying strata at the site.

5.8.2 It is understood that a programme of quarterly gas monitoring is currently on-going over a two-year monitoring period.

5.8.3 The results of the 3 no. rounds of ground gas monitoring undertaken to date (30th August, 28th November 2018 and 20th February 2019) have identified the following:

- Detectable ground gas flow rates of 0.0 l/hr;
- Carbon dioxide concentrations of up to 6.8%;
- Methane concentrations of up to 13.9%;
- No concentrations of carbon monoxide and hydrogen sulphide above the instrumentation detection limit; and
- Depleted oxygen concentrations as low as 15.3% v/v.

Carbon Dioxide Concentrations

5.8.4 Stabilised CO_2 concentrations measured within wells during the monitoring rounds generally ranged from 0% v/v to 0.6 % v/v with the only exception of borehole SBH6 where a peak CO_2 concentration of 6.8% v/v and a stabilised concentration of 6.2% v/v were recorded during the first monitoring round (30-08-2018).

Methane Concentration

5.8.5 No methane concentrations were measured in the majority of the monitoring wells during the monitoring rounds, with the exception of SBH6 where a peak CH_4 concentration of 13.9% v/v and a stabilised concentration of 11.8% v/v were recorded during the first monitoring round (30-08-2018).

5.8.6 Of note, several locations were not monitored during the second and third monitoring rounds due to no access available or flooded headworks or gas tap damaged.

Other Gases

5.8.7 No concentrations of Carbon Monoxide (CO) and Hydrogen Sulphide (HS) were detected in any accessible location during the three monitoring rounds undertaken.

6 CONCEPTUAL SITE MODEL

6.1 Introduction

6.1.1 The following sections provide a summary of the potential contamination sources, pathways and receptors identified at the Assessment Site based on the reports identified in Section 1.3.

Potential Contamination Sources

6.1.2 Based on the historical site information, site inspection undertaken by RPS and Ashdown and ground investigation and monitoring undertaken by Ashdown, the following potential contamination sources at the Assessment Site were identified:

6.1.3 On-site:

- Chemical contamination associated with the current on-site uses including storage of fuel oil, truck washing area, areas of oil / chemical storage and areas of waste storage (organic and inorganic contamination).

6.1.4 Off-site

- Chemical contamination associated with the adjoining Kemsley Paper Mill site, landfill sites/infilled settlements and sewage treatment works (inorganic, organic contamination, and ground gas generation potential).

Identified Receptors

6.1.5 The following key receptors that may be at risk from contamination in soils and groundwater beneath the Assessment Site were identified:

- Human Health
    - Construction workers; and
    - Future site users;
- Controlled Waters
    - Perched waters within the shallow London Clay;
    - Groundwater within the Lambeth Group (Secondary A aquifer); and
    - Surface Water: River Swale.

Pathways

6.1.6 The following potential contamination pathways were identified at the Assessment Site:

- Human Health
    - Potential impact to human health via direct dermal contact, ingestion (dust and / or soils) and inhalation (dust / vapours) with soil and groundwater contaminants;

- Potential for asphyxiation (CO_2) and explosive atmospheres (CH_4) resulting in ground gas migration into proposed structures; and
- Potential permeation of plastic water supply pipes.

- Controlled Waters
  - Potential migration of dissolved phase contamination from soil contamination vertically into the groundwater;
  - Potential migration of dissolved phase contamination from groundwater underlying the Assessment Site to local surface water courses (River Swale).
  - Surface run-off from site to the local surface water courses (River Swale).

6.1.7 The risk assessment is based on a proposed future industrial use of the Site and presented in Table 6.1 and Table 6.2

Table 6.1: Conceptual Site Model – Human Health Receptors

Source	Pathway	Receptor	Risk	Notes
				HUMAN HEALTH RECEPTORS
On-site Chemical contamination in Made Ground as consequence of current / historical site activities	Ingestion and dermal contact of soil / dust and Inhalation of organic vapours	Future Site Users	Low	Ashdown ground investigation has identified that the concentrations of contaminates recorded in the samples tested were generally very low and significantly less than their respective SSVs (where available). Ashdown ground investigation has identified that concentrations of chemical contaminants within soil were generally very low and significantly less than their respective SSVs (where available). Based on the laboratory test results, Ashdown also indicated that there is no significant risk to future end users of the site posed by soil vapours (petroleum hydrocarbon or volatile organic compounds).
	Inhalation of asbestos fibres	Future Site Users	Low to Moderate	Asbestos fibres have been identified to be present within shallow soils at a total of 1 location (amosite fibres in SBH1 0.2m bgl). Risk of exposure to future users will likely be limited based upon the low sensitivity of proposed construction works (new gas-fired CHP plant). Also, due to the presence of a thick concrete slab at this location, the presence of asbestos does not pose a risk to human health for current site users so long as the soils remain undisturbed. Should the development works require the concrete slab removal, mitigation measures will be required to be implemented to manage potential exposure risks due to the hazardous nature of asbestos.
		Construction Workers	Moderate	Asbestos fibres have been identified to be present within shallow soils at a total of 1 location (amosite fibres in SBH1 0.2m bgl) and poses a potential risk to construction workers. Mitigation measures will be required to be implemented to manage potential exposure risks to construction workers during development works.

	Potential Permeability of Plastic Supply Pipes	Future Site Users	High	Due to localised TPH concentrations in soil, should potable water supplies be required, suitable protection measures should be implemented.
Ground gas derived within off-site areas of landfill / infilled land	Migration of ground gas and accumulation in structures	Future Site Users	Moderate	Due to the age and size of the landfill area to the east, as well as its proximity to the Assessment Site, both RPS Preliminary Risk Assessment (RPS, 2018, Ref. 1) and Ashdown Quantitative Conceptual Model (Ashdown, 2018b, Ref. 5) identified a moderate risk for ground gas generation. Concentrations of methane of up to 13.9%v/v and of carbon dioxide up to 6.8% v/v have been measured during three gas monitoring rounds undertaken at the assessment Site.

Table 6.2: Conceptual Site Model – Controlled Water Receptors

Source	Pathway	Receptor	Risk	Notes
CONTROLLED WATER RECEPTORS				
Chemical contamination in Made Ground as consequence of current / historical site activities	Leaching of soil contamination and vertical migration	Perched shallow waters within the London Clay / Lambeth Group	Low	No data are available from the shallow perched waters identified at shallow depths in Made Ground at the Assessment Site. However, shallow perched water present within the shallow soils is not considered to be a controlled water body, but instead is considered as a potential source of contamination itself.
		Groundwater within the Lambeth group (Secondary A Aquifer)	Low	In general terms available deep groundwater quality dataset is characterised by low inorganic and very low organic levels of contamination, although three exceedances have been identified for nickel in GWBH2. Groundwater quality is characterised by the absence of TPH, BTEX, PAH and VOCs. The Assessment Site is not located within a Source Protection Zone and there are no groundwater abstractions within the vicinity of the Assessment Site.
		Groundwater within the Chalk (Principal Aquifer)	Low	The thickness of overlying deposits (Lambeth Group and Thanet Sand), recorded on site by Ashdown up to a maximum depth of 35.0 m bgl (BH2, BH4 and BH6) will likely afford the Chalk suitable protection from groundwater contamination. In addition, gross contamination has not been encountered at Assessment Site and therefore it is considered that there is a limited contamination source. A piling risk assessment in line with EA guidance will provide further protection to the Chalk aquifer.
	Lateral migration of contaminated groundwater	Surface water bodies (The Swale Estuary)	Low	Ground investigation undertaken at the Assessment Site and in other portions of the Paper Mill facility and adjacent areas indicate the presence of a discontinuous waterbody in the Made Ground that may be continuous with localised perched water occasionally identified locally in the upper surface of the underlying soils. Chemical analysis of the perched waters is not available. However, given the distance between the Swale Estuary and the Assessment Site (approx. 200m), there is significant potential for attenuation and retardation of contamination present with deeper groundwater along the groundwater migration pathway.

6.2 Conclusions

6.2.1 A desk-based review has been undertaken that conforms to the requirements of Communication 2014/C136/03 for a Baseline Report that includes the following:

- Stage 1 - Identify hazardous substances used, produced or released at the proposed installation;
- Stage 2 - Identify relevant hazardous substances used, produced or released at the installation from the list of hazardous substances identified in Stage 1;
- Stage 3 – Undertake an assessment of site-specific pollution possibility for relevant hazardous substances;
- Stage 4 – Evaluation of Site History and potential for relevant hazardous substances to be present in soils and groundwater;
- Stage 5 – Evaluation of Environmental Setting to determine the fate of potential emissions of relevant hazardous substances;
- Stage 6 – Site Characterisation that synthesises findings of Stage 5 and 6 on the basis of a Conceptual Site Model;
- Stage 7 – Review of Historical Site Investigation;
- Stage 8 – Production of Baseline Report.

6.2.2 The Relevant Hazardous Substances identified for the Assessment Site facility have been shown to include the following:

- Compressor Cleaner such as TURBOTECT 2020
- Diesel
- Sodium Bisulphite
- Sodium Hydroxide
- Sulphuric Acid

6.2.3 The risk to soil, groundwater and surface water has been minimised through a variety of measures and controls delivered through design and operational protocols for the facility. These include:

- Storage tanks for chemicals and oils being located in buildings or chemicals stores with secondary containment;
- New hardstanding (concrete) for outside operational areas;
- Material handling / processing to be undertaken within buildings;
- There will be no underground storage tanks; and

- Management systems and procedures include routine inspection and regular service and maintenance of infrastructure;

6.2.4 The receptors considered in the site-specific pollution potential included: shallow soils forming the unsaturated zone beneath hardstanding on the facility; perched groundwater in the top surface of the London Clay deposits underlying the sites; and deep groundwater in the confined Lambeth Group Sands / Thanet sands at depth.

6.2.5 The assessment of site-specific pollution potential concluded that RHSs used, produced or emitted on the Assessment Site facility represent a low risk to soil and groundwater receptors on the site.

6.2.6 On the basis of this assessment the baseline quality of the soil and groundwater has been defined through a review of historical reports and intrusive investigations relevant to the Assessment Site. Generally low levels of organic and inorganic contamination have been identified in the shallow soils underlying the site. with the exception of Asbestos fibres, identified at SBH1 (0.2 m bgl) beneath the concrete slab, and localised petroleum hydrocarbons concentrations.

6.2.7 Inorganic contaminants identified in the deep groundwater showed generally low concentrations with the only exception of three marginal exceedances recorded for Nickel in GWBH2. PAH, TPH, BTEX and VOCs were all recorded below the laboratory limit of detection.

6.2.8 The monitoring data available for deep groundwater indicates a generally good water quality consistent with the protection afforded by the London Clay Formation confining layer present across the site.

6.2.9 In the absence of discrete hot spots of gross contamination on the Assessment Site the tabulated soil and deep groundwater dataset provide a concentration range for contaminants of concern that is representative for the site.

6.2.10 However, no data are available of the discontinuous shallow perched waters encountered on site during the excavation and drilling works, principally within the Made Ground.

6.2.11 A review of the contaminants of concern associated with the RHSs identified on the site concluded that the baseline quality has been characterised for the majority of contaminants of concern associated with RHS.

6.2.12 Any contaminants not characterised, it has been also concluded that these substances are not expected to be present on the site as result of historical land-use on or near the Assessment Site.

6.2.13 In accordance with the conclusions of historical reporting the baseline dataset presented herein provided no evidence for an impact on deep groundwater quality by leachate generated from the adjacent landfill sites most notably the Kemsley Waste Disposal Site situated to the east.

References

1 (RPS, 2018) Desk Study and Preliminary Risk Assessment K4 CHP Development, Kemsley Paper Mill On Behalf Of DS Smith Paper Ltd, Ref. JER1201 prepared by RPS, dated March 2018;

2 (RPS, 2018a) The Kemsley Mill K4 Combined Heat and Power Generating Station Development Consent Order Report, Environmental Statement, Chapter 8 - Ground Conditions prepared by DHA Environment and RPS, dated April 2018;

3 (Ashdown, 2018) Desk Study Report, reference No. R18-12883/ds prepared by Ashdown Site Investigation, dated 20th April 2018;

4 (Ashdown, 2018a) Factual Report on the Ground Investigation, reference No. R18-12883/fr prepared by Ashdown Site Investigation, dated 15th June 2018;

5 (Ashdown, 2018b) Interpretative Geotechnical and Ground Contamination Risk Assessment Report, reference No. R18-12883/int prepared by Ashdown Site Investigation, dated 15th June 2018;

6 (Ashdown, 2018d) Quarterly Monitoring Report Proposed CHP Plant, Kemsley Mill, Kemsley, prepared by Ashdown Site Investigation, R18-12883/QR1 dated 7th September 2018;

7 (Ashdown, 2018e) Quarterly Monitoring Report Proposed CHP Plant, Kemsley Mill, Kemsley, prepared by Ashdown Site Investigation, R18-12883/QR2, dated 11th December 2018;

8 (RPS, 2018b) Ground Investigation Interpretative Report, New Southern Boundary Road, Kemsley Paper Mill, prepared by RPS, reference No. JER1612, dated December 2018;

9 (Ashdown, 2019) Quarterly Monitoring Report Proposed CHP Plant, Kemsley Mill, Kemsley, prepared by Ashdown Site Investigation, R18-12883/QR3, dated 5th March 2019;

10 (RPS 2017b) WTI Kemsley Generating Station, Power Upgrade: Preliminary Environmental Information Report (PIER) for Chapter 8: Hydrogeology, Ground Conditions and Contamination, JER6933, March 2017.

11 (LQM, 2015). The LQM/CIEH S4ULs for Human Health Risk Assessment.

Drawings

Appendix A

Desk Study and Preliminary Risk Assessment

Appendix B
Hazardous Substances Table

Appendix C

Safety Data Sheets

Appendix D

Interpretative Report

Appendix E

Factual Report on the Ground Investigation (Ashdown 2018a)

Appendix F

Quarterly Monitoring Reports (Ashdown, September 2018, December 2018, March 2019)