Environmental Permit Application

VPI Immingham Energy Park A
Main Supporting Document

VPI Immingham Energy Park A Limited

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Quality information

Prepared by	Checked by	Verified by	Approved by
Aakanksha Sinha Principal Environmental Permitting Consultant	Helen Watson Associate Director	Richard Lowe Director	Helen North Project Manager

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Prepared for:

VPI Immingham Energy Park A Limited

Prepared by:

Aakanksha Sinha
Principal Environmental Permitting Consultant
M: 07824-846-255
E: aakanksha.sinha@aecom.com

AECOM Limited
5th Floor, 2 City Walk
Leeds LS11 9AR
United Kingdom

T: +44 (0)113 391 6800
aecom.com

Table of Contents

Tables

1. Non – Technical Summary

This document supports the Environmental Permit application submitted by VPI Immingham Energy Park A Limited ('VPI-A') under the Environmental Permitting (England and Wales) Regulations 2016, as amended ('the EP Regulations'), for the operation of a gas-fired peaking generating station on land adjacent to the existing VPI Immingham LLP's Combined Heat and Power (CHP) Power Plant ('VPI Immingham CHP Power Plant') at South Killingholme, Immingham, DN40 3DZ. The new VPI-A gas-fired peaking generating station is hereafter referred to as the 'VPI Immingham Energy Park A' or 'the Installation').

The Installation comprises a new 49.5 MWe gas-fired peaking generating station, consisting of 11 reciprocating engines having a total thermal input of approximately 108MW (MWth), with separate flue stacks. The Installation will rely on the existing VPI Immingham CHP Power Plant for some ancillary infrastructure, but will otherwise operate as a separate installation.

The VPI Immingham Energy Park A will operate as a peaking plant to supply electricity to the National Grid during periods of peak demand, operating for no more than 2,250 hours in a year (or a rolling average of 1,500 hours over five years).

An application for Planning Consent (reference: PA/2018/918) was submitted alongside an Environmental Impact Assessment (EIA) for the Installation. At the time of the Planning application, the actual gas engines to be installed were unknown and therefore it was based on either 33 smaller engines or eight larger engines to provide an electrical output of 49.5Mwe. The actual design of 11 medium sized engines, providing the same electrical output, therefore falls within the 'envelope' created for the Planning application. As a result of the change in design, the assessment of impacts from the Installation have been reviewed and updated where necessary.

Although the proposed combustion activity falls under Section 1.1 Part A(1)(a): Burning of any fuel in an appliance with a rated thermal input of 50MW or more of the Environmental Permit (England and Wales) Regulations 2016 (as amended) ("EP Regulations"), by virtue of the overall thermal input to the engines (approximately 108MWth), the engines do not comprise a Large Combustion Plant (LCP) as the gross thermal input to each engine is less than 15MW. The thermal input into each engine is approximately 10MW, therefore, in accordance with the LCP Best Available Techniques (BAT) Reference document (LCP BRef), the engines fall outside the definition of Large Combustion Plant. As the thermal input for the individual engines is >1MW and <50MW, the engines are defined as Medium Combustion Plants (MCP), and are required to comply with the requirements of Schedule 25 of the EP Regulations.

As the engines operate independently from one another, the individual flues have been designated as Emission Points A1 to A11. The air quality assessment for the Installation has been undertaken, including detailed air dispersion modelling, to demonstrate appropriate flue stack heights for the actual engines are employed and that the emissions are satisfactorily dispersed. The modelling assessed the impact of pollutants emitted from the natural gas-fired engines namely oxides of nitrogen (NOx) and carbon monoxide (CO).

The assessment results in a maximum NO_2 annual mean process contribution (PC) at the worst-case human health receptor of 2% of the Environmental Standard. The second stage of assessment compares the Predicted Environmental Concentration (PEC) to the Environmental Standard. The annual average PEC at the worst-case receptor is 15.7µg/m^3, which represents 39% of the annual NO_2 Environmental Standard, and therefore is well below the Environmental Standard. It is therefore considered that the long-term impacts from the VPI Immingham Energy Park A will be very unlikely to result in any exceedance of the annual average NO_2 Environmental Standard at any human health receptor.

The maximum hourly mean process contribution of NO_2 at the worst-case human health receptor is represents 9% of the Environmental Standard, and therefore is considered to be insignificant at the first stage of screening.

The maximum 1-hour and 8-hour mean process contributions of CO at maximum off-site impact locations are below the threshold for insignificance for short-term impacts, with worst-case PC of 3% of the 1-hour mean and 8% of the hourly mean Environmental Standard.

In-combination impacts with the adjacent planned VPI-B OCGT Peaking Plant have also been assessed and the results are comparable with those from the VPI Immingham Energy Park A Installation on its own. This is due to the lower stack heights of the gas engines resulting in more localised ground level impacts. Again, although at the maximum human health receptor (R2 Station House) the maximum long-term PC represents 2% of the Environmental Standard and therefore cannot be screened as insignificant at the first stage of screening, the PEC is still only 15.7µg/m^3, which represents 39% of the annual NO_2 Environmental Standard, and therefore is well below the Environmental Standard.

The predicted annual average NOx concentrations at ecological receptors are below the 1% screening threshold to demonstrate insignificance at all receptors except at E1, a designated habitat site and also the E6, E7 and E8 Local Wildlife Sites. As the PECs are less than then Environmental Standard at all these sites (68%, 57%, 58% and 60% respectively) for both the operation of the VPI-A Gas Engines only and both the VPI-A Gas Engines and VPI-B OCGT sites in-combination, the impacts are considered to be acceptable based on the EA's screening methodology.

An assessment of the potential noise generated by the Installation has been undertaken to support the planning application for the Installation. At the Planning stage it was not known what size gas engines would be used for the final VPI Immingham Energy Park A configuration, and therefore the noise assessment carried out considered either the use of 33 small gas engines, or eight large gas engines to create an 'envelope' for which the final design would fall within. The assessment presented for Planning purposes therefore considered the worst-case impacts from the two plant designs assessed (which resulted from the 33 small gas engines). The assessment concluded that noise levels likely to be generated are below the 'lowest observable adverse effect level' (LOAEL) criteria of no greater than +5dB excess of rating level over the defined representative Background Sound Level at each Noise Sensitive Receptor (NSR).

A review of the noise assessment carried out for the Planning application has been carried out compared to the noise data for the new plant design, and it is considered that the 11 gas engine configuration falls within the assessed envelope and will result in impacts no worse than those predicted in the Planning application.

The gas engines will utilise an air-cooled cooling system using a closed-circuit cooling water loop, therefore the potential for visible plume emissions from the Installation is considered to be negligible.

The Installation will not have an associated liquid fuel storage area, due to the nature of the main fuel (natural gas); and will instead be connected to the National Grid Transmission (NGT) gas network and have a small Gas Reception facility on site.

In terms of raw material storage, the Installation will have an above ground tank for storing up to 5,000 litres of lubricating oil. The tank will be double skinned and therefore internally bunded so as to contain any accidental spills.

It is expected that water usage for the Installation will be minimal, and limited to the replacement or replenishment of water within the cooling water circuit. As the circuit is a closed loop system, the potential for loss of cooling water (which will have a small proportion of anti-freeze) is negligible. Any contaminated process effluent generated on site, e.g. from maintenance activities, will be stored in a dedicated tank on site, prior to being taken off-site by licenced contractors for appropriate disposal.

Due to the inherent nature of the proposed technology and the fuel employed, the likelihood of the generation of process wastewater is minimal, therefore, no discharge of process water to controlled waters is proposed from the Installation.

Due to the inherent nature of natural gas which will fuel the gas engines, there will be no residue following its combustion. Consequently, the Installation is expected to produce insignificant quantities of process waste. There may be small quantities of waste generated from maintenance and welfare activities, which will be stored, managed and disposed of appropriately. The key process waste is anticipated to be waste lubricating oil, which will be stored in a dedicated above ground tank. The tank will be double skinned and have a maximum capacity of 5,000 litres.

The tanker connection for delivery of lubricating oil will be housed within the bulk tank container (within the double skin); this will be accessed via a lockable drop-down access hatch. Therefore, any spillage that may occur during coupling or uncoupling hoses during oil delivery will be maintained within the bunded design of the tank.

The Installation will develop an Environmental Management System (EMS), in line with the requirements of the ISO14001 standard.

2. Introduction

This document supports the Environmental Permit application submitted by VPI Immingham Energy Park A Limited ('VPI-A') under the Environmental Permitting (England and Wales) Regulations 2016, as amended ('the EP Regulations'), for the operation of a gas-fired peaking generating station on land adjacent to the existing VPI Immingham LLP's Combined Heat and Power (CHP) Power Plant ('VPI Immingham CHP Power Plant') at South Killingholme, Immingham, DN40 3DZ. The new VPI-A gas-fired peaking generating station is hereafter referred to as the 'VPI Immingham Energy Park A' or 'the Installation'.

The Installation comprises a new 49.5 MWe gas-fired peaking generating station, consisting of 11 reciprocating engines. The Installation will rely on the existing VPI Immingham CHP Power Plant for some ancillary infrastructure; this is detailed further in this document. The Installation is intended to be commissioned in July 2023.

An application for Planning Consent (reference: PA/2018/918) was submitted alongside an Environmental Impact Assessment (EIA) for the Installation. At the time of the Planning application, the actual gas engines to be installed were unknown and therefore it was based on either 33 smaller engines or eight larger engines to provide an electrical output of 49.5MW_e. The actual design of 11 medium sized engines, providing the same electrical output, therefore falls within the 'envelope' created for the Planning application.

Planning Consent was granted by the North Lincolnshire Council in September 2018. On account of the change in design, the assessment of impacts from the Installation have been reviewed and, where necessary, revised.

This document presents the main supporting information for the Environmental Permit application for the Installation. The Installation's location is shown in Figure 1 whilst the layout of the Installation is shown in Figure 2 (all figures are provided in Appendix A).

2.1 Proposed Operations

VPI-A proposes to install a peaking power station consisting of 11 gas engines with a maximum gross electrical output of up to 49.5MW and will export electricity to the UK electricity transmission system (the 'National Grid') through the existing substation infrastructure on the adjacent VPI Immingham CHP Power Plant site. As the gross thermal input into the Installation is approximately 108MW, the proposed operations are covered under EP Regulations Schedule 1 Part 2 Section 1.1 Part A(1) (a) Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.

The Installation would be fuelled using natural gas from the UK gas transmission network provided through a new pipeline to be connected to the existing gas reception facility on the existing VPI Immingham CHP Power Plant.

The Installation will be located on a parcel of land leased from the adjacent Lindsey Oil Refinery (LOR) located to the north of the VPI Immingham CHP Power Plant.

The Port of Immingham is located approximately 1.75km to the southeast of the Installation at its closest point. The Humber ports facility is located approximately 1.25km north at its closest point and the Humber Refinery is located approximately 500m to the south beyond the VPI Immingham CHP Power Plant.

The nearest human health receptors are the villages of North and South Killingholme located approximately 1.7km west and southwest of the Installation respectively. The nearest residential property is a single property on Marsh Lane located approximately 650m to the east of the Installation boundary at its closest point.

The 11 gas-fired engines will have a thermal input of approximately 10MW each and will be individually housed within a precast concrete enclosure (the 'Engine Room'), and have individual stacks of 15.1m in height protruding from the Engine Room roof.

In addition, there are a number of ancillary elements; these elements are:

- Gas pipeline to the adjacent VPI Immingham CHP Power Plant. This may include a section of above ground pipeline to pass over the existing services, drainage ditch and roadway bordering the Installation;
- Gas receiving compound to monitor and regulate the flow of gas to the Installation;
- Black start unit (skid mounted diesel fired generator, with integral diesel storage tank);
- Raw/ fire water tank and fire pump for fire control purposes;
- Treated water tank to facilitate cooling of the engines;
- Lubrication oil tank, to facilitate the operation of the engines;
- Transformers to allow the export of electricity at the correct voltage;
- Gatehouse to control access to Installation site;
- Workshop and stores; and,
- Offices, workshops and a control module to facilitate the operation of the Installation.

Emissions will be discharged to atmosphere via 11 stacks (one for each of the 11 engines) as well as the diesel generator, Emission Points A1 – A12). The main emissions to air from the stacks will be:

- Oxides of nitrogen (NO_x) comprising nitric oxide (NO) and nitrogen dioxide (NO_2); created by the chemical combination of atmospheric oxygen and nitrogen within the high temperature combustion zone; and
- Carbon monoxide (CO).

Due to the inherent nature of natural gas, there would not be any emissions of sulphur dioxide or particulate matter from the gas engines.

The new combustion plant will be maintained to ensure optimum thermal and electrical efficiency and to minimise emissions generation. Monitoring will be carried out within 4 months of the start of operation of the Installation and then every three years thereafter.

The only raw materials stored at the Installation will be lubricating oil, which will be stored in a double skinned tank having a capacity of up to 5,000 litres.

The Installation will produce small quantities of waste in the form of used lubricating oil, which will be stored in a designated waste storage area and be disposed of appropriately.

There will be no process emissions to water, sewer or land from the proposed operation.

Planning permission for the proposed operations (application reference number: PA/2018/918) from North Lincolnshire Council was obtained in 2019. An Environmental Impact Assessment (EIA) (as Environmental Statement (ES)) was prepared for the Installation and is included in Appendix B.

The Installation boundary is shown in Figure 2 (Appendix A).

This application covers the following proposed activities and also the directly associated activities (DAA) for an Environmental Permit for the VPI Immingham Energy Park A.

Table 2-1: Schedule 1 Listed Activities

Activity Reference	Schedule 1 – Part 2 Reference	Description of Activity
AR1	Section 1.1 Part A(1)(a): Burning of any fuel in an appliance with a rated thermal input of 50MW or more.	Operation of 11 gas engines (each having an electrical output of 4.5MWe) burning natural gas for the production of electricity (approximately 108MW aggregated net rated thermal input).
AR2	Directly associated activity.	Diesel oil storage.
AR3	Directly associated activity.	Lubricating oil storage.
AR4	Directly associated activity.	Surface water drainage.

2.2 Environmental Setting

The VPI Immingham Energy Park A consists of an area of land of approximately 1ha in area, located immediately to the south of the existing Lindsey Oil Refinery (LOR) canteen building. The Installation site is currently undeveloped and consists of disturbed ground with limited vegetation.

The Installation site is bounded as follows:

- North: Undeveloped land and the LOR canteen building and car park;
- East: Undeveloped land;
- South: Pipework and services related to the operation of LOR, a vegetated drainage ditch and access trackway and the VPI Immingham CHP Power Plant; and,
- West: Undeveloped land access trackways and ponds associated with the drainage system for the P66 Humber Refinery and LOR. Beyond is a railway line and LOR itself. A single pylon associated with a high voltage transmission line is present approximately 20m from the Installation boundary.

3. Application Site Report

The Application Site Report has been prepared to reflect the proposed operations, and is included as Appendix C of this document.

The VPI Immingham Energy Park A is to be constructed on an existing greenfield area. No previous industrial operations have been undertaken at the Installation, and therefore there is no history of industrial pollution within the Installation boundary.

The Installation is to be located in an area comprising a mix of industrial and agricultural activities. In addition to the activities identified above, the land to the east of the Installation on the other side of Rosper Road comprises agricultural fields extending approximately 1km toward the Humber Estuary before industrial activities associated with the storage and export of gas and oil and other port activities commence along the banks of the estuary itself, approximately 1.4km from the Installation at is closest point.

LOR is located to the east of the Installation site with the VPI Immingham CHP Power Plant located immediately to the south, beyond which is the Humber Refinery approximately 500m to the south of the Installation at its closest point.

A railway spur runs north-south to the immediate west of the Installation. This spur services LOR and joins the main line approximately 400m south-west of the Installation. This line is the principal railway line in north-east Lincolnshire running between Cleethorpes and Barton on Humber.

The Application Site Report and the Baseline Conditions for the Installation will be maintained to reflect the Installation operations, in compliance with the Industrial Emissions Directive (IED).

The environmental sensitivity of the Installation site is considered to be as follows:

- Groundwater – Moderate sensitivity - Underlying Secondary Aquifer within the superficial glacial deposits, the underlying bedrock is classified as a Principal Aquifer - with low vulnerability, due to the over laying low-permeability superficial deposits;
- Surface water – Moderate sensitivity – River Humber, located approximately 1.4km directly to the east, there are a number of drains and tributaries of the River Humber in close proximity to the Installation;
- Land use – Low sensitivity – the Installation is surrounded by industrial and agricultural land and no significant land uses have been identified.

4. Operating Techniques

4.1 Technical Standards

Although the proposed combustion activity falls under Section 1.1 Part A(1)(a): Burning of any fuel in an appliance with a rated thermal input of 50MW or more of the Environmental Permit (England and Wales) Regulations 2016, as amended ('EP Regulations'), by virtue of the overall thermal input to the engines (approximately 108MWth) the engines do not comprise a Large Combustion Plant (LCP) as defined by the IED, as the gross thermal input to each engine is less than 15MW. As the gross thermal input into the individual engines is approximately 10MW (and therefore less than the aggregation threshold of 15MWth), in accordance with the LCP Best Available Techniques (BAT) Reference document (BRef), the engines fall outside the definition of LCP. As the thermal input for individual engines is >1MW and <50MW, the engines are defined as Medium Combustion Plants (MCP), and as such are required to comply with the requirements of Schedule 25 of the EP Regulations.

The Installation will operate in accordance with the applicable EA Sector Guidance, namely:

- EPR 1.01: How to comply with your environmental permit, Additional guidance for: Combustion Activities[1];
- BAT Reference Document for Large Combustion Plants[2] (LCP BRef);
- MCP and specified generator permits: how to comply [3]; and
- MCP and specified generators: environmental permits [4].

In addition, the Installation will operate in accordance with the EA guidance – 'Develop a management system: Environmental Permits'[5] as a good practice measure.

Figure 2 (Appendix A) shows the Installation boundary, including the proposed layout of the plant.

The proposed plant will be compliant with the Industrial Emissions Directive (IED) and Large Combustion Plant (LCP) BRef and relevant BAT Conclusions where required; and as a good practice measure, a summary of compliance against the BAT Conclusions is shown in Appendix D, with further discussion presented in the following sections.

4.2 Process Description

4.2.1 VPI Immingham Energy Park A

The Installation will comprise 11 reciprocating engines having a gross output capacity of up to 49.5MWe electricity for export to the National Grid. The Installation will comprise a fast response peaking plant. Fast response peaking plants are used to quickly increase or 'top up' the generating capacity during periods of increased need ('peak periods') by the National Grid. The peaking plant is normally dormant and can be brought online at short notice to help cope with periods of high demand or low supply nationally. It is anticipated that the Installation will not be operated for more than 1,500 hours per year (up to a maximum of 2,250 hours per year, not exceeding 1,500 hours as a rolling average over five years).

The operational capacity will vary depending on the demand from the National Grid; and is likely to always be lower than the maximum capacity. However, all assessments regarding the Installation's operation have been undertaken assuming 100% of the capacity is utilised, as a conservative approach.

[1] How to comply with your environmental permit, Additional guidance for: Combustion Activities (EPR 1.01), EA, March 2009
[2] Best Available Techniques (BAT) Reference Document for Large Combustion Plants – Final Draft, European IPPC Bureau, June 2016
[3] Medium combustion plant and specified generator permits: how to comply, EA, Published: 15 July 2019, available online at: https://www.gov.uk/guidance/medium-combustion-plant-and-specified-generator-permits-how-to-comply
[4] Medium combustion plant and specified generators: environmental permits, EA, Published: 15 July 2019, https://www.gov.uk/guidance/medium-combustion-plant-and-specified-generators-environmental-permits.
[5] Develop a management system: Environmental Permits, EA, February 2016

Reciprocating engines have been widely used for power generation, particularly for peaking and back-up generation, because of their ability to start up and shut down quickly and operate flexibly across a range of loads.

In a reciprocating engine, fuel is combusted in the cylinders of a multi-cylinder gas engine, utilising the air that is usually first pressurised by turbo charger(s) and then compressed by the pistons. The force developed turns a crank shaft, which then turns an alternator, which generates the electricity for export to the electricity network.

Each engine will have a dedicated stack associated with it, for the discharge of exhaust gases to atmosphere.

The generators are housed individually and will be located within a concrete enclosure with separate exhaust stacks, one for each engine, rising to a height of 15.1m above ground level. Each generator container will have an integrated ventilation system, which will cool the engine cell and engine, provide combustion air to the engine and also maintain the correct cell atmosphere for safe operation. The ventilation systems will comprise of inverter driven ventilation fans and actuated louvres. The control of these items is based on the temperature of the engine cell and the gas and fire system. If the ventilation system trips for any reason, the engine will automatically shut down.

Figure 2 (Appendix A) presents the indicative layout for the Installation.

Reciprocating engines typically have one or more cylinders in which fuel combustion occurs. The engines convert the chemical energy of the fuel into mechanical energy, in a design similar to a marine engine (HFO and/ or gas oil engine type) or automotive Otto (lean-burn gas engine type) engine. At the Installation, lean-burn gas engines are to be used. The LEANOX control system controls boost pressure according to the power at the generator terminals, and controls the mixture temperature according to the engine driven air-gas mixer.

In comparison to gas turbines, combustion in reciprocating engines is not continuous and takes place inside closed combustion chambers. During combustion, the pressure and temperature increase is very high, and this allows a high conversion efficiency for the comparatively small units used. The LCP BRef requires new engines combusting natural gas to have net electrical efficiency level in the range of 39.5 – 44%. The overall electrical efficiency of the engines installed at the Installation is expected to be over 42% (as per the Performance Guarantee), and therefore in line with the efficiency envelope quoted within the LCP BRef for gas engines, therefore exceeding the BAT requirements for such plant.

Small power plants comprising of reciprocating engines are more efficient than gas turbine-based plants in situations where considerable load variations are possible, and are considered cost-efficient solutions for peaking electricity supplies. In order to maintain satisfactory efficiency of peaking plants, smaller engines with the capability of quick start-up and shutdown are necessary, such that individual engines can be run at optimum loading and hence optimum efficiency.

Furthermore, reciprocating engines are able to maintain good performance at part load, with typically only a 10% increase in Specific Fuel Consumption (SFC) at half-load. Thermal performance below half-load deteriorates whilst pollutant emissions in exhaust gas increases.

As a consequence, the use of the proposed gas-engines for the Installation is considered to represent BAT for the purpose of providing a rapid-start, short-term power supply during periods of peak demand, as required by the National Grid.

Since the output capacity of the Installation is <300MW, it is not required to be Carbon Capture Readiness (CCR) compliant. In addition, the plant is not designed to be CHP-Ready and it is not intended to be utilised as a CHP, primarily because of the intermittent nature of the operation of the plant and the lack of a steam cycle and therefore generation of spent heated cooling water. It is not proposed to reassess the CHP potential of the Installation as the operating regime and lack of steam cycle will remain the same over its operational life.

4.2.2 Black-start Capability

The Installation will provide a ‘black-start’ capability which provides the capability to start the gas engines without any assistance from the National Grid electricity transmission system, in the event of a total or partial shutdown of the UK transmission system (so called ‘black-start’ capability). The

Installation could then be used to help restart the National Transmission System (NTS); power stations without black-start capability need to draw power from the transmission system to start operation. It is not possible to accurately predict the likely frequency or duration of black-start events. However, historically black-start events have been very infrequent in the UK.

The black start capability will include a single 200kVA backup diesel generator, which will have a thermal input of <0.5MW and therefore not fall under MCP requirements. The diesel would only be used to support black-start operations or to provide emergency supplies if connection to the grid system was lost. The generator will require routine testing to ensure that it remains fit for purposes and therefore it is assumed that it will be tested for 12 hours per year (1 hour per month). This operation has been included in the Air Dispersion Modelling carried out to support this application.

The diesel generator will have an integral 950l double skinned tank within the base of the containerised generator unit.

4.2.3 Cooling System

Engine cooling will be provided through a closed loop cooling system and fin fan cooler arrangement. These fans are external to any structure and will use air as the cooling medium. A small amount of water is retained in the closed loop system with top up periodically required. As there is no steam cycle installed there is no need for large volumes of cooling water.

4.2.4 Process Control System

A control building would be provided to facilitate control of the Installation. Operational control of the Installation could also be through the existing Control Room on the adjacent VPI Immingham CHP Power Plant, with its own Distributed Control System (DCS), although this will be dependent on the final design selected for implementation.

Data from the continuous process monitoring of the engines will be integrated into the process control system with relevant signals operating control-room alarms. All alarms will be monitored by the DCS in the control room.

This would also include contain a workshop, stores for spare parts, etc., offices and staff welfare facilities.

4.2.5 Ancillary Equipment and Structures

To support the operation of the gas engines, including the cooling system, a number of ancillary operations are required, including:

- Gas reception facility;
- Engine fuel gas supply;
- Fire protection system;
- Water supply infrastructure; and
- Surface water drainage.

A short summary of the above ancillary equipment is provided below.

4.2.5.1 Engine Fuel Gas Supply

A new gas connection pipeline would link into the existing gas supply infrastructure on the adjacent VPI Immingham CHP Power Plant. The new gas connection route would run from the VPI Immingham CHP Power Plant via a new above ground pipebridge over the existing services, ditch and roadway along the southern boundary of the Installation to a new Gas reception facility where the gas would be metered and conditioned to that required for the selected technology for the Installation.

Gas treatment could include filtering, pressure and temperature regulation and metering of the natural gas. A ‘pigging’ facility could also be included, which allows a ‘Pipeline Inspection Gauge’ (PIG) to be passed along the pipeline for periodic cleaning and maintenance checks.

The Installation would connect, via transformers, to the National Grid most likely by the existing 15.75 to 400kV connection located on the VPI Immingham CHP Power Plant.

4.2.5.2 Fire Protection

The Installation will include a fire/ raw water storage tank and a fire water pump house to be used in the event of a fire. In case of a fire, the outlet connection from the surface water attenuation system would be closed and surface run-off (i.e. fire-fighting and rain water) would be contained within the Installation.

The Engine Room will be constructed using non-combustible materials. Each generator container will comprise an integrated ventilation system consisting of inverter driven ventilation fans and actuated louvres. The operation of the ventilation system is based on the temperature of the engine cell and the gas and fire system. If the engine room temperature reaches 50°C, the engine and generator will be stopped via a dedicated cell temperature switch.

If gas is detected within the engine room (i.e., in the event of a leak), a two-fold control system will be in place to manage the situation. At 'pre-gas alarm' level (at 10% of the lower explosion limit), the louvers open and the fans ramp up to remove the gas from the engine room. A signal indicating this will be sent to the plant control system via the engine control panel and the engine will perform a controlled shut down. At 'gas alarm' at 20% of the lower explosion limit the louvers will open and the fans will ramp up to remove the gas from the Engine Room, and the engine shall perform an emergency stop. The 'gas alarm' signal will also isolate gas supply to the engine via the externally located gas slam shut valve.

The fire detection and alarm system for the Engine Room is designed to meet the classification "L2" as defined with BS 5839-1:2013 "Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning, and maintenance of systems in nondomestic premises".

The generator building house shall be arranged into the designated zones to be determined upon detailed design of the systems.

If fire is detected within the Engine Room, the control system will have two types of detection systems - thermal and optical. The fire detectors will be installed in strategic locations; the thermal fire detection will be located close to the ventilation outlet and the optical fire detection will be located above the alternator. Upon fire detection the ventilation fans will stop and dampers will close to isolate oxygen supply to the enclosure and starve the fire to extinguish it as soon as possible. The fire alarm signal will also isolate gas supply to the engine via the externally located gas slam shut valve and the engine shall perform an emergency stop.

Emergency lighting will indicate the emergency escape routes and exits within each enclosure. Emergency stop push buttons and fire extinguishers are installed close to the emergency exits in each cell.

The measuring head shall be attached on the covering or nearby the ground, dependent upon the gas source.

4.2.5.3 Gas Reception Facility

A gas receiving station or gas pressure reduction skid will be established at the Installation in order to receive natural gas from the new gas connection pipeline from the NTS.

No additional gas treatment or conditioning is proposed to be undertaken at the Installation once it is received. The gas may require preheating, and therefore a small boiler (less than 200kW thermal input) may be required. It is considered that any unit installation would be under the threshold for requiring an MCP permit.

4.2.5.4 Water Supply Infrastructure

The small amount of cooling water needed for auxiliary systems will be maintained in a closed loop system and would be topped up using water provided by a small water treatment plant at the Installation. This plant would be fed from the raw water tank. This tank in turn would be fed either by pipeline from the existing VPI Immingham CHP Power Plant or delivered by road tanker.

4.2.5.5 Surface Water Drainage

There will no process emissions to controlled waters from the Installation operations.

An Outline Drainage Strategy was developed for the Installation as part of the Flood Risk Assessment carried out for the ES (Appendix 13A of the ES (provided in Appendix B)) and drainage proposal for the Installation are being designed with this in mind.

The Installation will be designed so as to ensure that flooding on-site is mitigated to an acceptable level during the design event and any flooding is directed to non-critical areas. It is also required to prevent surface water flows originating within the Installation site from causing or exacerbating flooding to surrounding areas. Therefore, in line with EA advisory recommendations, CIRIA SuDS, manual best practice guidelines and local planning policy sustainable drainage systems should be used as a preferential option.

Access roads and pathways on the Installation are stoned systems and only roof drainage will be collected and actively drained to the Installation's attenuation system and tank. Such drainage will pass through an oil filter cartridge prior to entering the surface water drainage system.

Measures will be taken to ensure accidental flows such as fuel/ chemical spillages do not enter the surface water drainage; this will be confirmed prior to commencement of operations.

4.3 Management Systems

The Installation will be operated under a suitable environmental management system (EMS) developed in line with the requirements of ISO14001. The EMS will be developed prior to commencement of operations, and following commencement, it is envisaged that certification will be sought.

The management system is anticipated to outline policies and procedures aiming to minimise the risk of pollution and subsequent harm to the environment and to human health which may arise from the operations, maintenance, accidents, incidents and non-conformances specific to the Installation.

The management system and procedures will be available for inspection at the Installation and applicable to all staff, contractors and visitors. The management system will be developed such that it enables compliance with the conditions of the Environmental Permit and other legislative requirements to ensure environment protection and protection of human health. VPI-A will ensure that resources are available to implement the environmental policy and meeting its periodic environmental improvement programme.

Written procedures clearly describing roles and responsibilities, actions and communication channels for the operation of the Installation will be available for operational personnel dealing with emergency situations which may arise at the Installation.

The management systems and procedures will be externally audited and include contingency plans written in preparation for any foreseeable abnormal events. Internal review of the management system (or relevant parts therein) will be undertaken at an appropriate frequency or in the event of a change in operations/ Installation processes.

An internal auditing programme will be produced for the operation of the Installation, and will be reviewed regularly to demonstrate conformance with the management system and compliance with applicable compliance obligations. The programme will identify opportunities to enhance environmental and management system performance and to implement preventative/ corrective actions to minimise the risk of non-compliance. The findings of any such review and audits will be communicated to all staff and relevant external contractors as appropriate and where appropriate improvement works and corrective actions will be implemented. All internal reviews, audits, amendments to the management system and improvement measures implemented will be recorded for reference and inspection purposes.

4.4 General Maintenance

Maintenance will be undertaken in accordance with the original manufacturer's recommendations and/ or industry best practice and as dictated by the number of running hours or condition/ age of the plant. Due to the limited (and relatively low) annual running hours, it is likely that there would be a substantial gap (likely to be several years) between each significant plant overhaul period.

4.5 Raw Materials

The use of hazardous materials within the Installation will be eliminated by design where possible, and minimised where it is not practical to eliminate them.

Raw material substances will be stored in appropriate containers, within suitable spill protection including; double skinned tanks with leak detection, on bunded pallets, on drip trays, in specifically designed cabinets and cupboards or other appropriate storage units and areas. Storage of raw material substances for use in the Installation will be within a dedicated new Workshop/ Stores building.

The main raw material used at the VPI Immingham Energy Park A will be natural gas, which will fuel the plant. It is anticipated that up to 106kW of natural gas will be required for the operation of the entire Installation per hour; therefore, estimated to be up to 238.5MWh for up to 2,250 hours of annual operation. The gas receiving facility will receive natural gas from the NTS to ensure that the quality of the gas fed to the Installation is of suitable quality. Gas will not be stored on site prior to use as a fuel.

There will be a 5,000 litre clean oil tank which will be double skinned and have appropriate leak detection systems in place. The tanker connection for filling the tank is housed within the double skin of the bulk tank, this is accessed via a lockable drop down access hatch. Any spills from coupling and uncoupling during oil delivery will therefore be maintained within the bunded design of the tank.

No hazardous materials, including chemicals, will be stored at the Installation site. Any materials required for maintenance works will be brought to the Installation by the maintenance contractors, and removed following completion of works.

The EMS will comprise procedures for controlling raw material delivery including for oil transfer operations, and spill response procedures. Spill kits will be available at various locations at the Installation, including the designated area for material delivery.

All hazardous substances other than gas, lubricating oil and liquid fuels will be supplied, stored and used in containers of capacities 1m³ or less. The location of the material stores and tanks is shown Figure 2 (Appendix A).

4.6 Waste

The main waste stream generated at the Installation is anticipated to comprise waste lubricating oil. The waste lubricating oil storage tank, will be located alongside the clean lubricating oil, as shown on the plant layout drawing (Figure 2 – Appendix A). The waste lubrication oil tank will comprise a 5,000 litres double skinned tank, with appropriate leak detection systems, to the same design as the lubricating oil storage tank.

In addition to the waste lubricating oil, it is anticipated that small quantities of operational waste will be generated from the operation and maintenance of the proposed plant, in addition to minor amounts of general waste from plant staff.

Other wastes including chemical waste shall be either removed immediately from the Installation or stored in a covered skip pending removal. Disposal of such wastes shall be at a licensed waste disposal facility. No chemical, lubricant or fuel discharge will be permitted.

The operator will endeavour to minimise waste generation from the Installation operations, by implementation of appropriate measures. The operator will also record the nature and quantity of all waste generated at the Installation. It is anticipated that all waste generated at the Installation will be managed appropriately via licensed carriers and treatment facilities.

4.7 Energy

4.7.1 Energy Use

The VPI Immingham Energy Park A is expected to combust up to 238.5MWh of natural gas sourced from the NTS for up to 2,250 hours of annual operation (1,500 hours a year as a 5-year rolling average).

The internal electricity “parasitic load” of site operations when the site is operational is estimated to be approximately 1.63MW per year.

As the proposed plant is only intended to operate intermittently for a limited period annually, it will not generate power continuously. Therefore, it is not considered appropriate to configure the plant as CHP ready, primarily because of the intermittent nature of the operation of the plant and the lack of a steam cycle and therefore generation of spent heated cooling water. It is not proposed to reassess the CHP

potential of the Installation as the operating regime and lack of steam cycle will remain the same over its operational life.

4.7.2 Energy Efficiency

Separate gas metering into each engine will not be in place, but provision will be incorporated into the gas supply line to each engine to connect a temporary gas flow meter for the purposes of determining the electrical efficiency of individual gas engines. For the purposes of undertaking electrical efficiency performance test the Installation gas meter will be utilised.

Operating at maximum continuous rating (MCR) the plant is designed to achieve a gross electrical efficiency (Lower Heating Value (LHV)) of 40% when combusting natural gas (based on Minimum Performance Guarantee).

This efficiency is in line with the BAT-Associated Energy Efficiency Levels (BAT-AEEL)[6] of 39.5–44% for net electrical efficiency (%) for new engines combusting natural gas. However, it should be noted that the Installation is outside the scope of the LCP BRef and therefore does not need to comply with the BATc.

The equipment selected for use in the Installation and associated ancillary equipment are considered to represent energy efficient units for the proposed duties.

Elements of the plant's design that help achieve the high energy efficiency include the following:

- Modern design following current best practices in optimising efficiency;
- High efficiency motors and drives so as to reduce parasitic loads;
- The plant components have been sized appropriately for the design capacity of the plant, so that each element is operating optimally and efficiently; and
- Effective insulation of hot surfaces.

The plant will also be subject to regular planned maintenance in order to optimise the efficiency of the equipment on Installation.

5. Environmental Emissions

5.1 Emissions to Air

The Installation will comprise up to 11 gas fired engines, each having a thermal input of approximately 10MW; with the combined thermal input for the peaking plant estimated to be approximately 108MW.

Due to the combined thermal input of the Installation being in excess of 50MW, the plant is covered under Environmental Permit Regulations Schedule 1 – Part 2 Section 1.1 Part A(1)(a) (Burning of any fuel in an appliance with a rated thermal input of 50MW or more). Typically, combustion plants having a thermal input of greater than 50MW are classified as LCPs, and are required to comply with the associated emission limit values (ELVs) set by the IED. However, according to the IED, combustion plants comprising a group of combustion units, where the thermal input to individual units is below 15MW, the plant is exempt from compliance with the IED ELVs. However, having a thermal input >1MW, the individual engines at the peaking plant are covered under the Medium Combustion Plant Directive (MCPD) and are required to comply with these relevant ELVs, provided by Schedule 25B of the Environmental Permit Regulations 2016 (as amended). The engines will therefore meet the NOx ELV of 95mg/Nm^3 for new gas engines, specified within the MCPD.

The 11 gas engines will release waste combustion gases via individual stacks (Emission Points A1 – A11), each having a height of 15.1m.

The use of natural gas means that emissions of sulphur dioxide (SO_2) and particulates (PM) from the peaking plant will be negligible, and therefore have not been assessed.

[6] Best Available Techniques (BAT) Reference Document for Large Combustion Plants, Final Draft, Joint Research Centre, June 2016

Emissions of nitrogen oxides (NOx) will be controlled by primary means and the use of LEANOX burners, operated and controlled through an automated process control system in accordance with BAT.

Emissions of carbon monoxide (CO) will be controlled by primary means and balanced against the requirement to minimise NOx, as this has a greater potential for air quality impacts.

In addition, the black start engine will have its own stack (Emission Point A12) and during normal operation it will not release any emissions. In order to ensure that the black start engine remains fit for purpose, it will undergo routine testing, likely to comprise less than one hour of operation per month, therefore up to 12 hours operation per year. Due to the small size of the black start engine, it does not fall under the requirements of the MCP.

5.1.1 Flue Stacks

During normal operation there will be emissions from the gas engine stacks serving the Installation. The details of the point source emissions parameters are shown in Table 5-1.

Table 5-1: Emission Parameters and Pollutant Emission Rates

Parameter	Emission Points A1 – A11 (per flue)
Maximum volumetric flow (Am^3/s)	12.0
Oxygen content (%)	9.4
Moisture content (%)	10.1
Temperature (°C)	351
Maximum volumetric flow at reference conditions (Nm^3/hr)[1]	33,031
Approx. flue diameter (m)	0.7
Average efflux velocity (m/s)	31.1
NO_x ELV (mg/Nm^3)[2]	95
NOx release rate (g/s)	0.87
CO emission (mg/Nm^3)[2]	390
CO release rate (g/s)	3.58
Stack height (m) (above finished ground level)	15
Assumed maximum operating hours/ year	2,250

Note [1] Reference conditions are dry gas, O°C, 101.3kPa, 15% O_2

The Air Quality Assessment for the Installation is provided in Appendix E, with a summary of the predicted impacts from the emissions shown in Table 5-1 presented in Section 7.5.

The locations of the Emission Points for releases to air are shown in Figure 2 (Appendix A).

5.1.2 Use of NO_x Abatement Measures

The gas engines will be designed to achieve NOx (oxides of nitrogen) emissions not exceeding $95mg/Nm^3$ (in dry exhaust gas at 15% O_2, Standard Test Conditions, 273K, 101.3kPa) and shall comply with the emission limits stipulated in the MCPD for reciprocating gas engines installed after December 2018.

Each engine will achieve the specified NOx emission limit without requiring the use of a catalytic reduction system and will maintain emissions control through the engine management system. The Installation has therefore not been designed to include space for installation of supplementary NOx emissions abatement systems in future.

5.2 Emissions to Water

There will be no process discharges to controlled waters (ground water, surface water and sewer) from the Installation.

5.2.1 Surface Water Drainage

The Installation will increase the total area of impermeable surfaces at the Installation site. It has been assumed that post-development all operational areas within the VPI Immingham Energy Park A site will be 100% impermeable. Following the development works the surface water runoff rate will therefore increase and this increase in runoff will need to be attenuated prior to discharge to meet the required greenfield runoff rate.

The surface water drainage system which is to be installed as part of the Installation will ensure that flooding on the Installation site is mitigated to an acceptable level during the design event and any flooding is directed to non-critical areas. It is also required to prevent surface water flows originating within the Installation site from causing or exacerbating flooding to surrounding areas.

Only uncontaminated surface water run-off, will be discharged to the Internal Drainage Board (IDB) drain at Emissions Point W1 (Figure 2, Appendix A). No process water will be discharged to the IDB drain.

In the event of a fire, the surface water drainage system would be closed to prevent contaminated water being released through surface water drains. Fire water would be contained as far as possible and either be disposed off-site in accordance with waste management legislation (if contaminated) or treated and discharged to surface water in accordance with the Environmental Permit, if the water quality is acceptable for surface water discharge (and subject to agreement with the EA and/ or the IDB).

Any contaminated wastewater will be taken off-site for suitable disposal.

5.3 Emissions to Land

No direct process emissions will occur to land as a result of the operation of the Installation.

Roadways and pathways on Site, in areas where there is no risk of contamination, will consist of stone surfacing.

5.4 Odour Emissions

It is considered that, due to its inherent nature of the materials used onsite and the containment applied to the stored materials, that the proposed plant will not generate significant odour.

5.5 Noise Emissions

An assessment of the potential noise generated by the Installation has been undertaken to support the Planning application for the Installation. At the Planning stage, it was not known what size gas engines would be used for the final VPI Immingham Energy Park A configuration, and therefore the noise assessment carried out considered either the use of 33 small gas engines, or eight large gas engines to create an ‘envelope’ for which the final design would fall within. The assessment presented for Planning purposes therefore considered the worst-case impacts from the two plant designs assessed. The assessment is presented in Chapter 8 of the ES (provided in Appendix B) and concluded that noise levels likely to be generated are below the ‘lowest observable adverse effect level’ (LOAEL) criteria of no greater than +5dB excess of rating level over the defined representative Background Sound Level at each Noise Sensitive Receptor (NSR).

The new proposal for 11 engines, each of which is housed in a concrete acoustic enclosure, is most comparable to the 33 engines assessed for the Planning application and therefore, the calculations for that scenario were reviewed and compared to the noise data for the new configuration of 11 engines.

Data provided by the equipment manufacturer (Clarke Energy) for the new proposal was used to determine an overall sound power level for the proposed 11 engines. This gives an overall sound power level for all noise sources on site that is slightly less than the comparable overall sound power level for the 33 engine scenario assessed for the ES. Therefore, adopting the same prediction methodology as

used in the ES would result in a comparable predicted sound level at the closest residential property (Hazel Dene).
Based on this approach and the assumptions set out above, the overall conclusion of the Noise assessment carried out for the Planning application would remain valid i.e. the magnitude of impact is 'very low' and the significance of the effect is 'negligible'.

6. Monitoring

6.1 Infrastructure

An infrastructure monitoring plan will be put in place when the Installation is in operation, so as to protect the soil and groundwater beneath the Installation site.

It is expected that regular inspection of all infrastructure associated with bulk storage of oils, chemicals and fuels will be undertaken at the Installation. The routine infrastructure audits will be undertaken regularly.

The infrastructure monitoring plan will cover the inspection and maintenance of the plant and equipment, storage tanks, storage areas, drainage networks and surfacing; and will consist of a combination of weekly, monthly and quarterly inspections, alongside more infrequent activities such as drainage surveys and bund integrity tests.

6.2 Emissions to Air

There are 12 new Emission Points to air associated with the Installation and equipment covered by this application, comprising:

- Gas Engines 1 - 11 - Emission Points A1 – A11; and
- Black Start Diesel Engine – Emission Point A12.

Due to the individual thermal input of the gas engines being equal to or greater than 1MW and less than or equal to 20MW, the monitoring requirements of the MCPD apply to the emissions from the Installation. This requires that extractive monitoring is carried out every three years in the first instance.

The new combustion plant will be maintained to ensure optimum thermal and electrical efficiency and to minimise emissions generation. It is therefore envisaged that extractive monitoring will be carried out every 1,500 hours operation on each engine, or every five years, as appropriate.

Due to the small size and infrequent operation of the black start engine, it falls outside the MCP requirements and therefore no monitoring of the emissions is proposed.

The Environmental Permit will specify the emission limits and applicable analytical requirements for emissions monitoring. The proposed monitoring requirements are shown below in Table 6-1.

Table 6-1: Proposed Emissions and Monitoring (for insertion into permit)

Release Point	Parameter	Source	Limit (mg/Nm^3)(1, 2)	Reference Period	Monitoring Frequency	Monitoring Standard or Method
A1-A11	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	Engines 1 – 11	95	Average over the sampling period	Every 3 years	BS EN 14792
A1 – A11	Carbon Monoxide (CO)	Engines 1 – 11	No limit	-	Every 3 years	BS EN 15058

Note 1: Based on Reference conditions - dry gas, O°C, 101.3kPa, 15% O_2
Note 2: The limits do not apply during periods of shut down or start up.

6.3 Emissions to Sewer

No process emissions will be discharged to the sewer.

6.4 Emissions to Water

Measures will be taken to ensure accidental emissions such as fuel/ chemical spillages do not enter the surface water drains. Such measures will be confirmed and provided to the EA for approval as part of the final design prior to commencement of proposed operations. These measures are likely to include source control measures such as booms or absorbent systems.

Systems and procedures will be in place to ensure that the discharge is monitored and recorded as appropriate. Details of such systems will be finalised prior to commencement of operation.

A conceptual drainage strategy has been developed for the installation as part of the Flood Risk Assessment (FRA), and is included in Appendix 13A of the ES (Appendix B).

7. Environmental Risk Assessment (Impact Assessment)

This section discusses the potential impact on sensitive receptors and the surrounding area and shows how the emissions from the Installation have been assessed and minimised.

Guidance contained in the EA document – *'Risk assessments for your environmental permit'*[7], has been used to scope and assess the emissions from the Installation.

Where necessary, appropriate modelling has been completed to ensure that any predicted significant effects on sensitive receptors can be avoided or mitigated. The results of the modelling assessments are reported in the Air Quality Assessment and Noise Assessment and the included in Appendix E and Appendix B respectively.

7.1 Installation Location and Sensitive Receptors

7.1.1 Human Receptors

Receptors potentially affected by the emissions from the Installation, including local residential and amenity receptors, have been identified through site knowledge and desk study of local mapping. Isopleth figures of pollutant dispersion have been examined to identify the receptors that will receive the highest point source contributions and the assessment of impact has been made at these receptors.

North Lincolnshire Council (NLC) has declared two AQMAs within its administrative area (Scunthorpe and Low Santon, both for PM_{10}), both of which are over 5km from the Installation. The Low Santon AQMA was revoked in March 2018.

The adjacent North East Lincolnshire Council (NELC) has also declared two AQMAs (Immingham (also for PM_{10}) and Grimsby (for NO_2)). The Immingham AQMA was revoked in 2016 and the Grimsby AQMA is located over 10km to the southeast of the Installation. Given the distance of all the AQMAs from the Installation, it is considered that no significant impacts could occur at these locations as a result of the emissions from the VPI Immingham Energy Park A.

For the purpose of identifying potential human receptors in the vicinity of the Installation, the distance is defined (unless otherwise stated) as the shortest distance between the Installation's boundary and the receptor. Receptors potentially affected by emissions from the Installation including local residential and amenity receptors have been identified through desk studies of local mapping and consultation.

Table 7-1: Human Health Receptors in the Vicinity of the Installation

ID	Receptor Name	Receptor Type	Distance (km) and Direction
R1	Hazel Dene	Residential	0.7km East
R2	Station House	Residential	1.1km Northeast
R3	Fairfield House, North Garth	Residential	2.2km Northwest
R4	Old Vicarage, North Garth	Residential	2.1km Northwest

[7] https://www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits

ID	Receptor Name	Receptor Type	Distance (km) and Direction
R5	Manor Farm, North Killingholme	Residential	1.9km Northwest
R6	Church Lane, North Killingholme	Residential	1.6km West
R6	Westfield Farm, North Killingholme	Residential	1.8km West
R8	Staple Road, South Killingholme	Residential	1.7km Southwest
R9	Humber Road, South Killingholme	Residential	1.4km Southwest
R10	South Killingholme Primary School	School	1.9km Southwest
R11	East End Farm	Residential	1.3km Southwest
R12	Immingham	Residential	2.2km South
R13	Allerton Primary School	School	2.0km Southeast

7.1.2 Sensitive Environmental Habitats

Ecological receptors potentially affected by operational emissions have been identified through desk study of Defra Magic mapping[8]. Statutory designated sites (including Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites and Sites of Special Scientific Interest (SSSIs)) up to 15km have been included in the assessment; and non-statutory designations Local Wildlife Sites (LWS) and Sites of Nature Conservation Interest (SNCI) within 2km have been identified. No national (UK) designated sites, or local nature reserves (LNRs) have been identified within 2km of the Installation.

Statutory designated sites up to 15km from the Installation are listed in Table 7-2.

Table 7-2: European Designated Ecological Receptors in the Vicinity (within 15km)

ID	Receptor	Designation	Distance and Direction from Installation (km)
E1	Humber Estuary	SAC, SPA, Ramsar	1.4 km East
E2	North Killingholme Haven Pits	SSSI	2.0km North
E3	Swallow Wold	SSSI	11.9km South
E4	Wrawby Moor	SSSI	14.2km Southwest

In addition to the above statutory sites, there are several local designated sites consisting of LWSs and SNCI within 2km of the Installation site. These sites are listed below in Table 7-3.

ID	Receptor	Designation	Distance and Direction from Installation (km)
E5	Eastfield Road Railway Embankment	LWS	1.2km Southwest
E6	Burkinshaws Covert	LWS	0.5km North
E7	Rosper Road Pools	LWS	0.7km Southeast
E8	Chase Hill Wood	LWS	1.6km Northwest
E9	Mayflower Wood Meadow	LWS	1.4km Southwest
E10	Homestead Park Pond	LWS/SINC	2.0km Southeast
E11	Eastfield Road Pit	SINC	1.1km Southwest

[8] https://magic.defra.gov.uk/MagicMap.aspx, accessed on 24/10/2018

7.1.3 Hydrology

A review of Ordnance Survey maps indicated that the Installation site is located approximately 1.4km west of the River Humber, which flows northwest to southeast. The River Humber is a designated SAC, SPA and Ramsar site.

IDB drains run along the southern and western Installation site boundaries, and a small water storage pond is located approximately 80m west of the Installation site.

The Installation site is located in an area where the EA issue flood warnings, and within flood risk zone 3a, meaning there is a high (greater than 1 in 100) annual probability of flooding. Flood defences are located along the banks of the River Humber and the area falls under the jurisdiction of North East Lindsey IDB.

Further details of the hydrology at the Installation site and surrounding areas are provided in the Application Site Report (see Appendix C).

7.1.4 Geology

The Groundsure Geoinsight report records that the area adjacent to the north-western part of the Installation site lies within an area of historic surface ground workings associated with the disposal of liquid sludge from the LOR site. Anecdotal information from discussions with LOR site staff indicates that the area where the liquid waste was deposited was confined to the former field to the north of the site, and no liquid sludge was directly deposited on the Installation site.

Aerial imagery and topographical surveys show the eastern portion of the Installation site to be occupied with stockpiles. Discussions with LOR staff indicate that the stockpiles originated from topsoil and subsoil generated during reprofiling and construction of the car park in the northern portion of the site.

Superficial drift deposits on the Installation site are likely to comprise glacial deposits, comprising glacial till and glacial sands and gravels. More recent tidal flats alluvial deposits are shown to be present to the south of the site, but not extending onto the Installation site.

The 2006 Soil Mechanics Interpretative Report describes the glacial deposits as comprising “slightly sandy, slightly gravelly clay. The sand and gravel component comprises subangular to subrounded chalk, occasionally sandstone and shell fragments.”

Borehole logs from the 2006 Soil Mechanics Interpretative Report record glacial deposits are typically 16m to 20m thick near the northern area of site. This thickness is indicated by the 2006 ABB report to increase to 26m in BH7 (centre of the site). No data is available beyond the central area of Installation site however considering that the bedrock surface was found to be lying as deep as 45m below ground level in British Geological Survey (BGS) borehole logs approximately 1km south of the site, it is possible that the thickness of these deposits increases further in the southern half of the site.

The site is underlain by the Burnham Chalk Formation of the Upper Cretaceous period. The BGS Lexicon describes the Burnham Chalk Formation as “White, thinly-bedded chalk with common tabular and discontinuous flint bands; sporadic marl seams”. The upper 10m to 20m of the bedrock is frequently described as “soft chalk”, overlying “hard chalk and flints”, indicating that the upper part of the Chalk is extensively weathered.

Further details of the geology of Installation site are provided within the Application Site Report (Appendix C).

7.1.5 Hydrogeology

Consultation with the EA Aquifer Maps indicates that:

- The superficial glacial deposits are classified as a ‘Secondary Aquifer (undifferentiated)’, defined either as ‘permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers’, or ‘lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, tin permeable horizons and weathering’.
- The bedrock, Burnham Chalk Formation, is classified as a Principal Aquifer, defined as ‘highly permeable formations usually with a known or probable presence of significant fracturing. They

may be highly productive and able to support large abstractions for public supply and other purposes.

The 2006 Soil Mechanics ground investigation showed water was encountered within the more granular horizons within the glacial deposits in BH5 (located north of the Installation site). An initial water strike at 4.3m below ground level (bgl) subsequently rose slightly to give a resting water level of 3.9m bgl after 20 minutes, confirming shallow groundwater is expected to be sub-artesian in nature.

Additionally, during the 2009 - 2010 Highways England ground investigation, groundwater was encountered within the thicker granular glacial deposits, and in thin granular horizons within the glacial till, between depths of 2.4m and 15m bgl (-4.7 to -11.9m AOD). Again, sub-artesian groundwater conditions were noted in several locations where groundwater was encountered, with borehole water level rises of up to 8.3m.

The is not located within any drinking water safeguard zones (both groundwater and surface water).

7.1.6 Pathways for Pollution

In order for a pollution risk to occur, there has to be a source – pathway – receptor (S-P-R) linkage.

Pathways to sensitive receptors primarily include, but are not limited to, the following:

- Chemicals and lubricating oil required for the operation of the Installation might leach into the ground and be washed into surface water or groundwater through the underlying soils.
- Combustion gases from the Installation might be dispersed in the air to sensitive receptors.

In order to prevent and minimise the risk of pollution, the Installation will be designed and managed to isolate or reduce the effectiveness of these pathways, preventing contaminants from migrating off-site other than through properly managed abatement systems.

The detailed description provided in Appendix D of this supporting document demonstrates how BAT has been applied to prevent pollution from the Installation.

7.2 Impact Assessment

The following sections provide an assessment of the impact of releases from the Installation, so as to underpin and justify the measures that will be put in place for their control and that will adequately protect the environment.

The risk assessment approach has been based on the following four sequential stages:

- Identify risks from the activity;
- Assess the risks and check that they are acceptable;
- Justify appropriate measures to control the risks, if necessary; and
- Present the assessment as detailed in the EA's Risk Assessment Guidance[9].

Activities with the potential to impact on the surrounding environment have been identified in line with guidance provided in the EA's Risk Assessment Guidance, including:

- Amenity and accidents;
- Emissions to surface water;
- Emissions to air;
- Site waste;
- Global warming potential; and
- Emissions to groundwater.

[9] https://www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits

7.3 Amenity and Accidents

A qualitative risk assessment has been undertaken for the Installation and is included in Appendix F of this document.

A short description of the key potential risks from the Installation is provided in the following subsections.

7.3.1 Odour

Given the nature of the operations to be undertaken at the Installation, it is expected that odour from the proposed operations will not be a significant issue and therefore does not require additional management, e.g. through a formal odour management plan (OMP).

7.3.2 Noise and Vibration

A review of the noise assessment undertaken as part of the Planning application has concluded that the noise mitigation measures included within the ES, addressing the installation of 33 engines, are considered to be applicable to the engines being installed. These are summarised below and also within the noise assessment in the ES (Appendix B).

The ES assessment applied an 'acoustic feature correction' of +5 dB(A) to the predicted operational 'specific sound level' to provide the 'rating level'. Paragraph 8.6.27 of the Noise assessments states that '*A conservative BS4142 character correction of + 5 dB has been applied, on the assumption that the engine exhausts may include some residual tonal characteristics, although the intension is for these potential features to be designed out of the Proposed Development during the detailed design phase by the selection of appropriate plant, building cladding louvres and silencers/attenuators. This is considered conservative in the context of the prevailing noise environment, which is dominated by existing industrial sources*.' Assuming this approach is equally applicable to the current proposed 11 x J624 engines as the 33 engines proposed for scenario 2, then the overall sound 'rating level' at the closest residential property is comparable.

The 2018 ES assessment also uses the existing background sound level at the closest residential property in reaching a conclusion on the magnitude of impact and significance of effect. The ES sets out how the existing baseline conditions at the property were determined based on '*routine monitoring undertaken for the Immingham CHP site'*. It has been assumed that these measurements are still valid and therefore the same background sound level is applicable at the closest residential property as adopted in the ES.

During the detailed design stage, the plant will be designed to meet the noise limits presented in this assessment. The potential significant noise effects will be mitigated by design, where possible and feasible.

Control of noise emission from the Installation can be achieved in several ways, taking into account the numerous sound sources associated with it, as listed below:

- Housing the engines and generators within acoustic enclosures such as separate containers;
- Engines located within a pre-cast concrete enclosure; and
- Fitting appropriate in-line silencing to engine inlets and exhaust.

As the detailed design progresses additional noise control benefit may be derived from screening of certain sources by other structures on the site.

7.3.3 Fugitive Emissions

Based on the various controls placed on the Installation's plant and equipment, it is expected that fugitive emissions, particularly process emissions to air and water will be negligible.

7.3.4 Visible Plumes

The potential for visible plumes from the emission stacks (Emission Points A1 – A11) is considered to be very low as a result of the low water content and high temperature of the flue gas. There is no steam cycle or wet cooling tower plume associated with the operation of the gas engines at the Installation; therefore, visible condensing plumes are not expected to occur.

7.3.5 Accidents

A Safety Management System will be developed for the Installation which will include an Emergency Response Plan. The integrated ventilation system in each engine room will have a gas and fire alarm and will control and manage the operation of the generators based on the temperature of the engine room. If the ventilation system trips for any reason, the engine will automatically shut down.

In the event of a fire, the surface water drainage system would be isolated to prevent contaminated water being released through the surface water drainage system. Fire water would be contained onsite as far as practicable and either disposed off-site in compliance with waste management legislation (if contaminated) or discharged to surface water in accordance with the Environmental Permit, if the water quality is acceptable for surface water discharge (and subject to agreement with the EA). This strategy aims to prevent pollution of surface and groundwater waterbodies.

A number of environmental protection measures will be implemented onsite via the EMS to prevent and control spill events, including but not limited to:

- Procedures to deal with accidental pollution, along with any necessary equipment required by the procedures (e.g. spillage kits), will be held on the Installation site and all personnel will be trained in their use. The EMS will incorporate details on how to appropriately deal with accidental spillages to ensure they are not released into any surface water system;
- Implementation of containment measures, including bunding or double-skinned tanks for fuels and oils. All chemicals will be stored in accordance with their COSHH guidelines;
- Incorporation of interceptors into the drainage system to prevent any spilled oil or fuel entering the surface water drainage system or local water bodies.

The only abnormal operating conditions that will exist for the Installation will include events of emergency shutdowns, or failure of plant. These events will be managed within the EMS in order to reduce emissions to air and/ or to water during other than normal operating conditions from the Installation including the following elements:

- Set-up and implementation of a specific preventive maintenance plan for these relevant systems;
- Review and recording of emissions caused by abnormal events and associated circumstances and implementation of corrective actions if necessary;
- Periodic assessment of the overall emissions during abnormal events (e.g. frequency of events, duration, emissions quantification/ estimation) and implementation of corrective actions if necessary.

This plan would be regularly reviewed and amended as required to reflect the operation of the Installation.

As such, the appropriate design of the systems, including low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation, will be implemented at the Installation.

7.3.6 Flood Risk Assessment

The EA Flood Maps[10] show that the Installation is located in Flood Zone 3a (high risk of flooding). A detailed Flood Assessment plan is therefore not considered to be required for the Installation.

As a best practice measure, flood resilience measures will be incorporated into the design of the plant where appropriate so as to minimise the amount of damage and reduce the recovery time of the Installation in the unlikely case of the Installation site becoming flooded. These measures include:

- Pipelines and storage tanks used for the Installation will be designed to withstand the water pressures associated with high return period event flooding. Tanks will be bunded to a level as high as reasonably practical taking into account operational requirements. The tanks will be securely tethered in such a way to ensure the infrastructure remains secure during a flood event;
- Pollution control measures will be considered to prevent/ reduce the chance of any fuel stored onsite leaking. This will also assist with reducing the recovery time and costs at the Installation

[10] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

following flooding, by minimising the risk of possible contamination of the fuel stores by water ingress; and

- The expected 0.5% climate change scenario flood depth is 5.93mAOD (for the year 2083) and therefore the floor level of the site will be set at 5.93mAOD, to protect critical equipment.

7.4 Emissions to Water

There will not be any direct discharges to the ground/ groundwater of process water from the activities proposed by this application. Due to the inherent nature of the proposed activities, it is anticipated that the quantity of process water generated by the activity will be minimal.

As the Installation will be an active industrial site, pollution controls will be required to prevent accidental discharge of pollutants such as hydrocarbons with surface water. Pollution prevention is being considered throughout the design phases and will be undertaken as detailed below:

- The design of oil interceptors will be undertaken based on manufacturer supplied information. Provision will be made where appropriate to prevent silt and debris from entering the drainage system in accordance with Building Regulations 2010;
- Double bunded storage tanks will be used to ensure that accidental spillages of oil/ fuel will not enter the surface water network.

7.5 Emissions to Air

An air dispersion modelling exercise has been undertaken to assess the impact on local air quality as a result of the anticipated emission levels identified in Table 5-1 above. A copy of the air quality assessment is included in Appendix E and the key findings are summarised below.

7.5.1 Impact on Local Air Quality

The Installation will be designed such that combustion plant emissions to air comply with the emission requirements specified in the MCPD (i.e. ELVs).

The air quality impact assessment has been carried out with reference to the EA Risk Assessment methodology for Environmental Permitting. Detailed dispersion modelling has been used to calculate the concentration of pollutants at identified sensitive receptors and these have been compared with National Air Quality Strategy objectives, and Critical Levels and Critical Loads for ecosystems (hereafter referred to as Environmental Standards), with consideration for the baseline air quality and ecological deposition rates, in accordance with EA methodology.

Conservative assumptions have been made with regard to the operational parameters, to determine the maximum potential effects of the operation of the Installation on sensitive receptors. These assumptions include:

- Worst case MCPD NOx emissions limits (NOx 95mg/Nm^3 as an annual average);
- The assessment of annual average emissions for the maximum of 2,250 hours operation in one year; and
- The assessment of hourly average impacts assuming continuous operation throughout the year, to ensure that the worst-case meteorological conditions are taken into account.

The actual hours of operation of the VPI Immingham Energy Park A will be subject to the national demand for electricity and the economic viability of gas-fired generation. The likely operation of the plant would be to meet short-term peak demand, and therefore the plant would be likely to operate for periods of only a few hours at a time.

The in-combination impacts of the Installation together with the adjacent planned VPI-B OCGT Peaking Plant have also been assessed. This assessment also includes a number of worst-case assumptions, namely:

- Assessment of short-term impacts from the OCGT at IED limits, over the whole year to ensure meteorological conditions that lead to the worst-case impacts are taken into consideration; and;

- Assessment of annual average impacts from the OCGT at IED limits assuming operation of 2,250 hours per year, as the maximum annual operation taking into consideration an average of 1,500 hours operation over a 5-year rolling average.

7.5.2 Detailed Dispersion Modelling Results

The impact of the Installation's process contribution, from point source emissions, at human health receptors has been determined from isopleth figures for pollutant dispersion and the maximum model output has been used at discrete receptor locations.

The maximum NO_2 short-term process contribution (PC) at the worst-case location is not screened as "insignificant" by the dispersion modelling and the maximum hourly mean PC (as 99.79th percentile) represents 42% of the relevant Environmental Standard. The maximum impacts occur very close to the Installation Boundary and within the VPI-B Installation Boundary and is therefore not in an area where the general public can access. Predicted impacts at the worst-case human health receptor are considerably less than this, with a PC at the worst-case receptor (R1 Hazel Dean) predicted to represent 9% of the Environmental Standard, and therefore is considered to be insignificant at the first stage of screening. It is therefore considered that the short-term impacts from the VPI Immingham Energy Park A will be very unlikely to result in any exceedance of the hourly NO_2 Environmental Standard at any human health receptor. It should also be noted that this assessment includes the operation of the Black Start diesel engine, which will only be operated for very short periods for testing purposes, estimated to be up to 12 hours per year.

The maximum NO_2 annual mean process contribution (PC) at the worst-case location is 16% of the Environmental Standard, and therefore cannot be screened as insignificant at the first stage of screening. At the maximum human health receptor (R1 Hazel Dene) the maximum long-term PC is considerably reduced and represents 2% of the Environmental Standard. The second stage of assessment allows the Predicted Environmental Concentration (PEC) to be compared to the Environmental Standard. The annual average PEC at the worst-case receptor is 15.6µg/m^3, which represents 39% of the annual NO_2 Environmental Standard, and therefore is well below the Environmental Standard and therefore it is considered that the long-term impacts from the VPI Immingham Energy Park A will be very unlikely to result in any exceedance of the annual average NO_2 Environmental Standard at any human health receptor.

The maximum 1-hour and 8-hour mean process contributions of CO at maximum off-site impact locations are below the threshold for insignificance for short-term impacts, with worst-case PC of 3% of the 1-hour mean and 8% of the hourly mean Environmental Standard.

The results for the in-combination impacts with the adjacent planned VPI-B OCGT Peaking Plant are comparable with those to the VPI Immingham Energy Park A Installation on its own. This is due to the lower stack height of the gas engines resulting in ground level impacts occurring closer to the emission sources than for the OCGT. Again, although at the maximum human health receptor (R2 Station House) the maximum long-term PC represents 2% of the Environmental Standard and therefore cannot be screened as insignificant at the first stage of screening, the PEC is still only 15.7µg/m^3, which represents 39% of the annual NO_2 Environmental Standard, and therefore is well below the Environmental Standard.

The predicted annual average NOx concentration is below the 1% screening threshold to demonstrate insignificance at all designated sites except at the E1 SAC, SPA and Ramsar. The PEC represents 68% of the Environmental Standard at this site, and therefore it is considered that an exceedance would be very unlikely as a result of the operation of the Installation.

At the E6, E7 and E8 Local Wildlife Sites the PECs are 57%, 58% and 60% respectively and are therefore considered to be acceptable when compared to the EA's screening methodology for such sites.

The predicted deposition of nutrient nitrogen and acidity concentrations presented are below the 1% screening threshold at all statutory habitat receptors for the Installation on its own, and when operational with the VPI-B OCGT. The impacts at statutory sites can therefore be considered to be insignificant.

7.6 Site Waste

The proposed activities will use natural gas as a fuel which has a low potential to generate waste.

An assessment of the potential waste arisings from the proposed activities indicates that during operations, the peaking plant would generate waste lubricating oil, this will be stored in a dedicated tank having a capacity of 5,000 litres. Once this tank is full, the waste oil will be taken off-site for disposal by a licence waste contractor.

In addition to minor quantities of general domestic and industrial waste; primarily from maintenance activities.

All operational waste will be dealt with in accordance with the Installation's waste management procedures, and consigned via a registered waste carrier for treatment or disposal at a suitably licenced waste facility.

It is therefore considered that further assessment of the waste from the proposed Installation operations is not required.

7.7 Global Warming Potential (GWP)

This section is based on guidance presented in the EA's Assess the impact of air emissions on global warming[11].

The release of greenhouse gas emissions is anticipated primarily from the direct emissions produced or associated with energy and fuel use. The Installation will not import any electricity from the National Grid, and will utilise some of the electricity generated at the Installation for its use (as a parasitic load).

These releases have been identified and their global warming potential calculated below.

The anticipated emission of carbon dioxide resulting from the peaking plant from the consumption/ generation of energy is summarised in Table 7-3.

Table 7-3: Energy Consumption

Energy Source	Energy Consumption Primary		
	At Primary Source MWh	CO_2 Emission Factor kg/MWh	Annual CO_2 Emissions (tonnes)
Natural Gas (Peaking Plant)	238.5	190	45,315

The amount of energy consumed by the generating station itself when it is generating can be up to 1.63MW per year, and this has not been included in direct energy use. The parasitic load of the installation is estimated to generate annual CO_2 emissions of 600 tonnes, based on a CO_2 Emission Factor of 166kg/MWh.

[11] Guidance: Assess the impact of air emissions on global warming, EA, published 01st February 2016, available at: https://www.gov.uk/guidance/assess-the-impact-of-air-emissions-on-global-warming accessed on 04th July 2018

Appendix A - Figures

Figure 1 – Installation Location

Figure 2 – Installation Layout

Revision: 1 Drawn: LC Checked: DF Approved: AS Date: 2022-09-16

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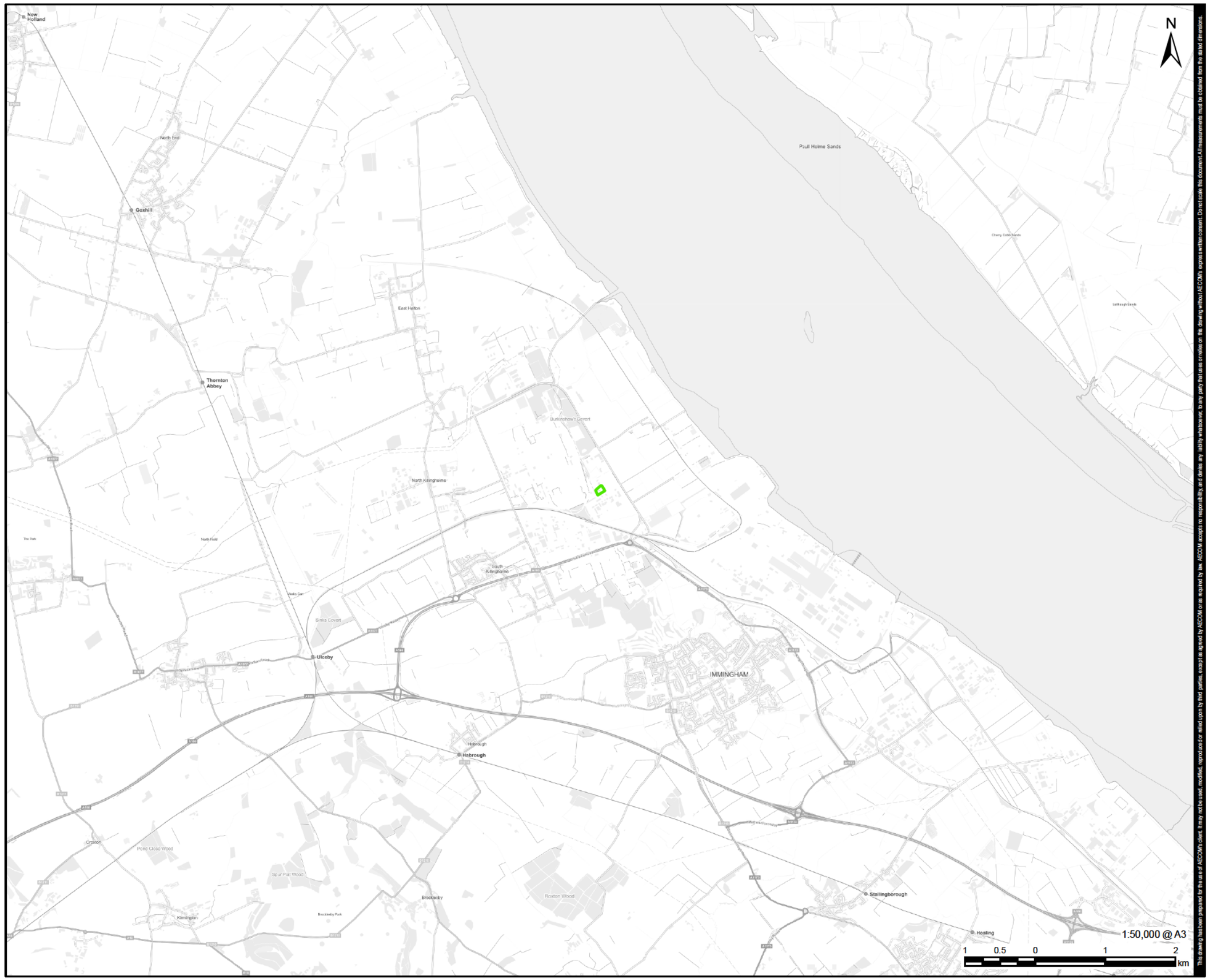

AECOM

PROJECT

VPI Immingham Energy Park A Power Plant

CLIENT

VPI Immingham Energy Park A Limited

CONSULTANT

AECOM Limited
One Trinity Gardens
Newcas le
NE1 2HF
www.aecom.com

LEGEND

Installation Boundary

NOTES

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ISSUE PURPOSE

PERMIT VARIATION APPLICATION

PROJECT NUMBER

60685042

FIGURE TITLE

Installation Location

FIGURE NUMBER

Figure 1

Revision: 2 Drawn: LC Checked: DF Approved: AS Date: 2022-09-21

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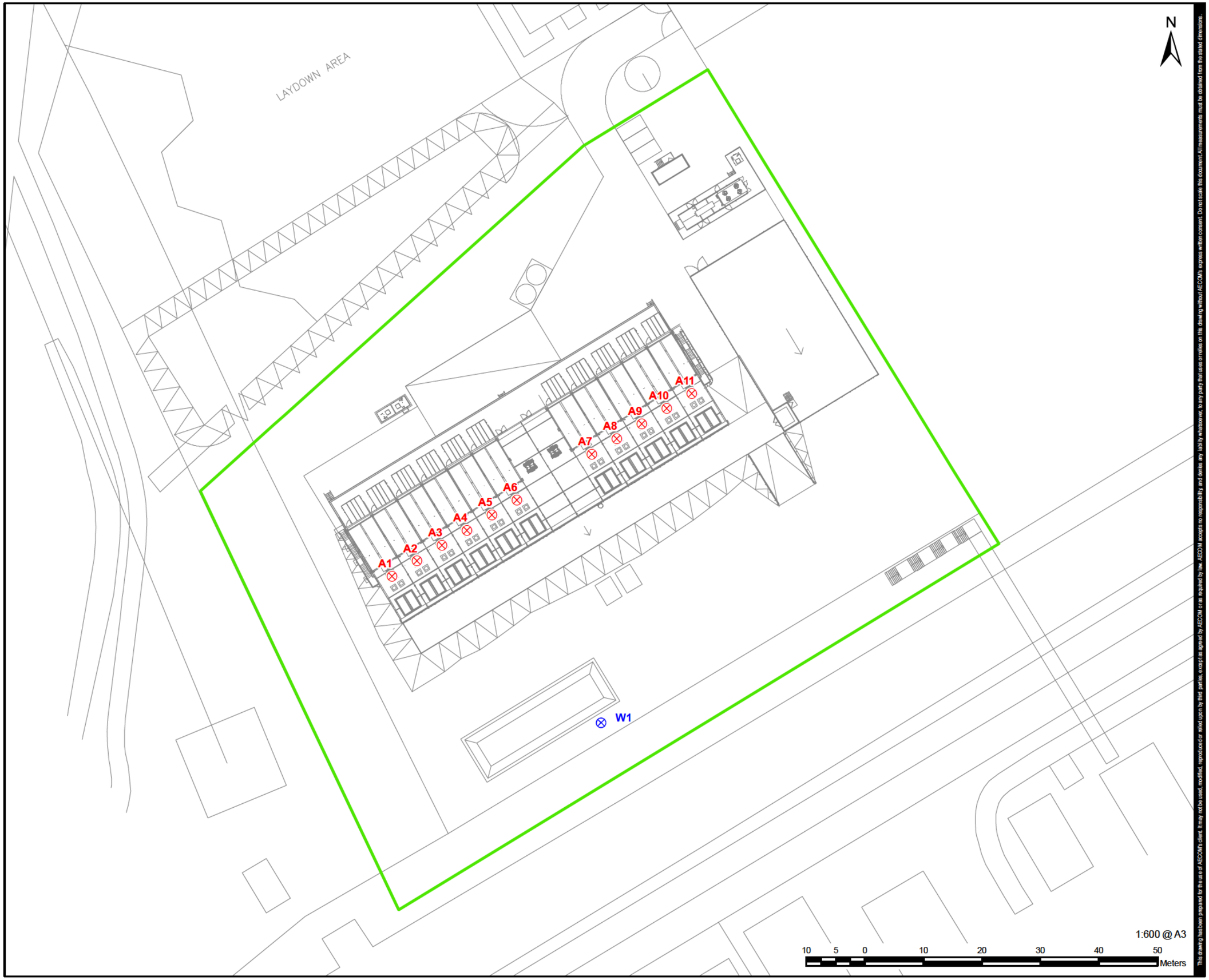

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CONSULTANT

AECOM Limited
One Trinity Gardens
Newcas le
NE1 2HF
www.aecom.com

LEGEND

- Installation Boundary
- Emission Point to Air
- Emission Point to Water

NOTES

ISSUE PURPOSE

PERMIT VARIATION APPLICATION

PROJECT NUMBER

60685042

FIGURE TITLE

Installation Location

FIGURE NUMBER

Figure 2

Appendix B – Environmental Statement

See separate electronic folder.

Appendix C – Application Site Report

AECOM

Environmental Permit Application

VPI Immingham Energy Park A
Appendix C – Application Site Report

VPI Immingham Energy Park A Limited

Project number: 60685042
60685042-EP-002

November 2022

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
Aakanksha Sinha Principal Environmental Permitting Consultant	Helen Watson Associate Director	Alex Freeman Associate Director	Helen North Project Manager

Revision History

Revision	Revision date	Details	Authorized	Position
1	13th September 2022	Initial draft	Helen North	Project Manager
	24th November 2022	Final	Helen North	Project Manager

Prepared for:

VPI Immingham Energy Park A Limited

Prepared by:

Aakanksha Sinha
Principal Environmental Permitting Consultant
M: 07824-846-255
E: aakanksha.sinha@aecom.com

AECOM Limited
5th Floor, 2 City Walk
Leeds LS11 9AR
United Kingdom

T: +44 (0)113 391 6800
aecom.com

Table of Contents

Tables

1. Introduction

This document supports the Environmental Permit application submitted by VPI Immingham Energy Park A Limited ('VPI-A') under the Environmental Permitting (England and Wales) Regulations 2016, as amended ('the EP Regulations'), for the operation of a gas-fired peaking generating station on land adjacent to the existing VPI Immingham LLP's Combined Heat and Power (CHP) Power Plant ('VPI Immingham CHP Power Plant') at South Killingholme, Immingham. The new VPI-A gas-fired peaking generating station is hereafter referred to as the 'VPI Immingham Energy Park A' or 'the Installation').

VPI-A proposes to install a peaking power station consisting of 11 gas engines with a maximum gross electrical output of up to 49.5 MW and will export electricity to the UK electricity transmission system (the 'National Grid') through the existing substation infrastructure on the adjacent VPI Immingham CHP Power Plant.

This document sets out the condition of the land on which the Installation will be situated, as it is at present, setting out the baseline prior to commencement of the listed activities. This document has been prepared on the basis of guidance provided in H5 - Site condition report – guidance and templates[1].

2. Site Details

Name of the applicant	VPI Immingham Energy Park A Limited
Activity address	VPI Immingham A Energy Park, Land to the north of the existing VPI Immingham CHP Power Plant, Rosper Road, South Killingholme, Immingham, DN40 3DZ
National grid reference	TA 516641 618468 Site location shown in Annex A – Figure 1

3. Condition of Land at Permit Issue

Environmental setting including:

- Geology
- Hydrogeology
- Surface waters

3.1 Geology

The British Geological Survey (BGS) 1:50,000 solid and drift geology map indicates that the Installation site is underlain by superficial deposits comprising Devensian aged glacial till, overlying bedrock comprising chalk of the Upper Cretaceous Burnham Chalk Formation. This is in general agreement with local historic boreholes accessed through the BGS, and reflected the geology encountered during the Phase 2 ground investigation.

3.1.1 Superficial Geology – Made Ground

During the Phase 2 ground investigation, Made Ground was present across the northern and eastern part of the Installation site.

The typical thickness of made ground encountered was approximately 1m, with a minimum of 0.3m and a maximum thickness of 1.4m.

Made ground deposits typically comprise brown through to black slightly sandy gravelly clay, with gravel of slag, sandstone, mudstone and chalk.

[1] H5 - Site condition report – guidance and templates, Version 3.0, EA, April 2013

3.1.2 Superficial Geology – Natural Deposits

Superficial deposits encountered on the Installation site extend to a depth of up to 27.5m, and comprise glacial deposits, comprising glacial till and occasional horizons of glacial sands and gravels.

Deposits encountered typically comprised clay, described as stiff, becoming very stiff with increasing depth.

3.1.3 Bedrock Geology

Published geological maps indicate that the Installation site is underlain by the Burnham Chalk Formation of the Upper Cretaceous period. Local historic boreholes indicate that the upper surface of the Chalk is typically located between approximately 18m and 20m below ground level (bgl). The upper 10m to 20m of the bedrock is frequently described as “soft chalk”, overlying “hard chalk and flints”, indicating that the upper part of the Chalk is extensively weathered.

Chalk bedrock was encountered on the Installation site boreholes to a variable depth from 21.5m to 27m.

3.2 Hydrology

A drainage ditch is located within the Installation site boundary. Local land drains are situated parallel with and directly adjacent to the Installation boundary along all directions. There are small watercourses located approximately 50m to the west of the site. Additional land drains are situated circa 50m and 120m to the west and north of the Installation site respectively.

The Humber Estuary is located approximately 1.4km to the east of the Installation.

Other water features in the vicinity of the Installation include a water storage lagoon around 50m west of the Installation, settling lagoons approximately 90m to the south-west of the Installation and Rosper Road pools approximately 740m to the south-east of the Installation.

There are no surface water abstractions for potable water within a 2km radius of the Installation.

There are four Licensed Discharge Consent records within a 0.5km radius of the Installation. Of these, all but one are listed as ‘revoked’. The active consent for the Lindsey Oil Refinery is for sewage discharge to the local land drain to the north-east of the Installation.

3.2.1 Flooding

The Environment Agency (EA) Flood Map indicates that the predominant flood risk on the Installation is associated with tidal flooding from the Humber Estuary located approximately 1.4km to the east.

The EA Flood Zone Map shows that the Installation site is located in Flood Zone 3a (high risk) and Flood Zone 2 (medium risk). The area to the north and north-west of the Installation (construction laydown area) is located in Flood Zone 1 (low risk). There are no formal flood defences in close proximity to the Installation; however, there are tidal flood defences in place along the entire south bank of the Humber Estuary. There are existing defences to the north and east of the Installation.

The EA has stated that the tidal flood defences provide protection against a flood event with a 0.5% chance of occurring in any year, based on the Still Water Tidal Water Levels.

The flood defences are owned both privately and by the EA and the EA has confirmed that the condition of the flood defences are classed as either ‘good’ (Condition Grade 2) or ‘fair’ (Condition Grade 3). The EA inspects these defences regularly to ensure that any potential defects are identified early.

Given the nature of the managed catchment with small watercourses of sufficient capacity, fluvial flood risk is considered to be low.

3.3 Hydrogeology

The superficial glacial deposits are classified by the EA as Secondary A (Undifferentiated) Aquifer, defined by the EA as 'an aquifer where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'.

The bedrock geology of Burnham Chalk Formation is classified as a Principal Aquifer, defined by the EA as 'layers of rock or drift deposits that have high intergranular and/ or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/ or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

There are no groundwater abstractions licenced within 2km of the Installation site.

3.4 Previous Land Use

Table 3-1 details the history of the Installation site, based on available OS historical mapping.

Table 3-1: Summary of Installation Site History

Year	On Site
1886 - 1887	Marsh land; Rosper Road present; East Middle Mere Road present.
1906 - 1910	No significant change.
1930 - 1947	No significant change.
1951	Drainage system in place.
1968	No significant change.
1974	Railway sidings present (west).
1983	No significant change.
2002	Pipeline on southern border of Installation site.
2010	No significant change.
2014	No significant change.
2017 aerial image (Google Earth)	Construction of Canteen building adjacent to the carpark; Construction laydown area now mostly empty; Changes to stockpile layouts across the site.

Pollution history including:

- Pollution incidents that may have affected land
- Historical land-uses and associated contaminants
- Any visual/ olfactory evidence of existing contamination
- Evidence of damage to pollution prevention

3.5 Licenced Installations with Pollution Potential

Active licenced sites within 500m of the Installation are listed below:

- Part A(1) and IPPC Authorised Activities – Related to the Immingham CHP plant.
- List 1 and 2 Dangerous Substances Inventory Sites – Related to the Phillips 66 Humber Refinery site.
- Licensed Discharge Consents - Related to sewage discharge from Lindsey oil refinery.
- Planning Hazardous Substance Consents and Enforcements - Related to VPI Immingham CHP Power Plant – Consent to store 3050 tonnes of petroleum gas oil
- Dangerous or Hazardous Sites - On site current COMAH site (lower tier) relating to VPI Immingham CHP Power Plant; and 2 off-site current

	COMAH sites (both upper tier) relating to the Total Lindsey Oil Refinery (100m north-east) and Phillips 66 Humber refinery (370m south).

3.6 Visual or Olfactory Evidence of Pollution

Hydrocarbon odours were noted in made ground beyond the Installation Boundary to the north of the Installation site, this can be attributed to the historical landfill related to liquid sludge disposal from the Lindsey Oil Refinery. However, no hydrocarbon odours were identified in the boreholes located within the installation boundary during the ground investigation.

No other evidence of prior pollution was noted during the ground investigation.

Baseline soil and groundwater reference data	Annex B – Phase 2 Ground Investigation

4. Permitted Activities

Permitted activities	Section 1.1 Part A(1)(a): Burning of any fuel in an appliance with a rated thermal input of 50MW or more.
Non-permitted activities undertaken	N/A
Document references for: Plan showing activity layout; and Environmental risk assessment.	Annex A - Figure 2 Table 4-1, and Appendix F of document reference: 60685042-EP-001.

As demonstrated in Table 4-1, the activities undertaken at the Installation and the associated pollution prevention and containment measures are considered to represent a negligible risk of pollution to the underlying soil and groundwater, hence no collection of baseline data is proposed.

The Installation will maintain an incident register throughout the lifetime of the operations which will log any losses of containment or near misses, and record whether the loss was contained within the Installation's systems (as expected) or managed to enter the underlying soil and groundwater, in which case the clean-up and remediation activities undertaken will be recorded.

The Installation will also maintain an infrastructure monitoring log to record the schedule inspection and maintenance of containment systems e.g. lubrication oil tank and bunding, and any significant maintenance or repair activities required.

A Conceptual Site Model (CSM) for the Installation is presented in Chapter 7 of the Phase 1 Geo-environmental Assessment (Appendix 12A of the Environmental Statement, provided in Appendix B of 60685042-EP-001).

Table 4-1: Environmental Risk Assessment from Raw Materials, and Wastes at the Installation

Substances	Relevant activity	Pollution Potential	Nature of primary containment	Testing and Inspection of primary Containment	Nature of secondary containment	Testing and Inspection of Secondary Containment	Nature of Tertiary Containment	Testing and Inspection of Tertiary Containment	Pollution prevention measures adequate?	Documented management system	Likelihood of pollution
Natural Gas	Delivery via pipeline	Loss due to leak in delivery pipework	Gas supply pipework	Pipework to be subjected to regular testing under Pressure Systems Safety Regulations.	N/A	N/A	N/A	N/A	Yes	Yes	Negligible
Diesel	Delivery by vehicle	Spillage during off-loading e.g. Flex hose/ connection failure	Road tanker/ retractable delivery hoses	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose.	The tanker connection will be housed within the tank container; this will be accessed via a lockable drop down access hatch. Any spills from coupling and uncoupling during the delivery will be contained within the bunded design of the tank	Visual inspection of the tank and the connection to ensure that it is in good working condition.	N/A	N/A	Yes	Yes - to be developed prior to 1st receipt of fuel	Negligible
Diesel	Storage	Leak from storage tank	950 litre tank	Integral tank with the generator unit.	The tank will be integral to the generator container. Any leaks from the diesel tank will be contained within the generator unit.	Regular visual inspection of tank and bunding, and testing of alarms.	N/A	N/A	Yes	Yes	Negligible
Cooling water with anti-freeze	Use in cooling circuit	Leak in the cooling circuit	Within sealed cooling circuit	Visual inspection of cooling circuit pipework and scheduled maintenance inspections.	N/A	N/A	N/A	N/A	Yes	Yes	Negligible

Substances	Relevant activity	Pollution Potential	Nature of primary containment	Testing and Inspection of primary Containment	Nature of secondary containment	Testing and Inspection of Secondary Containment	Nature of Tertiary Containment	Testing and Inspection of Tertiary Containment	Pollution prevention measures adequate?	Documented management system	Likelihood of pollution
				Scheduled coolant change-outs to minimise corrosion risk.							
Lubrication oil	Delivery by vehicle	Spillage during off-loading e.g. Flex hose/ connection failure	Road tanker retractable delivery hoses	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose.	The tanker connection will be housed within the tank container (i.e., the outer tank of the double skinned tank); this will be accessed via a lockable access hatch. Any spills from coupling and uncoupling during the delivery will be contained within the bunded design of the tank.	Visual inspection of the tank and the connection to ensure that it is in good working condition.	N/A	N/A	Yes	Yes - to be developed prior to 1st receipt of material	Negligible
Lubrication oil	Storage	Leak from storage	5,000 litre tank	Newly built double skinned tank. Will be subject to routine visual checks and inspection in line with manufacturer guidance.	The tank will be double skinned with leak detection.	Regular visual inspection of the outer tank both externally and internally to check for oil pools (which would indicate damage/ leak from the internal tank), and testing of alarms.	N/A	N/A	Yes	Yes	Negligible

Substances	Relevant activity	Pollution Potential	Nature of primary containment	Testing and Inspection of primary Containment	Nature of secondary containment	Testing and Inspection of Secondary Containment	Nature of Tertiary Containment	Testing and Inspection of Tertiary Containment	Pollution prevention measures adequate?	Documented management system	Likelihood of pollution
Water treatment chemicals	Storage	Leak from storage containers	Intermediate Bulk Containers (IBCs)	Chemicals to be stored in IBCs or other small containers within drip trays and other suitable bunds, in the dedicated store. These will be subject to routine visual checks and inspection in line with manufacturer guidance.	Drip trays and other appropriate bund for small containers.	Regular visual inspection of storage containers and drip trays.	Sealed drainage system in the store draining to the retention pond via oil water interceptors and waste-water sump.	Scheduled inspections	Yes	Yes	Negligible
Waste Lubrication oil	Storage	Leak from storage	5,000 litre tank	Newly built double skinned tank. Will be subject to routine visual checks and inspection in line with manufacturer guidance.	The tank will be double skinned with leak detection.	Regular visual inspection of bunding, and testing of alarms.	Site hardstanding and retention pond	Scheduled inspections	Yes	Yes	Negligible
Small quantities of waste chemicals	Maintenance	Leak from storage	Dedicated waste containers, with segregated storage of hazardous and non-hazardous waste.	New storage containers. Will be subject to routine visual checks and inspection.	The hazardous waste storage containers will be kept locked to prevent accidental loss.	Regular visual inspection of storage.	Site hardstanding and Containment sump	Scheduled inspections	Yes	Yes	Negligible

Annex A - Figures

- Figure 1 - Site Location
- Figure 2 – Site Layout

Revision: 1 Drawn: LC Checked: DF Approved: AS Date: 2022-09-16

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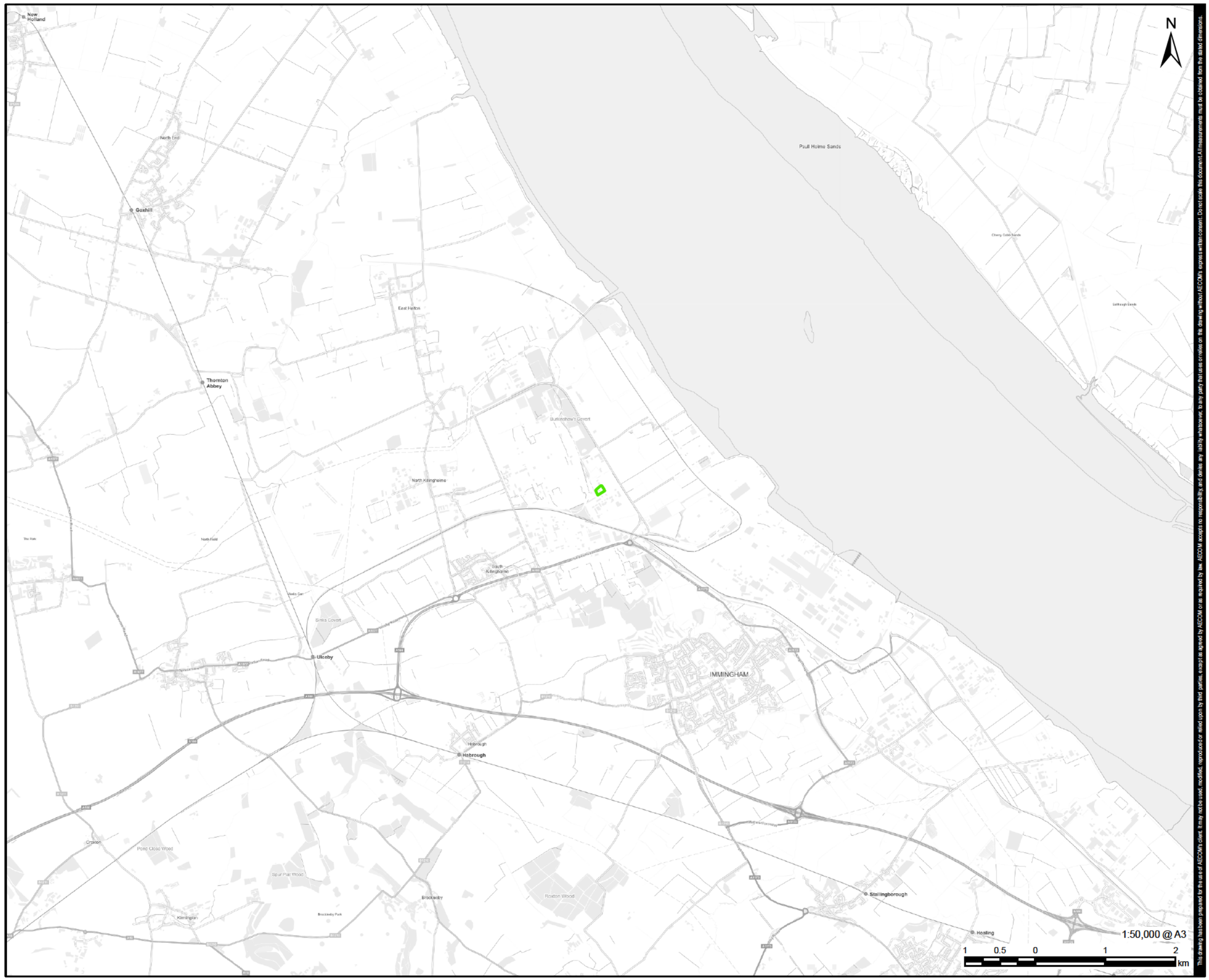

AECOM

PROJECT

VPI Immingham Energy Park A Power Plant

CLIENT

VPI Immingham Energy Park A Limited

CONSULTANT

AECOM Limited
One Trinity Gardens
Newcas le
NE1 2HF
www.aecom.com

LEGEND

Installation Boundary

NOTES

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Ordnance Survey 0100031673

ISSUE PURPOSE

PERMIT VARIATION APPLICATION

PROJECT NUMBER

60685042

FIGURE TITLE

Installation Location

FIGURE NUMBER

Figure 1

Revision: 2 Drawn: LC Checked: DF Approved: AS Date: 2022-09-21

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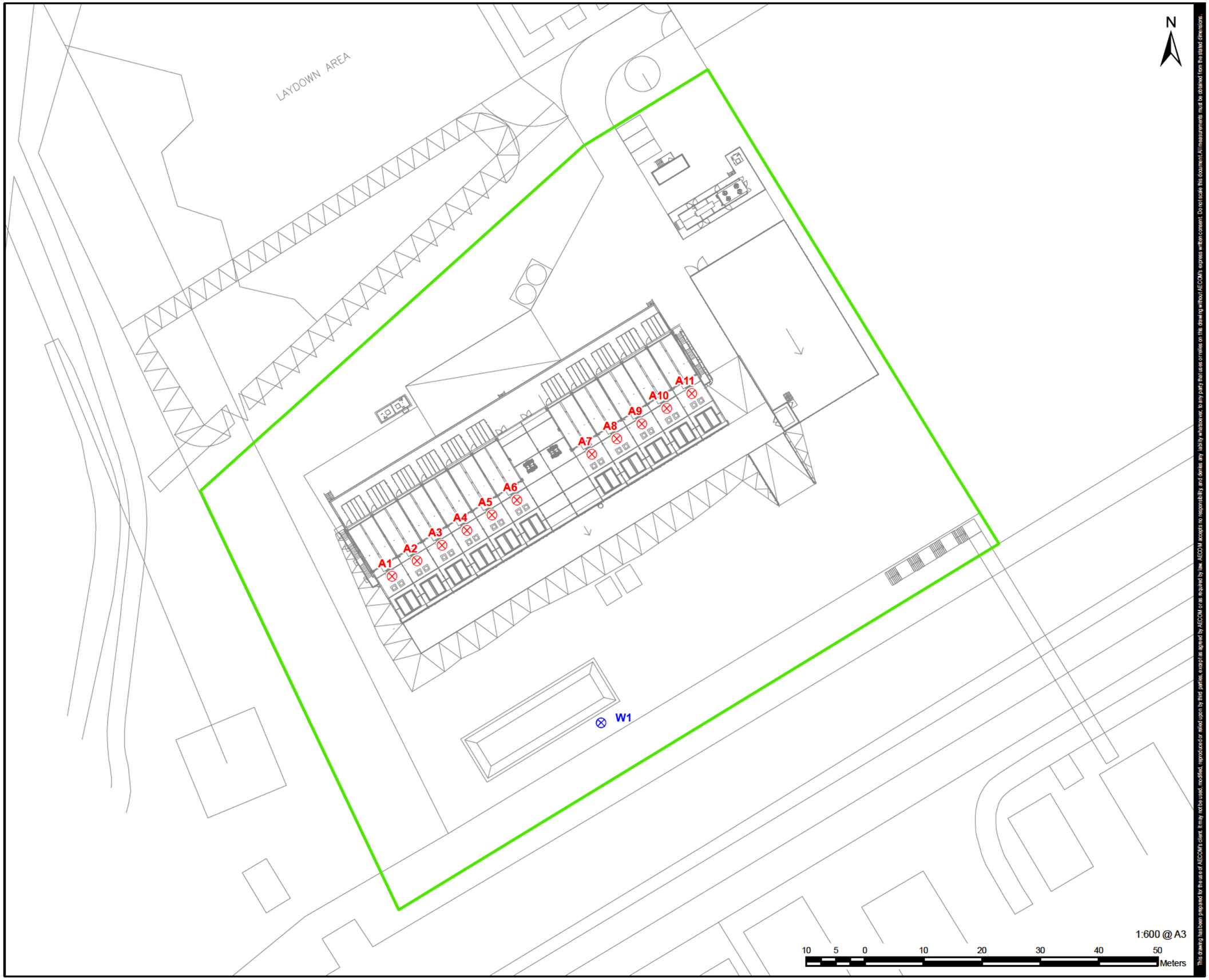

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LEGEND

- Installation Boundary
- Emission Point to Air
- Emission Point to Water

NOTES

ISSUE PURPOSE

PERMIT VARIATION APPLICATION

PROJECT NUMBER

60685042

FIGURE TITLE

Installation Location

FIGURE NUMBER

Figure 2

Annex B – Phase 2 Ground Investigation

See separate electronic folder.

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Appendix D – BAT Assessment

D.1 General BAT Conclusions from BAT Conclusions for Large Combustion Plants[12]

BAT No.	BAT Justification	BAT Status
1	**Environmental Management Systems:** BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features: i. commitment of the management, including senior management; ii. definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures paying particular attention to: a) structure and responsibility b) recruitment, training, awareness and competence c) communication d) employee involvement e) documentation f) effective process control g) planned regular maintenance programmes h) emergency preparedness and response i) safeguarding compliance with environmental legislation; v. checking performance and taking corrective action, paying particular attention to: a) monitoring and measurement (see also the Reference Report on Monitoring of Emissions to Air and Water – ROM) b) corrective and preventive action c) maintenance of records d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life including; a) avoiding underground structures b) incorporating features that facilitate dismantling c) choosing surface finishes that are easily decontaminated d) using an equipment configuration that minimises trapped chemicals and facilitates drainage or cleaning e) designing flexible, self-contained equipment that enables phased closure f) using biodegradable and recyclable materials where possible; ix. application of sectoral benchmarking on a regular basis. Specifically for this sector, it is also important to consider the following features of the EMS, described where appropriate in the relevant BAT:	A compliant EMS will be developed prior to plant commissioning. Details will be made available to the EA prior to commissioning of the combustion systems. Compliant

[12] Best Available Techniques (BAT) Conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants, The European Commission, 31 July 2017

BAT No.	BAT Justification	BAT Status
	x. quality assurance/quality control programmes to ensure that the characteristics of all fuels are fully determined and controlled (see BAT 9); xi. a management plan in order to reduce emissions to air and/or to water during other than normal operating conditions, including start-up and shutdown periods (see BAT 10 and BAT 11); xii. a waste management plan to ensure that waste is avoided, prepared for reuse, recycled or otherwise recovered, including the use of techniques given in BAT 16; xiii. a systematic method to identify and deal with potential uncontrolled and/or unplanned emissions to the environment, in particular: a) emissions to soil and groundwater from the handling and storage of fuels, additives, by-products and wastes b) emissions associated with self-heating and/or self-ignition of fuel in the storage and handling activities; xiv. a dust management plan to prevent or, where that is not practicable, to reduce diffuse emissions from loading, unloading, storage and/or handling of fuels, residues and additives; xv. a noise management plan where a noise nuisance at sensitive receptors is expected or sustained, including; a) a protocol for conducting noise monitoring at the plant boundary b) a noise reduction programme c) a protocol for response to noise incidents containing appropriate actions and timelines d) a review of historic noise incidents, corrective actions and dissemination of noise incident knowledge to the affected parties; xvi. for the combustion, gasification or co-incineration of malodourous substances, an odour management plan including: a) a protocol for conducting odour monitoring b) where necessary, an odour elimination programme to identify and eliminate or reduce the odour emissions c) a protocol to record odour incidents and the appropriate actions and timelines d) a review of historic odour incidents, corrective actions and the dissemination of odour incident knowledge to the affected parties.	
2	**Monitoring:** BAT 2. BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load, according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	The actual electrical efficiency of the proposed units will be determined and compared against that reported by the manufacturer, and applicable industry standards once the engines are installed in line with relevant ISO standards. This will be undertaken as part of the plant commissioning process. Compliant

<table>
<tr><th>BAT No.</th><th>BAT Justification</th><th>BAT Status</th></tr>
<tr><td>3</td><td>Monitoring:
BAT 3. BAT is to monitor key process parameters relevant for emissions to air and water including those given below.

<table>
<tr><th>Stream</th><th>Parameter(s)</th><th>Monitoring</th></tr>
<tr><td rowspan="3">Flue-gas</td><td>Flow</td><td>Periodic or continuous determination</td></tr>
<tr><td>Oxygen content, temperature, and pressure</td><td>Periodic or continuous determination</td></tr>
<tr><td>Water vapour content</td><td>Periodic or continuous measurement</td></tr>
<tr><td>Waste water from flue-gas treatment</td><td>Flow, pH, and temperature</td><td>Continuous measurement</td></tr>
</table>
</td><td>There are 11 main Emission Points to air associated with the Installation (A1 – A11), all releasing at a height of 15.1m.

Whilst the combined thermal input to the Installation combustion systems is >50 MW, the thermal each individual unit is <15MW and therefore the monitoring requirements of the MCPD apply to the emissions from the Installation.

This requires that extractive monitoring is carried out every three years in the first instance.

All monitoring will be undertaken using appropriate sample methods and standards aligned with the requirements of MCERTS and will include monitoring of Flow, Oxygen content, Temperature, Pressure, and Water vapour content.

There are no flue gas treatment measures which will generate wastewater, so monitoring of wastewater from flue gas treatment is not applicable.

Compliant</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>BAT Justification</th><th>BAT Status</th></tr>
<tr><td>4</td><td>Monitoring:
BAT 4. BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

<table>
<tr><th>Substance/ Parameter</th><th>Fuel/Process / Type of Combustion Plant</th><th>Combustion Plant Total Rated Thermal Input</th><th>Standard</th><th>Minimum Monitoring Frequency</th><th>Monitoring associated with</th></tr>
<tr><td>NOx</td><td>Natural-gas-fired boilers, engines, and turbines</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous(1)</td><td>BAT 42
BAT 43</td></tr>
<tr><td>CO</td><td>Natural-gas-fired boilers, engines, and turbines</td><td>All sizes</td><td>Generic EN standards</td><td>Continuous(1)</td><td>BAT 49
BAT 56</td></tr>
<tr><td>CH_4</td><td>Natural-gas-fired engines</td><td>All sizes</td><td>EN ISO 25139</td><td>Once every year(1)</td><td>BAT 45</td></tr>
</table>
Notes: (1) For gas turbines, periodic monitoring is carried out with a combustion plant load of > 70 %.</td><td>As stated in the response to item 3 above, the monitoring of the plant will be undertaken to comply with the requirements of the MCPD on a periodic basis using methods that meet the requirements of MCERTS.
Emissions of NOx and CO from the proposed peaking plant will be monitored using the following standards.
• NOx - BS EN 14792
• CO - BS EN 15058
If alternative methods are to be used these will be agreed in writing with the Environment Agency in advance.
Compliant</td></tr>
<tr><td>5</td><td>Monitoring:
BAT 5. BAT is to monitor emissions to water from flue-gas treatment in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.</td><td>There are no flue gas treatment measures which will generate wastewater, so monitoring of wastewater from flue gas treatment is not applicable.</td></tr>
<tr><td>6</td><td>General environmental and combustion performance
BAT 6. In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure an optimised combustion and to use an appropriate combination of the techniques given below.

<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>Fuel blending and mixing</td><td>Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type</td><td>Generally applicable</td></tr>
<tr><td>Maintenance of the combustion system</td><td>Regular planned maintenance according to supplier’s recommendations.</td><td>Generally applicable</td></tr>
<tr><td>Advanced control system</td><td>The use of a computer-based automatic system to control the combustion efficiency and support the prevention and/or reduction of emissions. This also includes the use of high-performance monitoring.</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and / or control command system.</td></tr>
<tr><td>Good design of the combustion equipment</td><td>Good design of furnace, combustion chambers, burners and associated devices.</td><td>Generally applicable to new combustion plants</td></tr>
<tr><td>Fuel choice</td><td>Select or switch totally or partially to another fuel(s) with a</td><td>Applicable within the constraints associated</td></tr>
</table></td><td>The fuel choice for the Installation (natural gas) is considered to be the cleanest non-renewable fuel used for combustion. No blending of fuel is proposed to be undertaken at site as the engines are configured to use the natural gas supplied from the national transmission system only.
The proposed reciprocating engines are considered to be the most appropriate and suitable combustion equipment for the site, having an electrical efficiency in line with that specified within the BAT conclusions. All installed plant and equipment will be maintained in line with manufacturer’s guidelines and site procedures. Process</td></tr>
</table>

BAT No.	BAT Justification			BAT Status
		better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used	with the availability of different suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance. For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant.	controls will be implemented on site to cover the operation of the proposed plant. Compliant
7	**General environmental and combustion performance:** BAT 7. In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NOx emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NOx ratio, homogeneous reagent distribution and optimum size of the reagent drops).			The plant is designed to meet the BAT Emission Limit Values (ELVs) through the use of primary measures comprising lean-mixture combustion control Not Applicable
8	**BAT Associated Emission Levels:** BAT 8. In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.			The proposed plant will be fitted with primary abatement measures (lean-mixture combustion control via the “LEANOX” system and combustion control), which will be an integral part of the operation. Therefore, the emission abatement systems will be used at optimal capacity and availability. Compliant

<table>
<tr><th>BAT No.</th><th>BAT Justification</th><th>BAT Status</th></tr>
<tr><td>9</td><td>BAT Associated Emission Levels:
BAT 9. In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1):
i. Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality;
ii. Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed);
iii. Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system).
Initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee.
<table><tr><th>Fuel</th><th>Substances/Parameters subject to characterisation</th></tr><tr><td>Natural gas</td><td>— LHV
— CH_4, C_2H_6, C_3, C_4+, CO_2, N_2, Wobbe index</td></tr></table></td><td>The Installation will be operated using natural gas supplied from the National Transmission System, the fuel supply contracts will include fuel specification. Intermittent analyses of the supplied natural gas will be undertaken by the plant operator to confirm that the fuels conform to the purchase specification. No additional conditioning or treatment of natural gas supplied is proposed to be undertaken prior to use in the engines.
Compliant</td></tr>
<tr><td>10</td><td>General environmental and combustion performance:
BAT 10. In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements:
• appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines);
• set-up and implementation of a specific preventive maintenance plan for these relevant systems;
• review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary;
• periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.</td><td>Prior to the commencement of the plant, a management plan in relation to OTNOC will be developed which captures the design elements relevant to OTNOC, a preventative maintenance plan and recording and assessment programme.
Compliant</td></tr>
<tr><td>11</td><td>General environmental and combustion performance:
BAT 11. BAT is to appropriately monitor emissions to air and/or to water during OTNOC.</td><td>All emissions from the Installation will be monitored during commissioning and periodically as advised in the response to BATc 3 to ensure that the plant does not lead to pollution of the receiving environment. The proposed monitoring regime is also shown in</td></tr>
</table>

<table>
<tr><th>BAT No.</th><th>BAT Justification</th><th>BAT Status</th></tr>
<tr><td></td><td></td><td>Section 6 of this document.
Given the nature of the equipment installed and the adherence to the manufacturer advised maintenance programme OTNOC events are considered unlikely. Should such events occur, additional spot sampling of emissions could be commissioned if required.
Compliant</td></tr>
<tr><td>12</td><td>Energy Efficiency:
BAT 12. In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given below.

<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>Combustion Optimisation</td><td>See description in Section 8.2. Optimising the combustion minimises the content of unburnt substances in the flue-gases and in solid combustion residues</td><td>Generally applicable</td></tr>
<tr><td>Optimisation of the working medium conditions</td><td>Operate at the highest possible pressure and temperature of the working medium gas or steam, within the constraints associated with, for example, the control of NOx emissions or the characteristics of energy demanded</td><td>Generally applicable</td></tr>
<tr><td>Optimisation of the steam cycle</td><td>Operate with lower turbine exhaust pressure by utilisation of the lowest possible temperature of the condenser cooling water, within the design conditions</td><td>Generally applicable</td></tr>
<tr><td>Minimisation of energy consumption</td><td>Minimising the internal energy consumption (e.g. greater efficiency of the feed-water pump)</td><td>Generally applicable</td></tr>
<tr><td>Preheating of combustion air</td><td>Reuse of part of the heat recovered from the combustion flue-gas to preheat the air used in combustion</td><td>Generally applicable within the constraints related to the need to control NOx emissions</td></tr>
<tr><td>Fuel preheating</td><td>Preheating of fuel using recovered heat</td><td>Generally applicable within the constraints associated with the boiler design and the need to control NOx emissions</td></tr>
<tr><td>Advanced control system</td><td>See description in Section 8.2. Computerised control of the main combustion parameters</td><td>Generally applicable to new units. The applicability to old units may be</td></tr>
</table>
</td><td>The Installation will not operate for more than 1,500 hours (as a 5-year rolling average) and therefore this BAT point is not application. That said, some aspects are applied to the Installation.

Compliant

Not Applicable

Not Applicable

Not Applicable

Not applied as units are designed to operate at ambient temperatures

Not Applied as gas engines are designed to operate on the gas provided by the NTS at the delivery temperature

Gas engines have an integrated control system</td></tr>
</table>

BAT No.	BAT Justification		BAT Status
	enables the combustion efficiency to be improved	constrained by the need to retrofit the combustion system and/or control command system	
Feed-water preheating using recovered heat	Preheat water coming out of the steam condenser with recovered heat, before reusing it in the boiler	Only applicable to steam circuits and not to hot boilers. Applicability to existing units may be limited due to constraints associated with the plant configuration and the amount of recoverable heat	Not Applicable
Heat recovery by cogeneration (CHP)	Recovery of heat (mainly from the steam system) for producing hot water/steam to be used in industrial processes/activities or in a public network for district heating. Additional heat recovery is possible from: — flue-gas — grate cooling — circulating fluidised bed	Applicable within the constraints associated with the local heat and power demand. The applicability may be limited in the case of gas compressors with an unpredictable operational heat profile	Not Applicable
CHP readiness	See description in Section 8.2.	Only applicable to new units where there is a realistic potential for the future use of heat in the vicinity of the unit	Not Applicable
Flue-gas condenser	See description in Section 8.2.	Generally applicable to CHP units provided there is enough demand for low- temperature heat	Not Applicable
Heat accumulation	Heat accumulation storage in CHP mode	Only applicable to CHP plants. The applicability may be limited in the case of low heat load demand	Not Applicable
Wet stack	See description in Section 8.2.	Generally applicable to new and existing units fitted with wet FGD	Not Applicable
Cooling tower discharge	The release of emissions to air through a cooling tower and not via a dedicated stack	Only applicable to units fitted with wet FGD where reheating of the flue-gas is necessary before release, and where the unit cooling system is a cooling tower	Not Applicable
Fuel pre-drying	The reduction of fuel moisture content before combustion to improve combustion conditions	Applicable to the combustion of biomass and/or peat within the constraints associated with spontaneous combustion risks (e.g. the moisture content of peat is kept above 40 % throughout the delivery chain). The retrofit of existing plants may be restricted by the extra calorific value that can	Not Applicable

BAT No.	BAT Justification			BAT Status
			be obtained from the drying operation and by the limited retrofit possibilities offered by some boiler designs or plant configurations	Not Applicable
	Minimisation of heat losses	Minimising residual heat losses, e.g. those that occur via the slag or those that can be reduced by insulating radiating sources	Only applicable to solid-fuel-fired combustion units and to gasification/IGCC units	Compliant Plant is designed to current design standards.
	Advanced materials	Use of advanced materials proven to be capable of withstanding high operating temperatures and pressures and thus to achieve increased steam/combustion process efficiencies	Only applicable to new plants	Not Applicable
	Steam turbine upgrades	This includes techniques such as increasing the temperature and pressure of medium-pressure steam, addition of a low-pressure turbine, and modifications to the geometry of the turbine rotor blades	The applicability may be restricted by demand, steam conditions and/or limited plant lifetime	Not Applicable
	Supercritical and ultra-supercritical steam conditions	Use of a steam circuit, including steam reheating systems, in which steam can reach pressures above 220,6 bar and temperatures above 374 °C in the case of supercritical conditions, and above 250 – 300 bar and temperatures above 580 – 600 °C in the case of ultra-supercritical conditions	Only applicable to new units of ≥ 600 MWth operated > 4 000 h/yr. Not applicable when the purpose of the unit is to produce low steam temperatures and/or pressures in process industries. Not applicable to gas turbines and engines generating steam in CHP mode. For units combusting biomass, the applicability may be constrained by high- temperature corrosion in the case of certain biomasses	Not Applicable
13	**Water usage and emissions to water:** BAT 13. In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.			The water requirements for the Installation are expected to be negligible, with the majority of the water use required for welfare facilities. Operational requirement for water is anticipated to only be for replacement or replenishment of water in the cooling circuit, which is expected to be infrequent. The operator will make all efforts to minimise water use and recycle water as much as reasonably
	Technique	**Description**		
	Water recycling	Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant		

BAT No.	BAT Justification	BAT Status
		practicable and is considering the installation of a rainwater harvesting system to provide the water required for the welfare facilities on site. Compliant
14	**Water usage and emissions to water:** BAT 14. In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.	There are no process water drainage systems on the site, sewage will be handled by dedicated systems, and rainwater run-off will be handled using a dedicated surface water drainage system. Drainage from site areas where oil handling activities occur will be designed to ensure that either the system is segregated from the surface water drainage system, or that appropriate controls are introduced to ensure that no contaminated water is discharged to controlled waters. Compliant
15	**Water usage and emissions to water:** BAT 15. In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques, and to use secondary techniques as close as possible to the source in order to avoid dilution.	Due to application of primary controls in the proposed plant, it is not proposed to carry out secondary flue gas treatment. Not Applicable
16	**Waste management** BAT 16. In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking: a. waste prevention, e.g. maximise the proportion of residues which arise as by-products; b. waste preparation for reuse, e.g. according to the specific requested quality criteria; c. waste recycling; d. other waste recovery (e.g. energy recovery), by using appropriate techniques.	Due to the inherent nature of the gas engines they will not lead to the production of process waste. The main waste stream is anticipated to be used lubricating oil, which will be stored separately in a dedicated tank with appropriate bunding in place. The operator shall investigate opportunities for offsite recycling of the waste lubricating oil. The new plant will also produce small quantities of domestic and industrial type waste from office operations and maintenance works. All waste will be recorded and managed appropriately in

<table>
<tr><th>BAT No.</th><th>BAT Justification</th><th>BAT Status</th></tr>
<tr><td></td><td></td><td>accordance with the on-site Waste Management Procedures compliant with the Waste Hierarchy.
Compliant</td></tr>
<tr><td>17</td><td>Noise emissions:
BAT 17. In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.
<table><tr><th>Technique</th><th>Description</th></tr><tr><td>Appropriate location of equipment and buildings</td><td>Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens.</td></tr><tr><td>Operational measures</td><td>These include:
• improved inspection and maintenance of equipment
• closing of doors and windows of enclosed areas, if possible
• equipment operated by experienced staff
• avoidance of noisy activities at night, if possible
• provisions for noise control during maintenance activities.</td></tr><tr><td>Low-noise equipment</td><td>This potentially includes compressors, pumps and disks.</td></tr><tr><td>Noise abatement</td><td>Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings</td></tr><tr><td>Noise-control equipment</td><td>This includes:
i. noise-reducers
ii. vibration or acoustic insulation, or vibration isolation
iii. enclosure of noisy equipment
iv. soundproofing of buildings</td></tr></table></td><td>All plant and equipment will be located either inside buildings or provided with appropriate enclosures to minimise the escape of noise. Since the Installation is not expected to operate 24 hours a day and 7 days a week, any noise will be intermittent in nature.
All equipment to be used will be new and low-noise.
A noise assessment undertaken for the Installation (see B of this document) shows that when compared against the existing background noise levels, the expected noise levels will not be significant.
All maintenance activities at the proposed plant will be scheduled such that minimum nuisance is created from any resultant noise.
Compliant</td></tr>
</table>

D.2 BAT Conclusions for the Combustion of Natural Gas from BAT Conclusions for Large Combustion Plants[13]

<table>
<tr><th>BAT No</th><th>BAT Justification</th><th>BAT Status</th></tr>
<tr><td>40</td><td>BAT 40. In order to increase the energy efficiency of natural gas combustion, BAT is to achieve the BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas.
<table>
<tr><th rowspan="2">Type of Combustion Plant</th><th>BAT-AEELs (1)</th></tr>
<tr><th>Net electrical efficiency (%)</th></tr>
<tr><th></th><th>New unit</th></tr>
<tr><td>Gas engine</td><td>39.5 – 44</td></tr>
</table>
Notes: (1) These BAT-AEELs do not apply to units operated <1,500 h/yr</td><td>The overall electrical efficiency of the peaking plant levels is expected to be over 42%, therefore within the efficiency envelope quoted within the LCP BRef for gas engines.
Compliant.</td></tr>
<tr><td>41</td><td>BAT 41: In order to prevent or reduce NOx emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given below.</td><td>Not Applicable</td></tr>
<tr><td>42</td><td>BAT 42. In order to prevent or reduce NOx emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below.</td><td>Not Applicable</td></tr>
<tr><td>43</td><td>BAT 43: In order to prevent and/or reduce NOx emissions to air from the combustion of natural gas in gas engines, BAT is to use one or a combination of the techniques given below:
<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th><th></th></tr>
<tr><td>Advanced control system</td><td>See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr</td><td>The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system</td><td>Compliant</td></tr>
<tr><td>Lean-burn concept</td><td>See description in Section 8.3. Generally used in combination with SCR</td><td>Only applicable to new gas-fired engines</td><td>Compliant</td></tr>
<tr><td>Advanced lean-burn concept</td><td>See description in Section 8.3.</td><td>Only applicable to new spark plug ignited engines</td><td>Not Applicable</td></tr>
<tr><td>Selective catalytic reduction (SCR)</td><td>See description in Section 8.3.</td><td>Retrofitting existing combustion plants may be constrained by the availability of sufficient space. Not applicable to combustion plants operated < 500 h/yr. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1 500 h/yr</td><td>Not Applicable as no SCR</td></tr>
</table></td><td></td></tr>
<tr><td>44</td><td>NOx, CO, NMVOC and CH_4 emissions to air
BAT 44. In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts.</td><td>Compliant</td></tr>
</table>

[13] Best Available Techniques (BAT) Conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants, The European Commission, 31 July 2017

BAT No	BAT Justification	BAT Status
	Compliance Measures: Appropriate management and control measures will be implemented to cover the operation of the proposed plant, to ensure that combustion of natural gas in the engines is optimised. The proposed plant is therefore expected to achieve BAT.	
	BAT AEL's BAT-associated emission levels (BAT-AELs) for NO_x emissions to air from the combustion of natural gas in engines (BATc Table 25) **Type of Combustion Plant** / **BAT-AELs (mg/Nm³) (1)**: Yearly Average — Daily average of average over the sampling period Engines: 20–75 — 55–85 **Notes:** (1) Optimising the functioning of an existing technique to reduce NOX emissions further may lead to levels of CO emissions at the higher end of the indicative range for CO emissions given after this table. As an indication, the yearly average CO emission levels will generally be: — 30–100 mg/Nm³ for existing engines operated ≥ 1 500 h/yr and for new engines.	Combustion plants comprising a group of combustion units, where the thermal input to individual units is below 15MW, is exempt from compliance with the LCPD ELVs. However, having a thermal input >1MW, the individual engines at the Installation are covered under the MCPD and are required to comply with the ELVs, provided by Schedule 25 of the Environmental Permit Regulations 2016 (as amended). Not Applicable
45	BAT 45. In order to reduce non-methane volatile organic compounds (NMVOC) and methane (CH4) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines, BAT is to ensure optimised combustion and/or to use oxidation catalysts.	The Installation will utilise systems for ensuring more efficient and optimised combustion, by managing the temperature and quality of the combustion air, to achieve BAT. It is not proposed to utilise oxidation catalysts. The BAT AEL's for formaldehyde and CH_4 (BATc Table 26) are not considered applicable due to the size of the individual units.

D.3 BAT Conclusions for Achieving Energy Efficiency at an Installation Level

BAT No.	BATc Requirements	BAT Status
1	Energy efficiency management BAT is to implement and adhere to an energy efficiency management system (ENEMS) that incorporates, as appropriate to the local circumstances, all of the following features (see Section 2.1. The letters (a), (b), etc. below, correspond those in Section 2.1): a. commitment of top management (commitment of the t op management is regarded as a precondition for the successful application of energy efficiency management) b. definition of an energy efficiency policy for the installation by top management c. planning and establishing objectives and targets (see BAT 2, 3 and 8) d. implementation and operation of procedures paying particular attention to: i. structure and responsibility ii. training, awareness and competence (see BAT 13) iii. communication iv. employee involvement v. documentation vi. effective control of processes (see BAT 14) vii. maintenance (see BAT 15) viii. emergency preparedness and response ix. safeguarding compliance with energy efficiency-related legislation and agreements (where such agreements exist). e. benchmarking: the identification and assessment of energy efficiency indicators over time (see BAT 8), and the systematic and regular comparisons with sector, national or regional benchmarks for energy efficiency, where verified data are available (see Sections 2.1(e), 2.16 and BAT 9) f. checking performance and taking corrective action paying particular attention to: i. monitoring and measurement (see BAT 16) ii. corrective and preventive action iii. maintenance of records iv. independent (where practicable) internal auditing in order to determine whether or not the energy efficiency management system conforms to planned arrangements and has been properly implemented and maintained (see BAT 4 and 5) g. review of the ENEMS and its continuing suitability, adequacy and effectiveness by top management For (h) and (i), see further features on an energy efficiency statement and external verification, below - when designing a new unit, taking into account the environmental impact from the eventual decommissioning of the unit - development of energy efficient technologies, and to follow developments in energy efficiency techniques.	The Operator will operate the Installation in accordance with an EMS. It is anticipated that the management of energy efficiency of the Installation will form part of the installation management system. Further details of the management system will be developed prior to commencement of operations. Compliant.
2	Planning and establishing objectives and targets Continuous environmental improvement BAT is to continuously minimise the environmental impact of an installation by planning actions and investments on	The Installation will be designed to current compliance and design standards. It will be operated in accordance with an EMS, with regular

BAT No.	BATc Requirements	BAT Status
	an integrated basis and for the short, medium and long term, considering the cost-benefits and cross-media effects	appraisal of the plant and equipment in use at the installation. Compliant.
3	Identification of energy efficiency aspects of an installation and opportunities for energy savings BAT is to identify the aspects of an installation that influence energy efficiency by carrying out an audit. It is important that an audit is coherent with a systems approach (see BAT 7).	The Installation will be designed to current compliance and design standards. It will be operated in accordance with an EMS, with regular appraisal of the plant and equipment in use at the Installation. Complaint.
4	Identification of energy efficiency aspects of an installation and opportunities for energy savings When carrying out an audit, BAT is to ensure that the audit identifies the following aspects (see Section 2.11): a. energy use and type in the installation and its component systems and processes b. energy-using equipment, and the type and quantity of energy used in the installation c. possibilities to minimise energy use, such as: • controlling/reducing operating times, e.g. switching off when not in use (e.g. see Sections 3.6, 3.7, 3.8, 3.9, 3.11) • ensuring insulation is optimised, e.g. see Sections 3.1.7, 3.2.11 and 3.11.3.7 • optimising utilities, associated systems, processes and equipment (see Chapter 3) d. possibilities to use alternative sources or use of energy that is more efficient, in particular energy surplus from other processes and/or systems, see Section 3.3 e. possibilities to apply energy surplus to other processes and/or systems, see Section 3.3 f. possibilities to upgrade heat quality (see Section 3.3.2).	The EMS will include procedures for regular energy efficiency auditing. Compliant.
5	Identification of energy efficiency aspects of an installation and opportunities for energy savings BAT is to use appropriate tools or methodologies to assist with identifying and quantifying energy optimisation, such as: • energy models, databases and balances (see Section 2.15) • a technique such as pinch methodology (see Section 2.12) exergy or enthalpy analysis (see Section 2.13), or thermoeconomics (see Section 2.14) • estimates and calculations (see Sections 1.5 and 2.10.2)	Appropriate tools will be used at the detailed design stage. Compliant.
6	Identification of energy efficiency aspects of an installation and opportunities for energy savings BAT is to identify opportunities to optimise energy recovery within the installation, between systems within the installation (see BAT 7) and/or with a third party (or parties), such as those described in Sections 3.2, 3.3 and 3.4.	See Section 4.7.2 of this document. Compliant.
7	A systems approach to energy management BAT is to optimise energy efficiency by taking a systems approach to energy management in the installation. Systems to be considered for optimising as a whole are • process units (see sector BREFs)	See Section 4.7.2 of this document. Compliant.

BAT No.	BATc Requirements	BAT Status
	• heating systems such as: steam (see Section 3.2) hot water • cooling and vacuum (see the ICS BREF) • motor driven systems such as: compressed air (see Section 3.7) pumping (see Section 3.8) • lighting (see Section 3.10) • drying, separation and concentration (see Section 3.11).	
8	Establishing and reviewing energy efficiency objectives and indicators BAT is to establish energy efficiency indicators by carrying out all of the following: a. identifying suitable energy efficiency indicators for the installation, and where necessary, individual processes, systems and/or units, and measure their change over time or after the implementation of energy efficiency measures (see Sections 1.3 and 1.3.4) b. identifying and recording appropriate boundaries associated with the indicators (see Sections 1.3.5 and 1.5.1) c. identifying and recording factors that can cause variation in the energy efficiency of the relevant process, systems and/or units (see Sections 1.3.6 and 1.5.2).	Objectives will be developed by the plant operational team following commissioning of the plant to ensure compliance with this BAT conclusion. Compliant.
9	Benchmarking BAT is to carry out systematic and regular comparisons with sector, national or regional benchmarks, where validated data are available.	It should be noted that there are no published BAT-Achievable Energy Efficiency Levels (BAT-AEELs) for large combustion plants operating for up to 1,500 hours per year.
10	Energy efficient design (EED) BAT is to optimise energy efficiency when planning a new installation, unit or system or a significant upgrade (see Section 2.3) by considering all of the following: a. the energy efficient design (EED) should be initiated at the early stages of the conceptual design/basic design phase, even though the planned investments may not be well-defined. The EED should also be taken into account in the tendering process b. the development and/or selection of energy efficient technologies (see Sections 2.1(k) and 2.3.1) c. additional data collection may need to be carried out as part of the design project or separately to supplement existing data or fill gaps in knowledge d. the EED work should be carried out by an energy expert e. the initial mapping of energy consumption should also address which parties in the project organisations influence the future energy consumption, and should optimise the energy efficiency design of the future plant with them. For example, the staff in the (existing) installation who may be responsible for specifying design parameters.	It should be noted that there are no published BAT-Achievable Energy Efficiency Levels (BAT-AEELs) for large combustion plants operating for up to 1,500 hours per year.
11	Increased process integration BAT is to seek to optimise the use of energy between more than one process or system (see Section 2.4), within the installation or with a third party.	See Section 4.7 of this document. Compliant
12	Maintaining the impetus of energy efficiency initiatives	The Installation will be subject to regular preventative maintenance cycles to

BAT No.	BATc Requirements	BAT Status
	BAT is to maintain the impetus of the energy efficiency programme by using a variety of techniques, such as: a. implementing a specific energy efficiency management system (see Section 2.1 and BAT 1) b. accounting for energy us age based on real (metered) values, which places both the obligation and credit for energy efficiency on the user/bill payer (see Sections 2.5, 2.10.3 and 2.15.2) c. the creation of financial profit centres for energy efficiency (see Section 2.5) d. benchmarking (see Section 2.16 and BAT 9) e. a fresh look at existing management systems, such as using operational excellence (see Section 2.5) f. using change management techniques (also a feature of operational excellence, see Section 2.5).	ensure the efficiency of plant and equipment is maintained. Compliant.
13	Maintaining expertise BAT is to maintain expertise in energy efficiency and energy-using systems by using techniques such as: a. recruitment of skilled staff and/or training of staff. Training can be delivered by in-house staff, by external experts, by formal courses or by self-study/development (see Section 2.6) b. taking staff off-line periodically to perform fixed term/specific investigations (in their original installation or in others, see Section 2.5) c. sharing in-house resources between sites (see Section 2.5) d. use of appropriately s killed consultants for fixed term investigations (e.g. see Section 2.11) e. outsourcing specialist systems and/or functions (e.g. see Annex 7.12).	The Installation will be operated by suitable personnel with required skills and training. The maintenance activities associated with the Installation will be undertaken by appropriately licensed contractors. Compliant.
14	Effective control of processes BAT is to ensure that the effective control of processes is implemented by techniques such as: a. having systems in place to ensure that procedures are known, understood and complied with (see Sections 2.1(d)(vi) and 2.5) b. ensuring that the key performance parameters are identified, optimised for energy efficiency and monitored (see Sections 2.8 and 2.10) c. documenting or recording these parameters (see Sections 2.1(d)(vi), 2.5, 2.10 and 2.15).	The Installation operations will be controlled via a central control room equipped with a system such as a DCS, to continuously monitor key performance aspects. Compliant.
15	Maintenance BAT is to carry out maintenance at installations to optimise energy efficiency by applying all of the following: a. clearly allocating responsibility for the planning and execution of maintenance b. establishing a structured programme for maintenance based on technical descriptions of the equipment, norms, etc. as well as any equipment failures and consequences. Some maintenance activities may be best scheduled for plant shutdown periods c. supporting the maintenance programme by appropriate record keeping systems and diagnostic testing d. identifying from routine maintenance, breakdowns and/or abnormalities possible losses in energy efficiency, or where energy efficiency could be improved	The Installation will be subject to regular preventative maintenance cycles to ensure the efficiency of plant and equipment is maintained. Compliant.

BAT No.	BATc Requirements	BAT Status
	e. identifying leaks, broken equipment, worn bearings, etc. that affect or control energy usage, and rectifying them at the earliest opportunity	
16	Monitoring and measurement BAT is to establish and maintain documented procedures to monitor and measure, on a regular basis, the key characteristics of operations and activities that can have a significant impact on energy efficiency. Some suitable techniques are given in Section 2.10.	The operations at the Installation will be monitored continuously to ensure optimum performance, including meeting energy efficiency objectives. Compliant.
17	Best available techniques for achieving energy efficiency in energy-using systems, processes, activities or equipment Combustion BAT is to optimise the energy efficiency of combustion by relevant techniques such as: those specific to sectors given in vertical BREFs	See Section 4.7 of this document, and LCP BAT assessment. Compliant.
18	Steam systems BAT for steam systems is to optimise the energy efficiency by using techniques such as: those specific to sectors given in vertical BREFs	N/A
19	Heat recovery BAT is to maintain the efficiency of heat exchangers by both: • monitoring the efficiency periodically, and • preventing or removing fouling.	N/A
20	BAT 20 – 29	N/A

Appendix E - Air Quality Assessment

See separate electronic folder.

Appendix F – Qualitative Risk Assessment

F.1 Assessment of Fugitive Emission Risks

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Escape of natural gas	Local residents/ businesses beyond the Installation boundary	Gas carried on wind leading to the development of flammable atmospheres	No on-site gas storage facilities minimising the likelihood of large gas release and the development of an explosive atmosphere. If there is a leak in the gas supply pipeline, the quantity released is expected to be dispersed and not lead to the development of an explosive atmosphere. An emergency shutdown valve will be in place that will shut in the event of sudden de-pressurisation of the pipeline. Its primary function is to prevent the continuous loss of gas in the unlikely event of a major leak in the downstream pipework. Gas systems will be included in site maintenance schedule.	Gas could reach sensitive receptors but appropriate design and management actions should minimise the quantity of gas at receptors. Probability of exposure is therefore very low especially given the distance to receptors.	Potential flammable vapour in the vicinity of local receptors.	Low
Escape of VOCs/ odour from stored fuel/ oils	Local residents/ businesses beyond the Installation boundary	Vapours/ odour carried on wind	The site will use and store limited quantities of raw materials, none of which are considered to be particularly odorous. All raw materials stored on site will be kept in appropriate containers, provided with sufficient spillage containment, in accordance with the relevant material specifications.	Fugitive vapours could reach sensitive receptors but appropriate storage and materials management should minimise the probability. Probability of exposure is therefore very low especially given the distance to receptors.	Complaints of odours/ smells in vicinity of local receptors.	Very low
Escape of raw materials including lubricating oils/ fuels	Local surface water and/ or groundwater	Flow by gravity/ drainage systems/ unsurfaced areas	Storage arrangements appropriate to materials being stored; bunded storage facilities; limited external storage facilities; high and low level tank alarm systems; and inspection and maintenance at regular intervals.	Fugitive releases could reach surface water and/ or groundwater but appropriate design and management actions should prevent this from happening. All bulk storage tanks will be double-skinned to provide sufficient containment in the event of a tank/ containment failure. Probability is therefore low.	Localised pollution of surface water and groundwater.	Low

F.2 Assessment of Accident Risks

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Fire	Local residents/ businesses beyond the Installation boundary. Site staff and Infrastructure.	Emissions of smoke to the air and potentially firewater, foam, etc. to site drainage and soil/ groundwater and controlled waters	Fire detection across all plant areas. Provision of a firefighting water main with adequate flow and pressure to feed fire suppression systems. Use of portable extinguishers plant wide and smoke vents in designated areas. Limited potential for firewater to become contaminated, and firewater will be contained as far as practicable within the site drainage system.	Appropriate design and management actions should allow the early detection of/ minimise the risk of fire spreading.	Complaints of smoke/ smells in vicinity from local residential receptors. Localised pollution of surface water and soil/ groundwater.	Low
Flooding of the site and associated contamination of flood waters with lubricating oil/ fuel stored on site	Local surface water and/ or groundwater	Flow by gravity/ drainage systems/ unsurfaced areas	Appropriate bunding and containment of all stored raw materials on site to prevent escape via flood waters.	The EA Flood Map for Planning shows that the site is located within Flood Zone 3a. Appropriate storage and containment measures will be designed into the Installation and implemented during the operation of the Installation to prevent any loss of any fuel/ oils stored.	Negligible risk of potential pollution of surface water and groundwater from escape of chemicals.	Negligible
Vandalism to plant, equipment and infrastructure and associated loss of fuel/ oil from site	Local residents/ businesses beyond the Installation boundary Air, land and water. Site staff and Infrastructure.	Emissions resulting from failure/ reduced performance of vandalised plant, equipment and infrastructure	Security fence; Intruder alarms and CCTV cameras at numerous locations on site, security control gates at site entrance with restricted entry; relevant signage; building envelope around a significant proportion of the operation/ process.	Negligible. Appropriate design and management actions should prevent vandalism happening.	Localised pollution of surface water and groundwater. Potential for injury, damage to plant/ equipment.	Low

Appendix G – List of Directors

Company name - VPI Immingham Energy Park A Limited

Company number - 11153063

Registered office address - 4th Floor, Nova South, 160 Victoria Street, London, England, SW1E 5LB

Company Secretary – Jane Elizabeth Essex, Appointed on: 16 January 2018

Details of Listed Active Company Directors

Director Name (Last name, First name)	Date of Birth	Appointed on
Brignall, David	[redacted]	
Hale, Simon Robert		

Appendix H – List of Documents Submitted

Question Reference	Document Title	Document Reference
Part A, Q5c	List of Directors	Appendix G, 60685042-EP-001
Part B2, Q3d	Management System	Section 4.3, 60685042-EP-001
Part B2, Q5a	Site Plan	Figure 2, Appendix A, 60685042-EP-001
Part B2, Q5b	Application Site Report	Appendix B, 60685042-EP-001
Part B2, Q5c	Non-Technical Summary	Non-Technical Summary, 60685042-EP-001
Part B2, Q6	Environmental risk assessment	Section 7, Appendix F, 60685042-EP-001
Part B3, Q1	Proposed activities	Section 2.1, 60685042-EP-001
Part B3, Table 1a	Types of activities	Table 2-1, 60685042-EP-001
Part B3, Table 2	Emissions to air	Section 5.1, 60685042-EP-001
	Emissions to water Emissions to sewer	Section 5.2, 60685042-EP-001
	Emissions to land	Section 5.3, 60685042-EP-001
Part B3, Q3a	Technical standards	Section 4.1, 60685042-EP-001
Part B3, Q3c, Q6d	Raw materials	Section 4.5, 60685042-EP-001
Part B3, Q4a	Monitoring: Emissions to air	Section 6.2, 60685042-EP-001
Part B3, Q5a	Environmental Impact Assessment (as Environmental Statement)	Appendix B, 60685042-EP-001
Part B3, Q6a	Energy Efficiency	Section 4.7.2, 60685042-EP-001
Part B3, Q6b; Part B3, Appendix 1, Q12	Energy Use	Section 4.7.1, 60685042-EP-001
Part B3, Q6e	Waste	Section 4.6, 60685042-EP-001
Part B3, Q7a	Details of proposed combustion plant	Section 2.1, 60685042-EP-001
Part B3, Appendix 1, Q10	Monitoring	Section 6, 60685042-EP-001
Part B3, Appendix 1, Q11	Energy	Section 4.7, 60685042-EP-001

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