Intended for
CyrusOne UK4 Limited

Date
March 2021

Project Number
1700003359

CYRUS ONE – BATH ROAD ENVIRONMENTAL PERMIT APPLICATION: OPERATIONS REPORT

RAMBOLL

CYRUS ONE – BATH ROAD
ENVIRONMENTAL PERMIT APPLICATION: OPERATIONS REPORT

Project No.	1700003359
Issue No.	1
Date	March 2021
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Version Control Log

Revision	Date	Made by	Checked by	Approved by	Description
1	01/03/2021	TM	TM	RAW	First Release to Client

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INTRODUCTION

This document supports the application submitted by CyrusOne UK4 Limited ("Cyrus One") to the Environment Agency ("EA") under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (the "Regulations") for a Part A(1) Environmental Permit (application reference EA/EPR/EP3508PS/A001) associated with the operation of combustion plant at the CyrusOne Datacentre located on Bath Road, Slough, SL1 4AA (the "site" or the "Installation"). An overview of the location of the site is provided in Figure 1 in Appendix 1.

The site comprises two adjacent facilities: a single 'L' shaped two-storey building, and a rectangular shaped two-storey building. These are currently under construction and upon completion they will be useds as datacentres with associated administrative offices. The buildings will be used as data halls, which under normal operating conditions will be powered using electricity from the national grid; however, provision has been made for two (2) banks of electricity generators on each building to provide electricity in the event of an interruption to the national grid supply. Eight (8) generators will be installed in each generator bank with a rated thermal input of 6.29MW each. When aggregated, the rated thermal input capacity of the sixteen generators proposed to be installed for each building will be 100.64MW (and a total of 201.28MWth across both buildings), exceeding the Part A(1) permitting threshold of 50 megawatts ("MW"), listed under Schedule 1, Part 2, Chapter 1, Section 1.1. of the Regulations. As the permitting threshold is exceeded, Cyrus One, as the current operator of the combustion plant, is required to obtain an environmental permit.

Due to the proximity of the two data halls they are considered to be a single installation and assessments are provided on this basis. There is the potential for the two sites to be operated independently in the future, but the management of both sites currently sites under CyrusOne UK Limited, and a single application for the installation is made on this basis.

This Operations report is intended to accompany Cyrus One's application to the Environment Agency for a permit to operate the combustion plant at the site and provides an overview of the proposed regulated activity and the operator's management arrangements.

GENERAL LIMITATIONS AND RELIANCE

This report has been prepared by Ramboll UK Limited ("Ramboll") exclusively for the intended use by CyrusOne UK Limited (the "Client") in accordance with the agreement (proposal reference number 1690013863-008), dated 12th December 2018 between Ramboll and the Client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended, or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the Client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. Ramboll neither owes nor accepts any duty to any third-party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

NON-TECHNICAL SUMMARY

This Part A(1) Environmental Permit application is submitted by CyrusOne UK4 Limited for the operation of combustion plant comprising electricity generators present at CyrusOne's Data Centres located at 225 and 227? Bath Road, Slough SL1 4AA.

The Installation comprises two data halls, each with two banks of electricity generators (diesel powered) present immediately adjacent to the data halls. The generators will not be routinely utilised for the generation of electricity to meet site demands and are intended as emergency generation provision in the event of an interruption to the electricity supply to the site from the National Grid. Each generator will operational for approximately 19-hours per annum as part of periodical testing and maintenance, in addition to any emergency operation.

In total sixteen generators will be present at each data centre (resulting in a total of thirty-two generators across the installation), with an aggregated net rated thermal input capacity of approximately 100.64MW for each data centre. Under Schedule 1, Part 2, Chapter 1, Section 1.1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ("the Regulations") the burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts is a regulated activity and an environmental permit is required to operate the Installation.

Activities directly associated with the Installation are limited to the handling (e.g. receipt), storage, and distribution of fuel, lubrication oils and engine coolants. The Installation boundary covers both data centres (London 4 and London 5), with each centre identified by a separate boundary.

Raw materials

The primary raw materials used in the permitted activity is diesel, which is used to power the generators, lubricants and coolants. All materials are provided with suitable containment measures.

Waste

The permitted activity generates little waste (primarily from maintenance and repair activities), with the majority of material removed from site at the point of generation.

Energy

Diesel is used as the predominant primary energy source for the facility; however, a limited amount of electricity is also used by the generator plant control equipment.

Emissions to air

Thirty-two emission points are present at the Installation (sixteen at each data centre), which have the potential to generate emissions of oxides of nitrogen (NO_x). As each of the generators at the site has a rated thermal input of below 15MW, the Installation is not classified as a Large Combustion plant, and the emission limit values specified under Chapter III of the Industrial Emissions Directive (2010/75/EU) are not applicable; however, the requirements set out in Chapter II of the IED are considered to apply, although there are no specific emissions limit values relevant to the Installation under this Chapter. As the generators are subject to the provisions of Chapter II of the IED the generator plant is considered to be an excluded generator for the purposes of Schedule 25B of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) for specified generators, and the emission limits and rules set out therein do not apply. The emissions limit values set out under the Medium Combustion Plant requirements of Schedule 25A of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) are considered to be applicable to the Installation. However, as the generators are planned to operate for less than 500 hours per year the emission limit values applicable under this Schedule will not apply.

The impact of the emissions from these points have been assessed using air dispersion modelling and the Environment Agency's risk assessment methodology, which demonstrates that the long-term and short-term impacts are insignificant.

As there are no emissions limit values relevant to the Installation the monitoring of NO_x emissions is not proposed.

Emissions to Water and Sewer

There are no process emissions to surface water or sewer associated with the Installation. Site run-off is controlled through interceptors before entering soakaways located around the site. Where drainage serves storage and delivery areas, shut-off valves are installed prior to entry into the soakaways.

Noise

A noise impact assessment has been undertaken and found that the predicted rating level at the nearest residential receptors will be equal to or marginally less than the typical daytime and night time background noise levels. Therefore, noise is not considered to be a significant issue at the Installation.

Environmental Management Systems

As the Installation is a new facility the Operator proposes to implement an environmental management system to manage the environmental aspects of the operation of the Installation.

Site Condition

A Site Condition Report (SCR) has been prepared which considers the risks presented by the materials stored at the installation, the sensitivity of the receiving environment and the measures in place to mitigate the potential for ground contamination. The primary risk is derived from the storage and use of diesel.

1. PROCESS DESCRIPTION

1.1 Process Summary and Technical Standards

1.1.1 Process Summary

The primary activities proposed to be undertaken at the site are associated with the operation and maintenance of two data centres, which are currently under construction, with a scheduled completion date of Q4 2021.

The data centres will each comprise a data hall (divided to form four independent data halls) with two banks of electricity generators (diesel powered) present immediately adjacent to the data hall. Under normal operating conditions the electricity demand for each data centre will be met through the provision of electricity from the national grid; however, under emergency conditions (e.g. an interruption to the supply of electricity from the National Grid) an uninterruptable power supply (UPS) and the proposed generator banks will provide electricity to each site until the electricity supply from the National Grid can be restored.

Each of the generator banks will comprise of eight (8) generators. Each generator will have a net rated thermal input of 6.29MW. In total thirty-two generators will be present at the site (sixteen for each data centre), with an aggregated net rated thermal input capacity of 201.28MW. Under Schedule 1, Part 2, Chapter 1, Section 1.1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ("the Regulations") the burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts is a regulated activity and an environmental permit is required prior to the plant being installed and commissioned[1]. The generators are being installed in sets of four, and at the time of the application the proposed date for the completion and commissioning of the generators is scheduled in Q4 2021; however, this may be subject to change.

It is proposed that each of the generators will have a dedicated diesel storage tank present below each generator set, which will store diesel to be used as fuel. Therefore, activities directly associated with the regulated activity at the site are limited to the storage, handling (e.g. receipt, distribution, fuel polishing etc.) and use of fuel across the site.

The site location is shown on Figure 1 and a site layout plan and Installation boundary is provided in Figure 2 provided within Appendix 1. The Installation boundary incorporates the diesel generators and the directly associated activities (delivery, containment and drainage) for both data centres. Site boundaries are included for each data centre as well.

1.1.2 Technical Standards

In compiling the environmental permit application, consideration has been given to the technical guidance and standards considered to be appropriate for the regulated activity proposed. A list of these guidance documents and standards is provided in the table below. This list includes the Environment Agency's Data Centre FAQ Headline Approach guidance, which is not an official release from the Environment Agency; however, this document forms the basis for a common methodology for applications for combustion activities associated with data centres. It should be noted that this guidance is not a legal document and presents the framework of the Environment Agency's approach to permitting of Data Centres.

[1] The Environmental Permitting (England and Wales) Regulations 2016 (as amended), Regulation 12

Table 1.1: Schedule of Technical Guidance

Title	Author	Date / Version
Data Centre FAQ Headline Approach	Environment Agency	July 2018 - Draft Version 10.0
Reference Document on Best Available Techniques on Emissions from Storage	European Commission	July 2006
Containment Systems for the prevention of pollution.	CIRIA	2014
Medium Combustion Plant: Medium Combustion Plant Directive Interim Guidance	Environment Agency	2018
Technical Guidance Note M5 - Monitoring of stack gas emissions from medium combustion plants and specified generators.	Environment Agency	V.01 September 2018
H5 Site Condition Report Guidance and Templates	Environment Agency	V.03 May 2013
Horizontal Guidance for Noise Part 2 – Noise Assessment and Control	Environment Agency	V.03 June 2004
Environmental Permitting Regulations (England and Wales) 2010, Regulatory Guidance Series, No RGN2: Understanding the Meaning of Regulated Facility.	Environment Agency	V.3.1 May 2015

In addition, the general permitting requirements set out on the Environment Agency's website have also been considered[2].

1.1.3 "Same Site" Permitting

The Operator set out its justification for the "same site" permitting of data centres operated by CyrusOne in Slough in a technical guidance note provided to the Environment Agency on 1st July 2019 (Ref. TN1700003359_CONV), which stated that on the basis of proximity, coherence and environmental management arrangements the site should not be considered to be part of the "same site" with other CyrusOne operated data centres in the vicinity (referred to as LON1 and LON3).

The Environment Agency responded to the justification set out in the technical note on 16th July 2019 and agreed in principle with the conclusions of the justification. Therefore, the application for the site has been prepared as a standalone application, covering the two adjacent sites known as LON4 and LON5.

1.2 Process Description

1.2.1 General Overview

CyrusOne intends to operate the sites as data centres. In the event of an interruption in the supply of electricity from the national electricity distribution network emergency electricity generation capacity will be provided to each data centre by sixteen (16) diesel-powered generator sets. Each of the generators will be identical, and will have the following specification (the manufacturers specification sheet has been provided as Appendix 2):

[2] https://www.gov.uk/topic/environmental-management/environmental-permits Environment Agency Website. Accessed on 20/05/2019

Table 1.2: Generator Specification

Manufacturer	Model	Net Rated Thermal Input (MW)	Thermal Efficiency	Output Rating kVA (kW)	Fuel
Cummins	C3000 D5e	6.29	38.15%	3000 (2400)	Diesel

Each of the generators will be run in Standby Mode, which is considered to be applicable for supplying power to varying electrical load for the duration of any power interruption of a reliable utility source.

In the event of a power supply interruption the immediate power demand of the site will be met via an uninterruptable power supply (battery bank) followed by the generators approximately 15 seconds after the National Grid power supply has been interrupted. The status of the supply interruption is constantly monitored, facilitating single or multiple generators to start depending on the severity of the failure in the supply. Once started the generators will remain operational until the supply from the National Grid is deemed to be stable. The return to the National Grid supply is a manual process, with the National Grid and generator supplies being interlocked to ensure that parallel running cannot be achieved.

The generators will only be used to meet site demand in the event of an interruption in electricity supply to the site. The generators will not be used for voluntary elective power, such as demand side response (i.e. on-site use), grid short term operating reserve (STOR) (i.e. off-site export of electricity) and frequency control by demand management (FCDM).

The generators are held in individual containers, incorporating an engine, and alternator, a battery bank and a day-tank, which is used to store diesel.

1.2.2 Stability of Electricity Supply

The power supply to the site is protected by an uninterruptable power supply (UPS), consisting of a bank of batteries capable of meeting the full load capacity of the site for approximately 10 minutes. The generators are automatically triggered to start once the power supply has been interrupted, providing power within 15 seconds of the failure of the National Grid supply, at which point the UPS would revert to standby.

The use of the generators to provide electrical power to the site is considered to be unlikely, on the basis that the site is supplied with electricity via two diverse routes providing a 2N level of resilience, where N is the power demand of the Installation.

The likelihood of long periods of reliance on the generators to provide power to the site is considered to be highly unlikely given that the National Grid Electricity Transmission System, which serves the site, has a reliability of 99.999967% (2018-19), indicating an average outage period of 10.4 seconds, with a total of 22 loss of supply incidents across the entire network. Specific local information has been requested from the Distribution Network Operator (DNO) for the Slough area, however we have received no response at the point of submission.

1.2.3 Testing Regime

Regular testing of the generators at the site will ensure that these are operational and capable of providing back-up power. Each of the generators at the site will be subject to a testing regime as set out in the table below:

Table 1.3: Testing Regime

Type of Test	Frequency	Load	Duration (Minutes)	Schedule
Off-load	Monthly	0%	60	Each generator will be tested individually in normal working hours, with one (1) generator tested per day. Using this schedule all generators will be tested each month
Full Rated Capacity	Annually	100%	180	This testing will be carried out on an individual basis and in normal working hours. This test will negate the need for the monthly off load test in the month it is undertaken
Black Building	Annually	Based on site demand at time of test	360	This test will usually be conducted outside of normal working hours and typically lasts for six (6) hours. The test will negate the need for the monthly off load test in the month it is undertaken. This test will be carried out for each data hall and in total eight (8) times across the two data centres to cover the Installation

Based on the testing regime set out above, the total planned operating hours for testing across all generators is six hundred and eight hours per annum. This is equivalent to a total of 19 hours per generator each year.

This testing regime is below the individual generator testing target set out by the Environment Agency within the Data Centre FAQ Headline Approach Guidance of 50 hours/annum per generator. The likely impacts associated with operating the generators in accordance with the above testing regime and the operation of the generators to support an interruption to the national grid power supply have been assessed and further information is available in the detailed air quality impact model provided with this application.

1.3 Directly Associated Activities

The following activities are considered to be directly associated with the principal regulated activity.

1.3.1 Diesel Handling

Diesel handling is principally associated with the delivery of diesel to the site. Based on the testing regime and fuel consumption rate defined on the manufacturer's specification sheets the approximate fuel consumption at the site will be 229,536 litres per annum, which equates to 7,173 litres per generator. Based on a fuel tanker capacity of 38,000 litres the minimum number of deliveries to the site is estimated to be four per year per data centre.

At the LON4 site, there are eight fill points serving the generators in the western generator bank, one per generator. These are proposed to be positioned adjacent to the storage tanks and will comprise a lockable fill point, each with a drip tray, level gauge, and visual and audible fill alarms. There is a single fill point for the generators in the eastern bank. The fill point will be located on the tertiary containment wall to the south and will comprise a lockable fill point with a drip tray, a level gauge, and visual and audible fill alarms. A steel fuel distribution pipe will route diesel to each tank and will be positioned aboveground within the tertiary containment structure. The containment for the fill points is presented in Figure LON04-PH1-JDA-DR-P-2010 included at Appendix 1.

At the LON5 site, there are three fill points serving the generators, located on the tertiary containment walls adjacent to the generator compounds and comprising a lockable fill point with a drip tray, a level gauge, and visual and audible fill alarms. A steel fuel distribution pipe will route diesel to each tank and will be positioned aboveground within the tertiary containment structure. The location of the fill points and associated containment is depicted in Figure LON05-PH1-JDA-XX-XX-DR-ME-5019 included at Appendix 1.

The general process of delivery of diesel comprises attaching a flexible hose to the fill points and pumping diesel from the road tanker into the storage tanks using a pump mounted on the delivery vehicle. Each of the fuel storage tanks at the site are fitted with overfill protection devices, which will close the fill point once the storage capacity is reached to prevent a spillage.

Further discussion regarding containment arrangements for the handling of diesel is provided in Sections 2.1.2 and 8.

1.3.2 Diesel Storage

It is proposed that diesel is stored in integrally bunded (110%) mild steel belly tanks, which are located directly below each of the generator containers (16 tanks present across the two generator banks). Each of the tanks will have bund alarms to detect any failure in the primary containment structure.

The tanks will have a nominal capacity of 31,000 litres each, which equates to 496,000 litres of capacity across each data centre (and a total of 992,000 litres across the installation). This is considered by the Operator to be sufficient capacity to enable the operation of all generators at the site at full load for a maximum period of 48-hours without the need to refuel.

There are also 16 day-tanks at each data centre (one tank in each generator container). The tanks are of single skinned mild steel construction and are filled via above ground pipework from the belly tanks located below each generator container. Diesel is fed from the day-tank to the engine via aboveground pipework. The generator container is designed to provide adequate secondary containment for the contents of the day tank in addition to the coolant and lubrication oil associated with the engine.

Further discussion regarding containment arrangements for the storage of diesel is provided in Sections 2.1.2 and 8.

1.3.3 Diesel Polishing

Diesel polishing is the process of cleaning diesel to remove water, sediment and microbial contamination, which may occur when fuel is stored for extended periods. Undertaking diesel polishing contributes to the prevention of blocked filters, fuel system failures, storage tank corrosion and ultimately engine failures.

The process of diesel polishing involves pumping diesel from the bottom of the storage tank though an opening on the top of the storage tank and through flexible aboveground pipework to a processing unit, where the fuel is passed through a series of filters before being pumped through flexible aboveground pipework and returned to the top of the storage tank.

It is proposed that diesel polishing is undertaken for each of the belly tanks at a minimum interval of twelve months, with the process being undertaken via a mobile processing unit operated by a third-party on a contract basis. Polishing activities are typically completed within a few hours depending on the capacity of the polishing equipment used by the third-party contractor.

Further discussion regarding containment arrangements during diesel polishing is provided in Sections 2.1.2 and 8.

2. RAW MATERIALS, WATER & WASTE

2.1 Raw Materials

2.1.1 Use

Raw materials use associated with the operation of the generator plant is detailed in the table below:

Table 2.1: Summary of Raw Material Use

Substance	Reason for use	State (Solid/ Liquid / Gas)	Estimated Annual Use	Maximum Storage Capacity	Environmental Hazard Statements
Diesel	Generator Fuel	Liquid	229,536 litres[3]	992,000 litres	H226 – Flammable liquid; H304 – Toxic; H373 – May cause damage to organs; H315 – Skin irritant; H332 – Harmful if inhaled; H351 – Carcinogenic; and H411 – Toxic to aquatic life
Lubricant Oil (Mineral)	Lubrication on generators	Liquid	13,216 litres[4]	13,216 litres[5]	Not Classified
Glycol (70/30 solution)	Generator coolant	Liquid	8,160 litres[6]	24,480 litres[7]	H304 – Harmful if swallowed

2.1.2 Storage & Containment

Lubricating oils and glycol coolants are both present within the generator sets. These substances are maintained at the optimal level for the operation of the generator sets by the Operators nominated maintenance contractor. There is no routine storage of lubricant or coolant at the installation other than within the generator plant. As the lubrication oil and the coolant are located within the generator plant secondary containment is provided by the generator container, which is of mild steel construction. Each generator container also holds a day-tank (approximately 1,000 litre capacity), which is used to store diesel. The generator container is designed to provide adequate secondary containment for the contents of the day-tank in addition to the coolant and lubrication oil.

Below each of the generator containers is an integrally bunded (110%) mild steel “belly tank”, containing diesel for the operation of the specific generator. The tanks have a nominal capacity of 31,000 litres each, which equates to 496,000 litres of capacity at each data centre (992,000 litres across the Installation). This is considered sufficient capacity to enable the operation of all

[3] Based on 10 hours under ¼ load (180 litres/hour per generator) and 9 hours under full load (597 litres/hour per generator).
[4] Based on the lubrication oil being changed on an annual basis.
[5] Based on a lubrication oil capacity of 413 litres per generator.
[6] Based on the coolants being changed once every three years.
[7] Based on a coolant capacity of 765 litres per generator.

generators at the site on full load for a maximum period of 48-hours without the need to refuel. The tanks are fitted with fill points, which are located on the western and eastern elevation of the generator areas to allow for the delivery of oil to each tank from a road tanker. The fill points are fitted with drip trays, a level gauge, visual and audible fill alarms. In addition, each tank is fitted with a bund alarm and an overfill protection device, which closes the fill point once the tank has become full to prevent a spillage.

The generator sets are present in two banks of eight at each data centre, with each bank located on an impermeable surface with sealed joints and a design containment of a minimum of 36m^3 (>110% of a single generator tank) plus 100mm freeboard. The surfacing is equipped with drainage to soakaway, with Darcy drain monitoring closure systems installed to seal the drainage in the event of a loss of containment beyond the internal secondary containment systems.

The roadways on which the road tankers will be located during fuel transfer are provided with 'sleeping policemen' to contain a minimum of 8m^3 (the capacity of a compartment within the road tanker). Surface water drainage from these locations are also equipped with Darcy drain monitoring closure systems to seal the drains in the event of a loss of containment during a road tanker delivery.

A drainage plan for each data centre is provided within Appendix 1 (drawing ref. LON04-PH1-JDA-DR-P-2010 and LON05-PH1-JDA-XX-XX-DR-ME-5019), along with the minimum containment calculation for the tertiary containment (drawing ref. LON4-PH1-JDA-XX-XX-DR-ME-5007 and document ref LON05-PH1-JDA-XX-XX-RP-ME-06152020).

2.1.3 Raw Material Efficiency Measures

Raw material use at the installation is limited to the use of diesel, lubrication oil and glycol based coolant. Annual consumption of lubrication oil and glycol are based on maintaining the generator plant in accordance with the manufacturer's specification for optimal performance of the plant. In addition regular maintenance of the generator plant ensures that use of these substances is kept to a minimum.

Diesel use at the site is primarily associated with the testing and maintenance schedule for the generator sets. This has been developed to allow for the optimal performance of the generator sets. The Operator proposes to maintain records of run-hours for each generator and associated fuel consumption to enable consumption of diesel to be monitored.

2.2 Water

2.2.1 Use

Water is not routinely used across the Installation; however, it may be used during scheduled maintenance activities to ensure that the engine coolant level within the engines is maintained at a suitable level by the operators nominated third-party maintenance contractor.

2.2.2 Efficiency Measures

As water use is not considered to be routine its use is not considered to require efficiency measures to be established.

2.3 Waste

2.3.1 Wastes Generated

Under normal operating conditions waste associated with the regulated activity are limited to oil contaminated absorbents, which may arise during small releases during refuelling (e.g. clean-up of drip trays etc.).

Under testing and maintenance operations of the generator plant (i.e. testing, maintenance and emergency power generation) the wastes arising from the regulated activity at the Installation will comprise:

Table 2.2: Summary of Wastes: Testing and Maintenance Operations

Description of Waste	Source	State (Solid/ Liquid / Gas)	Estimated Annual Quantity	Classification
Filters	Filtration of fuel and oil on generators	Solid containers with saturated filter material internally	<2 tonnes	Hazardous
Lubricant Oil (Mineral)	Lubrication on generators	Liquid	13,216 litres[8]	Hazardous
Glycol (70/30 solution)	Generator coolant	Liquid	Unknown[9]	Hazardous

Under abnormal conditions, such as a breakdown, fuel polishing or periodic overhauls wastes arising from the regulated activity at the installation will occur infrequently and will comprise:

Table 2.3: Summary of Wastes: Abnormal Operations

Description of Waste	Source	State (Solid/ Liquid / Gas)	Classification
Oily wastes	Filtration of fuel (diesel polishing)	Liquid	Hazardous
Batteries	Generators	Solid (contain sulphuric acid)	Hazardous
Engine / alternator parts	Generators	Liquid	Hazardous/non-hazardous depending on part and contamination with fuel / oil.

In addition to these wastes oil/fuel contaminated wipes and absorbents may arise on an ad-hoc basis resulting from small scale releases during maintenance and refuelling operations.

[8] Based on the lubrication oil being changed on an annual basis.
[9] Coolant is changed on three-yearly cycles.

2.3.2 Storage & Containment

Wastes arising under normal operating conditions are limited in volume and will be stored in a suitable sealed container, provided with secondary containment. Wastes arising from maintenance and abnormal conditions are not routinely stored on-site and will be removed by the third-party contractor undertaking these works. Liquid wastes stored on-site during maintenance / abnormal works will be suitably contained with adequate secondary containment.

2.3.3 Waste Minimisation

Wastes arising from the regulated activity at the Installation will be limited to the maintenance of the generators. Maintenance will be undertaken in accordance with the manufacturers specification and is intended to prolong the life and efficiency of the generator sets.

3. ENERGY USE & EFFICIENCY

3.1 Energy Consumption

This application for an environmental permit is made for the proposed regulated activity of burning of any fuel in an appliance with a net rated thermal input of 50 or more megawatts, when the National Grid supply is interrupted. Therefore, the focus of energy consumption under the permit is in relation to the generators alone, rather than the energy consumption of the data centre operations, which are not considered to be a regulated activity under the environmental permitting regime and are excluded from the Installation.

The annual fuel oil consumption associated with the testing and maintenance of the generators is estimated to be 229,536m^3, which is equivalent to 2,433.08 MWh. Electricity consumption will be relatively small and based around pre-heating the engines, monitoring and control systems. Electricity consumption within the data centres is excluded from this calculation as it does not form part of the permitted activity.

Table 3.1: Summary of Energy Consumption

Energy Source	Approximate Annual Energy Consumption		
	As Delivered (MWh)	At Primary Source (MWh)	% of total (primary)
Electricity	Nominal	Nominal	<1
Diesel	2,433.08[10]	2,433.08	>99

* For electricity from the public supply a factor of 2.4 should be used to convert from delivered to primary energy.

3.2 Energy Efficiency Measures

3.2.1 Operating & Management Procedures

The generators will be maintained and serviced in accordance with the manufactures recommended maintenance schedule to ensure the efficiency of the engines is maintained.

Given the infrequent, intermittent and unplanned nature of the operation of the generators other energy efficiency measures are not considered appropriate.

3.2.2 Energy Efficiency Directive – Article 14

Article 14 of the Energy Efficiency Directive (2012/27/EU) requires a cost-benefit analysis in relation to measures for promoting efficiency in heating and cooling at industrial installations with a thermal input exceeding 20MWth. Whilst this capacity is exceeded at the Installation, the operating hours for the plant are significantly below the 1,500 hours a year threshold which also applies. As a consequence, the generators would be exempt from the requirement to provide a cost-benefit analysis on recovery of heat as part of the application.

[10] Based on net calorific value for diesel (biofuel blend) of 10.60 kWh/litre set out in the Department of Business, Energy & Industrial Strategy Conversion Factors 2019.

4. EMISSIONS TO AIR, WATER, SEWER & LAND

4.1 Emissions to Air

Emissions to air from the installation will principally comprise combustion gases arising from the operation of the generation plant under emergency and testing and maintenance scenarios.

4.1.1 Point Source Emissions to Air

Combustion gases from the operation of each of the generators will be emitted to air via four stacks and would only take place in the event of an interruption to the Installation's electricity supply from the National Grid, or as a result of running the engines for maintenance and testing.

Each of the four stacks comprise a common windshield with four flues present within the windshield (there are sixteen flues present at the site in total – one flue per generator). The Emission Point reference and the method of emissions are as shown on the table below, these emission points are also shown on Figure 4 provided in Appendix 1 with the same reference number for convenience.

Table 4.1: Schedule of Electricity Generation Plant Emission Points

Combustion Plant (source)	Emission Point Reference	Stack Position	Stack Height (from ground level)	Parameters
LON4 Data Centre				
Generators 1 - 4	A1-A4	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 5 - 8	A5-A8	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 9 - 12	A9-A12	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 13 - 16	A13-A16	Vertical	16.5m	NO_x, SO_2, CO, Particulates
LON5 Data Centre				
Generators 1 - 2	A17-A18	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 3 - 4	A19-A20	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 5 - 6	A21-A22	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 7 - 8	A23-A24	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 9-10	A25-A26	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 11-12	A27-A28	Vertical	16.5m	NO_x, SO_2, CO, Particulates
Generators 13-16	A29-A32	Vertical	16.5m	NO_x, SO_2, CO, Particulates

As the flues are grouped either into two or four flues in close proximity, each 'stack' will have emissions totalling either thirty-eight or seventy-six hours based on the testing schedule listed under Section 1.2.3 of this report. The total planned operating hours for testing of all generators is three hundred and four (sixteen generators, nineteen hours each) per data centre per annum.

4.1.2 Emission Limit Values

As each of the generators at the site has a rated thermal input of below 15MW, the installation is not classified as a Large Combustion Plant, and the emission limit values specified under Chapter III of the Industrial Emissions Directive (2010/75/EU) are not applicable; however, the requirements set out in Chapter II of the IED are considered to apply, although there are no specific emissions limit values relevant to the Installation under this Chapter.

As the generators are subject to the provisions of Chapter II of the IED the generator plant is considered to be an excluded generator for the purposes of Schedule 25B of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) for specified generators, and the emission limits and rules set out therein do not apply.

The emissions limit values set out under the requirements of Schedule 25A of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) are considered to be applicable to the Installation. However, as the generators are planned to operate for less than 500 hours per year the emission limit values applicable under this Schedule will not apply to the plant.

Whilst there are no specified emission limit values, which are applicable to the site, according to the Manufacturers specifications, each of the generators meet the requirements of the TA-Luft 2g standard (considered to represent Best Available Techniques for emergency generator operation). The specific reference conditions and associated oxygen concentration used to determine compliance are stated in the TA-Luft Certificate for the generators, provided in Appendix 3.

4.1.3 Fugitive Emissions to Air

Fugitive emissions to air are not anticipated to arise at the Installation.

4.2 Emissions to Surface Water

4.2.1 Point Sources to Surface Water

The operation of the generator plant does not result in any discharges of wastewater to a surface water.

4.2.2 Fugitive Emissions to Surface Water

The operation of the generator plant does not result in any fugitive discharges of wastewater to a surface water.

4.3 Emissions to Groundwater

4.3.1 Point Source Emissions to Groundwater

Point source emissions to groundwater at the Installation are limited to discharges of surface water runoff from buildings and site surfaces through three soakaways present in the southern, north-eastern and north-western parts of the LON4 data centre and two soakaways present in the north-east corner of the LON5 data centre.

Surface water runoff from the generator areas is routed across the site through a dedicated surface water drainage system to a soakaway present below the service yard in the southern part

of the LON4 data centre. Surface water runoff from the roadways present adjacent to the east and west of the generators, which is proposed to be used for fuel delivery and fuel polishing, is routed to two soakaways located in the north-eastern and north-western parts of the LON4 data centre. Petrol interceptors and automatic inflatable shut-off valves are present on each of the surface water drainage systems prior to the water entering the soakaways.

For LON5, all drainage from the vicinity of the generators and delivery areas is directed to the main soakaway on the eastern side of the site. A Class 1 interceptor and automatic inflatable shut-off valve are installed prior to the soakaway.

Figures LON04-PH1-JDA-DR-P-2010 and LON05-PH1-JDA-XX-XX-DR-ME-5019 included in Appendix 1 provide an overview of the surface water drainage system across the two sites.

4.3.2 Fugitive Emissions to Groundwater

There are no fugitive emissions to groundwater associated with the regulated activity undertaken at the Installation.

4.4 Emissions to Sewer

There are no emissions to the foul or surface water municipal sewers associated with the regulated activity undertaken at the Installation.

4.5 Emissions to Land

There are no direct emissions to land associated with the regulated activity at the Installation. The surface water drainage at the site is directed to soakaway but will be uncontaminated and protected through the presence of interceptors and shut-off valves.

5. ODOUR & NOISE

5.1 Odour

There are no significant sources of odour from the permitted operations at the Installation, therefore odour is not considered further in this application.

5.2 Noise

The intermittent (and infrequent) short-term operation of the proposed generator plant presents a potential noise issue at the installation.

5.2.1 Noise Assessment

An environmental noise survey was undertaken by The EQUUS Partnership Ltd in April 2018 (Ref: EPL:8711) (the “third-party noise assessment”) to establish the prevailing noise climate in the vicinity of the site and to assess the impact of noise emissions from the proposed plant. A copy of the report has been provided in Appendix 4.

The third-party noise assessment identified the nearest sensitive receptors as being the south-western and south-eastern elevations of 227 Bath Road present from approximately 40m and 80m north respectively, and residential properties present to the south of the installation from 40m distant.

The noise assessment considered the impacts associated with the operation of four generators located closest to the receptors running at full load based on the manufacturer’s noise data, which is considered by the author of the noise assessment to represent the worst-case scenario.

5.2.2 Conclusions

The results of the survey found that the predicted rating level at the nearest residential receptors will be equal to or marginally less than the typical daytime and nigh time background noise level. Additionally, the third-party noise assessment found that the acoustic design requirements of the relevant national and local planning policies would be achieved. Therefore, noise is not considered to be a significant issue at the Installation and noise impacts are not considered further in this application.

6. MONITORING

6.1 Monitoring Emissions to Air

As discussed in Section 4.1.2 there are no emission limit values which are applicable to the site. Furthermore, emissions from the generator plant are not anticipated on a routine basis other than for testing or short-term operation in the event of a failure of the National Grid supply. Therefore, emission monitoring will be limited to that undertaken as part of routine maintenance and no formal monitoring under the Environmental Permit is proposed.

6.2 Monitoring Emissions to Water

There are no emissions to Water associated with the proposed regulated activity and therefore no monitoring is required.

6.3 Monitoring Emissions to Land

There are no emissions to land associated with the proposed regulated activity and therefore no monitoring is required.

6.4 Monitoring and Reporting of Waste

As the regulated activity is not associated with a Waste Installation or Activity, the monitoring and reporting of waste is not considered to be appropriate to the site, other than as required for resource efficiency requirements or other internal environmental management system requirements.

6.5 Monitoring Performance

The Operator proposes to monitor, and report performance based on the following parameters:

Table 6.1: Schedule of Monitoring Performance

Parameter	Reporting Frequency	Units
Diesel Consumption	Annually	Tonnes
Generator operation for testing / maintenance	Annually	• Total for the site (hours); • Total per generator (hours); • Total number of runs per generator; and • Number of minutes per run.
Generator operation for emergency running	Within 24 hours of emergency operation	• Date and time of National Grid failure; • Number of generators operating immediately after the failure; • Number of generators operating two hours after the failure; and • Total duration/anticipated duration of mains supply failure (hours)
Generator operation for emergency running	Annually	• Total number of runs (number); and • Total duration of runs (hours)

7. ENVIRONMENTAL MANAGEMENT SYSTEMS

7.1 Summary

CyrusOne is developing the site as a new Installation and therefore, the management system for the site has not yet been implemented; however, a management system will be developed and implemented in accordance with the Environment Agency's requirements for environmental management at permitted installations, which will include the following elements:

- Operations and maintenance;
- Management of change;
- Training and competence;
- Incidents, accidents & complaints management;
- Maintaining records; and
- Site closure.

A summary of the anticipated approach is provided below, although the final system as implemented may vary from this.

The management system will seek to identify and minimise the risk of pollution and harm to human health which may arise from operation, maintenance, accidents, incidents and non-conformances specific to the proposed operation of the generators. A list of environmentally critical plant and instrumentation will be developed and maintained. Maintenance of environmentally critical plant will be routinely included in the maintenance schedule.

The management system and procedures will be available for inspection upon request and will be applicable to all staff, contractors and visitors to the facility. The management system will be developed to enable compliance with the environmental permit and other legislative requirements for the protection of the environment and human health.

The management system and procedures will be subject to a regular review process. Internal review of the management system (or relevant parts therein) will be undertaken at least on an annual basis or in the event of a change in operations / site processes. Internal audits will be undertaken to ensure compliance with the management system, relevant legal requirements, environmental and management performance and to identify preventative / corrective actions to minimise the risk of breach / non-compliance. The findings of any such review and audits will be communicated to all staff and relevant external contractors and where appropriate improvement works / corrective actions implemented. All internal reviews, audits, amendments to the management system and improvement measures implemented will be recorded for reference and inspection purposes.

The following sections discuss the scope of the proposed management system and how it covers the main requirements for a management system set out in the Environment Agency's guidance.

7.2 Site Plans

A full final set of site plans for the proposed back-up generator facility will be developed and maintained to reflect the location, layout, boundary and as-built conditions of the site. All drawings will be to scale and will be amended as required to reflect any changes to the process and other construction / operation changes to the site.

A copy of site plans and drawings, including those presented in Appendix A, will be available from the operator for inspection / reference purposes.

7.3 Operations and Maintenance

CyrusOne are in the process of developing SOPs for the operation of the generator plant, including delivery of fuel and management of the drainage systems associated with the plant.

The generator plant will be operated and maintained in accordance with a maintenance management plan which adheres to the requirements of the manufacturer. A computerised maintenance management system (CMMS) will be used to support the planning and recording of maintenance activities at the facility.

The operations and maintenance strategy for the facility will be based on:

- plant and equipment condition monitoring – undertake performance and health checks to ensure safe and efficient systems;
- preventative programmed maintenance and cleaning – using the CMMS to optimise maintenance activities;
- undertaking defect reporting and rectification – providing rapid response to system faults;
- minimising downtime/breakdown maintenance – the use of skilled engineering maintenance staff and 'call off' contracts;
- analysing historical data – to identify failure mechanisms and allow for system modification to enhance reliability;
- planning outages – including routine inspections and planned refurbishment; and
- optimal spares holdings - optimising system availability by identification of critical and specialist equipment spares.

A list of environmentally critical plant and instrumentation will be developed and maintained on site. Maintenance of the environmentally critical plant and instrumentation will form a key part in developing the routine maintenance schedule to be implemented at the site.

7.4 Accidents and Incidents

In addition to SOPs covering the operation and maintenance of the generator plant, the management system will also include environmental SOPs and health and safety SOPs to minimise the risk of accidents that may result in significant pollution and harm to human health, including for example:

- the maintenance of raw materials and waste registers;
- the delivery of raw materials and diesel/chemical spill response procedures;
- COSHH and task-based risk assessments;
- safety induction;
- reportable incidents and incident response; and
- accident / incident review.

During operation of the generator plant, accidents and incidents (including near misses) will be recorded and investigated in line with relevant procedures. These procedures will also allow for the implementation of improvement measure to prevent or reduce the risk of re-occurrence of an incident or where this is not possible to reduce the potential impact of the incident.

7.5 COMAH Regulations

The generator plant will not keep or hold quantities of any dangerous substances identified in the Control of Major Hazards and Accidents (COMAH) Regulations above the designated thresholds.

7.6 Site Security

Security measures to prevent unauthorised access to the site have been considered as part of the design process. Given the 24-hour operation of the facility, security measures will include:

- 24-hour on-site staff presence;
- the provision of a 2.4-metre high anti-climb security fence around the site perimeter;
- Sliding security control gates at the site entrance;
- Relevant signage at the site entrance;
- provision of building envelope around a significant proportion of the operation / process; and
- Security measures will be included in the management systems and shown on relevant site plans and drawings.

7.7 Incidents / Non-Compliances / Non-Conformances

Various measures have been put in places as part of the design process to prevent, or where that is not practicable, to reduce emissions from the generator plant. Such design measures include for example the use of sealed and bunded containment measures, segregated drainage systems, installation of shut-off valves on higher risk drainage, etc.

Information in relation to incidents / non-compliances / non-conformances will be recorded and reported, including:

- the date, time and duration of the incident;
- notification of the incident to the Regulator;
- the receiving environmental media in the event of any emission as a result of the incident;
- an initial estimate of the quantity and composition of any emission;
- the measures taken to prevent or minimise any emission or further emission;
- the cause and circumstances of the incident;
- an assessment of any harm to the environment;
- the steps taken to bring the incident to an end; and
- if necessary, proposals for improvements / remediation / preventing a repetition of the incident.

Procedures for the notification, recording, investigation, remediation and reporting of non-compliance or non-conformances are covered in the existing management system and included as part of the “Incident Plan”, which will be developed during commissioning. The Incident Plan will be reviewed at least every 4 years. The findings of the review and any revisions to the plan will be recorded. Any changes to the plan will be communicated to the Regulator and to staff to ensure they are aware of the changes made.

7.8 Site Condition Report and Closure

Technical guidance states that as an operator when you come to apply to surrender your permit you need to be able to demonstrate that "you have taken the necessary measures to avoid pollution risk resulting from your activities and that the site has been returned to a satisfactory state".

To demonstrate this CyrusOne UK4 Ltd as Operator will:

- produce an application stage Site Condition Report when first applying for an environmental permit;
- update the Site Condition Report as appropriate during the lifetime of the permit; and
- complete the surrender parts and submit a fully completed Site Condition Report when applying to surrender the environmental permit.

The Site Condition Report describes and records the condition of the land and groundwater at the site at the point of permit issue. The report and supporting records will be maintained over the lifetime of the site to demonstrate that land and groundwater have been protected during the lifetime of the site and that the land is in a satisfactory state at the time of the permit surrender application.

An application stage Site Condition Report has been prepared in accordance with Horizontal Guidance Note H5[11] and is included with this application.

7.9 Complaints

Management of complaints will be addressed within the management system and will be applied to the generator plant as well as the data centre.

Any complaint received will be taken seriously and all necessary actions will be taken to investigate and fully resolve the complaint.

A record will be maintained of all complaints received in relation to alleged releases or emissions to the environment and the measures undertaken to resolve the issue. The record will contain the following information:

- the time and date the complaint was received;
- the method by which the complaint was communicated (e.g. letter, telephone, etc.);
- the name and contact details of the complainant;
- the nature of the complaint;
- investigation of the cause of the problem, measures taken to resolve it and ensure it is not repeated;
- the conclusion of any investigation and an explanation of the conclusions regarding the justification (or otherwise) of the complaint; and
- any actions following the investigation (e.g. feedback of findings to the complainant; amendment to process / management systems, etc.) and their time and dates of completion.

Records will be maintained by the operator and will be available for inspection on request.

[11] Horizontal Guidance Note H5, Guidance for applicants, Environmental Permitting Regulations, Site condition report – guidance and templates, LIT 8001 Version 3.0 April 2013

7.10 Resources and Training

CyrusOne is experienced in the operation of this type of facility and will provide a team of appropriately trained and skilled personnel to manage the operation and maintenance of the facility.

The majority of the data centre, excluding the generator plant, is designed to operate 24 hours per day and 7 days per week. Operation of the data centre will be undertaken on a shift basis. Specialist external contractors will also be used for certain maintenance activities, particularly during planned shutdowns for the plant.

All staff will work under CyrusOne's human resources policies and procedures including training and discipline. Staff will be trained to ensure competency in their particular role and to ensure they undertake their role in a safe manner.

- all new personnel will receive induction training, which will cover health, safety and environmental requirements.
- environmental awareness training will be provided to all employees and contractors involved with the generator plant. This will include the requirements of the Environmental Permit, including relevant emission limits and reporting requirements.
- key elements of operational training will form part of the technology supply contract and will be provided by specialist equipment manufacturers.

The site will establish and maintain job role profiles for all levels of personnel on-site which will provide minimum qualification and experience levels for all roles. A training matrix will also be maintained to ensure that all staff will receive appropriate training and where appropriate that refresher training is provided, including requirements for environmental training.

Training needs will be reviewed annually at a site level. Training will include environmental awareness training to ensure that all staff is fully aware of the environmental impacts of the generator plant and the potential impacts which could arise in the event of failure to control operations as designed together with notification procedures.

A training file will be kept for all personnel containing evidence of completed training, safety and technical competency assessments and also details of any briefings attended.

7.11 Emissions and Monitoring

Procedures for the monitoring of emissions will be developed as necessary and relevant to the generator plant, to include information on:

- emission points and any permitted discharge levels;
- monitoring locations, standards and reference conditions;
- frequency of monitoring, recording and reporting requirements; and
- emission control mitigation measures and management plans.

Environmental awareness training will be provided to all employees and contractors involved with the generator plant. This will include the requirements of the Environmental Permit, including relevant emission limits and reporting requirements.

7.12 Records

Records will be maintained in accordance with the requirements of the management system.

Records for the generator plant will include but not be limited to the following:

- incoming deliveries of diesel and other associated chemicals;
- water and energy use;
- hours of operation;
- emissions to air and water;
- waste arisings and disposal;
- incidents, accidents and emergencies and details of follow-up;
- maintenance works scheduled and status;
- site infrastructure and boundary inspection;
- site diary;
- any other records required to be kept by the Environment Permit.

Document control procedures will be implemented to ensure that all documents are stored and controlled for easy reference, revised when appropriate, and authorised by relevant staff where necessary.

Records will be maintained for a minimum period of 4 years.

7.13 Access to Environmental Permit

A copy of the Environmental Permit will be maintained on site and will be made readily available for inspection to all members of staff.

8. APPLICATION OF BAT

8.1 Determining Applicable BAT

The proposed regulated activity does not have a specific Best Available Technique (BAT) reference document or any associated BAT conclusions which are applicable. However, it is acknowledged that the Environment Agency has provided generic advice via the gov.uk website setting out general requirements for compliance with the conditions of a Permit. This generic guidance has been considered throughout the preparation of this application and therefore no specific assessment against these requirements is provided in this section.

In the absence of sector/activity specific BAT an assessment is provided in the following sections against the main applicable requirements set out within the following guidance:

- Environment Agency's Data Centre FAQ Headline Approach guidance; and
- CIRIA C736 – Containment Systems for the prevention of pollution.

8.2 FAQ Headline Approach Conclusions

Table 8.1: FAQ Headline Approach Conclusions

Requirement	Installation Arrangements	Conclusion
Diesel generators are presently the default technology for standby generators in Data Centres. However, the permit application still requires a BAT discussion detailing the choice of engine, the particular configuration and plant sizing meeting the standby arrangement (e.g. 2n).	Generator units chosen are capable of delivering an N+1 standby arrangement with a relatively high efficiency (>38%) and meeting TA Luft standards.	The generator sets and configuration are appropriate for the installation.
Standby engine capacities are aggregated in MW thermal input at the quoted standby rating, being usually 110% of the continuous rating.	In total sixteen generators will be present at each data centre. Each of the generator banks is proposed to comprise eight (8) generators. Each generator will have a net rated thermal input of 6.29MW (based on the manufacturers thermal efficiency value of 38.15%.). Therefore, the aggregated net rated thermal input capacity of each data centre is 100.64MW, with a total for the Installation of 201.28MWth.	The Installation exceeds the threshold for a Part A(1) Permit under Schedule 1, Part 2, Chapter 1, Section 1.1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

Requirement	Installation Arrangements	Conclusion
If precise MWth figures are unavailable and spec sheets or face-plates are unclear, the calculation for MWth derived from MVA output is based on: power factor 0.8 and an assumed poor conversion efficiency of 0.35 for MWth to MWelec.	Although not stated on the specification sheet for the generators the manufacturer has confirmed that the thermal efficiency of the generators is 38.15%. The specification sheet lists the standby kW rating as 2400. Based on these values the MWth rating of the generators, based on the provided calculation equals 6.29MWth input per generator.	Each of the generators has a net rated thermal input of 6.29MW based on the provided methodology.
The sum of generator plant capacities is based only on MW thermal inputs of all plant regardless of the standby configuration. MWe output constraints such as realistic customer load or other practical output limiting factors do not constitute a limit to the MWth input as defined in the EA's guide RGN02.	The MWth capacities of the generators at the site have been calculated only on MWth inputs without any constraints/limiting factors applied.	Limiting factors have not been applied to the MWth capacities of the generators.
Proximity of data centres with a company campus, adjacent, neighbouring or close-by buildings in urban locations (e.g. within a common trading estate but only separated by a road width or notional distance) may constitute a single site for determining the boundary of the installation as 'same site – same operator' as per RGN02	The Installation consists of two adjacent data centres (LON4 and LON5) and is considered to be a single site under this application. Otherwise, the data centres are located approximately 1.2km south of the Operators next nearest data centre located on Liverpool Road, Slough. Given the distance between the sites and the lack of coherence (e.g. no power link between the sites and no sharing of physical resources) the sites are considered to be technically separate.	The proposed Installation is considered to be a separate site to other sites operated by CyrusOne in the vicinity.
Permits will include a maximum 500 hour 'emergency/standby operational limit' for any or all the plant producing on-site power under the limits of the combustion activity; and thereby emission limit values ELVs to air (and thus engine emissions monitoring) are not required within the permit.	The operation of the generators at the Installation is predicted to be below the 500-hour threshold for emergency/ standby operation. It is noted that emission limit values are not applicable to the site under this operational scenario.	The site meets the emergency / standby operational limit and therefore no emission limit values are applicable.

Requirement	Installation Arrangements	Conclusion
Emergency hours' operation includes those unplanned hours required to come off-grid to make emergency repair of electrical infrastructure associated but occurring only within the data centre itself.	The site has a 2N level of resilience built into the supply from the national grid, therefore the requirement to operate the generators under an emergency scenario is unlikely. However, should this be required, performance will be monitored in accordance with the monitoring requirements set out in Section 6 of this report.	The use of generators to make emergency repairs of electrical infrastructure is unlikely given the inbuilt 2N resilience of the national grid supply.
Each individual generator with its own discharge stack, can be maintained, tested and used in a planned way for up to 500 hours per calendar year each without ELVs (and hence no monitoring) under IED/MCPD. Though clearly the EA expects planned testing and generator operations to be organised to minimise occasions and durations (subject to client requirements). Ideally a target should seek to keep individual generator testing to below 50 hours/annum each as required for MCPD specified generator exclusion.	As set out in Section 1.2.3 of this report the testing regime for all generators will equate to three hundred and four hours of operation. This equates to 19 hours per generator, which is well below the 50-hour target.	The testing regime proposed is below the individual generator testing target set out by the Environment Agency within the Data Centre FAQ Headline Approach Guidance of 50 hours/annum per generator.
The whole or part site can only operate as emergency plant up to 500 hours as an absolute limit for grid backup issues; but that individual plant (at any load) with its own stack (or a stack with multiple plant) with justification can be operated for up to 500 hours (ideally <50) each as part of its non-emergency role under maintenance and testing.	The planned operational scenarios for the site will be 19 hours per generator per year. Whilst the emergency operation of the plant cannot be foreseen based on the security of the supply to the site and the stability of the national grid exceeding the 500-hour emergency operations limit is highly unlikely.	The proposed Installation will operate at less than 50 hours per generator for maintenance, and it is anticipated that the emergency operation of the generators will be below 500 hours based on the reliability of the National Grid.
For the purposes of determining operating hours, data centre diesel generators are regarded as having a minimal start-up or shut-down times. Operational hours start on the first fuel ignition.	The power supply into the Installation is constantly monitored, should the power supply be interrupted the site's UPS will ensure continuity of supply and the generators will start automatically taking over from the UPS typically within a 15 second timeframe. The run time on each generator is logged from the first ignition.	The generators at the site have minimal start-up and shut-down times. Operational hours for all generators are metered.

Requirement	Installation Arrangements	Conclusion
Data Centre permits (unless they apply and justify it in a permit application) will expressly have a limit on the activity to exclude voluntary 'elective power operation' such as demand side response (i.e. on-site use) or grid operating reserve (STOR) (i.e. off-site export of electricity) and Frequency Control by Demand Management (FCDM) for grid support. This is primarily to differentiate data centres from 'diesel arrays or MCPD specified generators' that voluntarily operate within the balancing market, and importantly a clear way to demonstrate minimisation of emissions to air as 'Emergency plant'.	The generators will only be used to meet site demand in the event of an interruption in electricity supply to the site. The generators will not be used for voluntary elective power, such as demand-side response (i.e. on-site use), grid short term operating reserve (STOR) (i.e. off-site export of electricity) and frequency control by demand management (FCDM).	The generators at the Installation will not be used for voluntary elective power operation.
The default engine specification as a minimum for new plant to minimise the impacts of emissions to air (NOx) is 2g TA-Luft (or equivalent standard). A detailed cost benefit analysis (CBA) is otherwise needed justifying worse emission such as 4g TA-Luft plant or for example a justification under FCDM.	Engine emissions at prime rating corrected to 5% O_2 content, are in compliance with the TA Luft Standard. Certification from the manufacture is provided as Appendix 3.	The generators proposed will meet the default engine specification and therefore there is no requirement for a detailed cost-benefit analysis.
CBA for improved exhaust emissions, dispersion and mitigations from the plant is expected for the maintenance/testing and the emergency standby roles.	Cost-benefit analysis is not required for the Installation as the proposed generators meet the default engine specification.	The generators proposed will meet the default engine specification and therefore there is no requirement for a detailed cost-benefit analysis.
Retrofit abatement techniques for existing installations for engine emissions such as selective non-catalytic or catalytic reduction (SNCR or SCR) would not normally be expected for standby plant to mitigate the emissions for standby/emergency operation. BAT might include improved flue gas dispersion (e.g. stack modifications, increased height) or improved low NOx engine management controls or possibly fuel choice.	The Installation is a newly constructed installation with no significant impact and therefore retrofitting or other mitigations are not required.	Retrofitting abatement technologies or mitigating emissions are not required.

Requirement	Installation Arrangements	Conclusion
Operations and management procedures should reflect the outcomes of the air quality modelling by minimising the duration of testing, phasing engines into subgroups, avoiding whole site tests and planning off-grid maintenance days and most importantly times/days to avoid adding to “at risk” high ambient pollutant background levels.	The testing regime for the Installation has been designed to meet the manufacturers recommendation and ensure that the generator provision is operational. This testing regime is based upon testing a single unit or small groups at any one time and was considered in the air quality modelling, which determined that there is no negative impact to local air quality.	The testing regime for the Installation will not negatively impact background pollutant levels.
When AQ modelling the emissions from the engines, the certified technical standard provided by the manufacturer should be used (i.e. likely worst-case emissions).	The data from the certified technical standard provided by the manufacturer of the generators has been used in the air quality modelling.	The data from the certified technical standard provided by the manufacturer of the generators has been used in the air quality modelling.
The groundwater monitoring of fuel storage tanks and distribution pipework using GW boreholes is risk based for the site condition report (SCR) and IED 5-yearly monitoring. Should GW monitoring be required for underground tanks and/or the SCR, the boreholes should be positioned for whole site surveillance (for the SCR) rather than as a very local control immediately around the buried fuel oil tanks (i.e. not be just an addition to double skinned tanks already protected by leak detection and hence ignoring distribution pipework etc).	Due to the level of information available regarding the condition of the site at the time of the preparation of the site condition report, the conditions of the site have been characterised and no further intrusive ground investigations are required in this regard. The Operator intends to adopt a risk-based approach to 5-yearly monitoring.	The condition of the site is based on available information and no further investigations are proposed. The Operator will adapt a risk-based approach to any future monitoring of soil and groundwater conditions.

Requirement	Installation Arrangements	Conclusion
10-yearly soil sampling under IED is normally not needed but still needs some justification.	The Operator does not intend to undertake 10-yearly soil sampling; however, a risk-based approach will be applied at that time taking into consideration the operations undertaken at the site, the management techniques implemented, records of accidents and incidents relating to losses of containment of relevant hazardous substances and associated corrective action reports. Given current controls proposed (e.g. primary, secondary and tertiary containment, impermeable hardstanding across operational areas of the site, management controls for handling hazardous substances) there is a reduced risk of the soil at the site being impacted.	Current control measures are suitable to prevent impacts to soil at the Installation. However, a risk-based approach will be taken in year ten of operations, taking into account the performance of the site over the preceding ten years to determine if an intrusive soil investigation is necessary.

Requirement	Installation Arrangements	Conclusion
The permit application must assess and provide evidence of actual reliability data for the local electricity grid distribution (including data centre internal electrical design) for the EA to judge the realistic likelihood of the plant needing to operate for prolonged periods in an emergency mode (especially if emissions model so as to exceed short term air quality standards).	The power supply to the site is protected by an uninterruptable power supply (UPS), consisting of banks of batteries capable of meeting the full load capacity of the site for approximately 10 minutes. The generators are automatically triggered to start once the power supply has been interrupted, providing power within 20 seconds of the failure of the National Grid supply, at which point the UPS would revert to standby. The use of the generators to provide electrical power to the site is considered to be unlikely, on the basis that the site is supplied with electricity via two diverse routes and associated infrastructure (e.g. transformers) providing a 2N level of resilience, where N is the power demand of the installation. The likelihood of long periods of reliance on the generators to provide power to the site is considered to be highly unlikely given that the National Grid Electricity Transmission System, which serves the site, achieved an overall reliability of supply of 99.999967% (2018-19), indicating an average outage period of 10.4 seconds, with a total of 22 loss of supply incidents across the entire network. (according to the National Grid National Electricity Transmission System Performance Report 2018–2019[12]).	The likelihood of the Installation needing to operate for prolonged periods in an emergency mode is considered highly unlikely.
Optimising grid reliability within the site as part of general BAT to minimise emergency operating hours is required – evaluation is needed within the permit application on the Tier reliability standard under ISO27001 and Uptime.	The site has a 2N level of resilience in relation to grid reliability. This is provided through two diverse supply routes into the site and duplicate electricity distribution infrastructure within the site.	The site has optimised the grid reliability within the site to minimise emergency operating hours. Use of battery storage as back-up minimises the emergency operation of the generators.

[12] https://www.nationalgrideso.com/insights/transmission-performance-reports National Grid Website.

Requirement	Installation Arrangements	Conclusion
Reporting of standby engine operational run hours and discussion of any electrical outages (planned or grid failures regardless of duration) required annually.	The Operator propose to record and report on operational run hours of all generators and electrical outages on an annual basis.	The Operator will monitor and report operational run hours in accordance with the Environment Agency's Requirements.
Assuming AQ modelling, based on operating scenarios, indicates a local air quality risk then notification to the EA of unplanned (and pre-notification of planned) continuous grid outage exceeding 18 hours LAQM (or the otherwise assessed short term interval from modelling) is likely required under a permit schedule 5 notification.	The air quality model does not indicate that the operation of the installation will have a significant impact on local air quality therefore the notification to the EA of unplanned and pre-notification of planned continuous grid outages is not considered to be necessary.	The notification to the EA of unplanned and pre-notification of planned continuous grid outages is not considered to be necessary.
The notification requirement stated in the permit should also indicate the actual number of generators that need to be operating above which the local air quality is at risk e.g. 'notification of continuous emergency operation exceeding 18hours with 5 or more engines operating together is required' (i.e. model shows 4 or less engines unlikely to breach LAQ).	The notification to the EA of unplanned and pre-notification of planned continuous grid outages is not considered to be necessary, on the basis that the local air quality model indicates that the operation of the installation will have no significant impact on local air quality.	The notification to the EA of unplanned and pre-notification of planned continuous grid outages is not considered to be necessary, on the basis that the local air quality model indicates that the operation of the installation will have no significant impact on local air quality.
Assuming AQ modelling, based on emergency outage operating scenarios, indicates a very significant risk to local air quality and identified receptors, the EA will ask the operator to have a written AQ outage action plan to manage the issue for prolonged emergency running of the plant. An AQ outage action plan is also likely required for sites which might operate in conjunction with other neighbouring large sites during an outage i.e. data centre hubs.	The air quality modelling, which takes into consideration emergency outage operating scenarios, indicates that there is an insignificant risk to identified receptors from the operation of the combustion plant for emergency events up to 36 hours in total. As such an air quality outage action plan is not considered necessary.	Based on the results of the air quality modelling an air quality outage action plan is not required.

Requirement	Installation Arrangements	Conclusion
Due to the emphasis of the permit on electrical (and cooling) systems it is noted that the EA considers the F-Gas regulations as falling under the remit of the EPR permit (for notifications and management) where F-gases (or potentially any polluting potential substance) are used directly under the combustion aspects of the permitted activity (e.g. switchgear).	There are no uses of F-gases at the Installation, which are directly associated with the combustion activities.	This element of BAT is not applicable to the proposed Installation.
The permit application should detail the likely quantities of waste engine oil generated annually - EWC 13 02 waste oils following servicing for example. Although unlikely to be huge, the Pollution inventory has a reporting threshold of 1 tonne for non-hazardous waste but technically no lower thresholds for hazardous waste oil.	As discussed in section 2.3 of this report it is anticipated that approximately 13,216 litres of waste lubricating oil will be generated at the Installation each year.	The Operator will report on all relevant substances and wastes emitted from the Installation in accordance with the pollution inventory reporting requirements.
The permit application is for the combustion plant and associated environmental concerns and not for the Data Centre itself. The applicant should be aware that the permitting process and application is accessible to the public so should have regard to 'Commercial in Confidence' and Critical National Infrastructure.	The Applicant acknowledges the guidance on commercial confidentiality and in this instance has not applied for the Environment Agency to consider aspects of the application as commercially confidential. Additionally, the proposed Installation is not regarded as critical national infrastructure.	A claim for commercial confidentially has not been made.

8.3 CIRIA C736 Conclusions

In preparing the application the containment arrangements for hazardous substances handled and stored at the site have been evaluated against the general requirements of the CIRIA C736 guidance on Containment Systems for the Prevention of Pollution: Secondary, Tertiary and Other Measures for Industrial and Commercial Premises. This is deemed to meet the general requirements set out in the Reference Document on Best Available Techniques on Emissions from Storage, and therefore a specific evaluation against the Emissions from Storage BREF has not been undertaken. This review is intended as a general summary of containment arrangements and should not be considered as a comprehensive technical evaluation of the containment arrangements at the Installation against the requirements of the CIRIA C736 guidance. A summary of the review is provided in the table below.

Table 8.2: CIRIA C736 Conclusions

Requirement	Installation Arrangements	Conclusion
Risk Assessment and Classification of Secondary and Tertiary Containment Systems		
Apply the source-pathway-receptor model to determine the site hazard rating.	The main potential source of contamination at the site will be the handling and storage of hazardous substances (predominantly oils and diesel). Storage and handling arrangements will include suitable primary, secondary and tertiary containment and management controls. The site is located in a moderately sensitive location in relation to environmental receptors and therefore the overall site hazard rating is moderate.	The site hazard classification is moderate.
Take account of the events, which may lead to a release of inventory and the likelihood of such an occurrence. Determine overall site risk rating.	Based on a site hazard rating of moderate and a frequency of loss of containment classified as moderate (between 1% (1 in 100) and 0.001% (1 in 1 million), the overall risk rating is moderate.	The overall site risk rating is moderate.
Based on the overall site risk rating determine the appropriate design classification for containment systems (i.e. Class 1, Class 2 or Class 3).	As the overall risk rating is moderate the appropriate classification of containment systems at the site is Class 2.	Containment Type Class 2 is appropriate for the site.
Secondary and Tertiary Containment		
Select secondary and tertiary containment taking into consideration the nature and quantity of inventory to be stored within the containment structure, receptors (proximity and sensitivity), site constraints and financial constraints.	The Operator proposes to install secondary containment bunds to all diesel storage tanks, which will be located within tertiary containment. Refuelling and diesel polishing will take place in areas of the site where there is tertiary containment provision, including automatic drain closure valves.	The Operator proposes to install secondary and tertiary containment arrangements appropriate to the hazardous substance handling and storage requirements of the Installation.

Requirement	Installation Arrangements	Conclusion
Containment System Capacity		
Determine the total volume of inventory to be stored within the containment system based on brimful capacity of storage vessels, unless an overflow is fitted below the brimful level, in this instance the total capacity is taken as the level at which the storage vessel would overflow.	The brimful capacity for diesel and lubricating oil at each data centre is approximately 518,608 litres. Comprising 512,000 litres of diesel and 6,608 litres of lubricating oil. This results in a total capacity across the installation of 1,037,216 litres.	
Where a single bulk liquid tank is bunded, the recommended minimum bund capacity is 110% of the capacity of the tank.	Each of the diesel storage tanks has a nominal capacity of 31,000 litres and each tank is positioned within a mild steel secondary containment tank, which provides 110% of the primary containment tank volume (i.e. 34,100 litres). The lubricating oil is stored within the generator containers, which provide 110% containment for the lubricating oil and diesel stored in the 1,000-litre diesel day tank located within the container.	The secondary containment provision at the site associated with the storage of diesel and lubricating oil meets the 110% capacity requirement.
Where two or more tanks are installed within the same bund, the recommended capacity of the bund is the greater of: • 110% of the capacity of the largest tank within the bund; and • 25% of the total capacity of all of the tanks within the bund, except where tanks are hydraulically linked in which case they should be treated as if they were a single tank.	Each diesel tank is provided with a secondary containment bund providing 110% containment. Each bank of generators will also have tertiary containment in the form of a reinforced concrete bund present along their perimeters. The total volume of inventory present within each bund will be 259,304 litres (comprising diesel stored in 8 x 1000 litre capacity day tanks, 8 x 31,000 litre capacity storage tanks and 3,304 litres of lubricating oils stored within the generator lubrication systems). The total capacity of each tertiary containment bund will be a minimum of 70m^3 which is 27% of the total inventory stored within the bund.	The tertiary containment system for the generator plan is sufficient to retain over 25% of the total capacity present within the bund in the highly unlikely event of a catastrophic loss of containment.

Requirement	Installation Arrangements	Conclusion
The containment capacity should allow for rain falling over the containment area immediately preceding an incident (i.e. before it could be removed as part of routine operations) and immediately after an incident (i.e. before a substance, which had escaped from the primary containment, could be removed from the bund).		
Firefighting agents, including water-based foams, are accounted for in the estimation of containment capacity by making an adequate allowance in the design of the height of the wall (freeboard). The amount of freeboard required for firefighting foam should be agreed with the Fire and Rescue Service, but the amount should be no less than 100 mm	A firefighting agent freeboard of 100mm has been included in tertiary containment arrangements at the site.	
It is difficult to provide general recommendations for capacity allowance for firefighting water as much depends on the nature of the site and the manner of response to an incident. However, since many incidents are likely to involve fire, and almost all 'worst case' scenarios involve fire, making adequate provision for retention or recycling of firefighting and cooling water is of critical importance.	A fire suppression system has not been specified for the generator banks.	
General Design and Performance Requirements for Bunds		

Requirement	Installation Arrangements	Conclusion
Bund walls should be high enough to retain the contents of the primary storage, with appropriate allowances for rainwater and firefighting water.	As each of the diesel storage tanks are integrally bunded there is sufficient capacity in the event of a loss of containment of the primary containment tank. Each secondary containment tank is sealed, and rainwater would not ingress into the primary or secondary containment structure, therefore no allowance has been made for this. In the event of a fire the tertiary containment structures at the Installation would be utilised to contain all firefighting agents and water.	Containment structures at the site make appropriate allowances for rainwater and firefighting water.
It is important to be able to detect if there is leakage from a primary storage vessel so that remedial action can be taken.	Each of the primary diesel storage tanks are integrally bunded. Whilst there is no provision for the routine visual inspection of the secondary containment tanks each bund is proposed to be fitted with a bund alarm, which will detect a leak in the primary containment tank.	All primary diesel storage tanks will feature a leak detection system.
Bunds should not be equipped with means for gravity discharge, even if lockable valves are provided.	The secondary containment tanks, which serve the primary diesel storage tanks do not feature any gravity discharge points or lockable valves.	Gravity discharge from the secondary containment tanks is not possible.
Piercing the walls or floor of a bund for pipework, ducts, control cable etc, introduces a source of potential leakage and, with the exception of overflow pipes, should be avoided unless there is no practical alternative. Where practical, pipework should be routed over the top of the bund wall, rather than through it. However, where penetrations cannot be avoided, careful detailing of the means of sealing these is essential.	The tertiary containment system is designed to exceed a minimum containment requirement of 110% of one tank capacity. This is achieved by low-level kerb-type containment. There will be no pipework or duct piercings within this minimum containment height.	Risk of leakage is reduced through avoidance of very low-level piercings

Requirement	Installation Arrangements	Conclusion
Bunds should be 'watertight' or liquid retaining as defined by compliance with British Standards or other recognised standards appropriate to the form and/or materials of construction and containment class.	The secondary containment tanks are of mild steel construction with welded joints. Each of these tanks is watertight. Tertiary containment bund walls and other tertiary containment structures (e.g. roadways used for containment of spillage during refuelling) are also impermeable.	Secondary and tertiary containment systems at the site are suitable for containment Class 2 systems and are watertight.
Bunds should be capable of withstanding the static and dynamic loads associated with the release of liquid from primary storage tanks	The secondary containment tanks are an integral part of the diesel storage arrangements and have been designed to withstand the static and dynamic loads associated with the release of liquid from the primary storage tank; however, catastrophic failure of the primary tank is considered highly unlikely.	Secondary containment structures are capable of withstanding static and dynamic loads associated with the loss of containment of the primary storage tank.
For bunds up to 25m^3 capacity and constructed from concrete or masonry it is practical to test for leakage by filling with water using the following recommended methods: • On a dry day the bund should be filled to brimful capacity with water containing a marker dye; • The bund should be covered (to reduce evaporation) and left for six hours after which there should be no drop in the water level; • If the bund is found not to be watertight then the source of the leak should be identified and remedied; and • The test should be repeated until the bund is found to be watertight.	Secondary containment structures are constructed of steel and therefore the testing arrangements outlined are not considered practical. Testing of the integrity of the tertiary containment systems is not practical due to the generator plant positioned within the bund making such testing inappropriate due to potential damage to plant and equipment.	Testing of secondary and tertiary containment is not practical / feasible.

APPENDIX 1
FIGURES

APPENDIX 2
GENERATOR SPECIFICATION

APPENDIX 3
GENERATOR TA-LUFT CERTIFICATION

APPENDIX 4
NOISE ASSESSMENT REPORT