LON1X0 Data Centre, Slough: Environmental Permit Application

REVISED PERMIT APPLICATION SUPPORTING INFORMATION FOR THE INSTALLATION OF BUILDING C, LON1X2.

Clarification Note

Please note that References to Yondr reflect the original site operator named in supporting reports. The permit has since been transferred to Ramsgate Lux SCSp as confirmed in the permit transfer EPR/NP3829SP/T002.

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Summary of Changes

This variation application relates to the addition of a new data hall within the existing permitted data centre site. The new hall will introduce updated emission points (EP53 to EP84) and emission sources (S53 to S84) associated with 32 Diesel fired backup electricity generators and 2 additional Diesel-Driven Fire Pumps.

The installation is a data centre for the provision of online data services to multiple clients. The purpose of this amended application is to provide for the installation of 32 new diesel fired emergency back-up generators. installation under the Environmental Permitting Regulations 2016 (as amended), which may be required to provide energy supply to power a data centre in the unlikely event of disruption in the grid power supply. To meet this requirement, each data centre building (A, B, and C) will be supported by emergency back-up generators housed within a ground-floor compound. The existing Buildings A and B are each served by 26 generators, the proposed Building C will be equipped with 32 generators. This will require an extension of the existing boundary line/perimeter of the existing Permit. Please refer to Appendix A for Site Drawings.

The site layout has been updated to incorporate LON1x2, the new data hall, and the Environmental Risk Assessment (ERA) has been amended to reflect the new infrastructure and associated risks. Revised Air Quality and Noise Impact Assessments have been completed to account for the additional hall, alongside an updated Site Condition Report and a Groundwater Monitoring and Decommissioning Report.

The Site Condition Report (SCR) now includes the revised site boundary and updated geology, hydrogeology, and hydrology. Results from the new air quality and noise assessments, as well as groundwater monitoring, have been integrated to demonstrate current soil, gas and water quality conditions.

The air quality assessment included an atmospheric dispersion modelling study of emissions from the 32 standby emergency generators associated with the LON1X2 facility (Building C) in addition to the 52 standby emergency generators associated with the adjacent LON1X0 facility (Building A and B). The detailed assessment of the emissions has been undertaken using an internationally accepted model (AERMOD) to evaluate the impacts on human health and ecology during scheduled routine testing ('most-likely' testing scenario) and during a power outage ('worst case' emergency scenario). The operation of individual generators at the expanded facility for routine testing is concluded not to present a significant adverse effect on the nearest sensitive human health and ecological receptors. During a worst-case emergency outage, the hourly standard for NO2 and the AEGL-1 level for non-disabling health effects may be exceeded; however, the probability of such an event coinciding with the least favourable hours of meteorological data for dispersion is extremely low.

The noise impact assessment concluded that the cumulative noise levels from the entire site are within the limits specified by Planning Condition 12, thereby supporting its discharge and confirming that the site will operate in accordance with relevant environmental noise standards. The total site emissions have been calculated by combining ESA's assessment for Building C with Sweco's assessments for Buildings A and B, the Substation, and the Mechanical Yard.

Full versions of these reports can be found in the relevant appendices:

- Appendix A – Drawings
- Appendix B – Environmental Risk Assessment
- Appendix C – Nature & Heritage Conservation Screening Report
- Appendix D - Diesel Generator Specification.
- Appendix E – Air Quality Assessment
- Appendix F – Site Condition Report
- Appendix G – Noise Impact Assessment
- Appendix H – Fire Pump Engine Specification
- Appendix I - The Health, Safety, Quality and Environmental Management System
- Appendix J - Groundwater Monitoring and Decommissioning Report

Non-Technical Summary

This document and associated appendices form the application for an Environmental Permit (EP) to operate a diesel-fired emergency back-up generation installation under the Environmental Permitting Regulations 2016 (as amended). The application is made by Ramsgate Lux SCSP, the legal operator responsible for the diesel-fired emergency back-up generation installation at the Wexham Road data centre campus.

The proposed variation relates to the addition of a new data hall, Building C, which will expand the site's standby generation capacity. Building C will include:

- 32 MTU 20V4000 DS3300 gas oil-fuelled standby generators, each rated at 6.9 MWth, with a combined thermal input of approximately 222 MWth.
- 2 Clarke JU4H-LP24 diesel-driven fire-water pumps for emergency fire suppression.

The standby or emergency generators are designed to operate only during grid power outages, providing critical standby electricity to maintain data centre operations. With the inclusion of Building C, the total aggregated combustion capacity on-site will increase to approximately 518.041 MWth.

This Non-Technical Summary (NTS) covers the following:

- The planned activities for the data centre.
- The purpose of the application.
- The key technical standards and safety measures to be implemented on site.

Site Location

Location and Site Overview

The new data centre (Building C, or LON1X2) will be built alongside two existing buildings (A & B) at the former AkzoNobel site on Wexham Rd, Slough.

- North: The Grand Union Canal, with residential areas beyond it.
- East: The old Uxbridge Road Gas Works, with more homes past Uxbridge Road.
- South: A new residential development is being built, followed by a railway line and further residential areas.
- West: Wexham Road, with commercial and industrial properties on the other side.

Environmental Context

The site is in a generally developed area with no special landscape, ecological, or heritage protections.

- Landscape: It is not near any protected landscapes like National Parks. The nearest ones are over 13km away.
- Nature Conservation: There are no protected ecological sites on or immediately around the property. The nearest protected nature areas, Black Park Country Park and Wraysbury Gravel Pit, are about 4km north and 5km south, respectively. There are also very few trees on the site.
- Air Quality & Flooding: The site is not in an Air Quality Management Area. It is also located in a low-probability flood zone (Flood Zone 1), meaning the risk of flooding is minimal.
- Heritage: The site is not within or next to a Conservation Area.

Operations

Electricity for the operation of the data centre will be provided from connections to the local electricity transmission network; however, given the nature of data centres and their requirement to have an available energy supply at all times, generators will provide emergency power to the data centre in the event of a disruption in the grid power supply.

The data centre is currently served by 52 emergency back-up generators within a compound, each with an individual associated stack. The current installation consists of 52 x 5.67 MWth reciprocating engines and will operate to provide emergency back-up power to an associated data centre should there be a break in supply from the grid. Buildings A&B also include 2 Clarke JU4H-LP24 diesel-driven fire-water pumps. The combined net thermal input of the current installation is 295.4 MW.

The additional installation, Building C, will include 32 x 6.9 MWth MTU 20V4000 DS3300 gas oil-fuelled standby generators and 2 Clarke JU4H-LP24 diesel-driven fire-water pumps. The gas oil generators are solely used to provide standby/emergency electricity generation capacity to power the data centre in the event of a grid power failure. The addition of building C will result in the site having an aggregated total combustion capacity on-site of approximately 518.041 MWth. A maximum volume of 1,841,028 litres of diesel can be stored at the total site.

Details on the updated site boundary and new emission points can be located in Appendix A

The generators will require periodic testing to ensure performance and availability in the event of an unplanned or emergency power loss. There are two routine test regimes for the standby generators:

- Monthly testing at no load for approximately 15 minutes per generator; and
- Biannual on-load testing for a maximum of 6 hours per event.

Management Systems

The data centre will be operated per the following standards, or suitable equivalent standards:

- ISO/IEC 27001:2013 that specifies the requirements for establishing, implementing, maintaining and continually improving an information security management system; and
- ISO9001:2015 that specifies the requirements for establishing, implementing, monitoring, managing and improving quality throughout the organisation.0

In addition, an environmental management system (EMS) will be in place. The EMS will place particular importance on:

- Reducing risks to the environment to a level that is as low as reasonably practicable using best available techniques. Refer to Section 6 for further details.
- Integrating EMS responsibilities within line management.
- A commitment to personnel environmental awareness and competence.
- The ongoing monitoring and review of environmental performance; and
- A commitment to working to achieve continuous improvement in environmental performance.

Energy Efficiency

Due to the back-up nature of the installation operation, which requires fast, flexible operation, diesel-fuelled back-up generators are the chosen technology, with other potential options considered such

as combined cycle operation not feasible. The plant selected to provide back-up generation has a gross thermal efficiency of approximately 42% (from original EPR application).

Raw Materials, Water and Waste

The main raw materials used within the installation will be diesel for fuel and lubrication oil. No routine water intake is required for the installation as onsite cooling systems are closed circuits. Waste generation from the installation is anticipated to be low and will result primarily from maintenance activities.

Emissions to Water, Land and Groundwater

Surface water outfalls connect to new Thames Water sewers located on the eastern site boundary, as per the approved drainage strategy refer to drawings contained in the *Drainage Services Report, C1101-OCSC-XX-XX-RP-C-0001*. The foul water network outfalls to a Thames Water-adopted sewer located at the southern boundary of the site.

The drainage design incorporates Sustainable Urban Drainage Systems (SuDS) principles where feasible, following the drainage hierarchy and guidance from Building Regulations, CIRIA C753: The SuDS Manual, and Slough Borough Council planning recommendations. In line with the approved BWB drainage strategy, peak flow rates have been reduced to match greenfield runoff rates for both the 1 in 1-year and 1 in 100-year plus climate change events. Proposed surface water discharge rates of 7 L/s (North) and 8 L/s (South) comply with the outline planning application P/00072/09.

All in-ground pipework is designed to BS EN 752 and "*Sewers for Adoption*" standards. Simulations using Causeway Flow confirm that the drainage network will prevent flooding during rainfall events up to the 1 in 100-year plus 40% climate change scenario.

The wastewater system separates foul and surface water flows and complies with Building Regulations 2010 (Drainage and Waste Disposal, 2015 edition). It includes gravity-based outfalls, strategic manhole placements for maintenance access, and connections for sanitary discharges, operational gullies, and machinery requiring wastewater management.

No direct emissions to land or groundwater are anticipated. All discharges are routed through controlled and permitted infrastructure, ensuring compliance with environmental standards and minimising pollution risk.

Air Emissions Risk Assessment

Atkins Realis were appointed to issue an air quality assessment for the site to support in the discharge of planning condition 17 associated with the hybrid planning application reference P/00072/096 which asks to *'demonstrate that ambient concentrations of applicable pollutants during the operation of the proposed facility (s) would not result in significant impact at relevant sensitive receptors*.'

The assessment included an atmospheric dispersion modelling study of emissions from the 32 standby emergency generators associated with the LON1X2 facility (Building C) in addition to the 52 standby emergency generators associated with the adjacent LON1X0 facility (Building A and B). The detailed assessment of the emissions has been undertaken using an internationally accepted model (AERMOD) to evaluate the impacts on human health and ecology during scheduled routine testing ('most-likely' testing scenario) and during a power outage ('worst case' emergency scenario). The operation of individual generators at the expanded facility for routine testing is concluded not to present a significant adverse effect on the nearest sensitive human health and ecological receptors. During a worst-case emergency outage, the hourly standard for NO2 and the AEGL-1 level for non-disabling

health effects may be exceeded; however, the probability of such an event coinciding with the least favourable hours of meteorological data for dispersion is extremely low. Please refer to Appendix E for the full Air Quality Assessment Report.

Noise Impact Assessment

ES Acoustics Ltd (ESA) were appointed by Ramsgate to undertake a noise impact assessment in support of the reserved matters submission for Building C of the proposed data centre development located at Wexham Road, Slough SL2 5DB. This assessment has been carried out to address the requirements of Planning Condition 12 associated with outline planning permission reference: P/00072/096.

Baseline sound conditions in the surrounding area were previously characterised by WYG as part of the noise assessment submitted with the outline planning application (Report Reference A114100, dated December 2019). ESA has used these established baseline parameters to inform the current assessment and ensure alignment with the planning condition.

This report presents the predicted noise emissions from the plant associated with Building C and evaluates the cumulative noise impact of the entire development. The total site emissions have been calculated by combining ESA's assessment for Building C with Sweco's assessments for Buildings A and B, the Substation, and the Mechanical Yard. The combined results demonstrate that the cumulative noise levels are within the limits specified by Planning Condition 12, thereby supporting its discharge and confirming that the site will operate in accordance with relevant environmental noise standards. Please refer to Appendix G for the full Noise Impact Assessment**.**

Best Available Techniques

The principle of BAT involves using the most effective and advanced methods to prevent or reduce emissions and resource consumption, while being technically feasible and cost-effective. For a data centre, this focuses primarily on energy efficiency (the largest environmental impact), water use, and emissions control. Ramsgate has specified high-efficiency IT equipment and advanced cooling systems, including air-side economisation and variable speed drives, supported by a comprehensive Building Management System. A closed chilled water system is used to minimise mains water consumption. Emissions are reduced through low NOx engines with SCR and DPF, use of Ultra-Low Sulphur Diesel, and strict maintenance. Waste is managed through IT asset disposition, modular design for deconstruction, and consideration of heat reuse, although not implemented here. Noise is controlled via acoustic enclosures, low-noise fan technology, and strategic site layout. For further information on BAT, please refer to Section 5 of this report.

1. Introduction

Proposed Addition

This document and associated appendices form the application for an Environmental Permit (EP), to vary a bespoke installation permit (EPR/NP3829SP), and operate a diesel-fired emergency back-up generation installation under the Environmental Permitting Regulations 2016 (as amended). The application is made by Ramsgate Lux SCSP, which is the legal entity that will be responsible for operating the generating installation.

The installation currently includes two separate buildings (Buildings A and B), and the variation is a new installation, Building C, as shown on the updated site plans included with this application (Appendix A).

Electricity for operation of the data centre will be provided from connections to the local electricity transmission network; however, given the nature of data centres and their requirement to have an available energy supply at all times, generators which will provide emergency power to the data centre in the unlikely event of disruption in the grid power supply.

Currently, each data centre building (A&B) is served by 26 emergency back-up generators within a compound on their ground floors. The additional installation, Building C will include an additional 32 emergency back-up generators within the site boundary. Due to permanent electrical infrastructure limitations, the Building C generators will be de-rated to a power output of 2,200 kW. All data halls consist of Rolls-Royce MTU DS3300 diesel generating set with MTU 20V4000G34F NOx turbocharged diesel engine and Leroy Somer LSA53.2 L14 / 4p brushless synchronous alternator.

The combined net thermal input of the installation is 518.041 MWth (includes 4 diesel driven fire water pumps). The generators can 'operate' during an emergency for up to 500 hours per calendar year, and a maximum volume of 1,841,028 litres of diesel can be stored at the site.

The engines will be containerised and located within a secure area. Diesel will be stored and supplied within integral Diesel Fuel Bulk Belly Tanks, each containing 21,747 L Brim-full and 16,551 L. useable diesel mounted below each generator, allowing for 24 hours of storage for each generator set. Each tank/generator is provided with an integral fuel polishing.

Buildings A and B each have a receiver tank, (brim full capacity of 1,620 litres) while Building C will have two receiver tanks (brim full capacity 1,750 litres, therefore 3500 litres total) and a dedicated refuelling point for the entire system. All tanks are double-skinned and comply with the Oil Storage Regulations. These fuel tanks are double walled or double skinned which serves as a full containment bund for each unit.

Table 1 LON1X0 Diesel Storage Capacity Values

Item	Building A (26)	Building B (26)	Building C (32)
Generator Belly Tanks (Brim Full) L	565,422	565,422	695,904
Generator Belly Tanks (Design) L	430,326	430,326	529,632
Receiver Tanks (Brim Full) L	1,620	1,620	3,500
Receiver Tanks (Design) L	1,500	1,500	3,000
Pipework Volume L	1,207	1,207	1,826
Fire Water Pump Tanks L	550	550	1100
Overall Total (Brim Full) L	569,349	569,349	702,330
Overall Total (Design) L	434,253	434,253	535,558

The generators will provide power to the data centre in the event of an emergency situation such as a brown or black-out of the local electricity transmission network where there are fluctuations or loss of the electrical power provided by the network.

The generators, in accordance with the manufacturer requirements, will be subject to planned maintenance and testing. No electricity will be exported from the generating installation.

1.1. Site Location

The data centre facility comprises two buildings, A & B, and the addition to this site is the construction and operation of Building C (LON1X2). The data halls are located in the central part of the former AkzoNobel Decorative Coatings, Slough Manufacturing Unit, located at Wexham Rd, Slough SL2 5DS, National Grid Reference SU 98700 80300.

The Grand Union Canal lies beyond this area with residential properties present north of the Canal. To the east lies Uxbridge Road Gas Works with Uxbridge Road and residential properties present beyond. Immediately to the south, a new residential development is under construction.

This is, in turn bound by the Railway Line with residential properties beyond. Commercial and industrial properties lie beyond Wexham Road to the west. There are no formal landscape designations (such as Areas of Outstanding Natural Beauty or National Parks close to the Site. The nearest formal landscape designations are located 13km and 40km respectively.

There are no identified statutory ecological designations within the site or surrounding areas. The closest statutory ecological designations are Black Park Country Park (SSSI) and Wraysbury & Hythe End Gravel Pit (SSSI), which are located approximately 4km to the north and 5km to the south of the site, respectively. Tree cover is also very sparse across the Site.

The Site does not lie within an Air Quality Management Area. Further, the entirety of the Site is located in a low probability flood risk zone (Flood Zone 1). The Site is also not located within or adjacent to a Conservation Area. A site location plan is included in Appendix A Drawings.

1.2. The Applicant

The applicant and operator are Ramsgate Lux SCSp (Ramsgate), with a registered office address at 41 A Avenue Kennedy 2082 Luxembourg, 1273, company number B243203.
The Directors, as listed on Companies House are provided in application form part A1.

1.3. Regulated Installation and Applicable Guidance

1.3.1 Pre-application Advice

Basic pre-application advice was obtained from the EA; this comprised the provision of a Nature and Heritage Conservation Screening Report (reference EPR/NP3829SP/P003).

A copy of this screening report in included in the Environmental Risk Assessment (ERA) submitted in support of this permit application.

In addition to the screening report, basic pre-application advice was received in respect of:

- Installation;
- Combustion (Part A) Data Sites;
- Combustion (Part A) Supplementary Data Sites FAQ;
- Noise Impact Assessment, and;
- Noise Management Plan;
- Odour Management Plan, and;
- Dust Emissions Management plan

The advice set out as part of the pre-application consultation has been considered in compiling this application.

In addition, the enhanced pre-application service was obtained from the EA, Pre-application reference: EPR/NP3829SP/P002.

1.3.2 Environmental Permit Application

The installation currently includes two separate buildings (Buildings A and B) under permit EPR/NP3829SP, and the variation applies is a new installation on site, Building C, as shown on the updated site plans included with this application (Appendix A).

The data centre currently comprises in total a rated electrical generating capacity of 63.2 MWe (net, under standby operation of the engines) with an approximate corresponding thermal input of 295 MWth based on 52 engines with a 5.67 MWth capacity. With the additional installation of Building C, the rated electrical generating capacity will be derated to 2,200 kWe, thus meaning Building C will be (32*2.2 MWe) or 70.4 MWe total, and the total site (Buildings A, B and C) will have a net thermal input of approximately 518.041 MWth.

The Medium Combustion Plant (MCP) Directive, as transposed into English law via the EPR, contains an exemption for plants that operate for a limited number of hours. This is specifically covered in Schedule 25A, Part 2, Section 9(2) of the EPR. The regulation states that the emission limit values do not apply to a MCP if: "...*it is operated for less than 500 hours per year, in accordance with a condition included in the environmental permit for that plant*."

Both air quality and noise assessments have been undertaken in response to planning requirements and referred to within this permit application included assessment of the impacts from the proposed enlarged facility.

1.3.3 Regulated Activities

Each engine has a net thermal input below 15 MWth and is designed with a dedicated exhaust stack. Based on the Industrial Emissions Directive's aggregation rules concerning common stacks, we have determined that the installation should not be classified as a Large Combustion Plant. However, this determination is subject to confirmation by the competent regulator.

Accordingly, the installation does not fall within Chapter III of the IED and is instead regulated as a combustion plant under Chapter II. Therefore, the emission limits for LCPs within the relevant BAT Conclusions do not apply.

Each individual engine is classified as a Medium Combustion Plant (MCP). However, as the total operating hours for each plant will not exceed 500 hours per year, they will be operated under the limited operation exemption and will not be required to comply with the standard emission limits set out in Schedule 25A of the Environmental Permitting Regulations (EPR). This exemption will be formalised as a condition within the EPR permit.

In addition to the generators, the storage of fuel oil (diesel) in storage tanks is undertaken; this is considered to be a 'directly associated activity'.
The EA has issued draft guidance titled "Data Centre FAQ Headline Approach". The installation has been assessed against the BAT set out in that draft guidance.

1.3.1.1. Stationary Technical Unit (STU)
1.3.1.2. Directly Associated Activities (DAA)
1.3.1.3. Medium Combustion Plant and Specified Generators

The Medium Combustion Plant Directive (MCPD) was transposed into UK law in early 2018 via the Environmental Permitting (England and Wales) (Amendment) Regulations 2018. In addition to MCPD requirements, these regulations also brought in requirements for Specified Generators (i.e. any combustion plant generating electricity) into UK law.

These back-up generators are operated for emergency purposes only and will therefore be classified as 'excluded plants' under the EPR 2016, meaning they do not require a standalone MCP permit. Furthermore, as their total operation will not exceed 500 hours per year, they will qualify for the limited operation exemption and will not be required to comply with the standard emission limit values (ELVs) for NOx (190 mg/Nm^3)

1.3.4 Structure of the Permit Application

This Section introduces the proposed site activities. The following Chapters provide further details and supporting information including:

- Section 2 Application Forms (Parts A, C2, C3 and F1);
- Section 3 Management System;
- Section 4 Emissions and Monitoring;
- Section 5 Best Available Techniques.

2. Application Forms (Parts A, C2, C3 and F1)

Application for an environmental permit
Part A – About you

You will need to complete this part of the application form if you are applying:

- for a new permit
- to vary (change) an existing permit
- to surrender your permit
- to transfer an existing permit to yourself

Visit our website to check this is the latest version of the form: **https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-a-about-you**.

Please read through the form before completing it. We expect it will take less than 1 hour to complete if you have all the necessary information available.

The form can be:

1. Saved onto a computer and then filled in.

   We recommend you use an Adobe Acrobat product to complete the form. You may not be able to complete the form using different software, such as a PDF reader built into your internet browser.
2. Printed off and filled in by hand. Please write clearly in the answer spaces.

Contents

Section 1: About you

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Section 7: Contact details

Section 8: How to contact us

Section 9: Where to send your application

Section 10: Feedback

Appendix 1: Date of birth information for installation and waste activities (applications for a new permit or transferring a permit and variations to a waste activity) only

Section 1: About you

About you

Tick the box that describes you as the applicant.

- ☐ An individual. Now go to **section 2**.
- ☐ A group of individuals. Now go to **section 3**.
- ☐ A public body or public corporation. Now go to **section 4**.
- ☐ A government department. Now go to **section 5**.
- ☑ A registered company, limited liability partnerships or other incorporated body. Now go to **section 6**.

To apply, you must be the legal operator of the activity or facility. See: **https://www.gov.uk/guidance/legal-operator-and-competence-requirements-environmental-permits#what-a-legal-operator-is**

Section 2: Applications from an individual

2.1 Name of applicant

Title (optional)

First name

Last name

2.2 Address of applicant

Address

Postcode

Use a business address where possible. Otherwise use a personal address. Individuals based overseas must provide an address for service in the UK.

Now go to **section 7: Contact details**

Section 3: Applications from groups of individuals

Examples of groups of individuals include:

- individuals acting jointly
- individuals that are partners in a general or limited partnership (but not a limited liability partnership)
- unincorporated charities, trusts and associations, (unless recognised as a legal person)

3.1 Trading or organisation name (if any)

Note: we can only issue and transfer permits to named individuals and not to trading or organisation names

3.2 Organisation type

For example, individuals acting jointly (e.g. a club), general partnership, unincorporated charity

3.3 Charity Commission registration number (if any)

Some individuals or groups of individuals with recognised charitable status are entitled to reduced permit fees for certain water discharge activities. We need the Charity Commission registration number to check if this applies to this application.

3.3 Companies House or Limited Liability Partnership number

3.4 Names and addresses of individuals

Provide the names and addresses of all individuals acting jointly, or in a general or limited partnership. Enter the name and address of the first individual. Provide a continuation sheet for all remaining individuals.

For corporate partners in a general or limited partnership, provide the company name and registration number on the continuation sheet.

For unincorporated trusts, charities and associations, provide the name and address of the nominated representative who will hold the permit in the organisation's name and all individuals that form the governing body, for example trustees. Use a continuation sheet as necessary.

Section 3: Applications from groups of individuals, continued

3.4a Name of first individual

Title (optional)

First name

Last name

3.4b Address of first individual

Address

Postcode

Use a business address where possible. Otherwise use a personal address. Individuals based overseas must provide an address for service in the UK.

3.4c Continuation sheet

Document reference of continuation sheet (if any):

Now go to **section 7: Contact details**

Section 4: Applications from public bodies or public corporations

4.1 Name of public body or corporation

4.2 Type of public body or corporation

For example, local government body, executive agency, non-departmental public body

4.3 Charity Commission number (if any)

Section 4: Applications from public bodies or public corporations, continued

4.4 Address of public body or corporation

Address

Postcode

Now go to **section 7: Contact details**

Section 5: Applications from government departments

5.1 Title of Secretary of State for relevant department

Title

For example, Secretary of State for Environment, Food and Rural Affairs

5.2 Address of the government department

Address

Postcode

Now go to **section 7: Contact details**

Section 6: Applications from registered companies, limited liability partnerships and other corporate bodies

6.1 Name of company, limited liability partnership or other incorporated body

Ramsgate Lux SCSp

6.2 Type of incorporated body

Private Limited Company

For example, private limited company, public limited company, limited liability partnership, incorporated society, charitable incorporated organisation or community interest company

6.3 Companies House registration number (if any)

B243203

6.4 Charity Commission number (if any)

6.5 Additional information if not registered with Companies House or The Charity Commission

If you are not registered with Companies House or The Charity Commission, supply:

- evidence that your company or corporate body is a legal entity
- a description of how you will be the legal operator if you are an overseas company without a UK presence.

This does not apply to variations or surrender applications.

Document reference for evidence/description:

Evidence of legal entity could, for example, include:

- a copy of your Certificate of Incorporation for companies.
- a copy of your Memorandum and Articles of Association for incorporated charities and trusts

Section 6: Applications from registered companies, limited liability partnerships and other corporate bodies, continued

6.6 Principal address or Registered Office of registered company, limited liability partnership or other incorporated body

Address

41 A Avenue Kennedy 2082 Luxembourg

Postcode

1273

For registered companies and limited liability partnerships this is the office address registered with Companies House. For other incorporated bodies use your principal business address or the address registered with The Charity Commission.

6.7 Main business address of registered company, limited liability partnerships or other incorporated body

Address

7th Floor
Aldgate House
33 Aldgate High Street
London
EC3N 1AG

Postcode

EC3N 1AG

Your main UK business address is required only if your principal or registered office address is overseas.

Now go to **section 7: Contact details**

Section 7: Contact details

7.1 Application contact

Provide the details of someone we can contact about your application. The person must have the authority to act on your behalf.

Title (optional)

First name

Isabel

Last name

Limrick

Position

Address

Cleve Quarter,
Monahan Road, Cork.
Ireland
T12 X06K

Postcode

T12 X06K

Phone number

+353 (85) 164 3589

Email

isabellimrick@ehsint.com

☑ Tick if you would like all general communication about this application sent to the above email address.

7.2 Contact for receipt of official documents

This question does not apply to applications from individuals acting jointly

Provide the details of someone we can send official documents to, such as notices and copies of permits.

For companies this must be a company secretary, clerk or a director.

For partnerships, this must be a person with control or management of the partnership.

☐ Tick if the contact is the same as in question 7.1 (application contact). Otherwise complete the details below.

Section 7: Contact details, continued

Title (optional)

Mr

First name

Phillip

Last name

Hallett

Position

Registered Company UK Branch Manager

Email

philip.hallett@yondrgroup.com

Telephone number

+44 (0)7827 985 486

7.3 Operational contact

This is optional for variations and surrenders. We use this information to help us know who to contact about operations at the site, returns and reporting.

☐ Contact details are the same as question 7.1 (application contact)

☐ Contact details are the same as question 7.2 (contact for receipt of official documents)

Otherwise complete the details below.

Title (optional)

Critical Services Manager

First name

Ivan

Last name

Spiridonov

Address

Wexham Road Data Centre
Wexham Road
Slough
United Kingdom

Postcode

SL2 5DS

Phone number

+44 7827833926

Section 7: Contact details, continued

Email

London1YOPS@yondrgroup.com ; ivan.spiridonov@yondrgroup.com

7.4 Billing contact

Provide a billing contact where we can send invoices, such as the annual subsistence charge

☐ Contact details are the same as question 7.1 (application contact)

☐ Contact details are the same as question 7.2 (contact for receipt of official documents)

☐ Contact details are the same as question 7.3 (operational contact)

Otherwise complete the details below.

Title (optional)

Mr

First name

Paul

Last name

Smith

Position

Collen Campus Commercial Lead

Address

Wexham Road Data Centre
Wexham Road
Slough
SL2 5DS
United Kingdom

Postcode

SL2 5DS

Phone number

Email

Now fill in Appendix 1 if you are applying for a new permit or transferring a permit for an installation or waste activity.

This does not apply to applications from public bodies, statutory corporations or government departments.

Section 8: How to contact us

If you have difficulty filling in this form, please contact the person who sent it to you or contact us as shown below.

General enquiries: 03708 506 506 (Monday to Friday, 8am to 6pm)

Textphone: 03702 422 549 (Monday to Friday, 8am to 6pm)

Email: **enquiries@environment-agency.gov.uk**

Website: www.gov.uk/government/organisations/environment-agency

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve it. More information on how to do this is available at: **www.gov.uk/government/organisations/environment-agency/about/complaints-procedure**

Please tell us if you need information in a different language or format (for example, in large print) so we can keep in touch with you more easily.

Section 9: Where to send your application

Send one electronic copy of your completed application via email to:

- **PSC-WaterQuality@environment-agency.gov.uk** for water discharge activities
- **PSC@environment-agency.gov.uk** for waste or installation activities
- **flood.permitting@environment-agency.gov.uk** for flood risk activities

Alternatively send one paper copy of your application to:

Integrated Permitting Services
Environment Agency
Quadrant 2
99 Parkway Avenue
Parkway Business Park
Sheffield
S9 4WF

Section 10: Feedback

We want to make our forms easy to fill in and easy to understand. Please use the space below to give us any comments that you may have about this form. (You don't have to answer this part of the form, but it will help us improve our forms if you do.)

How long did it take you to fill in this form?

2 hours

We will use your feedback to improve our form. Would you like a reply to your feedback?

- [x] Yes please
- [ ] No thank you

Appendix 1: Date of birth information for installation and waste activities (applications for a new permit or transferring a permit and variations to a waste activity) only

This appendix applies to installation and waste operation activities. Only complete if you are applying for a new permit or to transfer an existing one. This does not apply to applications from public bodies, public corporations and government departments

Dates of birth information in this appendix will not be put onto our Public Register

1 Are you applying as an individual; group of individuals; or a registered company, Limited liability partnership or other incorporated body?

☐ An individual. Now go to **2**.

☐ A group of individuals. Now go to **3**.

☐ A registered company, limited liability partnership or other incorporated body. Now go to **4**.

2 Applications from an individual

Title (optional)

First name

Last name

Date of birth (DD/MM/YY)

3 Applications from a group of individuals

Provide the names and dates of birth of all individuals acting jointly, or in a general or limited partnership.

For unincorporated trusts, charities and associations provide the name and date of birth of all individuals that are part of the group's controlling or guiding mind. For example:

- trustees
- chairperson
- treasurer
- secretary
- or a person with a similar position

Provide a continuation sheet where necessary.

First individual

Title (optional)

First name

Last name

Date of birth (DD/MM/YY)

Second individual

Title (optional)

First name

Last name

Date of birth (DD/MM/YY)

Third individual

Title (optional)

First name

Last name

Date of birth (DD/MM/YY)

Fourth individual

Title (optional)

First name

Last name

Date of birth (DD/MM/YY)

Continuation sheet for additional individuals or corporation

Document reference of continuation sheet (if any):

4 Applications from registered companies, limited liability partnership or other incorporated bodies

For registered companies provide the names and dates of birth of all directors and any company secretary.

For limited liability partnerships provide the names and dates of birth of all partners.

For other incorporated bodies provide the name and date of birth of all individuals that are part of the body's controlling or guiding mind. For example:

- trustees
- chairperson
- treasurer
- secretary
- or a person with a similar position

Use a continuation sheet where necessary.

Provide the company name and registration number on a continuation sheet for any corporate:

- directors
- company secretaries
- partners

First person

Title (optional)

First name

Last name

Position

Date of birth (DD/MM/YY)

Second person

Title (optional)

First name

Last name

Position

Date of birth (DD/MM/YY)

Third person

Title (optional)

First name

Last name

Position

Date of birth (DD/MM/YY)

Fourth person

Title (optional)

First name

Last name

Position

Date of birth (DD/MM/YY)

Continuation sheet for additional people

Document reference of continuation sheet (if any):

Application for an environmental permit Part F1 – Charges and declarations

We recommend you use an Adobe Acrobat product to complete the form. You may not be able to complete the form using different software, such as the PDF reader built into your internet browser

Fill in this part for all applications for:

- installations (excluding new permit and variation applications for intensive farming. Use application form Part B3.5 or C3.5 instead)
- waste operations
- mining waste operations
- medium combustion plant
- specified generators
- water discharges (excluding treated domestic sewage effluent discharges of up to 15 cubic metres (15m^3) a day into ground or up to 20 cubic metres (20m^3) a day to surface water)
- groundwater activities (excluding small discharges of 15m^3 per day or less if using Part B6.5 OR existing small discharges to Source Protection Zone1 if using Part B6.6)

Please check that this is the latest version of the form available from our website.

Please read through this form and the guidance notes that came with it.

The form can be:

1) saved onto a computer and then filled in.

2) printed off and filled in by hand. Please write clearly in the answer spaces.

We anticipate it will take less than 3 hours to fill in this form if you have all the necessary information available.

Contents

1 Working out charges

2 Payment

3 Privacy notice

4 Confidentiality and national security

5 Declaration

6 Application checklist

7 How to contact us

8 Where to send your application

1 Working out charges

You must fill out this section for all applications except for waste mobile plant and Part B surrender notifications.

You have to submit an application fee with your application. For guidance on the fee and how to pay your charges, please see our charging guidance (**https://www.gov.uk/government/publications/environmental-permitting-charges-guidance**) and the current charging scheme **https://www.gov.uk/government/publications/environmental-permits-and-abstraction-licences-tables-of-charges**. You can also contact us for pre-application advice to help work out the charges.

Please note that there is an annual subsistence charge to cover the costs we incur in the ongoing regulation of the permit.

Table 1 – Type and number of facilities being applied for

For example, if you are submitting one installation application, enter the number one into the first column.

Installation	Waste	Mining waste	Medium Combustion Plant (MCP)/ Specified Generator (SG)	Water discharge	Groundwater activity
1					

Table 2 – General application charge (A)

Charge activity reference from the charging scheme tables	Charge activity description from the charging scheme tables	What are you applying for? For example, a new permit, minor variation, normal variation, substantial variation, surrender, low risk surrender, transfer	Amount
e.g. 1.17.3	e.g. Section 5.2 – landfill for hazardous waste	e.g. transfer application	e.g. £5,561
1.10.1	Section 1.1 – combustion plant –	Substantial Permit Variation	£17,193
	rated thermal input of 50MWth or more.		
Total A			£17,193

1 Working out charges, continued

Table 3 – Additional assessment charges (B)

Part 1.19 Charges for plans and assessments			Tick appropriate
Reference	Plan or assessment	Charge	
1.19.1	Waste recovery plan or variation or revision of a waste recovery plan.	£1,231	☐
1.19.2	Habitats assessment (except where the application activity is a flood risk activity, water discharge or groundwater activity).	£779	☐
1.19.3	Fire prevention plan (except where the application activity is a farming installation).	£1,241	☐
1.19.4	Pests management plan (except where the application activity is a farming installation).	£1,241	☐
1.19.5	Emissions management plan (except where the application activity is a farming installation).	£1,241	☐
1.19.6	Odour management plan (except where the application activity is a farming installation).	£1,246	☐
1.19.7	Noise and vibration management plan (except where the application activity is a farming installation).	£1,246	☐
1.19.8	Ammonia modelling assessment	£620	☐
1.19.9	Dust and bio-aerosol management plan.	£620	☐
1.19.10	Habitats assessment for discharges to water and groundwater activities.	£2,035	☐
1.19.11	Specific Substances Assessment for a water discharge activity to surface water.	£3,774	☐
1.19.12	Specific Substances Assessment for a groundwater activity.	£1,546	☐
1.19.13	Advertising	£500	☐
Total B			0

Total charges

Add the total charges from Table 1 to the total charges from Table 2 (total A plus total B)

£17,193.00

2 Payment

You must fill out this section for all applications except for waste mobile plant and Part B surrender notifications.

Tick below to show how you have paid.

☐ Cheque

☐ Credit or debit card

☑ Electronic transfer (for example, BACS)

Cheques

You should make cheques payable to 'Environment Agency' and make sure they have 'A/c Payee' written across them if it is not already printed on.

2 Payment, continued

Please write the name of your company and application reference number on the back of your cheque. We will not accept cheques with a future date on them.

Credit/debit cards

If you are paying by credit or with debit card we will call you. We can accept payments by Visa, MasterCard or Maestro card only.

☐ Call me to arrange payment by debit or credit card

Electronic transfer BACS

If you choose to pay by electronic transfer, you will need to use the following information to make your payment:

Company name	Environment Agency
Company address	SSCL (Environment Agency), PO Box 797, Newport Gwent, NP10 8FZ
Bank	RBS/NatWest
Address	London Corporate Service Centre, CPB Services, 2nd Floor, 280 Bishopsgate, London EC2M 4RB
Sort code	60-70-80
Account number	10014411
Account name	EA RECEIPTS
Payment reference number	PSCAPPXXXXXYYY

You need to create your own reference number. It should begin with PSCAPPWASTE (Waste), PSCAPPINST (Installation), PSCAPPWQ (Water Quality) (to reflect the facility type) and it should include the first five letters of the company name (replacing the X's in the above reference number) and a unique numerical identifier (replacing the Y's in the above reference number). The reference number that you supply will appear on our bank statements.

You should also email your payment details and reference number to **ea_fsc_ar@gov.sscl.com**.

If you are making your payment from outside the United Kingdom, it must be in sterling. Our IBAN number is GB23NWBK60708010014411 and our SWIFTBIC number is NWBKGB2L.

If you do not quote your reference number, there may be a delay in processing your payment and application.

Provide a unique reference number for the application, i.e. do not only use the company name only

PSCAPPCOLLE001

State who is paying (full name and whether this is the agent/applicant/other)

Collen Construction Ltd

Fee paid

£ £17,193

Date payment sent (DD/MM/YYYY)

/11/2025

3 Privacy notice

The Environment Agency runs the environmental permit application service.

See **https://www.gov.uk/guidance/environmental-permits-privacy-notice** for how we use your personal information in services to support environmental permitting.

4 Confidentiality and national security

Confidentiality

We will normally put all the information in your application on a public register of environmental information. However, we may not include certain information in the public register if this is in the interests of national security, or because the information is confidential.

You can ask for information to be made confidential by enclosing a letter with your application giving your reasons. If we agree with your request, we will tell you and not include the information in the public register. If we do not agree with your request, we will let you know how to appeal against our decision, or you can withdraw your application. You can find guidance on confidentiality in 'Environmental permitting guidance: core guidance', published by Defra and available at **https://www.gov.uk/government/publications/environmental-permitting-guidance-core-guidance--2**.

Only tick the box below if you wish to claim confidentiality for parts of your application

☐ Please treat the specified information in my application as confidential

National security

You can tell the Secretary of State that you believe including information on a public register would not be in the interests of national security. You must enclose a letter with your application telling us that you have told the Secretary of State and you must still include the information in your application. We will not include the information in the public register unless the Secretary of State decides that it should be included.

You can find guidance on national security in 'Environmental permitting guidance: core guidance', published by Defra and available at **https://www.gov.uk/government/publications/environmental-permitting-guidance-core-guidance--2**

You cannot apply for national security via this application.

Now fill in section 5

5 Declaration

If you knowingly or recklessly make a statement that is false or misleading to help you get an environmental permit (for yourself or anyone else), you may be committing an offence under the Environmental Permitting (England and Wales) Regulations 2016.

A relevant person should make the declaration (see the guidance notes on part F1). An agent acting on behalf of an applicant is NOT a relevant person.

Each individual (or individual trustee) who is applying for their name to appear on the permit must complete this declaration. You will have to print a separate copy of this page for each additional individual to complete.

If you are transferring all or part of your permit, both you and the person receiving the permit must make the declaration. You must fill in the declaration directly below; the person receiving the permit must fill in the declaration under the heading 'For transfers only'.

5 Declaration, continued

Note: we will issue a letter to both current and new holders to confirm the transfer. If you are changing address we will need to send this letter to your new address; therefore please tell us your new address in a separate letter.

If you are unable to trace one or more of the current permit holders please see below under the transfers declaration.

I declare that the information in this application is true to the best of my knowledge and belief. I understand that this application may be refused or approval withdrawn if I give false or incomplete information.

If you deliberately make a statement that is false or misleading in order to get approval you may be prosecuted.

☑ Tick this box to confirm that you understand and agree with the declaration above, then fill in the details below (you do not have to provide a signature as well)

☑ I confirm that my standard facility will fully meet the rules that I have applied for (this only applies if the application includes standard facilities)

☑ Tick this box if you do not want us to use information from any ecological survey that you have supplied with your application (for further information please see the guidance notes on part F1)

Name

Title

Mr

First name

Phillip

Last name

Hallett

on behalf of (if relevant; for example, a company or organisation and so on)

Ramsgate Lux SCSp

Position (if relevant; for example, a company or organisation and so on)

UK Branch Manager

Today's date (DD/MM/YYYY)

09/12/2025

For transfers only – declaration for person receiving the permit

A relevant person should make the declaration (see the guidance notes on part F1). An agent acting on behalf of an applicant is NOT a relevant person.

I declare that the information in this application to transfer an environmental permit to me is true to the best of my knowledge and belief. I understand that this application may be refused or approval withdrawn if I give false or incomplete information.

Note: If you cannot trace a person or persons holding the permit you may be able to transfer the permit without their declaration as above. Please contact us to discuss this and supply evidence in your application to confirm you are unable to trace one or all of the permit holders.

If you deliberately make a statement that is false or misleading in order to get approval you may be prosecuted.

5 Declaration, continued

☐ Tick this box to confirm that you understand and agree with the declaration above, then fill in the details below (you do not have to provide a signature as well)

Name

Title

First name

Last name

on behalf of (if relevant; for example, a company or organisation and so on)

Position (if relevant; for example, a company or organisation and so on)

Today's date (DD/MM/YYYY)

Now go to section 6

6 Application checklist

You must fill in this section.

If your application is not complete, we will return it to you. If you aren't sure about what you need to send, contact us before you submit your application. For further information on pre-application advice, see **https://www.gov.uk/guidance/get-advice-before-you-apply-for-an-environmental-permit.**

You must do the following:

☑ Complete legibly all parts of the application form that are relevant to you and your activities

☑ Identify relevant supporting information in the form and send it with the application

☑ List all the documents you are sending in the table below.

☑ For new permit applications or any changes to the site plan, provide a plan that meets the standards given in the guidance note on part F1

☐ Provide a supporting letter for any claim that information is confidential

☑ Get the declaration completed by a relevant person (not an agent)

☑ Send the correct fee

6 Application checklist, continued

Continue on an extra sheet if necessary.

Question reference	Document title	Document reference
All forms where relevant	EPR Application Supporting Information Document LON1X0_LON1X2	
Section 5	Ramsgate & Yondr Group Structure_08122025	1. Ramsgate & Yondr Group Structure_08122025
Section 5	Power of Attorney for Phillip Hallet	2. Board_Resolutions_Ramsgate_Lux_SCSp_151
	Short Narrative explaning Phillip has replaced the named Power of Attorney on the earlier Tra	3. Ramsgate Accompanying Explanation on Change to Declaration Contact

Document reference

EPR Application Supporting Information Document

7 How to contact us

If you have difficulty filling in this form, please contact the person who sent it to you or contact us as shown below.

General enquiries: 03708 506 506 (Monday to Friday, 8am to 6pm)

Textphone: 03702 422549 (Monday to Friday, 8am to 6pm)

Email: **enquiries@environment-agency.gov.uk**

Website: **www.gov.uk/government/organisations/environment-agency**

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve.

Please tell us if you need information in a different language or format (for example, in large print) so we can keep in touch with you more easily.

8 Where to send your application

For how many copies to send see the guidance note on part F1.

Please send your filled in application form and supporting documents to:

For water discharges and groundwater activities by email to
PSC-WaterQuality@environment-agency.gov.uk

For waste, installations, medium combustion plant and specified generators by email to
PSC@environment-agency.gov.uk

For large electronic documents (too large for email attachment) you can upload your applications to file sharing sites and send us a link to download the documents. Alternatively, you can send more than one email with documents attached.

Or by post to:

Permitting Support, NPS Sheffield
Quadrant 2
99 Parkway Avenue
Parkway Business Park
Sheffield
S9 4WF

Do you want all information to be sent to you by email?

☑ Please tick this box if you wish to have all communication about this application sent via email (we will use the details provided in the Part A form).

Feedback

(You don't have to answer this part of the form, but it will help us improve our forms if you do.)

We want to make our forms easy to fill in and our guidance notes easy to understand. Please use the space below to give us any comments you may have about this form or the guidance notes that came with it.

How long did it take you to fill in this form?

We will use your feedback to improve our forms and guidance notes.

Would you like a reply to your feedback?

☐ Yes please

☐ No thank you

For Environment Agency use only

Date received (DD/MM/YYYY)

Our reference number

Payment received?

☐ No

☐ Yes

Amount received (£)

Application & Guidance for an environmental permit Part C2 – General – varying a bespoke permit

Use this form if you are applying to make a non-administrative variation (change) to the conditions or any other part of your permit.

In addition to this form, you will also need to complete:

- **Part A: about you https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-a-about-you**
- **Part F1: charges and declarations https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-f1-opra-charges-declarations**

You will also need to complete one or more additional part C forms, depending on your proposed change:

- **Part C3: vary a bespoke installation permit https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-c3-varying-a-bespoke-installation-permit**
- **Part C4: varying a bespoke waste operation permit https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-c4-varying-a-bespoke-waste-operation-permit**
- **Part C5: vary a permit to a mining waste permit, or vary a bespoke mining waste permit https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/582774/LIT_6785.pdf**
- **Part C6: vary a water discharge activity, groundwater activity, or point source emission to water from an installation https://assets.publishing.service.gov.uk/media/66743838d427ab249955cef2/Part_C6_vary_a_bespoke_water_discharge_activity_and_groundwater__point_source__environmental_permit.pdf**
- **Part C7: vary a bespoke groundwater permit to discharge used sheep dip, waste pesticide washing or other waste substances https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-c7-varying-a-bespoke-groundwater-permit**

If you are not changing to or adding a different facility type, the additional Part C form will depend on your permitted facility type. For example, if you are proposing to change the conditions of an installation permit, the additional form you need to complete is Part C3.

If you are changing to or adding a different facility type, the additional form you complete will depend on the facility you are changing to or adding.

Some examples are given below:

- Waste operation changing to an installation – if your changes mean that your existing waste operation becomes an installation you will need to fill in **Part C3: vary a bespoke installation permit https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-c3-varying-a-bespoke-installation-permit**
- Installation changing to a waste operation – if your changes mean that your existing installation becomes a waste operation you will need to fill in **Part C4: varying a bespoke waste operation permit https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928388/Application-for-environmental-permit-Part-C4-varying-a-bespoke-waste-operation-permit.pdf**

- Change to add a waste operation to an installation – if you are applying to add a waste operation to your existing installation you will need to complete application form **Part C4: varying a bespoke waste operation permit https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928388/Application-for-environmental-permit-Part-C4-varying-a-bespoke-waste-operation-permit.pdf**
- Change to add an installation to a waste operation – if you are applying to add an installation to your existing waste operation you will need to complete application for **Part C3: vary a bespoke installation permit https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-c3-varying-a-bespoke-installation-permit**
- Change to add an inert mining waste operation – if you have an existing permit for a water discharge activity that is integral to the mining waste operation and you wish to vary this permit by adding the requirements for an inert mining waste operation, complete forms Part A, C1 and F1. Please note that we will issue a bespoke permit, but it will resemble the standard rules for mining waste as closely as possible but will not technically be standard rules permit.
- Changing from a standard rule to a bespoke permit – the additional Part C form will depend on the bespoke facility type you are changing to. For example, if you are changing to a bespoke waste operation permit, you will need to complete the **Part C4 form https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928388/Application-for-environmental-permit-Part-C4-varying-a-bespoke-waste-operation-permit.pdf**
- Change to convert to or add a standard facility – to convert your existing permit to a standard permit or add a standard facility, do not complete this part of the form, but see: **Part C1: vary a standard facilities permit https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928394/Application-Part-C1-varying-a-permit-to-change-to-or-add-a-standard-facility.pdf**

To make an administrative change to your permit, do not complete this form. Instead see: **Part C0.5 administrative change to a standard or bespoke permit https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-c05-administrative-variation-of-a-standard-or-bespoke-permit**

To vary (change) your intensive farming permit, do not complete this form. Instead use: **https://www.gov.uk/government/publications/application-to-vary-an-environmental-permit-part-c3.5**

To vary (change) your medium combustion plant/specified generator permit, do not complete this form. Instead see: **https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-c2.5-vary-to-add-a-new-mcpsg-or-change-an-existing-mcp-or-sg-permit**

You only need to give us details in this application for the parts of the permit that will be affected (for example, if you are adding a new facility or changing an existing one).

You do not need to resend any information from your original permit application if it is not affected by your proposed changes.

Please check that this is the latest version of **Part C2 form: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928047/Application-for-a-permit-Part-C2-general-varying-a-bespoke-permit.pdf**

This form can be:

- Saved onto a computer then filled in. We recommend you use an Adobe Acrobat product to complete the form. You may not be able to complete the form using different software, such as a PDF reader built into your internet browser.
- Printed off and filled in by hand. Please write clearly in the answer spaces.

Contents

1 About the permit

2 About your proposed changes

3 Your ability as an operator

4 Environmental risk assessment

5 Site condition report

6 Other supporting information

7 Consultation

8 How to contact us

Appendix 1 – Low impact installation checklist

Appendix 2 – Date of birth information for Relevant offences and/or Technical competence questions only

Appendix 3 – Example site plan

1 About the permit

1a Have you spoken to the Environment Agency already about this application?

☐ No

☑ Yes Provide your pre-application reference number. For further information on pre-application advice see **Get advice before you apply for an environmental permit https://www.gov.uk/guidance/get-advice-before-you-apply-for-an-environmental-permit**

Pre-application reference number

EPR/NP3829SP/P002 CRM:0640985

Reference for the extra documents

None

1b If we have agreed you can send application information in stages

Provide your proposed timetable giving the dates of when you will submit each piece of information. For further information please see the guidance on **Send environmental permit application information in stages https://www.gov.uk/guidance/send-environmental-permit-application-information-in-stages**

Timetable document reference

n/a

1c Permit number

What is the permit number that this application relates to?

EPR/NP3829SP

This is the permit number starting with 'EPR' and can be found on your subsistence invoice, for example 'EPR/AB1234CD'

1d Site details (excludes mobile plant)

What is the site name, address and postcode?

Site name

Wexham Road Data Centre

Address

Wexham Road Data Centre
Wexham Road
Slough
United Kingdom

Postcode

SL2 5DS

1 About the permit, continued

National grid reference for the centre of the site

SU 98700 80300

Provide the 12-digit Ordnance Survey national grid reference for the centre of the site: for example, ST12345 67890.

There are several online resources available that can help find the grid reference. For example go to the Ordnance Survey website at **https://explore.osmaps.com/?lat=51.776100&lon=-1.894300&zoom=7.0000&style=Standard&type=2d**, locate and right click on the centre of the site.

2 About your proposed changes

2a Type of variation

What type of variation are you applying for? For examples of the different variation types, see our 'Charging Scheme Guidance' **https://www.gov.uk/government/publications/environmental-permitting-charges-guidance/environmental-permitting-charges-guidance#varying-a-permit-charge**.

- ☐ Minor variation
- ☐ Normal variation
- ☑ Substantial variation

2b Changes or additions to existing activities

2b.1 Provide a summary of the changes or additions you want to make to each activity, include details of any changes to discharge points or site boundaries.

2b.2 Provide further details of your proposed changes or additions in a separate document

The installation is a data centre providing online data services to multiple clients. This application seeks a variation to the existing permit to allow the installation of 32 new diesel - fired emergency backup generators. Under the Environmental Permitting (England and Wales) Regulations 2016 (as amended), these generators may be required to supply power to the data centre in the unlikely event of a grid power disruption. To meet this requirement, each data centre building (A, B, and C) will be supported by emergency backup generators housed within a ground floor compound. Buildings A and B currently each have 26 generators, while the proposed Building C will be equipped with 32 generators. This will require an extension of the existing boundary line/perimeter of the existing Permit. The Engineering Drawing LON1X2=RKD=CZ - ZZ - DR - A - 00002 "Overall Site Ownership" dated 07 - JULY - 2025 is located in

Document reference of the detailed changes or additions

PASI - SOC - p.3

2 About your proposed changes, continued

2b3 Do you want to remove an activity from your permit?

☑ No

☐ Yes Enter the activity that you are applying to remove in the text box below.

2c Consolidate (combine) two or more permits into one

If you have more than one permit on the same site you can apply to combine them into a single permit.

We will combine the existing permits into a single replacement permit. Where we agree to combine the permits, old style permit conditions will be replaced with modern ones that deliver an equivalent standard. An existing condition may be used if it does not have a modern equivalent.

We may require additional information from you, for example, about your management system.

It is advisable to obtain pre-application advice before you apply to combine your permits. See **https://www.gov.uk/guidance/get-advice-before-you-apply-for-an-environmental-permit**

Note: You will need to pay a variation charge for each permit being consolidated. See the 'Consolidate permits through variations' section of our Charging Scheme Guidance **https://www.gov.uk/government/publications/environmental-permitting-charges-guidance/environmental-permitting-charges-guidance#consolidate-2-or-more-permits-into-1**.

Do you want to combine two or more permits into one?

☐ Yes – list all the permit numbers you want to combine in Table 1 below.

Table 1 – Permit numbers

☑ No – **go to question 2d**

2 About your proposed changes, continued

2d Consolidate (update) a single permit

We will usually issue a new, updated permit whenever variations are made. If your permit has old style conditions we will usually replace them with modern ones that deliver an equivalent standard. An existing condition may be used if it does not have a modern equivalent.

We do this updating as a regulator initiated variation, so it is not something you need to apply for. If you do not want us to do this, tick the box in 2d.1 below and tell us why.

2d.1

☐ I do not want my permit updated with modern conditions.

Explain your reasons below:

Sometimes we will be unable to update old style conditions as a regulator initiated variation. For example, where the work is disproportionate to the type of variation applied for.

You can still apply to consolidate and update your old-style conditions, but this may incur an additional charge. See the 'Consolidate permits through variations' section of our Charging Scheme Guidance **https://www.gov.uk/government/publications/environmental-permitting-charges-guidance/environmental-permitting-charges-guidance#consolidate-a-single-permit**. You will need to include this as part of your overall application charge.

It is advisable to obtain pre-application advice before you apply to update and modernise your permit. See **https://www.gov.uk/guidance/get-advice-before-you-apply-for-an-environmental-permit**

2d.2

☑ I am applying to update and modernise my permit.

2e Low impact installations (installations only)

This applies to low-risk installation activities only. If this is not applicable, answer 'No' go straight to **section 3** on the application form.

Read the low impact installation guidance in **appendix 1** to check whether your installations fit the criteria. You must tell us how you meet the criteria in a separate document, giving the document reference in this section.

You must complete the low installation checklist in **appendix 1**. Tick the box to confirm you have filled it in.

2 About your proposed changes, continued

2e.1 Will the changes mean the facility qualifies as a low impact installation?

☑ No Now go to section 3

☐ Yes If yes, tell us how you meet the low impact installation criteria (see the guidance notes in **Appendix 1**

Document reference

☐ Tick the box to confirm you have filled in the low impact installation checklist in Appendix 1 for each regulated facility

3 Your ability as an operator

If you are applying to add waste installations or waste operations (relevant waste operations) to a permit that has not previously had them, you need to fill in all of section 3. Otherwise, complete the relevant questions as indicated by the accompanying guidance.

Relevant waste operations are one or both of the following:

- A waste operation (not carried on at an installation or by means of a Part B mobile plant).
- A specified waste management activity (certain installations carrying out waste management activities).

For further details refer to **https://www.legislation.gov.uk/uksi/2018/1227/regulation/4/made**

When deciding such applications we consider whether you will be competent operator. We look at any unspent relevant convictions; your technical ability; financial competence; and check that you have a management system.

3a Convictions for any relevant offences

This question applies to relevant waste operations only. Complete the question if you are applying to add a relevant waste operation to a permit that has not had one before.

It does not apply to applications from public bodies or government departments.

Relevant convictions are explained at: **https://www.gov.uk/government/publications/relevant-conviction-guidance-for-permit-applications-for-waste-activities-and-installations-only**

Do you, or any other relevant person, have any unspent convictions for any relevant offence?

☑ No Now go to **question 3b**

☐ Yes Please give details below

3 Your ability as an operator, continued

Name of the relevant person

Title (Mr, Mrs, Miss and so on)

First name

Last name

Position held at the time of the offence

Name of the court where the case was dealt with

Date of the conviction (DD/MM/YYYY)

Offence and penalty set

Date any appeal against the conviction will be heard (DD/MM/YYYY)

If necessary, use a separate sheet to give us details of other relevant offences and tell us below the reference number you have given the extra sheet.

Document reference

☐ Tick this box to confirm you have provided dates of birth for each relevant person in **Appendix 2**.

Relevant person

For individuals or groups of individuals

A 'relevant person' is:

- the individual where the permit holder is a sole individual
- all individuals where the permit holder is a group of individuals, (such as individuals in a general or limited partnership)

For registered companies

A 'relevant person' is the company itself and any:

- director
- company secretary
- manager
- similar corporate officer

3 Your ability as an operator, continued

For limited liability partnerships

A 'relevant person' is:

- the partnership itself
- all partners

For other organisations or bodies

A relevant person is any person who is part of the controlling or guiding mind of the organisation or body. This could be, for example any:

- trustee
- chairperson
- treasurer
- secretary
- person with a similar position

Relevant unspent convictions must be declared whether the relevant person has been:

- convicted of a relevant offence themselves
- held one of the positions above at a time when the organisation or body was convicted of a relevant offence

3b Technical ability

Section 3b applies to relevant waste operations only.

Complete the questions if:

- you are adding a relevant waste operation to a permit that has not had one before; or
- your proposed variation will change your current technical competence requirements

'Relevant waste operations' are one or both of the following:

- a waste operation (not carried on at an installation or by means of a Part B mobile plant).
- a specified waste management activity (certain installations carrying out waste management activities). For further details about specified waste management activities refer to 2(4) and 2(5) of **https://www.legislation.gov.uk/uksi/2018/1227/regulation/4/made**

3b.1 Which technical competence scheme are you using?

We need to be satisfied that you will have sufficient technical ability to operate your facility.

To demonstrate your technical ability, you must comply with one of the government approved technical competence schemes. The two schemes currently approved are:

- Chartered Institute of Wastes Management/Waste Management Industry Training and Advisory Board (CIWM/WAMITAB) scheme: **https://ciwmquals.co.uk/competence/**.
- Energy and Utility Skills/Environmental Services Association/ (EU skills/ESA) scheme: **https://www.euskills.co.uk/about/our-industries/waste-management/competence-management-system/**.

3 Your ability as an operator, continued

Tick the scheme(s) you are using to demonstrate your technical competence.

☐ CIWM/WAMITAB. Go to question 3b.2

☐ EU skills/ESA. **Go to question 3b.3**

3b.2 CIWM/WAMITAB scheme

The information you provide in this section must be for the person(s) providing technical competence once the new or changed waste operation starts.

Note: grace periods do not apply to variation applications.

Provide the following information for each technically competent manager (TCM).

Use a separate sheet to provide the information for each TCM where more than one is being provided.

Document reference for continuation sheet, (if applicable):

a. Details of the technically competent manager

Title (Mr, Mrs, Miss and so on)

First name

Last name

Phone

Email

☐ Tick this box to confirm you have provided the date of birth for the TCM in **Appendix 2**.

Complete table 2 for any other sites where the manager provides technical competence. This includes permits held by other operators and any other sites where they are intending to provide technically competent management.

3 Your ability as an operator, continued

Continue on a separate sheet as required.

Table 2		
Permit number	**Site address**	**Postcode**

Document reference of the extra sheet (if applicable)

For information on how much time the TCM must be on site, see: **https://www.gov.uk/guidance/legal-operator-and-competence-requirements-environmental-permits#how-much-time-your-technically-competent-manager-must-be-on-site**.

b. Provide evidence of relevant technical competence

Tick the document(s) you are submitting to show evidence of technical competence. The original and continuing competence must be relevant to the activity you are applying for.

Primary competence qualification

☐ a copy of the primary competence qualification certificate(s)

☐ copy of current continuing competence certificate(s). This is required when the original qualification is over 2 years old.

Deemed competence

☐ evidence of deemed competence and current continuing competence certificate(s)

Environment Agency assessed competence

☐ evidence of passing an Environment Agency assessment and current continuing competence certificate(s)

Transitional provisions (for previously exempt activities)

☐ generic knowledge test certificate and current continuing competence certificate(s).

The generic knowledge test option only applies to managers nominated under the 2010 exemption transitional arrangements.

3 Your ability as an operator, continued

3b.3 EU skills/ESA scheme

Provide evidence of technical competence.

☐ Tick this box to confirm you have included a copy of your Competence Management System (CMS) certificate and any appendices

Now go to question 3c

3c Finances

Section 3c applies to installations, waste operations and mining waste operations only.

Complete question 3c.1 if you are applying to add a relevant waste operation to a permit that has not had one before.

Otherwise start at question 3c.2 for variations to all landfills, Category A and hazardous waste mining waste facilities.

If you want to change your permit to extend the area of a landfill or mining waste facility as described above, you will need to discuss when is necessary to review the expenditure plan/ cost profile for variation.

3c.1 Financial competence – adding a relevant waste operation to a permit that has not had one before.

Do you or any relevant person or a company in which you (or they) (or any relevant person) were a relevant person, have current or past bankruptcy or insolvency proceedings against you?

☑ No

☐ Yes Please give details below, including the required set-up costs (including infrastructure), maintenance and clean-up costs for the proposed facility against which a credit check may be assessed.

We may contact a credit reference agency for a report about your business's finances.

See **Environmental permits privacy notice** – **https://www.gov.uk/guidance/environmental-permits-privacy-notice** for how we use your personal information to support environmental permitting.

3 Your ability as an operator, continued

Financial provision – variations to a landfill, Category A or hazardous waste mining waste facilities.

When you apply to change your permit, you must also review your financial provision. This is to make sure it covers any changes in liability.

For further guidance for landfills see: **https://www.gov.uk/guidance/landfill-operators-environmental-permits/calculate-your-financial-provision#review-and-change-your-financial-provision**

For further guidance for mining waste facilities see: the 'Financial guarantees' section of 'Environmental Permitting Guidance – The Mining Waste Directive' **https://www.gov.uk/government/publications/environmental-permitting-guidance-the-mining-waste-directive**

3c.2 Do you need to change the amount of financial provision?

You need to provide an expenditure plan. Tell us the document reference here and send the documents with the application form when you've completed it.

☐ Yes Go to question 3c.3

☑ No Provide an explanation in the box below and then go to **question 3d**

Not applicable, this is not a waste management site. Therefore, no ELRA/CRAMP are required.

3c.3 How do you plan to make financial provision?

You need to satisfy us that you are financially capable of meeting the obligations of the permit, including during aftercare.

Tick the type of financial provision you intend to use:

☐ Renewable bonds

☐ Cash deposits with the Environment Agency

3c.4 Submit your revised expenditure plan

For landfills, include any updated monitoring point plan or monitoring and extraction point plan. For guidance see: (**https://www.gov.uk/guidance/landfill-operators-environmental-permits/calculate-your-financial-provision**).

Document reference for revised expenditure plan

3 Your ability as an operator, continued

3d Management systems

You must complete section 3d for all variation applications

You must have an effective, written management system in place that identifies and reduces the risk of pollution. You can show this by using a certified scheme or your own system. For guidance on developing a management system see: **https://www.gov.uk/guidance/develop-a-management-system-environmental-permits**

If you operate more than one site, you need to be able to explain what happens at each site and which parts of the overall management system apply. For example, at some sites you may need to show you are carrying out additional measures to prevent pollution because they are nearer to sensitive locations than others.

For waste and installation activities only: your management system must also explain your resilience to climate change. Explained at: **https://www.gov.uk/guidance/climate-change-risk-assessment-and-adaptation-planning-in-your-management-system**.

For small sewage treatment activities only: your management system must ensure that your sewage treatment system is maintained and run effectively. **https://www.gov.uk/guidance/develop-a-management-system-environmental-permits**

You can find guidance on management systems here: **https://www.gov.uk/guidance/develop-a-management-system-environmental-permits**

☑ Tick this box to confirm that you have read the guidance and that your management system will meet our requirements

What management system are you providing for your regulated facility?

☐ ISO 14001

☐ BS 8555 (Phases 1–5)

☐ BS EN ISO 14005:2019

☐ Green dragon

☐ EMAS Global

☐ Other

☑ Own management system

Please send us a summary of your updated management system and a copy of your accreditation (if applicable) with your application.

Document reference/s

PASI - 3 - p.14, PASI - App - I - p.42

4 Environmental risk assessment

Your environmental risk assessment will need updating to consider any additional or other changes in risk. The risk assessment must show the measures in place to reduce and control risks.

The risk assessment must follow the methodology set out in 'Risk assessments for your environmental permit' (see **https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit**), or an equivalent method.

Include modelling reports and files where you have carried out detailed modelling.

If a habitat site is within screening distance, then an additional fee will be required. See **https://www.gov.uk/government/publications/environmental-permits-and-abstraction-licences-tables-of-charges**

You must provide an updated environmental risk assessment. Your risk assessment should clearly identify any additional or other changes in risk. This does not apply when we can do the risk assessment for you. We can do the risk assessment for you where you are:

- a farmer discharging certain substances to ground
- discharging domestic treated sewage, (depending on volume and site sensitivities)

See 'Risk assessments for your environmental permit' at **https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#when-the-environment-agency-can-do-your-risk-assessment** for further details on when we can do your risk assessment for you.

Document reference(s) for the updated risk assessment, including modelling reports and files where applicable

PASI - App - B - p.35

5 Site condition report

This section is applicable to Part A installations, waste and mining waste operations only. Do not complete for mining waste facilities.

This section does not apply to areas of land where waste is permanently deposited, for example areas of landfill, mining waste operations and deposit for recovery. It does apply to any parts of the site where waste will not be permanently deposited, for example a weighbridge area that will not be backfilled with waste.

You can contact us for pre-application advice on site condition reports, see: **https://www.gov.uk/guidance/get-advice-before-you-apply-for-an-environmental-permit**

If you want to make any of the changes listed in question 5a, you will need to submit an updated site condition report (SCR). This must include an updated site plan. For details of what to include on the site plan, see the H5 template linked below.

If you do not currently have an SCR, you should use the **H5 Site Condition Report word template https://www.gov.uk/government/publications/environmental-permitting-h5-site-condition-report** to prepare one.

You should keep your SCR up to date throughout the life of your permit. It will help you show how you have protected land and groundwater when you come to surrender your permit.

For SCR guidance and a template see:

https://www.gov.uk/government/publications/environmental-permitting-h5-site-condition-report.

5 Site condition report, continued

5a Are you proposing to make any of the following changes:

- extend your site boundary
- add an installation
- use, produce or release any new hazardous substances
- relocate hazardous substances to a new area within your site?

☐ No **Go to section 6**

☑ Yes Provide a site condition report, or an updated site condition report together with a summary of the changes.

Document reference(s) of your site condition report

PASI - App - F - p.39

Document reference(s) of your change summary document

PASI - SOC - p.3

For installations, go to question 5b

For waste and mining waste operations, go to **section 6**.

5b Stage 1 to 3 assessment for hazardous substances (installations only)

Question 5b only applies to installations.

If you want to make any of the changes listed in question 5b, you will need to update your stage 1 to 3 assessment. If you do not already have a stage 1 to 3 assessment, you will need to carry one out.

For guidance on producing a stage 1 to 3 assessment, see 'EC Commission Guidance concerning baseline reporting (2014/C 136/03)' (**https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0506(01)&from=EN**)

We have also produced a stage 1 to 3 assessment guidance document with worked examples. To request a copy, contact our pre-application service and ask for 'EPR advice note: Stage 1 to 3 assessment'. See: **https://www.gov.uk/guidance/get-advice-before-you-apply-for-an-environmental-permit**

Are you proposing to make any of the following changes:

- use, produce or release any new hazardous substances
- relocate any hazardous substances you currently use, produce or release to a new area within your site boundary?

☑ No **Go to section 6**

☐ Yes Tick to confirm you have included a stage 1 to 3 assessment as part of your updated site condition report

Go to question 5c

5 Site condition report, continued

5c Baseline reference data (installations only)

Section 5c only applies to installations.

If your stage 1 to 3 assessment identifies a risk to soil and groundwater from relevant hazardous substances, you must provide baseline reference data for those substances. You may be unable to provide this information as part of your application. In this situation, it is likely that we will include an improvement condition in your permit. This will require you to submit baseline reference data within a given timeframe.

You will also be required to do periodic monitoring of soil and groundwater if your stage 1 to 3 assessment identified there is a risk to soil and groundwater from relevant hazardous substances.

It is recommended that you plan for this and include details of your proposed monitoring plan in your updated site condition report. The monitoring period in your permit will depend on the severity of the risk.

If your stage 1 to 3 assessment identifies a risk to soil and groundwater from any other potentially polluting substances, we recommend you establish baseline reference data.

5c.1 Has your stage 1 to 3 assessment identified a risk to soil and groundwater from relevant hazardous substances?

☐ No

☐ Yes Go to question 5c.2

5c.2 Have you have provided baseline reference data in your site condition report?

☐ No

☐ Yes

5c.3 Has your stage 1 to 3 assessment identified a risk to soil and groundwater from any other potentially polluting substances?

☐ No Go to section 6

☐ Yes Go to question 5c.4

5c.4 Have you have provided baseline reference data in your site condition report?

☐ No

☐ Yes

6 Other supporting information

6a Provide a non-technical summary of your application

Write a summary that explains your application. Summarise the key technical standards and control measures for your proposed changes. Use non-technical language wherever possible and avoid detailed data and scientific discussion. Other parts of the application form will ask for these details when necessary.

For mobile plant, tell us how the proposed changes could impact land quality. Describe the mobility of your plant and how you intend to operate.

6 Other supporting information, continued

Document reference of the non-technical summary

PASI - NTS - p.5

6b Updated site plans (not for mobile plant)

If you are extending your site boundary or adding a discharge point you must send us a revised site plan or plans.

For an example of a suitable plan please see **Appendix 3**.

If you are sending us a paper copy of your plan it must be either A3 or A4 size. Alternatively, you can send us an electronic copy. For both formats, the plan must be legible at A4 size, drawn to scale, and include a scale bar. The plan should also include a date, a reference and local features.

For installations, waste and mining waste operations your site plan must also:

- identify all the land on which your activities will take place
- clearly show the outline of the site (preferably in a green colour)

It may be possible to incorporate your site plan into your site condition report plan.

For water discharge or groundwater activity permits your site plan must also show:

- any treatment plant
- the sample point
- the point where the effluent is discharged to the receiving environment

Are you extending your site boundary or adding a discharge point?

☐ No

☑ Yes

Document reference/s of the plans

PASI - App - A - p.34

6c Fire prevention plan (not for mobile plant)

You may need to submit a fire prevention plan (FPP) if you want to start storing combustible waste.

You may need to submit a revised FPP if your changes will increase the fire risk in other ways. This could be an increase in the risk of a fire occurring or an increase in the environmental risk if a fire occurs.

You will not need an FPP if both of the following apply:

- you only store waste with low combustibility
- we are satisfied that you can meet the 3 fire prevention objectives without using any of the measures in our FPP guidance (or alternative measures)

See our FPP guidance at: **https://www.gov.uk/government/publications/fire-prevention-plans-environmental-permits**

6 Other supporting information, continued

Complete this question if you accept or propose to accept combustible waste.

6c.1 Does our Fire Prevention Plan guidance apply to any of your activities?

☐ No Go to section 7

☐ Yes Go to question 6c.2

6c.2 Do you want to start storing combustible waste or will the fire risk increase in other ways?

☑ No

☐ Yes Provide a fire prevention plan or revised fire prevention plan that meets our guidance.

Document reference of the fire prevention plan

7 Consultation

Complete questions 7a to 7c for installations and waste operations and 7d for installations only. You will only need to answer the following questions if your proposed changes will result in the release of any substances to sewer or certain waters.

Does the change or addition to the waste operation or installation involve releasing any substance into any of the following?

7a A sewer managed by a sewerage undertaker?

☐ No

☑ Yes Please name the sewerage undertaker

Thames Water

7b A harbour managed by a harbour authority?

☑ No

☐ Yes Please name the harbour authority

7c Directly into inshore waters?

☑ No

☐ Yes Please name the relevant Inshore Fisheries and Conservation Authority (**https://association-ifca.org.uk/**)

7 Consultation, continued

7d Is the installation on a site for which:

7d.1 a nuclear site licence is needed under section 1 of the Nuclear Installations Act 1965?

☑ No

☐ Yes

7d.2 a policy document for preventing major accidents is needed under regulation 5 of the Control of Major Accident Hazards Regulations 2015, or a safety report is needed under regulation 7 of those Regulations?

☑ No

☐ Yes

8 How to contact us

If you have difficulty using this form, please contact the person who sent it to you or contact us as shown below.

General enquiries: 03708 506 506 (Monday to Friday, 8am to 6pm)

Textphone: 03702 422 549 (Monday to Friday, 8am to 6pm)

Email: **enquiries@environment-agency.gov.uk**

Website: **www.gov.uk/government/organisations/environment-agency**

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve it.

Please tell us if you need information in a different language or format (for example, in large print) so we can keep in touch with you more easily.

Feedback

(You don't have to answer this part of the form, but it will help us improve our forms if you do.)

We want to make our forms easy to fill in and our guidance notes easy to understand. Please use the space below to give us any comments you may have about this form or the guidance notes that came with it.

How long did it take you to fill in this form?

We will use your feedback to improve our forms and guidance notes

Would you like a reply to your feedback?

☐ Yes please

☐ No thank you

Appendix 1 – Low impact installation checklist (if you completed question 2f, low impact installations, you must also complete this checklist below).

Guidance for applicants on low impact installations

The Industrial Emissions Directive (IED) requires us to permit all installations regardless of their potential for environmental harm.

Consequently, we have developed the Low Impact Installation (LII) permit. If the criteria for LII are met, then a simpler permitting approach is adopted but all other aspects of the Environmental Permitting Regulations (EPR) still apply. LII sites are expected to require minimal regulatory effort by our staff.

Such reduction in regulatory effort can be reflected in lower subsistence charges for operators. The low impact qualifying criteria are demanding, as they are not designed to circumvent the purposes of the IED Directive or the Environment Permitting Regulations that implement them.

We do not consider the following waste activities under Schedule 1 of the Environmental Permitting Regulations to be eligible for the low impact approach:

- Section 5.1 – Incineration and co-incineration of waste
- Section 5.2 – Disposal of waste by landfill
- Section 5.3 – Disposal or recovery of hazardous waste, (except for standard rules SR2012 No13 for the treatment of incinerator bottom ash)
- Section 5.4 – Disposal, recovery or a mix of disposal and recovery of non-hazardous waste
- Section 5.6 – Temporary or underground storage of hazardous waste Requirements on the operator

Requirements on the operator

If you can comply with this guidance, you may pay the lower subsistence charge, as set out in our charges scheme. You must first demonstrate to us that your installation can have only a low impact on the environment through your variation application. We will check that the application is duly made and meets the criteria set out in this guidance. If we do not agree that the installation meets these criteria, we will not proceed to determine the application.

An application for a permit variation must address all the matters set out in the guidance on environmental permitting applications in sufficient detail to allow us to determine it, even if you believe that you are likely to satisfy the LII criteria. You must show through your application that your installation meets each of the conditions set out below. The application might not have to be as detailed as that required for installations that do not meet these criteria. However, it will still need to be made in the proper manner, advertised and entered on the Public Register in the usual way. In coming to our view, we will consider any comments that we receive about the application as part of the consultation process.

The permit conditions for a LII will meet the requirements of the Environmental Permitting Regulations. The permit conditions will also aim to ensure that an installation is operated in such a way that all appropriate measures are taken to avoid pollution, in particular through the application of best available techniques (BAT) and achieving a high level of protection of the environment as a whole. The operator will be required to report each year that the installation is still running as set out in the application and certify that actual releases remain below the levels set out in this guidance.

Appendix 1 – Low impact installation checklist, continued

Installation reference

Low impact installation criterion	Section of supporting document that shows how your proposed activity meets the LII criterion	Do you meet LII criterion?
A – Management techniques		☐ Yes ☐ No
B – Aqueous waste		☐ Yes ☐ No
C – Abatement systems/ releases to air		☐ Yes ☐ No
D – Emissions to groundwater		☐ Yes ☐ No
E – Waste production		☐ Yes ☐ No
F – Energy consumption		☐ Yes ☐ No
G – Accident prevention		☐ Yes ☐ No
H – Noise		☐ Yes ☐ No
I – Emissions of polluting substances		☐ Yes ☐ No
J – Odours		☐ Yes ☐ No
K – Compliance history		☐ Yes ☐ No

If you answered 'No' to any of the questions above, your installation cannot be considered as a low impact installation.

Appendix 1 – Low impact installation checklist, continued

Determination of low impact installations

We will determine what constitutes a low impact installation according to the principles set out below. You must demonstrate to our satisfaction that such is the nature of the installation, there is no reasonable likelihood that you will fail to meet any of these criteria.

A. **Management techniques:** All the criteria described below must be met without having to rely on significant management effort. In other words, the installation intrinsically must have only a low environmental impact, including under start up, shut down, or abnormal operating conditions.

B. **Wastewater:** The installation must not release more than 50 m³ per day of water from process activities conducted at the installation giving rise to effluent. No account need be taken of the volume of water exported from the installation as product. Characterise and quantify any aqueous effluents released from the installation on a daily basis and provide justification that the installation releases no more than 50 m³ per day of water from process activities.

C. **Abatement systems/releases to air:** The installation must comply with the criteria in this guidance without having to rely on active abatement for releases to the environment outside of any buildings. Releases must not be dependent on continuing or correct operation of equipment, where failure of active pollution prevention systems could result in an unacceptable external release. For example, if the installation depends on active abatement in the form of scrubbers, filters or electrostatic precipitators to achieve the releases to the environment set out in this guidance, it is unlikely that it can be treated as having only a low potential for impact. However, abatement systems installed solely for the protection of workers (where abatement is not to attenuate external environmental releases) need not be included in this assessment.

D. **Emissions to groundwater:** There must be no planned or fugitive emission from the permitted installation into the ground, or any soak away. This does not preclude the discharge of clean rainwater run-off into soak ways.

E. **Waste production:** The installation must not produce more than one tonne of waste or 10 kg of hazardous waste per day, averaged over a year, with no more than 20 tonnes of Directive waste or 200 kg of hazardous waste being produced in any one day.

F. **Energy consumption:** The installation must not consume energy at a rate greater than 3 MW or, if the installation uses a combined heat and power installation to supply any internal process heat, 10 MW. These limits apply to the sum of energy imported as electricity and produced on site through the combustion of fuels.

G. **Accident prevention:** You must have in place satisfactory containment measures to prevent fugitive emissions to surface water, sewer or land and ensure that these are adequately maintained at all times. This requirement applies to all substances present on site and in any quantity.

H. **Noise:** There must be only a low potential for causing offence due to noise. An installation will not be considered as a low impact installation if it may give rise to noise noticeable outside the installation boundary. This requires the exercise of judgement, taking account of any history of noise complaint arising from the installation and consideration of the likely offsite noise levels and proximity of sensitive receptors. Describe the main sources of noise from the installation, the nearest noise sensitive locations and any relevant noise measurement surveys which have been undertaken, and the proposed techniques and measures for the control of noise. Provide justification that there is only a low potential for offence due to noise.

Appendix 1 – Low impact installation checklist, continued

I. **Emissions of polluting substances:** Justify that there will be no likelihood of a release to the environment of any particular substance from the whole installation at a rate greater than that determined as insignificant as set out in our guidance note (search for 'Control and monitor emissions for your environmental permit' at: **https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit**. Describe the nature, quantities and sources of foreseeable emissions from the installation.

J. **Odour:** There must be only a low potential for giving offence due to odour. An installation will not be considered as a low impact installation if it may give rise to an offensive smell noticeable outside the installation boundary. This requires the exercise of judgement, taking account of any history of odour complaint from the installation and whether this class of activity is known by experience to give rise to smells. A significant possibility or actual history of excursions or fugitive emissions, for example from stored materials, would suggest that the installation could not be treated as having a low impact. Provide details of potential sources of odour from the installation, for example from stored materials, and justify that there is only a low potential for offence due to odour.

K. **Compliance history:** If any of the following enforcement actions have taken place at the same installation under the same management (and where appropriate, have not been overturned on appeal), then it will not normally be considered further as a low impact installation:

- prosecution*
- formal caution*
- suspension notice*
- enforcement notice relating to an actual or potential environment incident*

* (All under EPR or the equivalent under previous environmental regimes)

Appendix 2 – Date of birth information for Relevant offences and/or Technical competence questions only

Date of birth information in this appendix will not be put onto our Public Register

1 Relevant Offences – date of birth information for each relevant person

Please give us the following details if you have answered 'Yes' to question 3a1

Name of relevant person 1

Date of birth (DD/MM/YY)

Name of relevant person 2

Date of birth (DD/MM/YY)

Name of relevant person 3

Date of birth (DD/MM/YY)

Name of relevant person 4

Date of birth (DD/MM/YY)

Continue on a separate sheet as required

Document reference of continuation sheet

Appendix 2 – Date of birth information for Relevant offences and/or Technical competence questions only, continued

2 Technical competence – date of birth information for each technically competent manager

Please give us the following details (relevant waste operations only)

Name of technically competent manager 1

Date of birth (DD/MM/YY)

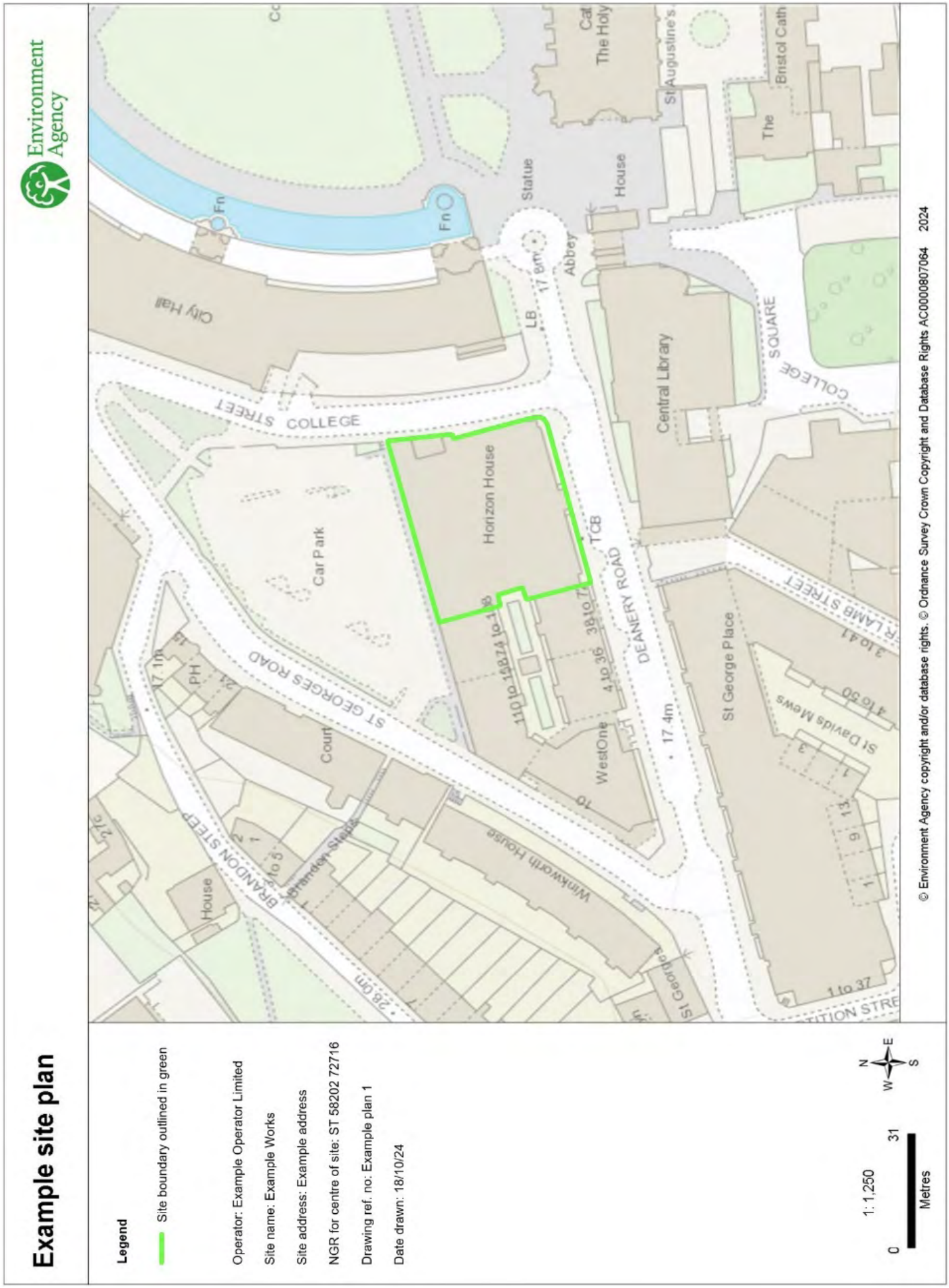
Name of technically competent manager 2

Date of birth (DD/MM/YY)

Continue on a separate sheet as required

Document reference of continuation sheet

Appendix 3 – Example site plan



Copyright issue

Please note that some plans and maps will be copyright. Unless you are using your own maps or plans or have paid for the copyright (for example with Ordnance Survey) you may not have the right to reproduce the map or plan.

Application for an environmental permit
Part C3 – Variation to a bespoke installation permit

Environment Agency

Fill in this part of the form, together with part A, part C2 and part F1, if you are applying to vary (change) the conditions or any other part of the permit.

Please check that this is the latest version of the form available from our website.

You only need to give us details in this application for the parts of the permit that will be affected (for example, if you are adding a new facility or making changes to existing ones).

You do not need to resend any information from your original permit application if it is not affected by your proposed changes.

Please read through this form and the guidance notes that go with it.

The form can be:

1) saved onto a computer and then filled in. Please note that the form follows a logic that means questions will open or stay closed depending on a previous answer. So you may not be able to enter text in some boxes.
2) printed off and filled in by hand. Please write clearly in the answer spaces.

It will take less than three hours to fill in this part of the application form.

Contents

1 What activities are you applying for?

2 Point source emissions to air, water and land

3 Operating techniques

4 Monitoring

5 Environmental impact assessment

6 Resource efficiency and climate change

Appendix 1 – Specific questions for the combustion sector

Appendix 2 – Specific questions for the chemical sector

Appendix 3 – Specific questions for the waste incineration sector

Appendix 4 – Specific questions for the landfill sector and recovery of hazardous waste on land activities

1 What activities are you applying to vary?

Fill in Table 1a below with details of all the activities listed in schedule 1 or other references (see note 1) of the Environmental Permitting Regulations (EPR) and all directly associated activities (DAAs) (in separate rows), that you propose to vary.

Note: if you want to add a Medium Combustion Plant or Specified Generator (MCP/SG) to your installation please use part C2.5 instead. If you want to vary an intensive farm permit please use part C3.5 instead.

Fill in a separate table for each installation you are applying to vary. Use a separate sheet if you have a long list and send it to us with your application form. Tell us below the reference you have given the document.

Document reference

1 What activities are you applying to vary?, continued

Table 1a – Types of activities

Schedule 1 listed activities						
Installation name	Schedule 1 or other references (See note 1)	Description of the activity (See note 2)	Activity capacity (See note 3)	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity (if this applies) (See note 3)	Non-hazardous waste treatment capacity (if this applies) (See note 3)
If there are not enough rows, send a separate document and give the document reference number here	Put your main activity first			For installations that take waste only	For installations that take waste only	For installations that take waste only
LON1X0	Section 1.1 Part A	Combustion Activities	518.041 MWth			

Directly associated activities (See note 4)		
Name of DAA If there are not enough rows, send a separate document and give the document reference number here	Description of the DAA (please identify the schedule 1 activity it serves)	
Storage, handling and transfer of gas oil (diesel)	Relates only to the storage and use of materials for the use within emergency standby generators.	
For installations that take waste (See note 5 below)	Total storage capacity	
	Annual throughput (tonnes each year)	

1 What activities are you applying to vary?, continued

Notes

1. Quote the section number, part A1 or A2 or B, then paragraph and sub paragraph number as shown in EPR part 2 of schedule 1.
2. Use the description from schedule 1 of EPR. Include any extra detail that you think would help to accurately describe what you want to do.
3. By 'capacity', we mean:

- the total incineration capacity (tonnes every hour) for waste incinerators
- the total landfill capacity (cubic metres) for landfills
- the total capacity (cubic metres) for the recovery of hazardous waste on land
- the total treatment capacity (tonnes each day) for waste treatment operations
- the total storage capacity (tonnes) for waste storage operations
- the processing and production capacity for manufacturing operations, or
- the thermal input capacity for combustion activities

4. Fill this in as a separate line and give an accurate description of any other activities associated with your schedule 1 activities. You cannot have Directly Associated Activities (DAAs) as part of a mobile plant application.
5. By 'total storage capacity', we mean the maximum amount of waste, in tonnes, you store on the site at any one time.

Types of waste accepted

For those installations that take waste, for each line in Table 1a (including DAAs), fill in a separate document to list those wastes you will accept on to the site for that activity. Give the List of Wastes catalogue code and description (see https://www.gov.uk/government/publications/waste-classification-technical-guidance).

If you need to exclude waste from your activity or facility by restricting the description, quantity, physical nature, hazardous properties, composition or characteristic of the waste, include these in the document. Send it to us with your application form.

Please provide the reference for each document.

You can use Table 1b as a template.

If you want to accept any waste with a code ending in *99*, you must provide more information and a full description of the waste in the document, (for example, detailing the source, nature and composition of the waste). Where you only want to receive specific wastes within a waste code you can provide further details of the waste you want to receive. Where a waste is dual coded you should use both codes for the waste.

Document reference of this extra information

1 What activities are you applying to vary?, continued

Table 1b – Template example – types of waste accepted and restrictions

Waste code	Description of the waste
Example	Example
02 01 08*	Agrochemical waste containing hazardous substances
18 01 03*	Infectious clinical waste, not contaminated with chemicals or medicines – human healthcare (may contain sharps) for alternative treatment
17 05 03*/17 06 05*	Non-hazardous soil from construction or demolition contaminated with fragments of asbestos cement sheet

1c Recovery of hazardous waste on land

Are you applying for a waste recovery activity involving the permanent deposit of inorganic hazardous waste on land for construction or land reclamation?

No ☑ Now go to question 2

Yes ☐

Have you written a waste recovery plan (WRP) that shows that you will use waste to perform the same function as non waste materials you would have used?

No You must write a WRP to support your application.

Yes

Have we advised you during pre-application discussions that we believe the activity is waste recovery?

No

Yes

Have there been any changes to your proposal since the discussions?

No

Yes

Please send us a copy of your current waste recovery plan that complies with our guidance at https://www.gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-recovery-plans-and-deposit-for-recovery-permits. You need to highlight any changes you may have made since your pre-application discussions.

Document reference

Please note that there is an additional charge for the assessment or re assessment of a waste recovery plan that must be submitted as part of this application. For the charge see https://www.gov.uk/government/publications/environmental-permitting-charges-guidance/environmental-permitting-charges-guidance

2 Point source emissions to air, water and land

Fill in Table 2 below with details of the point source emissions that result from the operating techniques at each of your installations.

Fill in one table for each installation, continuing on a separate sheet if necessary.

Table 2 – Emissions (releases)

Installation name	LON1X0			
Point source emissions to air				
Emission point reference and location	Source	Parameter	Quantity	Unit
A1 to A84 (generator exhausts)	Gas Oil Fuelled	Oxides of		1137 mg/mN^3
Not to exceed values at n4 in engine cycle	Gas Oil Fuelled	Carbon monoxide	308	mg/mN^3
	Gas Oil Fuelled	Hydrocarbons	45	mg/mN^3
	Gas Oil Fuelled	Particulate Matter	24	mg/mN^3
Point source emissions to water (other than sewers)				
Emission point reference and location	Source	Parameter	Quantity	Unit
Point source emissions to sewers, effluent treatment plants or other transfers off site				
Emission point reference and location	Source	Parameter	Quantity	Unit
Point source emissions to land				
Emission point reference and location	Source	Parameter	Quantity	Unit

You will also need to complete application form part C6 if your variation includes changing or adding a point source emission(s) to:

- water
- groundwater or
- sewer

Supporting information

3 Operating techniques

3a Technical standards

Fill in Table 3a for each activity at the installation you refer to in Table 1a above and list the 'Best Available Techniques' you are planning to use. If you use the standards set out in the relevant BAT conclusion(s), BAT reference document(s) (BREF) and/or technical guidance(s) (TGN) there is no need to justify using them within your documents in Table 3a.

For Part A(2) activities refer to https://www.gov.uk/government/collections/integrated-pollution-prevention-and-control-sector-guidance-notes and for Part B and Schedule 14 activities see https://www.gov.uk/government/collections/local-air-pollution-prevention-and-control-lappc-process-guidance-notes

You must justify your decisions in a separate document if:

- there is no technical standard
- the technical guidance provides a choice of standards, or
- you plan to use another standard

This justification could include a reference to the Environmental Risk Assessment provided in part C2 (general bespoke permit) of the application form.

For each of the activities listed in Table 1a, the documents in Table 3a should summarise:

- the operations undertaken
- the measures you will use to control the emissions from your process, as identified in your risk assessment or the relevant BAT conclusions, BREF or technical guidance
- how you will meet other standards set out in the relevant BAT conclusions document, BREF or technical guidance

Table 3 – Technical standards

Fill in a separate table for each activity at the installation.

Installation name	LON1X0	
Description of the schedule 1 activity or directly associated activity	Best available technique (BATC, BREF or TGN reference) (see footnote below)	Document reference (if appropriate)
Combustion activities including "burning fuel in an appliance with a rated thermal input of 50 or more megawatts"	BAT has been assessed for the emergency diesel generators and will be applied as detailed in the attached BAT	PASI - 5 - p. 17

* Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

In all cases, describe the type of facility or operation you are applying for and provide site infrastructure plans, location plans and process flow diagrams or block diagrams to help describe the operations and processes undertaken. Give the document references you use for each plan, diagram and description.

Document reference: LON1X0_LON1X2 Permit Application Supporting Informati

3a1 Does your permit (in Table 1.2 Operating Techniques or similar table in the permit) have references to any of your own documents or parts of documents submitted as part of a previous application for this site?

No ☑ Now go to 3b

Yes ☐ Please tell us in a separate document what document references are no longer valid or have been superseded and why

Please also tell us below the reference number you have given the document and send it in with your application

Document reference

3b General requirements

Fill in a separate Table 4 for each installation.

Table 4 – General requirements

Name of the installation	LON1X0
If the technical guidance or your risk assessment shows that emissions of substances not controlled by emission limits are an important issue, send us your plan for managing them	Document reference or references N/A
Where the technical guidance or your risk assessment shows that odours are an important issue, send us your odour management plan	Document reference or references N/A
If the technical guidance or your risk assessment shows that noise or vibration are important issues, send us your noise or vibration management plan (or both)	Document reference or references N/A

For guidance on risk assessments for your environmental permit see https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

3c Types and amounts of raw materials

Fill in Table 5 for all schedule 1 activities. Fill in a separate table for each installation.

Table 5 – Types and amounts of raw materials

Name of the installation		LON1X0		
Capacity (See note 1 below)				
Schedule 1 activity	Description of raw material and composition	Maximum amount (tonnes) (See note 2 below)	Annual throughput (tonnes each year)	Description of the use of the raw material including any main hazards (include safety data sheets)
Part A(1) (a)	The storage, handling and transfer of gas oil relates only to the use	1537.26	538.96	The storage, handling and transfer of gas oil relates only to the use of emergency

Notes

1 By 'capacity', we mean the total storage capacity (tonnes) or total treatment capacity (tonnes each day).

2 By 'maximum amount', we mean the maximum amount of raw materials on the site at any one time.

Use a separate sheet if you have a long list of raw materials, and send it to us with your application form. Please also provide the reference of this extra sheet.

Document reference n/a

3d Information for specific sectors

For some of the sectors, we need more information to be able to set appropriate conditions in the permit. This is as well as the information you may provide in sections 5, 6 and 7. For those activities listed below, you must answer the questions in the related document.

Table 6 – Questions for specific sectors

Sector	Appendix
Combustion	See the questions in appendix 1
Chemicals	See the questions in appendix 2
Incinerating waste	See the questions in appendix 3
Landfill and recovery of hazardous waste on land	See the questions in appendix 4

General information

Complete section 4 if you are proposing to change or add an emission point(s).

4 Monitoring

4a Describe the measures you use for monitoring emissions by referring to each emission point in Table 2 above

You should also describe any environmental monitoring. Tell us:

- how often you use these measures
- the methods you use
- the procedures you follow to assess the measures

Document reference: Monitoring stack emissions: low risk MCPs and specified g

4b Point source emissions to air only

4b1 Has the sampling location been designed to meet BS EN 15259 clause 6.2 and 6.3?

No ☐
Yes ☑

4b2 Are the sample ports large enough for monitoring equipment and positioned in accordance with section 6 and appendix A of BS EN 15259?

No ☐
Yes ☑

4b3 Is access adjacent to the ports large enough to provide sufficient working area, support and clearance for a sample team to work safely with their equipment throughout the duration of the test?

No ☐
Yes ☑

4b4 Are the sample location(s) at least 5 HD from the stack exit

No ☐
Yes ☑

4b5 Are the sample location(s) at least 2 HD upstream from any bend or obstruction?

No ☐
Yes ☑

4b6 Are the sample location(s) at least 5 HD downstream from any bend or obstruction?

No ☐
Yes ☑

4b7 Does the sample plane have a constant cross sectional area?

No ☐
Yes ☑

4b8 If horizontal, is the duct square or rectangular (unless it is less than or equal to 0.35 m in diameter)

No ☐
Yes ☑

4b9 If you have answered 'No' to any of the questions 4b1 to 4b8 above, provide an assessment to how the standards in BS EN 15259 will be met.

Document reference of the assessment

5 Environmental impact assessment

5a Have your proposals been the subject of an environmental impact assessment under Council Directive 85/337/EEC of 27 June 1985 [Environmental Impact Assessment] (EIA)?

No ☑ Now go to question 6

Yes ☐ Please provide a copy of the environmental statement and, if the procedure has been completed:

- a copy of the planning permission
- the committee report and decision on the EIA

Document reference of the copy

6 Resource efficiency and climate change

If the site is a landfill or a recovery of hazardous waste on land activity, you only need to fill in this section if the application includes gas engines.

6a Describe the basic measures for improving how energy efficient your activities are

Document reference of the description: PASI - 5 - p. 17

6b Provide a breakdown of any changes to the energy your activities use up and create

Document reference of the description: PASI - 5 - p. 17

6c Have you entered into, or will you enter into, a climate change levy agreement?

No ☑ Describe the specific measures you use for improving your energy efficiency

Document reference of the description: PASI - 5 - p. 17

Yes ☐ Please give the date you entered (or the date you expect to enter) into the agreement (DD/MM/YYYY)

Please also provide documents that prove you are taking part in the agreement.

Document reference of the proof

6d Explain and justify the raw and other materials, other substances and water that you will use

Document reference of the justification: PASI - 5 - p. 17

6e Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste

If you produce waste, describe how you recover it. If it is technically and financially impossible to recover the waste, describe how you dispose of it while avoiding or reducing any effect it has on the environment.

Document reference of the description: No waste is produced other than as specified in the ERA

7 How to contact us

If you need help filling in this form, please contact the person who sent it to you or contact us as shown below.

General enquiries: 03708 506 506 (Monday to Friday, 8am to 6pm)

Textphone: 03702 422 549 (Monday to Friday, 8am to 6pm)

Email: enquiries@environment-agency.gov.uk

Website: https://www.gov.uk/government/organisations/environment-agency

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve it.

Please tell us if you need information in a different language or format (for example, in large print) so we can keep in touch with you more easily.

Feedback

(You don't have to answer this part of the form, but it will help us improve our forms if you do.)

We want to make our forms easy to fill in and our guidance notes easy to understand. Please use the space below to give us any comments you may have about this form or the guidance notes that came with it.

How long did it take you to fill in this form?

We will use your feedback to improve our forms and guidance notes, and to tell the Government how regulations could be made simpler.

Would you like a reply to your feedback?

Yes please ☐

No thank you ☐

Crystal Mark 19107
Clarity approved by Plain English Campaign

For Environment Agency use only

Date received (DD/MM/YYYY)

Payment received?

No ☐

Yes ☐ Amount received

Our reference number

£

Plain English Campaign's Crystal Mark does not apply to appendices 1 to 4.

Appendix 1 – Specific questions for the combustion sector

1 Identify the type of fuel burned in your combustion units (including when your units are started up, shut down and run as normal). If your units are dual fuelled (that is, use two types of fuel), list both the fuels you use

Fill in a separate table for each installation.

Installation reference			
Type of fuel	When run as normal	When started up	When shut down
Coal	☐	☐	☐
Gas oil	☑	☑	☑
Heavy fuel oil	☐	☐	☐
Natural gas	☐	☐	☐
WID waste	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Landfill gas	☐	☐	☐
Other	☐	☐	☐

Notes

1. Not covered by Industrial Emissions Directive 2010/75/EU.
2. 'Biomass' is referred to The Renewables Obligation Order 2002 (https://www.legislation.gov.uk/uksi/2002/914/contents/made)

Give extra information if it helps to explain the fuel you use.

Document reference

Appendix 1 – Specific questions for the combustion sector, continued

2 Give the composition range of any fuels you are currently allowed to burn in your combustion plant

Fill in a separate table for each installation, continuing on a separate sheet if necessary

Fuel use and analysis					
Installation reference	LON1X0				
Parameter	Unit	Fuel 1	Fuel 2	Fuel 3	Fuel 4
Maximum percentage of gross thermal input	%	Typical EN590			
Moisture	%	0.02			
Ash	% wt/wt dry	0.01			
Sulphur	% wt/wt dry	0.001			
Chlorine	% wt/wt dry	0.016*			
Arsenic	% wt/wt dry	0.016*			
Cadmium	% wt/wt dry	0.016*			
Carbon	% wt/wt dry	87			
Chromium	% wt/wt dry	0.016*			
Copper	% wt/wt dry	0.016*			
Hydrogen	% wt/wt dry	12.75			
Lead	% wt/wt dry	0.016*			
Mercury	% wt/wt dry	0.016*			
Nickel	% wt/wt dry	0.016*			
Nitrogen	% wt/wt dry	0.05			
Oxygen	% wt/wt dry	0.009*			
Vanadium	mg/kg dry	0.016*			
Zinc	mg/kg dry	0.016*			
Net calorific value	MJ/kg	45.4			

Appendix 1 – Specific questions for the combustion sector, continued

3 If NOx factors are necessary for reporting purposes (that is, if you do not need to monitor emissions), please provide the factors associated with burning the relevant fuels

Fill in a separate table for each installation.

Installation reference	LON1X0
Fuel	NOx factor (kgt^{-1})
Fuel 1	N/A
Fuel 2	
Fuel 3	
Fuel 4	

Note: kgt^{-1} means kilograms of nitrogen oxides released for each tonne of fuel burned.

4 Will your combustion plant be subject to Chapter III of the Industrial Emissions Directive 2010/75/EU?

No ☑ Now fill in application form part F

Yes ☐

5 What is your plant?

an existing one ☐ A plant licensed before 1 July 1987

a new one ☐ A plant licensed on or after 1 July 1987 but before 27 November 2002, or a plant for which an application was made before 27 November 2002 and which was put into operation before 27 November 2003

a new-new one ☑ A plant for which an application was made on or after 27 November 2002 If you run more than one type of plant or a number of the same type of plant on your installation, please list them in the table below

6 If you run more than one type of plant or a number of the same type of plant on your installation, please list them in the table below

Fill in a separate table for each installation.

Installation reference	
Type of plant	Number within installation
Existing	
New	
New-new	
Gas turbine (group A)	
Gas turbine (group B)	

Appendix 1 – Specific questions for the combustion sector, continued

7 If you run an existing plant, have you submitted a declaration for the 'limited life derogation' set out in Article 33 of Chapter III of the Industrial Emissions Directive?

No ☑ Now go to question 9

Yes ☐

8 Have you subsequently withdrawn your declaration?

No

Yes

9 List the existing large combustion plants (LCPs) which have annual mass allowances under the National Emission Reduction Plan (NERP), and those with emission limit values (ELVs) under the LCPD

Installation reference	
LCPs under NERP	LCPs with ELVs
No Plants currently exist under this provision.	No Plants currently exist under this provision.

10 Do you meet the monitoring requirements of Chapter III of the Industrial Emissions Directive?

No ☑

Yes ☐ Document reference

11 Are you substantially refurbishing an existing installation according to the meaning given in Article 14 of the Energy Efficiency Directive?

No ☑

Yes ☐ Now go to question 12

12 Have you carried out a cost–benefit assessment (CBA) of opportunities for cogeneration (combined heat and power) or district heating under Article 14 of the Energy Efficiency Directive?

No ☑ Please provide supporting evidence of why a CBA is not required (for example, an agreement from us)

Document reference of this evidence: Not requested by EA

Yes ☐ Please submit a copy of your CBA

Document reference of the CBA

Appendix 2 – Specific questions for the chemical sector

1 Please provide a technical description of your activities

- The description should be enough to allow us to understand:
- the process
- the main plant and equipment used for each process
- all reactions, including significant side reactions (that is, the chemistry of the process)
- the material mass flows (including by products and side streams) and the temperatures and pressures in major vessels
- the all emission control systems (both hardware and management systems), for situations which could involve releasing a significant amount of emissions – particularly the main reactions and how they are controlled
- a comparison of the indicative BATs and benchmark emission levels standards: technical guidance notes (TGNs) (see https://www.gov.uk/government/collections/technical-guidance-for-regulated-industry-sectors-environmental-permitting); additional guidance 'The production of large volume organic chemicals' (EPR 4.01); 'Speciality organic chemicals sector' (EPR 4.02); 'Inorganic chemicals sector' (EPR 4.03); and best available techniques reference documents (BREFs) for the chemical sector

Document reference

2 If you are applying for a multi-purpose plant, do you have a multi-product protocol in place to control the changes?

No ☐

Yes ☐ Provide a copy of your protocol to accompany this application

Document reference

3 Does Chapter V of the Industrial Emissions Directive (IED) apply to your activities?

No ☐

Yes ☐ Fill in the following

3a List the activities which are controlled under the IED

Installation reference	
Activities	

3b Describe how the list of activities in question 3a above meets the requirements of the IED

Document reference

Appendix 3 – Specific questions for the waste incineration sector

If you are proposing to accept clinical waste, please complete your answer to question 3a 'Technical standards' with reference to relevant parts of our healthcare waste appropriate measures guidance (see https://www.gov.uk/guidance/healthcare-waste-appropriate-measures-for-permitted-facilities)

1a Do you run incineration plants as defined by Chapter IV of the Industrial Emissions Directive (IED)?

No ☐ You do not need to answer any other questions in this appendix

Yes ☐ IED applies

1b Are you subject to IED as

An incinerator? ☐

A co-incinerator? ☐

2 Do any of the installations contain more than one incineration line?

No ☐ Now go to question 4

Yes ☐

3 How many incineration lines are there within each installation?

Fill in a separate table for each installation.

Installation reference		
Number of incineration lines within the installation		
Reference identifiers for each line		

You must provide the information we ask for in questions 4, 5 and 6 below in separate documents. The information must at least include all the details set out in section 2 ('Key Issues') of S5.01 'Incineration of waste: additional guidance' (under the sub heading 'European legislation and your application for an EP Permit'). See https://www.gov.uk/government/collections/technical-guidance-for-regulated-industry-sectors-environmental-permitting.

You must answer questions 7 to 13 on the form below.

4 Describe how the plant is designed, equipped and will be run to make sure it meets the requirements of IED, taking into account the categories of waste which will be incinerated

Document reference

5 Describe how the heat created during the incineration and co-incineration process is recovered as far as possible (for example, through combined heat and power, creating process steam or district heating)

Document reference

Appendix 3 – Specific questions for the waste incineration sector, continued

6 Describe how you will limit the amount and harmful effects of residues and describe how they will be recycled where this is appropriate

Document reference

For each line identified in question 3, answer questions 7 to 13 below

Question 3 identifier, if necessary

7 Do you want to take advantage of the Article 45 (1)(f) allowance (see below) if the particulates, CO or TOC continuous emission monitors (CEM) fail?

No ☐

Yes ☐ This allows 'abnormal operation' of the incineration plant under certain circumstances when the CEM for releases to air have failed. Annex VI, Part 3(2) sets maximum half hourly average release levels for particulates (150 mg/m3), CO (normal ELV) and TOC (normal ELV) during abnormal operation.

Describe the other system you use to show you keep to the requirements of Article 13(4) (for example, using another CEM, providing a portable CEM to insert if the main CEM fails, and so on).

8 Do you want to replace continuous HF emission monitoring with periodic hydrogen fluoride (HF) emission monitoring by relying on continuous hydrogen chloride (HCl) monitoring as allowed by IED Annex VI, Part 6 (2.3)?

Under this you do not have to continuously monitor emissions for hydrogen fluoride if you control hydrogen chloride and keep it to a level below the HCl ELVs.

No ☐

Yes ☐ Please give your reasons for doing this

Appendix 3 – Specific questions for the waste incineration sector, continued

9 Do you want to replace continuous water vapour monitoring with pre-analysis drying of exhaust gas samples, as allowed by IED Annex VI, Part 6 (2.4)?

Under this you do not have to continuously monitor the amount of water vapour in the air released if the sampled exhaust gas is dried before the emissions are analysed.

No ☐

Yes ☐ Please give your reasons for doing this

10 Do you want to replace continuous hydrogen chloride (HCl) emission monitoring with periodic HCl emission monitoring, as allowed by IED Annex VI, Part 6 (2.5), first paragraph?

Under this you do not have to continuously monitor emissions for hydrogen chloride if you can prove that the emissions from this pollutant will never be higher than the ELVs allowed.

No ☐

Yes ☐ Please give your reasons for doing this

Appendix 3 – Specific questions for the waste incineration sector, continued

11 Do you want to replace continuous HF emission monitoring with periodic HF emission monitoring, as allowed by IED Annex VI, Part 6 (2.5), first paragraph?

Under this you do not have to continuously monitor emissions for hydrogen fluoride if you can prove that the emissions from this pollutant will never be higher than the ELVs allowed.

No ☐

Yes ☐ Please give your reasons for doing this

12 Do you want to replace continuous SO_2 emission monitoring with periodic sulphur dioxide (SO_2) emission monitoring, as allowed by IED Annex VI, Part 6 (2.5), first paragraph?

Under this you do not have to continuously monitor emissions for sulphur dioxide if you can prove that the emissions from this pollutant will never be higher than the ELVs allowed.

No ☐

Yes ☐ Please give your reasons for doing this

Appendix 3 – Specific questions for the waste incineration sector, continued

13 If your plant uses fluidised bed technology, do you want to apply for a derogation of the CO WID ELV to a maximum of 100 mg/m³ as an hourly average, as allowed by IED Annex VI, Part 3?

No ☐

Does not apply ☐

Yes ☐ Please give your reasons for doing this

14 Are you substantially refurbishing an existing installation according to the meaning given in Article 14 of the Energy Efficiency Directive?

No ☐

Yes ☐ Please go to question 15

Document reference of the CHP-ready assessment

15 Have you carried out a cost–benefit assessment (CBA) of opportunities for cogeneration (combined heat and power) or district heating under Article 14 of the Energy Efficiency Directive?

No ☐ Please provide supporting evidence of why a CBA is not required (for example, an agreement from us)

Document reference of this evidence

Yes ☐ Please submit a copy of your CBA

Document reference of the CBA

Appendix 4 – Specific questions for the landfill sector and recovery of hazardous waste on land activities

1. For the landfill sector, provide your Environmental Setting and Installation Design (ESID) report and any other risk assessments to control emissions.

For recovery of hazardous waste on land activities, provide your Environmental Setting and Site Design (ESSD) report and any other risk assessments to control emissions

Document reference

2. For recovery of hazardous waste on land activities, provide your Waste Acceptance Procedures (including Waste Acceptance Criteria)

Document reference

Refer to our guidance at
https://www.gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-acceptance-procedures-for-deposit-for-recovery

3. Provide your hydrogeological risk assessment (HRA) for the site

Document reference

4. Provide your outline engineering plan for the site

Document reference

5. Provide your stability risk assessment (SRA) for the site

Document reference

6. Provide your landfill gas risk assessment (LFGRA) for the site

Document reference

We have developed guidance on these assessments and their reports which can be found at
https://www.gov.uk/government/collections/environmental-permitting-landfill-sector-technical-guidance

7. For recovery of hazardous waste on land activities, have you completed a monitoring plan for the site?

No ☐ Please refer to the section of your ESSD that explains why this is unnecessary for your site

Document reference of this evidence

Yes ☐ Document reference

8. Have you completed a proposed plan for closing the site and your procedures for looking after the site once it has closed?

No ☐ If you have answered 'no' for recovery of hazardous waste on land activities, refer to the section of your ESSD that explains why this is unnecessary for your site

Document reference of this evidence

Yes ☐ For landfill you must provide a closure and aftercare plan

Document reference

3. Management System

The management system for the installation remains as described in the original environmental permit application (EPR/NP3829SP) and has not been modified as part of this variation.

No changes are proposed to the management system as part of this permit variation, and it remains suitable and sufficient for the activities covered under the revised permit. The Health, Safety, Quality and Environmental Management System, Version 2.0 of 27-SEPTEMBER-2024 Appendix I.

Environmental, Social and Governance (ESG) is led by the site ESG Manager but delivered by the business. It involves ensuring that the policies, processes, controls, and data collection methods to ensure performance is managed ethically, responsibly and sustainability. ESG practices touch on all parts of the business and issues and includes carbon footprint, labour standards, responsible procurement, and several other areas.

ISO 14001 accreditation is held by YRamsgate Lux SCSP of the organisation and the Slough data centre follows ISO 14001 specifications, however the site is not itself accredited to this Standard.

4. Emissions and Monitoring

4.1 Emissions to Air

Emissions to air from the installation will result from exhaust gases generated from combustion of diesel within the engines. Each of the 84 engines will require its own stack. For plant maintenance there are operational and safety advantages in providing separate stacks as maintenance on one engine will not prevent the operation of the remaining engines. This will allow electricity generation at any time, a significant advantage for a plant designed to provide emergency back-up power at short notice. A combined stack would also have visual impact as it may have a higher exit height compared to individual stacks. Furthermore, the footprint of the plant is such that there is insufficient space to accommodate a combined stack structure in one location.

The 6.9 MWth engines chosen for the installation are manufactured by Rolls Royce and comprise MTU DS3300 diesel generating set with MTU 20V4000G34F NOx turbocharged diesel engine and Leroy Somer LSA53.2 L14 / 4p brushless synchronous alternator. These comply with the required emissions standards within 'TA-Luft 2g' or Tier II USEPA as required by the EA guidance11.

Each of the exhaust stacks in Buildings A&B have a flue height of 21.95 m, and each of the exhaust stacks in Building C will be 15.95 m in height. The locations of these emissions points are illustrated on the site layout drawing. The stacks are designated emission points EP1 – EP84. The total site also contains 4 Diesel-Driven Fire Pumps, marked as emission points EP85-88 on the site layout drawing.

The stack emission parameters for the 32 diesel generators (Rolls Royce DS3300) associated with LON1X2 (Building C), and LON1X0 facility (Buildings A and B) generators are set out in the Air Quality Assessment Appendix E.

4.2 Emissions to Land

There will be no emissions to land associated with operation of the installation. A Site Condition Report (SCR) has been prepared for the site and is included in Appendix F.

4.3 Emissions to Surface Waters and Sewer

The subject site has undergone demolition and ground remediation works in 2021. All exposed ground was mechanically proven to 2m bgl and any obstructions removed. Therefore, all of the existing underground drainage was removed as part of these works.

4.3.1 Emissions to Sewer

New foul and surface water sewers running along the eastern boundary of Buildings A & B (Phase 1) and southeast of Building C boundary were installed post remediation works and have been adopted by Thames Water. Refer to the drainage layout presented in Appendix A of this report showing sewers to connect to within the site boundary.

It is proposed to drain foul water from the site separately to surface water discharging into Thames Water adopted, or to be adopted, foul sewer located at the southeast boundary. The foul water discharge into public sewer shall be by gravity means, subject to confirmation of existing invert levels.

Foul water flows have been determined using the method outlined in Section 2.1.3 of the National Annex of BS EN 752:2008 and section 85.1 of Sewers for Adoption 7th Edition. This method is recommended when individual discharge units (DUs) are unknown and assumes a trade effluent flow

of 0. 7 litres per second per hectare (where the proportion of wet industry is unknown). Thus, the average flow can be calculated as follows:

- Q(foul) = 0. 7 x A(ha)
- Q = 0. 7 x 0.863 (Internal area of the building)
- Q = 0.604 litres per second

Therefore, it is estimated that the average foul flow (AFF) from the new development is 0.604 litres per second, and the estimated peak foul flow (6AFF) is 3.62 litres per second.

4.3.2 Emissions to Water

Clark Smith Partnership Limited have been appointed by Ramsgate Lux SCSP to prepare a Drainage Strategy, relating to the final phase of the data centre campus at Wexham Road. This is in support of an application to discharge Condition 9 (ref. P/00072/096). And O'Connor Sutton Cronin & Associates Ltd. (OCSC) were commissioned to carry out the design of the Civil Engineering services, surface water drainage and wastewater drainage associated with the above-mentioned proposed development.

The surface water design for the development is divided into two networks: North and South. Consistent with the previous design, the northern network falls in an easterly direction across the entire northern boundary of the site to a pump with a discharge rate of 7 litres per second (l/s). The attenuation system for this network has been revised to include four cast in situ concrete tanks, each providing a total storage capacity of 415.8 cubic meters (m^3). The two networks previously proposed for the southern section have been combined into a single network, which now flows in an easterly direction across the entire southern portion of the site to a pump discharging at a rate of 8 l/s. This new configuration includes one cast in situ concrete attenuation tank with a total storage volume of 1,620 m^3. The attenuation tank type has been revised from Geocell to cast in situ concrete to accommodate the increased tank depths, high water table and lateral forces.

Surface water outfalls connect to new Thames Water sewers located on the eastern site boundary, as per the approved drainage strategy. For details on maintenance please refer Engineering Services Report prepared by O'Connor Sutton Cronin & Associates. Document Ref C1101-OCSC-XX-XX-RP-C-0001.

5. BAT Assessment

5.1 Determining Applicable BAT

The proposed regulated activity does not have an applicable specific Best Available Technique (BAT) reference document or any associated BAT conclusions. However, it is acknowledged that the EA has provided generic advice setting out the general requirements for compliance with the conditions of a Permit for emergency generators at an installation as well as those installed at datacentre developments. 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. The EA has provided the following guidance:

- Data Centre FAQ Headline Approach; and
- Emergency backup diesel engines on installations: best available techniques (BAT).

The principle of BAT involves using the most effective and advanced methods to prevent or reduce emissions and resource consumption, while being technically feasible and cost-effective. For a data centre, this focuses primarily on energy efficiency (the largest environmental impact), water use, and emissions control.

1. **Energy Efficiency (The Core of Data Centre BAT)**

This is the most significant area for applying BAT, as IT equipment and cooling are the primary energy consumers.

BAT Objective: Minimise the Power Usage Effectiveness (PUE) and maximise energy efficiency.

Design & Operational Measures:

Ramsgate has specified the use of servers, storage systems, and networking equipment equipped with high-efficiency power supplies (rated 80 Plus Platinum or Titanium) and processors optimized for low power consumption during idle states. While Ramsgate does not directly supply IT equipment, tenants are informed of the BREEAM requirements related to IT infrastructure. It is noted that the project achieved a BREEAM “Very Good” rating at the design stage.

Advanced Cooling Systems:

Air-Side Economisation: Building C uses outside air for cooling whenever ambient conditions allow. This is a cornerstone of BAT for data centres in temperate climates like the UK.

Liquid Cooling: Ramsgate has not implemented direct-to-chip or immersive liquid cooling technologies for high-density compute racks. Instead, the facility uses an air conditioning system designed to operate with zero loss, maintaining efficiency through conventional cooling methods.

Variable Speed Drives (VSDs): Installation of VSDs on all major motor-driven systems (chillers, pumps, fans) to match energy consumption precisely to the real-time cooling load. Ramsgate notes that chillers are configured in loops that cycle to optimise operational efficiency.

Building Management System (BMS): A comprehensive BMS has been implemented to optimise energy use across the facility. It coordinates key systems including IT load, cooling, and humidity control to ensure efficient and responsive environmental management.

2. **Water Conservation**

BAT Objective: Minimise the use of mains water, particularly potable water, for cooling purposes.

Design & Operational Measures:

Closed-Loop Circuits: Where water-cooled systems are used, closed-loop circuits with high-concentration cycles are employed to minimise blowdown and reduce water waste. In this case, a closed chilled water system is in place.

3. **Emissions to Air (from Generators)**

BAT Objective: Minimise emissions of Nitrogen Oxides (NOx), Sulphur Dioxide (SO2), and Particulate Matter (PM), even when not strictly required by permit exemptions. We have low NOx engines installed.

Design & Operational Measures:

Generators: The installed generators, Rolls Royce MTU machines comply with "2g TA-Luft" or <2000 mg NOx. These engines are fitted with Selective Catalytic Reduction (SCR) and Diesel Particulate Filters (DPF).

Use of Ultra-Low Sulphur Diesel (ULSD): YRamsgate uses ULSD to minimise SO2 and PM emissions, this is attested by review of the fuel's Safety Data Sheet which specifies the fuel type as Ultra-Low Sulphur Diesel, AD10.

Regular Maintenance: Ramsgate has implemented a strict preventative maintenance schedule for generators to ensure they operate at peak efficiency and lowest emissions.

4. **Circular Economy & Waste Management**

BAT Objective: Prevent waste and promote the reuse and recycling of materials.

Design & Operational Measures:

IT Asset Disposition (ITAD): Ramsgate has partnered with certified ITAD providers to ensure that decommissioned servers and hardware are either refurbished for reuse or responsibly recycled. While IT equipment is provided by the tenant and not under Yondr's direct control, tenants are made aware of and are expected to follow best practice guidelines in line with sustainability objectives.

Heat Reuse (Where Feasible): Opportunities to export waste heat to adjacent buildings or district heating networks were considered. However, there is no viable use for the waste heat at this location. While not implemented here, heat reuse remains a hallmark of leading BAT approaches.

Design for Deconstruction: The facility has been designed with modular components and materials that support future disassembly and recycling at the end of its lifecycle. This approach aligns with circular economy principles and is reflected in the BREEAM "Very Good" rating awarded at the design stage.

5. **Noise Prevention and Control**

BAT Objective: Prevent and minimise noise emissions at source.

Design & Operational Measures:

Acoustic Enclosures & Attenuation: The generators are containerised gen-sets with integrated acoustic lining – this is a BAT approach.

Low-Noise Fan Technology: The cooling systems incorporate low-energy, low-impact equipment, including fans designed to operate at reduced speeds and larger diameters to minimise noise generation at the source.

Strategic Site Layout: In so far as possible this has been achieved; Noise-emitting plant such as generators, chillers, and air handling units (AHUs) have been positioned away from the site's nearest noise-sensitive receptors as far as practically possible, in line with best practice for acoustic impact reduction.

5.2 Summary of BAT Assessment

At the time of writing there are no relevant published BAT reference documents (BREF notes) for Data Centres. The previous guidance document: 'Combustion Activities (EPR 1.01)' was withdrawn in August 2018. To replace this, the EA have produced a working draft BAT guidance document specifically for Data Centres: 'Data Centre FAQ Headline Approach v21' (November 2022). This BAT assessment is structured using this guidance document and seeks to provide evidence of BAT or justification where the requirements have not been met. Note: Each individual Emergency Standby Generator (ESG) is significantly below the threshold of 15MWth for large combustion plant. Therefore, the BAT requirements for large combustion plant are not relevant for this installation.

All the generator sets due to be commissioned are over 1MWth and are therefore classed as new 'Medium Combustion Plant '(MCP). These generator sets are 'limited hour MCPs', as they are purely standby plant that will operate less than 500 hours per year and there is no capacity agreement in place.

Data Centre Design

Uninterruptible power provision

The data centre functions by renting out data halls to a customer, these halls are subsequently filled with various servers and associated IT equipment. This equipment requires a stable and constant supply of electricity to operate. 'Uptime' or power availability is a term used to explain how reliable a power source is. Data Centres require a high level of uptime or uninterruptible power provision, and being supplied by the national grid brings a risk of a mains failure events (black out) or fluctuations outside of acceptable limits (brown outs). Downtime, i.e., power failures or voltage drops, even momentarily, may mean loss of service to customers, e.g., banks. This could have significant negative implications to site services, both in terms of direct financial costs and indirectly through reputational damage. Therefore, an uninterruptible power supply is critical to a data centre's ability to operate. The Uptime Institute's Tier classification and performance standard2 provides an objective basis for comparing one site's infrastructure versus another. The differing tiers are summarised below.

	Tier I	Tier II	Tier III	Tier IV
Active Capacity Components to Support IT Load	N	N+1	N+1	N after any failure
Distribution Paths	1	1	1 active and 1 alternate	2 simultaneously active
Concurrently Maintainable	No	No	Yes	Yes
Fault Tolerance (single event)	No	No	No	Yes
Compartmentalization	No	No	No	Yes
Continuous Cooling*	load density dependent	load density dependent	load density dependent	Yes (Class A)

Figure 1 Tier Classification - Uptime Institute

Uptime is calculated based on the amount of downtime a site experiences as a % of the year, i.e., 99% or 'two 9's' corresponds to about 7 hours and 12 minutes of downtime per month. As the "nines" uptime increases – to three (99.9%), four (99.99%) and five (99.999%), the downtime decreases. In general, five nines are considered a reasonably high reliability. With six nines, or 99.9999%, an average customer would experience about 2.6 seconds of downtime per month, or less than 32 seconds per year. The National Grid produce an annual report of performance. Below is the performance statement from the National Grid report for 2022/233. "*The Overall Reliability of Supply for the NGET Transmission System during 2022-23 was: 99.999997%*".

Onsite electrical infrastructure

For operational resilience purposes, it is preferable to have numerous power supplies to the site; this provides an alternate route to switch to, should one supply be compromised during an outage. This can be provided in several ways, but the common option is to have separate supply routes within one substation, or to have multiple substations onsite. If one supply route fails, the data centre can switch to the alternate supply that is unaffected. The ability to switch to the unaffected supply route reduces the duration for which the generators operate in the event of an outage. LON1Xo has this ability.

Based on the guidance in the EAs "Data Centre FAQ v21 – Working Draft". The key criteria used in the selection of the BAT to fulfil the backup power requirements are split into two categories:

- Operational requirements
- Environmental risks

The criteria for both categories have been chosen based on the main risks posed and in accordance with the risk assessment guidance for bespoke permits.

Table 2 Operational Requirements

Criteria	Consideration	Relative weighting
Cost benefit analysis	The initial capital cost of the technology being considered, and the potential cost of potential mitigation measures need to be considered to ensure they are not disproportionately high compared to the environmental benefits. Otherwise, the operator will cease to be competitive.	High – impacts competitiveness

Proven as a reliable technology	The resilience requirements of data centres are such that the key operational criterion is for the technology used to be a proven and reliable technology. An indication of reliability of a technology can be taken from the number of instances that the technology in question has been successfully utilised in the industry, i.e., whether this is a tried and tested technology or is it new and emerging. The technology also needs to suit the prevailing model of the industry	High – if technology is not proven it presents a risk to the operator
Cold start capability	The technology will need to have the ability to start operating quickly in the event of a sudden loss of power. A warm start configuration would necessitate 24/7 operation of generators at the site: creating unnecessary fuel costs and environmental impacts. A slow start technology would necessitate additional energy storage UPS capacity (in the form of batteries or flywheels), taking up additional space and creating additional cost.	High – the ability to provide instant power is critical to business functions
Space requirements	Space requirements are relevant as an environmental consideration as a technology that requires excessive use of space (in the form of generator units, energy storage UPS capacity, and fuel storage) will reduce the amount of space available at the data centre for the IT equipment it is designed to host. This will necessitate a larger site area or construction of additional sites to provide the same level of service.	High/Medium – space limitations often dictate the technologies that can be considered
Fuel suitability	The fuel used needs to be capable of being stored/transported to and across the site without excessive risks to operations e.g., low risk of combusting.	Medium – low volatility and low risk is vital
Lifetime of stored fuel	The fuel needs to be stored onsite potentially over a long period of time as mains failure events are rare and as such the generators are not routinely operated, other than for maintenance and testing purposes. The fuel stored onsite may remain unused for a long period of time and should therefore be of a type that will remain useable under these conditions – rather than becoming a waste product in need of disposal.	Medium to low – whilst an added cost it is not a significant or high priority

Table 3 Environmental Risks

Criteria	Consideration	Relative weighting
Air quality impact	Local air quality impacts from exhaust of combustion gases when operating the technology in combination with the fuel being combusted	High – internal combustion engines perform poorly but they are run infrequently
Noise/odour	The technology should not incite regular Odour/Noise complaints from nearest sensitive receptors e.g., residences.	Low – complaints are unlikely due to infrequent operation
Global warming impact	The global warming impact of the fuel being combusted should compare favourably against the electrical output of the technology	Medium – impact is high, but combustion of fuel is infrequent
Release to water / ground (fuel spillage)	The risk of fuel escaping to the environment, e.g., local river course/ground should be low.	Low – fuel use is low due to infrequent operation
Fugitive emissions (leak of fuel vapours)	The risk of fuel escaping to the air, e.g., gaseous escape should be low.	Low – fuel use is low due to infrequent operation

The following technologies were considered for the provision of emergency power to the Data Centre:

- Diesel Generators
- Diesel rotary uninterruptible power supply engines (DRUPS)
- Natural Gas (piped) Fuelled Generator – Spark Ignition Engine
- Natural Gas (piped) Fuelled Generator – Gas Turbine (CCGT or OCGT)
- Liquid Petroleum Gas (LPG) Fuelled Generator – Spark Ignition Engine
- Hydrogen Fuel Cell Technology
- Standby Gas turbine Technology

The conclusion of the assessment is that emissions optimised generator sets operating on Diesel have been selected again as BAT for this installation for the following reasons, which are in line with EA BAT guidance for Data Centres:

1) Proven technology for providing reliable power supply
2) Start-up time & cold start capability
3) Space requirements
4) Capital expenditure
5) Environmental impact
6) Fuel storage

Generator Emissions Performance

The new (and existing) generator sets that have been selected to support the site development are emissions optimised and achieve the Tier II US EPA standard (See Appendix B). The installation is located within an Air Quality Management Area (AQMA) for NO2 and as such, the operator has made significant investment in NOx abatement technology in the form of Selective Catalytic Reduction (SCR). All generators will be fitted with SCR to achieve a NOx concentration of <250 mg/Nm3 (5% O2). Once

the SCR is fully operational, the NOx emissions will be reduced to a level that surpasses what can generally be achieved by a gas generator of equivalent size and output. This SCR system is to be located on top of the generator container and connected to the generator flue system. The system works by dosing the exhaust mwthes with ammonia to convert NOx to Nitrogen (N2) and water (H2O).

The generator emissions rates used in the Air Quality Assessment (AQA) are presented in Table 7.1 below.

Table 4 Generator Emission Rates

Data Hall	Generator Set Make/model		Engine	Abated NOx Mass emissions in g/sec.	PM_{10} Mass emissions in g/sec.
Buildings A and B	MTU DS3300	20V4000	20V4000G34F 6ETC	2.22	0.47
Building C (LON1X2))	MTU DS3300	20V4000	20V4000G34F	2.25	0.43

Generator Noise Attenuation

Each generator shall be fitted with a dedicated exhaust gas flue system. All generators will be housed within containers, and the containers complete with inlet/outlet attenuators, silencers and SCR, that will incorporate acoustic treatment to ensure that a sound pressure level 1m from the container does not exceed 80db at a distance of 1m.

For more information on noise impacts, please refer to the noise impact assessment submitted with the application ('Noise Impact Assessment').

Generator Flue and Exhaust Design

The flue arrangement for the new generator sets has been summarised below with further information in Table 5.

Each engine is provided with a dedicated attenuated exhaust gas flue system.

- Each flue will exit into a common outlet air plenum that will rise and terminate above roof level
- The grouping and allocation of the flues is a fixed requirement agreed during planning of the permitted development

Table 5 Generator Set Flue arrangement

Building	No of Gensets	Flue Height	Building Height	Flue Orientation	Cowling or caps fitted
A and B	52	21.95 m	19.95	Vertical	No
C	32	15.95 m	14.5 m	Vertical	No

Dispersion of pollutants has been considered when designing the flues for the generators. As a result, all flues are unimpeded by flaps/cowls and have been orientated vertically, terminating at more than

1m above the height of the buildings. The design of the flues is therefore considered to be BAT for this application.

Fuel Storage

The Generator Sets require adequate fuel storage to allow them to operate during a grid failure. The Generator Sets are capable of operating on diesel, which is supplied from day or "belly" tanks local to the generator they serve.

The fuel storage for each of the three Data Halls (Buildings A, B & C) consists of 84 no 16,551 Litre (effective volume) double-walled generator belly tanks. Each of the fuel storage tanks is equipped with a leak detection sensor which will set off an alarm on the generator control panel, relevant tank control panel and at the master control panels.

The fill operator can monitor the fuel level in the selected belly tank as it is being filled and can cease the fill operation when the required fuel level has been reached. If the operator fails to cease the fill operation the tank would fill until the belly tanks "HiHi" float switch is activated which would cease the fill operation with a warning light / sounder at the fill cabinet. An overfill prevention valve is fitted to each fill line on each belly tank as a final measure to prevent overfilling the belly tanks.

Fuel Management Procedures and Security

Fuel consumption is low in this installation due to the plant being used for emergency backup power generation only. As such, fuel deliveries are typically between once to twice per year. When required, refuelling is conducted by trained fuel tanker drivers and supervised by a trained member of the site engineering team.

A standard operating procedure (SOP) is to be implemented to facilitate refuelling activities. This SOP is intended to help reduce the risk of spillage during refuelling. These are supplemented by additional supplier procedures for fuel deliveries. In addition to this, additional controls are to be developed to help reduce the risk of an incident including an SOP for spill response and spill kits.

The fuel tanks are installed with a framed structure that prevents rainwater contamination. The structure will be bunded with a separator provided locally to ensure containment of potential spillages. Class 1 oil interceptors are to be incorporated at the downstream network and refuelling area. This will help ensure that contaminated runoff does not exit the site by isolating the system.

A periodic preventative maintenance regime is implemented at Buildings A and B, and this regime shall be extended to cover Building C once it becomes operational. This regime includes periodic visual checks for leaks/spills and checks for suitably stocked spill kits, and that these are located within close proximity of fuel storage tanks and fill points.

A 50-litre fuel spill kit with drain covers is located in the vicinity of the fill point to reduce the risk of spilt fuel entering the drainage network during refuelling or in an emergency.

Ramsgate has a thorough security regime in place, ensuring access to all critical areas is restricted without permission. The site will be operated 24-7, with a 24-7 managed security staff, CCTV and an alarm system in place. The site has a security office that allows operations to switch on all external luminaires on intruder detection by an operation switch.

The above controls and operating techniques are these are considered to meet the EA's BAT requirements for the Data Centre.

Tertiary Containment

Where possible, sustainable drainage systems (SuDS) have been incorporated into the site drainage design. This includes the use of green roofs and permeable paving systems, which provides water filtration to remove suspended solids, metals & hydrocarbons from storm-water runoff.

To provide an additional level of treatment, a Class 1 full retention separator with an overflow alarm are located at the downstream extent of the network, as well as an additional localised interceptor at the refuelling point to the north of building 2.

The proposed location of the downstream interceptor is shown in the site-wide drainage plan drawing number LON1X2-OCS-CZ-ZZ-DR-C-4002, attached in Appendix A. This shows the storm water attenuation tanks and the interceptors.

Surface water outfalls connect to new Thames Water sewers located on the eastern site boundary. This outfall is fitted SHUT OFF Valve with hydrocarbon sensors (to detect any diesel leakages) connected to Building Management System. Upon alarming, the shut off valve will stop the discharge of potentially contaminated water. The storm sewer system is fitted with flow protection to control the rate of discharge of 15 litres/sec.

Operating Techniques

Generator operation

The generators are to be used purely as standby plant to provide emergency standby power in the event of grid failure. There is no capacity agreement in place or elective operation of the plant for generating revenues. Therefore, operation of the generators is likely to be limited to monthly maintenance and testing only.

Maintenance & Testing

The maintenance schedule for the generators is based on manufacturer guidelines. These guidelines help to prolong the life of the equipment, reduce the use of raw materials (e.g., replacement parts, oil changes) and ensure the engines perform efficiently to prevent increases in pollutant levels or black smoke.

Regimes for monthly and annual testing are detailed below. The AQA has not identified significant impacts to short term Air Quality from the proposed test regime.

The current test regime is considered to meet the BAT requirements. Where possible and practicable, the intention will be to avoid testing during peak traffic periods when background NOx has the potential to be elevated and to avoid testing during school hours. There may be instances where operational requirements dictate the time tests are to be undertaken.

F-Gas

Fluorinated gases or 'F-gases' will not be used in the permitted activities e.g., generators and associated fuel storage.

There is potential that F-gases will be used in the chiller plant and/or air conditioning units. This plant is to be maintained in accordance with manufacturer specifications and recommendations with relevant documentation retained. During the development of the sites Environmental Management System, an F-gas register is to be maintained onsite, and will include details such as plant make, model and serial number, the type and volume of refrigerant, and maintenance history. Any significant releases or leaks are to be recorded and, notified to the EA as soon as possible.

Energy Efficiency

Energy management

There is increasing attention on energy efficiency and better energy management. The most prominent indicator of a Data Centre's energy efficiency is PUE (Power Usage Effectiveness), and this is often reported as a metric to customers.

PUE is the ratio of the total energy delivered to the site compared with the energy used by just the IT equipment. A PUE of 2 means that 50% of the power delivered to the site is used to run the IT equipment. The closer the PUE is to 1, the more efficient the data centre is at delivering power to the IT equipment. Most efficient Data Centres are seeking to achieve a PUE of approximately 1-1.2.

To ensure that the IT load, critical and ancillary loads can be supported by both the generator capacity at N and not exceed the 1.5 PUE at worst-case design condition, the peak PUE will be sufficiently low.

UK ETS

The site will need to apply for an amended Greenhouse Gas (GHG) Permit from the EA to participate in the UK Emissions Trading System (UK ETS). This is required for installations with combustion plant in excess of 20MWth.

Participating in UK ETS will require extensive monitoring of generator operational hours and fuel use to determine CO2 emissions per year. This GHG data will need to be externally verified prior to submitting to the EA annually.

ESOS

The UKs Energy Savings Opportunities Scheme (ESOS) is a mandatory energy assessment scheme for organisations in the UK that meet the qualification criteria. At the time of writing these criteria are any company that either:

- employs 250 or more people,
- has an annual turnover in excess of £44 million, and
- an annual balance sheet total in excess of £38 million

There is potential that this site could form part of an ESOS submission which would seek to identify opportunities to improve energy efficiency.

CCA

Once the full site is operational there is potential for the operator to apply for a Climate Change Agreement (CCA) or amend existing agreements to cover this installation. These agreements are voluntary agreements made between UK industry and the EA to reduce energy use and CO2 emissions.

Energy management techniques will be implemented to monitor, record and track power usage effectiveness (PUE) within the data centre.

Measures to improve energy efficiency

The electricity efficiency of the generators ranges from 30-40%. Heat recovery on generators is not a viable option since the generators are backup plant that operate infrequently (approx. <30 hours per year). To ensure the generators operate as efficiently as possible, the site follows a periodic preventative maintenance regime. This involves regular checks of the generators to help ensure each generator is operating efficiently.

The contractor has designed all energy systems to be efficient, and where possible, select equipment from the Energy Technology List so the Colt can benefit from Enhanced Capital Allowance (ECAs). IT equipment integral to the design and operation of Data Centres, e.g., UPS systems, generators, cooling, BMS/EMS, etc., will be produced in accordance with the "*EU Code of Conduct on Data Centres - Best practice supplement version 2".*

Efficient Use of raw Materials

The main raw materials that will be used include:

Diesel

The generators shall run on diesel oil only. The installation will store enough diesel to provide 48 hours' worth of electricity when running at 100% continuous rated load. Due to the highly reliable grid supply, it is unlikely that large volumes of fuel will be consumed by this installation. Fuel use will mostly be limited to maintenance running of the generators. The planned maintenance regime in place will help seek efficient fuel use by the generators. As per Table below, each generator is tested for 20 hours per year. The generator datasheets provide fuel consumption at 50, 75 and 100% load. Using 100% load, the total estimated fuel consumption for each generator can be seen below.

Table 6 Estimated Fuel Consumption for Testing Regime.

Genset details	Fuel use per year
Bldg. A and B (20V4000G34F 6ETC)	Based on Verified fuel use date from GHG Permit verified audits
Bldg. C (20V4000G34F)	Total estimated fuel use for Buildings A, B and C is 540 tonnes of Diesel.

Diesel has been selected due to the ability to store sufficient volumes to ensure security of supply. Other fuels have been considered, but do not currently provide the same level of security. Natural gas could not be stored in sufficient volumes and would be reliant on the National Transmission System. A contract for an uninterruptable supply would be excessively costly given the infrequency of use. Further reasons for fuel selection are given in the ERA Due to the limited hours of operation, any potential benefits from the lower impacts associated with emissions from natural gas are reduced.

Lubrication oils

The engines require lubrication oil to reduce wear and tear through friction. Periodic replacement of this oil is required. Waste oils are to be stored and disposed of responsibly and in accordance with applicable legislation.

Avoidance, Recovery & Disposal of Wastes

Waste

Waste streams arise as a result of operation and maintenance of the combustion plant. Maintenance extends the life of the plant and resolves issues in a timely manner, reducing waste associated oils, lubricants & replacement parts. The installation does not produce significant amounts of waste due to the standby nature of the generators.

A licenced third-party maintenance contractor is responsible for removing waste produced as a result of generator maintenance.

Waste streams arising from this installation can include:

- Lubrication oils used in maintenance and servicing (minimal)
- Air and fuel filters (minimal)
- Fuel that has reached end of life (infrequent)
- Used spill kits (emergency only, unlikely)
- Decommissioned plant (end of life only)

Ramsgate aims to minimise waste generation through efficient use of raw materials including diesel, filters, and lubrication oils.

For example, the need to dispose of waste fuel is reduced/minimised by fuel polishing through a fuel polishing unit. This unit filters the diesel in the tank, removing moisture and particulates from the fuel, ensuring the generators run cleanly. The aim is to help maintain the fuel to a usable standard, preventing early degradation and ultimately extending the life of the fuel.

General Management

Management Standards

The potential for adopting the following management standards (or equivalent, including non-certified standards) is to be reviewed once the full site is operational:

- ISO 14001:2015 – specifies the requirements for an environmental management system that an organisation can use to enhance its environmental performance.
- ISO 50001:2018 – for organisations committed to addressing their impact, conserving resources and improving efficient energy management. Designed to support organisations in all sectors, this ISO standard provides a practical way to improve energy use, through the development of an Energy Management System.
- ISO/IEC 27001:2013 – specifies the requirements for establishing, implementing, maintaining, and continually improving an information security management system within the context of the organisation. It also includes requirements for the assessment and treatment of information security risks tailored to the needs of the organisation. The requirements set out in ISO/IEC 27001:2013 are generic and are intended to be applicable to all organisations, regardless of type, size, or nature.
- ISO9001:2015 – specifies the requirements for establishing, implementing, monitoring, managing, and improving quality throughout the organisation.

Environmental Management System

Once the full site is operational, there are plans to implement an effective EMS. The management system will be developed in accordance ISO 14001:2015, or a suitable equivalent standard.

The site EMS includes the policies, management principles, organisational structure, responsibilities, standards/procedures, process controls and resources in place to manage environmental protection across the permitted activities at the installation. Specific focus is placed on:

- Reducing risks to the environment to a level that is as low as reasonably practicable using best available techniques.
- Integrating EMS responsibilities within line management.
- A commitment to personnel environmental awareness and competence.
- The ongoing monitoring and review of environmental performance.
- A commitment to working to achieve continuous improvement in environmental performance.

Integral to the EMS is an overarching environmental policy. This seeks to underpin the EMS and help ensure uptake by all staff with sufficient training provided as required.

The operator will maintain records associated with the management system. These records will be stored on their central system and will be updated in line with the management system's policies. Records to be kept include:

- Organisational procedures
- EMS manual
- Aspect register
- Compliance register
- Monitoring documents
- Accident, prevention, and control procedures
- Training records
- Review and audit records
- Environmental risk assessments

Emissions

There will be no point source emissions to water, air or land, except from the sources and emission points identified in the Site Emission Points Drawing LON1X2-APM-ZZ-ZZ-SK-M-9801, Rev 4 of 10-NOV-2025. Please refer to Appendix A for the full drawing.

Emissions identified as significant have been further expanded in the following sections.

Noise Impact assessment

A noise impact assessment (NIA) was completed in support of the application for an environmental permit. This report identifies sensitive receptors and potential sources of noise from the installation. The primary noise sources are the sites generators. The impact assessment concluded the following:

"The results indicate that during the planned testing periods, the calculated site Rating Levels at the closest noise sensitive receptors range between 6dB below and 4dBabove the existing background sound level.

When considered in context, the risk of an adverse noise impact during the daytime period is low. The criteria adopted for this assessment (based on the Local Planning Authorities noise criteria) of a rating level to be no more than 5 dB above the background sound level is met.

Therefore, no further mitigation measures, other than those already incorporated at design stage, are required."

Given the above, the site's generator sets are unlikely to have a significant impact on surrounding receptors and therefore represent BAT.

Point source emissions to sewer/surface water

The site's drainage system is split into separate foul and surface water drainage systems. The site is to be covered in good quality hard standing. Contaminated discharges to sewer are not anticipated, as the site is fully impermeable and The EA are to be notified where incidents occur that have the potential to cause pollution/environmental harm.

Surface/storm water: The location for where the site's surface water drainage system enters the local Thames Water network is identified in Drawings number LON1X2-OCS-CZ-ZZ-DR-C-4000 Parts 1, 2 and 3, refer to Appendix A. The surface water drainage system is connected to attenuation ponds before entering full containment interceptors and Vortex separators, before pumped discharge to the local network. Discharges are expected to be limited to surface water run-off, which is not anticipated to contain spilt fuel due to the mitigation measures in place at the fuel oil storage installations. The site will retain the first 5 mm of rainfall on site and intercept as much rainfall as possible. The pumped discharge rate is limited to 15 L/sec. All storm events including a 1 in 100-year storm event together with an additional allowance of 40% to adapt to climate change has been designed into the surface/storm sewer system. In conformance with planning permission there is no infiltration drainage within the site due to the potential for oil leaks leading to surface water contamination. The generator yards are bunded for environmental protection. The surface water drainage system follows performance requirements that ensure all surfaces are suitably graded, so surface water is conveyed to the drainage system, and the drainage systems will adequately convey flows in a controlled manner. The site's drainage system and interceptor will be subject to periodic visual inspections and integrity testing as part of the maintenance requirements.

The site design includes the use of source capture and separation of potential fuel spills surrounding fuelling points, to ensure all high-risk areas appropriately managed and contained.

The fuel tanks will be installed with a framed structure that prevents rainwater contamination. The structure will be bunded with a separator provided locally to ensure containment of potential spillages. Class 1 oil interceptors are to be incorporated at the downstream network and refuelling area. This will help ensure that contaminated runoff does not exit the site by isolating the system.

The site's drainage system and interceptor will be subject to periodic visual inspections and integrity testing as part of the maintenance requirements.

The closest water course, Datchet Brook receives surface water discharges following on-site attenuation in the ground via a series of underground attenuation tanks which gradually discharge directly through the Thames Water surface sewer on site.

The foul drainage for Building C will utilising one of the existing foul connections to the Thames Water foul sewer. Prior to the planning application, an enquiry was made to Thames Water to ensure that the foul drainage would be acceptable in principle, with a response of no objections.

Foul water flows have been determined using methods from National Annex of BS/EN 752:2008 and Section B5.1 of Sewers for Adoption &7th Edn). His assumes an effluent flow rate of 0.7 L/s/ha. Thus, average flow is given by Q (foul) = 0.7 x A (ha)

Q = 0.7 x 0.863 (Internal area of building)

Q = 0.604 L/s.

Thus, the average foul flow (AFF) rate is 0.604 L/s, and the estimated peak foul flow (^*AFF) rate is 3.62 L/s.

Air Quality Assessment

Emissions to air will occur from the operation of the generators. Due to the data centre's high levels of resiliency, it is expected that operation will be limited to maintenance and testing only, with no capacity agreement/ 'elective operation' agreement being entered into by Ramsgate.

An Air Quality Assessment (AQA) (LON1X2 DATA CENTRE, SLOUGH, JOB NO. 100122494 of 30 Oct 2025) was completed in support of the permit application to predict the impacts of operating the generators on short- and long-term air quality. In summary, this study states that the operation of the individual generator sets at the expanded Data Centre for routine testing and maintenance is considered not to present a significant adverse effect on the nearest sensitive human health and ecological receptors. During a worst-case emergency outage, the hourly standard for NO2 and the AEGL-1 level for non-disabling health effects may be exceeded, however the probability of such an event coinciding with the least favourable hours of meteorological data for dispersion is extremely low.

The detailed assessment of the emissions has been undertaken using an internationally accepted model (AERMOD) to evaluate the impacts on human health and ecology during scheduled routine testing ('most-likely' testing scenario) and during a power outage ('worst case' emergency scenario).

Scenario 1: 'Testing and Maintenance'

For the 'most-likely' testing scenario, no exceedances of the short-term and long-term assessment criteria for NO2, PM10 or PM2.5 were identified at any human health receptors, either in proximity to the facility or beyond, including the Slough AQMA No.4. Furthermore, the contributions at ecological receptors were less than 1% of the long-term critical levels and loads and less than 10% of the short-term critical level.

Scenario 2: Emergency operation

72-hour 'Grid Failure'/power outage emergency, or the 'worst case emergency' scenario, hypothetical outages of 4-, 12- and 72-hour duration were considered. The modelling shows that for a full outage, exceedances of both the hourly NO2 AQS standard and the AEGL-1 could occur, but the AEGL-2 will not be exceeded. This assumes a full outage requiring all engines to operate at load coincides with the very least favourable hours of meteorological data for dispersion. The probability of this happening is

extremely low as such an outage is a 1 in 23 years event. Further calculations using the hypergeometric mean approach have shown that, for 24 hours of power outage in a year, the probability of an exceedance of the AQS objective for a cumulative outage across all sites is below 1%, while the probability of the AEGL-1 being exceeded on more than 4 occasions is less than 2%.

The conclusion of the AQA indicates that there is a low likelihood of that short- and long-term impacts from operation of the sites ESGs is likely to be insignificant.

Given the above, the sites ESGs are unlikely to have a significant impact on surrounding receptors and therefore represent BAT.

Air Quality Management Plan

To help reduce the potential impacts during a prolonged outage, BAT is therefore to develop an Air Quality Management Plan (AQMP) once the full (Buildings A, B and C) site is operational. This will include data and general observations of the following:

- Outage occurrence – e.g., date, time, season, meteorologic factors
- Receptors – e.g., AQ model receptors, general public
- Outage situation – e.g., likely duration, how receptors are affected.

The AQMP forms a basis for identifying which receptors may be affected and if notification is required. It is to be developed in conjunction with the Local Authority and its Local Air Quality Management (LAQM) process. Once the AQMP is finalised, it shall be submitted to the EA for final approval.

Monitoring

Emissions limits & flue gas monitoring

The purpose of the emergency standby plant is to provide power in the event of failure of national grid supplies and is unlikely to exceed operating 50 hours per year. As such, the generators ae classed as 'limited hour MCPs' and are therefore exempt from meeting the BAT emissions limit values (ELVs) for new MCPs/Specified generators.

To facilitate monitoring, the flues are to be fitted with appropriate sampling ports to allow for NOx and CO monitoring.

Monitoring of flue gas monitoring is to be completed in accordance with web guide "*Monitoring stack emissions: low risk MCPs and specified generators*" Published 16 February 2021 (formerly TGN M5).

In line with existing permits for data centres, the expectation is that monitoring will be undertaken every 1500 hours of generator operation or once every five years (whichever comes first). The first round of monitoring is to be conducted on the new generators within the first year of operation.

This monitoring will seek to confirm that the generators and their respective SCR systems are achieving the performance specification detailed in the MTU Engine Specification Sheet (Appendix D).

Monitoring data will be used to report total mass emissions for NOx, SOx, PM, and CO to the EA annually as part of the pollution inventory returns.

Generator operation

Generator operational hours and fuel consumption for maintenance, testing and for an outage are to be monitored and reported to the EA annually. In addition to the annual report, outages that result in generator operation should be notified to the EA within 72 hours of emergency operations commencing.

Discharges to sewer

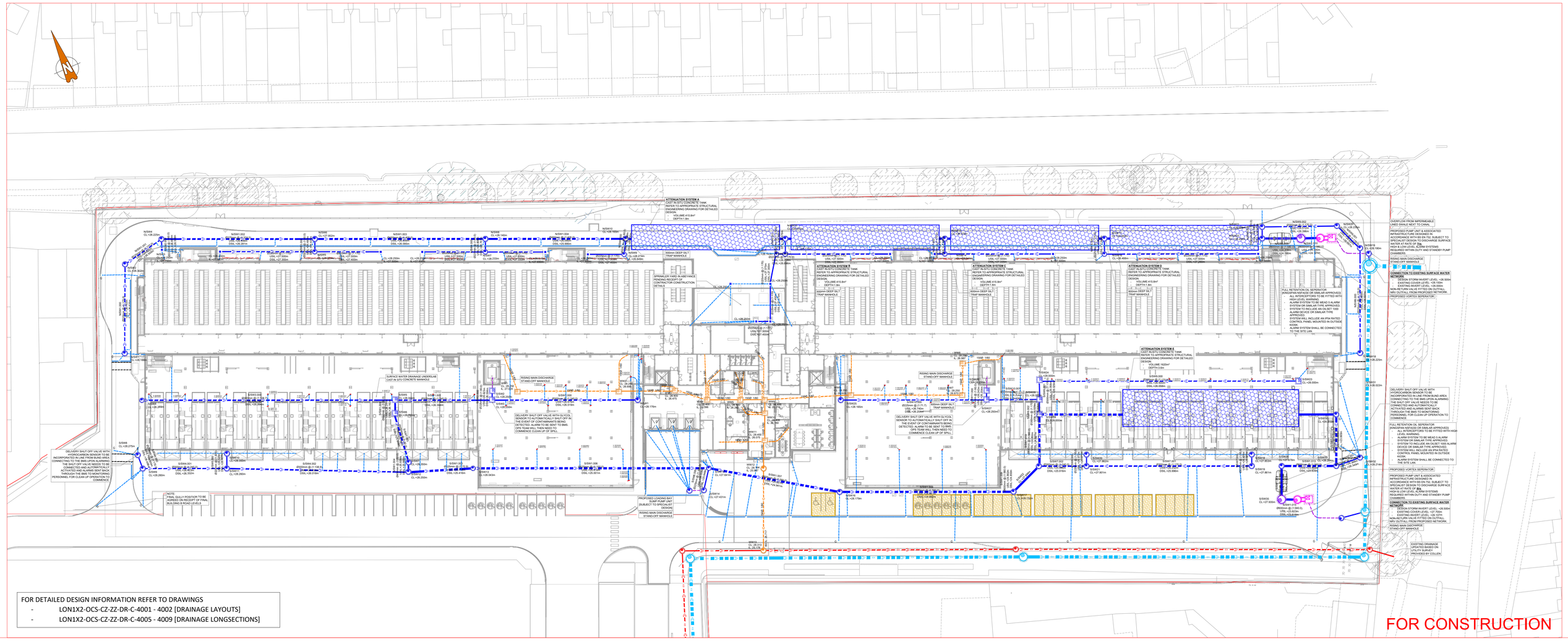
Contaminated discharges to sewer are not anticipated. Any surface water run off which discharges to surface drainage will first pass via the drainage interceptors (Vortex and Full Retention) and the on-site attenuation ponds. This will be subject to periodic visual inspections. The EA is to be notified by the operator where significant pollution incidents occur that have the potential to cause harm.

5.3 Conclusion

We have set out the proposed design and operating techniques for this installation, and these are considered to meet the EA's BAT requirements for the Ramsgate Data Centre at Wexham Road, Slough SL2 5DS.

Appendices

Appendix A – Drawings



FOR DETAILED DESIGN INFORMATION REFER TO DRAWINGS
- LON1X2-OCS-CZ-ZZ-DR-C-4001 - 4002 [DRAINAGE LAYOUTS]
- LON1X2-OCS-CZ-ZZ-DR-C-4005 - 4009 [DRAINAGE LONGSECTIONS]

FOR CONSTRUCTION

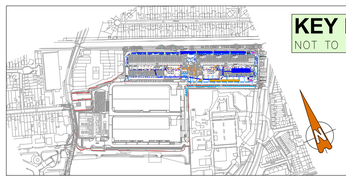
GENERAL NOTES:

1. ALL NOTED LEVELS ARE TO ORDNANCE DATUM.
2. REFER TO ARCHITECT'S LAYOUT FOR ALL SET-OUT INFORMATION.
3. REFER TO ARCHITECT / LANDSCAPE ARCHITECT'S DESIGN DRAWINGS FOR DETAILS OF PROPOSED SURFACE FINISHES AND LANDSCAPING [INCLUDING GREEN ROOFS].
4. ALL DRAINAGE COVER LEVELS ARE TO BE COORDINATED WITH PROPOSED ROAD DESIGN LEVELS AND ARCHITECT/LANDSCAPE ARCHITECT'S PROPOSED FINISH LEVELS.
5. ALL INTERNAL CHAMBER COVERS TO BE DOUBLE SEALED, AND CLASSIFICATION D400 LOADING WHERE LOCATED IN VEHICULAR AREAS.
6. ALL NEW DRAINAGE IS DESIGNED IN ACCORDANCE WITH SEWERS FOR ADOPTION AND BUILDING REGULATIONS PART H: DRAINAGE WASTE DISPOSAL SUBJECT TO RESTRICTIONS IMPOSED BY THE ESISTING BUILDING
7. ALL CONNECTIONS TO NEW DRAINAGE NETWORKS ARE TO BE MADE AT AN ANGLE OF 90° OR IN THE DIRECTION OF FLOW.
8. REFER TO ARCHITECT AND M&E ENGINEERING DESIGN DRAWINGS FOR CONFIRMATION OF LOCATION AND SPECIFICATION OF FLOOR GULLIES.
9. REFER TO M&E ENGINEERING DESIGN FOR CONFIRMATION OF WASTE AND SANITARY POP-UP/OUTLET LOCATIONS.
10. THE CONTRACTOR IS TO VERIFY INVERT LEVEL AT PROPOSED CONNECTION TO EXISTING SEWERS, PRIOR TO ANY OTHER WORKS BEING CARRIED OUT, AND MAKE ANY DISCREPANCIES KNOWN TO THE ENGINEER.
11. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMATION OF PRESENCE ALL EXISTING UTILITIES, IF ANY, ALONG ROUTE OF PROPOSED DRAINAGE NETWORKS - BY INTRUSIVE INVESTIGATION OR EQUAL.
12. EXISTING PUBLIC SEWER TO BE JET CLEANED AND CCTV SURVEYED PRIOR TO, AND AFTER PROPOSED CONNECTIONS FROM NEW NETWORK. CONTRACTOR TO CONFIRM THE EXISTING MANHOLE LOCATIONS AND INVERTS PRIOR TO COMMENCEMENT. ENGINEER TO BE ADVISED IN WRITING OF ANY DISCREPANCIES FROM INFORMATION SHOWN ON RECORD DRAWINGS.
13. ALL NEW DRAINAGE INFRASTRUCTURE TO BE JET CLEANED AND CCTV SURVEYED, WITH ANY NOTED DEFECTS REMEDIATED, ON COMPLETION OF WORKS, TO THE SATISFACTION OF THE LOCAL AUTHORITY.
14. SEWERS - SUBJECT TO APPROVAL TO CONNECT [EXISTING THAMES SURFACE AND WASTEWATER]
15. THE INTEGRITY OF THE EXCAVATIONS IS TO BE MAINTAINED BY THE CONTRACTOR AT ALL TIMES, REFER TO THE SOIL INVESTIGATIONS REPORT.
16. UNDERGROUND SERVICES CO-ORDINATION IS ONGOING - DRAINAGE IS SUBJECT TO CHANGE

LEGEND:

- uPVC TWINWALL SURFACE WATER DRAINAGE OR SIMILAR APPROVED
- 100mmØ SURFACE WATER DRAINAGE SN8
- uPVC SN8 WASTEWATER DRAINAGE OR SIMILAR APPROVED
- INTERNAL WASTEWATER DRAINAGE SN8
- EXISTING SURFACE WATER DRAINAGE
- EXISTING WASTEWATER DRAINAGE
- RISING MAIN
- WASTEWATER DRAINAGE PRECAST CONCRETE MANHOLE
- SURFACE WATER DRAINAGE PRECAST CONCRETE MANHOLE
- EXISTING SURFACE WATER DRAINAGE MANHOLE
- EXISTING WASTEWATER DRAINAGE MANHOLE
- CAST IN-SITU INTERNAL WASTEWATER MANHOLE IN ACCORDANCE WITH BUILDING REGS PART H [DOUBLE-SEALED RECESSED COVERS REQUIRED]

- SURFACE WATER ACCESS JUNCTION
- KLARGESTER CLASS I FULL RETENTION FUEL SEPARATOR
- TRAPPED ROAD GULLY/TRAPPED GULLY
- SURFACE WATER ACO CHANNEL/ GATIC DRAIN WITH ACCESSIBLE SUMP OUTLETS [TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURE'S GUIDELINES & RECOMMENDATIONS]
- PERVIOUS PAVING
- SURFACE WATER ATTENUATION



KEY PLAN
NOT TO SCALE

SURFACE WATER NETWORK - NORTH

USMH	USCL (m)	USIL (m)	PN	SLOPE (1:X)	DSCL (m)	DSIL (m)	PIPE DIA. (mm)	USMH DIA. (mm)
1	28.188	26.763	1.000	170.0	28.302	26.625	225	1200
2	28.302	26.625	1.001	170.0	28.225	26.556	225	1200
3	28.311	26.603	2.000	60.0	28.225	26.556	225	1050
4	28.225	26.406	1.002	324.0	27.952	26.281	375	1350
5	28.071	26.487	3.000	60.0	27.952	26.431	225	1200
6	27.952	26.206	1.003	405.0	28.140	26.095	450	1350
7	28.233	26.808	4.000	60.0	28.140	26.751	225	1200
8	28.140	26.095	1.004	405.0	28.165	25.998	450	1350
9	28.274	26.849	5.000	60.0	28.165	26.790	225	1200
10	28.165	24.700	1.005	351.7	28.072	24.582	600	1500
11	28.143	26.718	6.000	170.0	28.175	26.696	225	1200
12	28.175	26.696	6.001	170.0	28.072	26.676	225	1200
13	28.072	24.582	1.006	332.0	28.279	24.457	600	1500
14	28.341	26.916	7.000	170.0	28.279	26.896	225	1200
15	28.279	24.457	1.007	334.7	28.463	24.333	600	1500
16	28.488	27.063	8.000	170.0	28.463	27.042	225	1200
17	28.463	24.333	1.008	330.7	28.258	24.208	600	1500
18	28.225	26.800	9.000	170.0	28.190	26.637	225	1200
19	28.190	26.637	9.001	170.0	28.235	26.587	225	1200
20	28.235	26.512	9.002	170.0	28.308	26.396	300	1200
21	28.308	26.396	9.003	170.0	28.258	26.378	300	1200
22	28.258	24.208	1.009	580.0	28.205	24.190	600	1500
23	28.205	24.190	1.010	580.0	28.182	24.181	600	1500

SURFACE WATER NETWORK - SOUTH

USMH	USCL (m)	USIL (m)	PN	SLOPE (1:X)	DSCL (m)	DSIL (m)	PIPE DIA. (mm)	USMH DIA. (mm)
1	28.176	26.676	1.000	245.0	28.250	26.519	300	1200
2	28.250	26.623	2.000	80.0	28.250	26.594	225	1200
3	28.250	26.519	1.001	245.0	28.000	26.394	300	1200
4	28.289	26.740	3.000	178.7	28.000	26.394	300	1200
5	28.000	26.244	1.002	50.0	28.000	26.162	450	1350
6	28.000	26.162	1.003	50.0	28.350	25.938	450	1350
7	28.350	25.938	1.004	50.0	28.250	25.868	450	1350
8	28.275	26.500	4.000	170.0	28.260	26.498	225	1200
9	28.260	26.423	4.001	245.0	28.260	26.332	300	1200
10	28.350	26.524	5.000	30.0	28.260	26.407	225	1200
11	28.260	26.332	4.002	138.8	28.250	26.018	300	1200
12	28.250	25.718	1.005	70.9	28.043	25.416	600	1500
13	28.043	25.416	1.006	150.0	27.641	25.001	600	1500
14	27.431	26.006	6.000	100.0	27.641	25.946	225	1200
15	27.641	25.001	1.007	580.0	28.179	24.941	600	1500
16	28.179	24.941	1.008	580.0	28.132	24.862	600	1500
17	28.132	24.862	1.009	580.0	27.994	24.850	600	1500
18	27.853	26.428	7.000	30.0	27.981	26.327	225	1200
19	27.861	26.252	7.001	170.0	27.901	25.996	300	1200
20	27.862	26.172	8.000	30.0	27.901	26.071	225	1200
21	27.901	25.996	7.002	240.0	27.994	25.916	300	1200
22	27.994	24.850	1.010	580.0	28.000	24.827	600	1500
23	28.000	26.500	9.000	170.0	28.000	26.058	300	1200
24	28.000	26.058	9.001	170.0	28.000	26.029	300	1200
25	28.165	26.740	10.000	71.7	28.250	26.204	225	1200
26	28.250	26.243	11.000	60.0	28.250	26.204	225	1200
27	28.250	26.204	10.001	71.7	28.000	26.104	225	1200
28	28.000	26.029	9.002	170.0	28.000	26.006	300	1200
29	28.000	24.132	1.011	350.0	28.310	23.889	600	1500
30	28.310	23.889	1.012	560.0	28.284	23.865	600	1500
31	28.022	26.597	12.000	100.0	28.214	26.388	225	1200
32	28.214	26.388	12.001	170.0	28.284	26.349	225	1200
33	28.284	23.865	1.013	560.0	27.878	23.839	600	1500
34	27.878	23.839	1.014	560.0	27.935	23.823	600	1500
35	27.935	23.823	1.015	560.0	27.965	23.816	600	1500

SURFACE WATER NETWORK - NORTH OUTFALL

USMH	USCL (m)	USIL (m)	PN	SLOPE (1:X)	DSCL (m)	DSIL (m)	PIPE DIA. (mm)	USMH DIA. (mm)
1	28.052	26.627	1.000	170.0	28.150	26.609	225	1200

SURFACE WATER NETWORK - SOUTH OUTFALL

USMH	USCL (m)	USIL (m)	PN	SLOPE (1:X)	DSCL (m)	DSIL (m)	PIPE DIA. (mm)	USMH DIA. (mm)
1	28.058	26.847	1.000	170.0	28.166	26.809	225	1200

WASTEWATER NETWORK

USMH	USCL (m)	USIL (m)	PN	SLOPE (1:X)	DSCL (m)	DSIL (m)	PIPE DIA. (mm)
WW1	28.250	27.024	1.000	80.0	28.250	26.695	150
WW2	28.250	26.695	1.001	80.0	28.400	26.475	150
WW3	28.400	26.475	1.002	80.0	28.400	26.396	150
WW4	28.400	26.396	1.003	80.0	28.400	26.292	150
WW5	28.400	26.292	1.004	80.0	28.400	26.213	150
WW6	28.250	26.987	1.005	80.0	28.250	26.870	150
WW7	28.250	26.870	1.006	80.0	28.250	26.503	150
WW8	28.250	26.503	1.007	80.0	28.400	26.213	150
WW9	28.400	26.213	1.008	80.0	28.400	26.160	150
WW10	28.400	26.160	1.009	80.0	28.400	26.075	150
WW11	28.400	26.075	1.010	80.0	28.194	25.987	150
WW12	28.194	25.987	1.011	80.0	28.313	25.178	150

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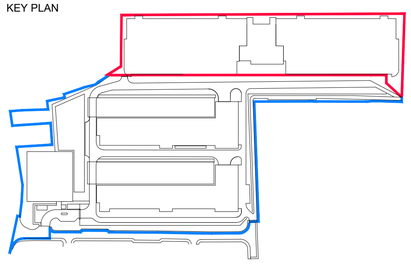
IPD PARTNERS

ORIGINATOR

OCSC
O'CONNOR . SUTTON . CRONIN
MULTIDISCIPLINARY CONSULTING ENGINEERS
Civil / Structural / Environmental / Mechanical /Electrical / Sustainability

KEY PLAN



Rev	Description	Drn	Chck	Date
C6	LEGEND UPDATED AS CLOUDED	MC	DC	14.03.25
C5	GULLIES ADDED AS CLOUDED	MC	DC	06.02.25
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C3	LAYOUT UPDATED	RC	COM	20.12.24
C2	LEGEND UPDATED	COR	COM	05.12.24
C1	CONSTRUCTION ISSUE	COR	COM	08.11.24
P2	SUITABLE FOR TENDER	COR	COM	23.08.24
P1	SUITABLE FOR TENDER	COR	MK	06.08.24

Campus Number & Name
LON1 LONDON ONE

Project
LON1X2
LONDON ONE PHASE THREE

yondr
www.yondrgroup.com

Drawing Title
PROPOSED DRAINAGE LAYOUT
SHEET 1 OF 3

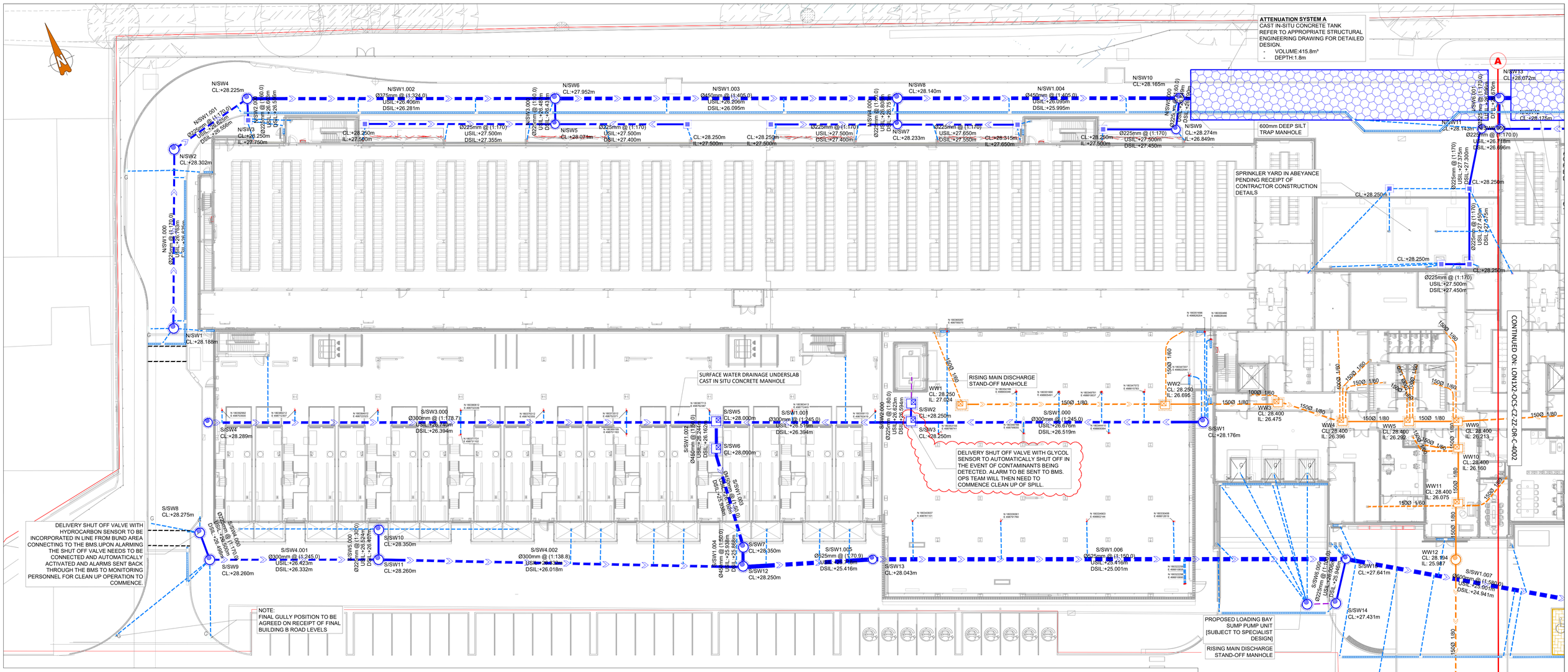
Status Code
A5 - AUTHORISED & ACCEPTED - STAGE 5

Stage
CONSTRUCTION ISSUE

Scale @ A1
1 : 500

Drawing Number
LON1X2-OCS-CZ-ZZ-DR-C-4000

Rev
C6



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3. REFER TO ARCHITECT / LANDSCAPE ARCHITECT'S DESIGN DRAWINGS FOR DETAILS OF PROPOSED SURFACE FINISHES AND LANDSCAPING [INCLUDING GREEN ROOFS].
4. ALL DRAINAGE COVER LEVELS ARE TO BE COORDINATED WITH PROPOSED ROAD DESIGN LEVELS AND ARCHITECT/LANDSCAPE ARCHITECT'S PROPOSED FINISH LEVELS.
5. ALL INTERNAL CHAMBER COVERS TO BE DOUBLE SEALED, AND CLASSIFICATION D400 LOADING WHERE LOCATED IN VEHICULAR AREAS.
6. ALL NEW DRAINAGE IS DESIGNED IN ACCORDANCE WITH SEWERS FOR ADOPTION AND BUILDING REGULATIONS PART H: DRAINAGE WASTE DISPOSAL SUBJECT TO RESTRICTIONS IMPOSED BY THE ESISTING BUILDING
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9. REFER TO M&E ENGINEERING DESIGN FOR CONFIRMATION OF WASTE AND SANITARY POP-UP/OUTLET LOCATIONS.
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- INTERNAL WASTEWATER DRAINAGE SN8
- EXISTING SURFACE WATER DRAINAGE
- EXISTING WASTEWATER DRAINAGE
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- WASTEWATER DRAINAGE PRECAST CONCRETE MANHOLE
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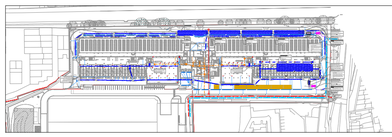
- PERVIOUS PAVING
- SURFACE WATER ATTENUATION



KEY PLAN
NOT TO SCALE

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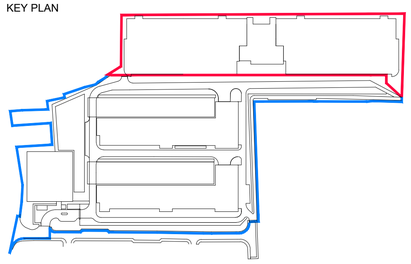

Rev	Description	Drn	Chck	Date
C6	LEGEND UPDATED AS CLOUDED	MC	DC	14.03.25
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C3	LAYOUT UPDATED	RC	SD	20.12.24
C2	LEGEND UPDATED	COR	COM	05.12.24
C1	CONSTRUCTION ISSUE	COR	COM	08.11.24

Campus Number & Name
LON1 LONDON ONE

Project
LON1X2
LONDON ONE PHASE THREE

yondr
www.yondrgroup.com

Drawing Title
PROPOSED DRAINAGE LAYOUT
SHEET 2 OF 3

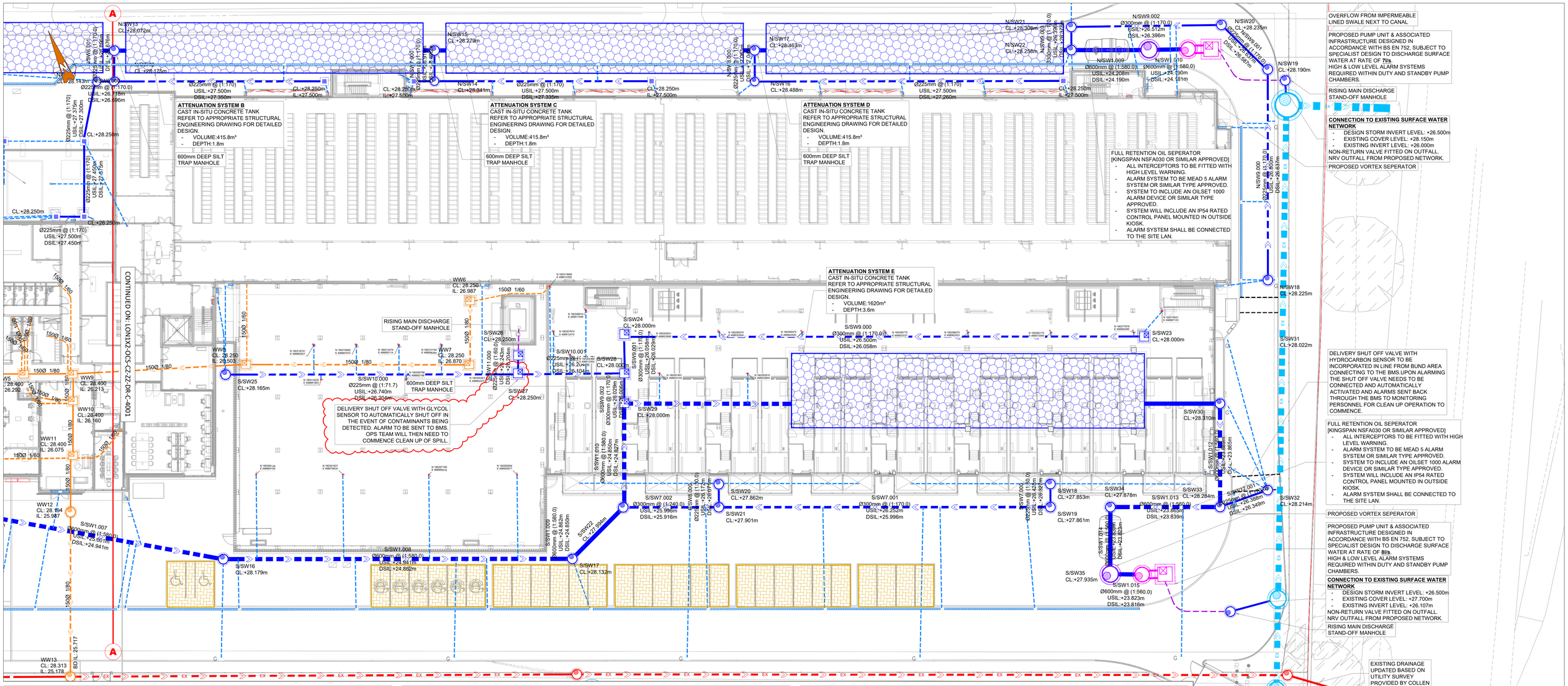
Status Code
A5 - AUTHORISED & ACCEPTED - STAGE 5

Stage
CONSTRUCTION ISSUE

Scale @ A1
1 : 250

Drawing Number
LON1X2-OCS-CZ-ZZ-DR-C-4001

Rev
C6



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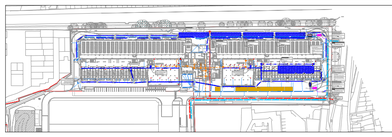

KEY PLAN
NOT TO SCALE

FOR FURTHER DESIGN INFORMATION REFER TO DRAWINGS LON1X2-OCS-CZ-ZZ-DR-C-4005 - 4009 [DRAINAGE LONGSECTIONS]

FOR CONSTRUCTION

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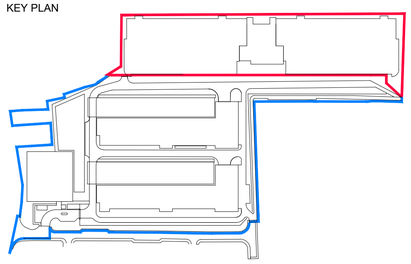
KEY PLAN



Rev	Description	Drn	Chck	Date
C6	LEGEND UPDATED AS CLOUDED	MC	DC	14.03.25
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C3	LAYOUT UPDATED	RC	SD	20.12.24
C2	LEGEND UPDATED	COR	COM	05.12.24
C1	CONSTRUCTION ISSUE	COR	COM	08.11.24

Campus Number & Name
LON1 LONDON ONE

Project
LON1X2
LONDON ONE PHASE THREE

yondr
www.yondrgroup.com

Drawing Title
PROPOSED DRAINAGE LAYOUT SHEET 3 OF 3

Status Code
A5 - AUTHORISED & ACCEPTED - STAGE 5

Stage
CONSTRUCTION ISSUE

Scale @ A1
1 : 250

Drawing Number
LON1X2-OCS-CZ-ZZ-DR-C-4002

Rev
C6

EXTERNAL AREAS SCHEDULE	
1	VEHICLE STORE
2	SITE WIDE CEP
3	BUILDING A MV ROOMS
4	WASTE STORE
5	BUILDING B MV ROOMS

KEY:

- SITE OWNERSHIP BOUNDARY
- DEVELOPMENT / SITE BOUNDARY
- ABOVE GROUND GANTRY
- FENCELINE
- AIR EMISSIONS POINT
- FUEL FILL POINT
- FIRE WATER PUMP EXHAUST POINT

NOTES:

1. ALL LEVELS ARE IN METRES ABOVE DATUM UNLESS STATED OTHERWISE
2. MAPPING IS ON ORDNANCE SURVEY TAKEN FROM ANS-BWB-XX-DDG-DR-C-500-[S0-P1]_INDICATIVE DRAINAGE LAYOUT DRAFT.DWG
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ARCHITECTS PLANS.
4. AIR EMISSION POINTS ARE INDICATIVE AND DO NOT CONTAIN NORTHINGS/EASTINGS
5. FUEL FILL POINTS FOR BUILDINGS A & B ARE NOT INDICATED

N

FP-04
FP-03
F-03
F-04
F-02
F-01
A-1 A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11 A-12 A-13 A-14 A-15 A-16 A-17 A-18 A-19 A-20 A-21 A-22 A-23 A-24 A-25 A-26
A-27 A-28 A-29 A-30 A-31 A-32 A-33 A-34 A-35 A-36 A-37 A-38 A-39 A-40 A-41 A-42 A-43 A-44 A-45 A-46 A-47 A-48 A-49 A-50 A-51 A-52
A-53 A-54 A-55 A-56 A-57 A-58 A-59 A-60 A-61 A-62 A-63 A-64 A-65 A-66 A-67 A-68 A-69 A-70 A-71 A-72 A-73 A-74 A-75 A-76 A-77 A-78 A-79 A-80 A-81 A-82 A-83 A-84
SUBSTATION
BUILDING A
SHARED CYCLEWAY AND FOOTPATH (PUBLIC USE)
BUILDING B MAIN BUILDING ENTRANCE
BUILDING A MAIN BUILDING ENTRANCE
E = 498774.325m
N = 180246.037m
FFL = 28.100mAOD
E = 498749.253m
N = 180176.367m
FFL = 28.25mAOD
SPINE ROAD BY OTHERS
WEXHAM ROAD
UXBRIDGE ROAD
0 15 30 Meters

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IPD PARTNERS

collen Founded 1810

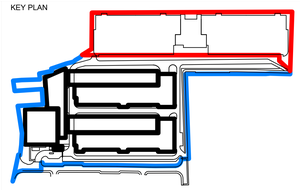
OCSC O'CONNOR · SUTTON · CRONIN MULTIDISCIPLINARY CONSULTING ENGINEERS

RKD

ORIGINATOR

AMPROMECH CONSULTING ENGINEERS

KEY PLAN



Rev	Description	Drn	Chck	Date
P4	CORRECTED POINT NUMBERING	COF	AJ	10/11/25
P3	ISSUED FOR INFORMATION	COF	AJ	16/7/25
P2	ISSUED FOR INFORMATION	COF	AJ	14/7/25
P1	ISSUED FOR INFORMATION	COF	AJ	10/7/25

Campus Number & Name: LON1 London One

Project: LON1X2 FACILITY C

yondr www.yondrgroup.com

Drawing Title: EMISSION POINT LOCATIONS

Status Code: S2 - INFORMATION

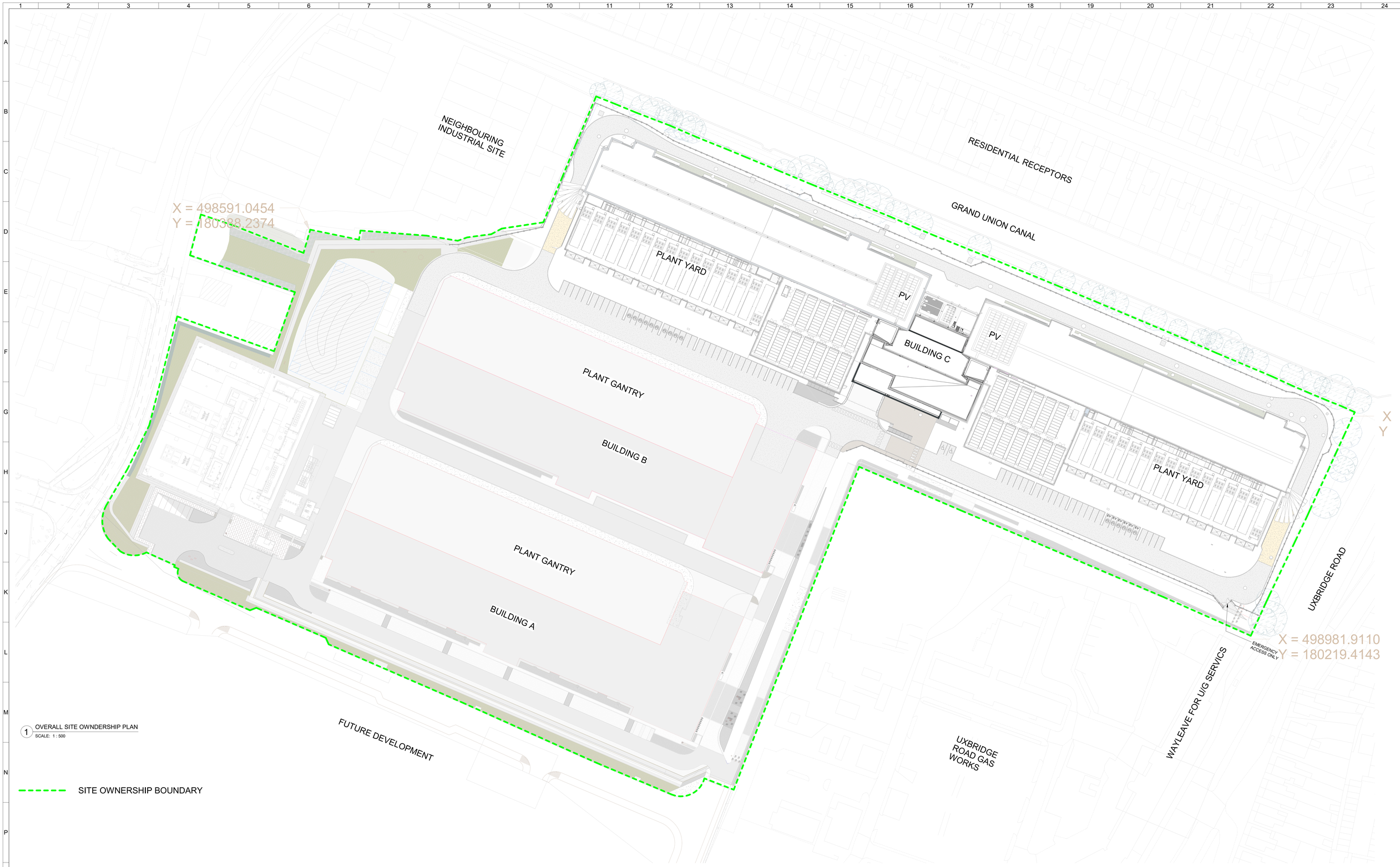
Stage: INFORMATION

Scale @ A0: NTS

Drawing Number: LON1X2-APM-ZZ-ZZ-SK-M-9801

Rev: P4

11/09/2024



1 OVERALL SITE OWNDERSHIP PLAN
SCALE: 1 : 500

SITE OWNERSHIP BOUNDARY

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This drawing is to be read in conjunction with all related consultants drawings and any other relevant information.
Do not scale from this drawing. All dimensions in millimetres unless otherwise stated. All dimensions to be verified on site prior to the commencement of any work or the production of any shop drawing. All discrepancies to be reported to Yondr immediately.

Note:
The site plan and sections shown here is for illustration purpose only.
Please refer to the design information by the Civil Engineer and Landscape Architect for any information regarding the setting out of elements on the site, including buildings, roadways, utilities and landscaped areas
Civil model design in development at time of issue, fence design and arrangement to be reviewed following updated civil IFC issue. Site boundary fence line subject to review with Yondr Security team.
Landscape design to be developed by SWECO LANDSCAPE - to be updated

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SCALE 1:500 METERS

IPD PARTNERS

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OCSC O'CONNOR · SUTTON · CRONIN MULTIDISCIPLINARY CONSULTING ENGINEERS
AMPROMECH CONSULTING ENGINEERS

ORIGINATOR
RKD

KEY PLAN

Rev	Description		Dm	Chck	Date
C1	Issued for Construction		BS	PB	07.07.25

Campus Number & Name: LON1 London One
Project: LON1X2 FACILITY C
yondr www.yondrgroup.com

Drawing Title: OVERALL SITE OWNERSHIP PLAN
Status Code: A5 - Authorised & Accepted - Stage 5
Stage: Construction Issue
Scale @ A0: As indicated
Drawing Number: LON1X2-RKD-CZ-ZZ-DR-A-00002
Rev: C1

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Appendix B – Environmental Risk Assessment

LON1X0 Data Centre, Slough: Environmental Permit Application

APPENDIX B- REVISED ENVIRONMENTAL RISK ASSESSMENT TO INCLUDE BUILDING C, LON1X2.

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1. Introduction

This Environmental Risk Assessment (ERA) has been carried out in support of an application for an environmental permit for an addition to the LON1X) data centre, specifically Building C or LON1X2. This ERA supplements the existing permit application for Buildings A and B, which is already in operation. It includes an assessment of the risk to the environment and human health from a diesel fired emergency back-up generation installation with associated diesel storage.

The Environment Agency (EA) Guidance, "*Risk assessments for your environmental permit*", Gov.UK, sets out information on when an environmental risk assessment is required together with notes on how to complete a risk assessment.

The following environmental risk assessment has been developed following the Environment Agency Guidance for risk assessment for environmental permits. The assessment of risks is presented in the risk assessment tables in Section 2.

Site location

The data centre is located in the central part of the former AkzoNobel Decorative Coatings, Slough Manufacturing Unit, located at Wexham Rd, Slough SL2 5DS, National Grid Reference SU 98700 80300

The project (LON1x2) comprises the installation of Building C on the purpose-built Data Centre campus site, located in Slough, London, UK.

At present, the site consists of Buildings A&B (LON1X0), which operate independently, and the proposed modification, referred to as LON1X2, involves the addition of a third structure, Building C, to the existing data centre complex. The site was redeveloped under Slough Borough Planning permission P/00072/096 and is located in the central part of the former AkzoNobel Decorative Coatings, Slough Manufacturing Unit located at Wexham Rd, Slough SL2 5DS, National Grid Reference SU 98700 80300.

The area immediately to the north of the proposed data centre is currently unoccupied land. The Grand Union Canal lies beyond this area with residential properties present north of the Canal. To the east lies Uxbridge Road Gas Works with Uxbridge Road and residential properties present beyond. Immediately to the south, a new residential development is under construction. This is in turn bound by the Railway Line with residential properties present beyond. Commercial and industrial properties lie beyond Wexham Road to the west.

There are no formal landscape designations (such as Areas of Outstanding Natural Beauty or National Parks close to the Site. The nearest formal landscape designations are located being 13km and 40km respectively.

There are no identified statutory ecological designations within the site or surrounding areas. The closest statutory ecological designations are Black Park Country Park (SSSI) and Wraysbury & Hythe End Gravel Pit (SSSI), which are located approximately 4km to the north and 5km to the south of the site respectively. Tree cover is also very sparse across the Site.

Slough Borough is covered by five AQMAs, the Data Centre is not within any of these five AQMAs according to the Slough Borough Council 2024 Air Quality Annual Status Report (ASR). This means

these areas are recognised as having air quality levels that fail to meet the national objectives for key pollutants. The primary pollutant of concern is Nitrogen Dioxide (NO_2). This is largely generated by road traffic emissions. Monitoring and modelling showed that the problem was widespread, particularly along the town's major transport corridors, rather than being confined to a few small hotspots.

Further the entirety of the Site is located in a low probability flood risk zone (Flood Zone 1). The Site is also not located within or adjacent to a Conservation Area.

The site is in a generally developed area with no special landscape, ecological, or heritage protections.

- Landscape: It is not near any protected landscapes like National Parks. The nearest ones are over 13km away.
- Nature Conservation: There are no protected ecological sites on or immediately around the property. The nearest protected nature areas, Black Park Country Park and Wraysbury Gravel Pit, are about 4km north and 5km south, respectively. There are also very few trees on the site.
- Air Quality & Flooding: The site is not in an Air Quality Management Area. It is also located in a low-probability flood zone (Flood Zone 1), meaning the risk of flooding is minimal.
- Heritage: The site is not within or next to a Conservation Area.

Site activities

The proposed development shall include the following key features, a data centre building comprising data halls and associated support plant, storage, office and welfare accommodation, logistics area and loading bay, external plant gantry accommodating 32 Rolls-Royce MTU 20V4000 DS3300 gas oil-fuelled standby generators, electrical plant rooms and heat rejection plant, ancillary support functions, external compounds, and associated infrastructure.

Electricity for the operation of the data centre will be provided from connections to the local electricity transmission network; however, given the nature of data centres and their requirement to have an available energy supply at all times, generators will provide emergency power to the data centre in the event of a disruption in the grid power supply

The existing data centre is currently served by 52 emergency back-up generators within a compound, each with an individual associated stack. The current installation consists of 52 x 5.67 MWth reciprocating engines and will operate to provide emergency back-up power to an associated data centre should there be a break in supply from the grid. Buildings A and B also include 2 Clarke JU4H-LP24 diesel-driven fire-water pumps. The combined net thermal input of the current installation is 295.4 MW. The expanded data centre which will include the existing Buildings A and B together with the new Building C will have a rated thermal input of 517.097 MWt for the existing and the 32 new generator sets and 0.944 MWt for the combined fire water pump engines, thus giving a total site rated thermal input of 518.041 MWt for the entire site upon construction and commissioning.

The location of the generators, fuel tanks, emissions points (flues/stacks) and surface water connections are shown in the site plans found in Appendix A to the Permit Application Supporting Information Document.

Site history

Historically, the site has been used for paint and coating manufacture from 1919 until operation ceased in 2018. Prior to this the site was utilised for brick-earth excavation and brick making in the late 1800s as well as for a US/Canadian Army Storage Base between 1914-1918.

Planning permission was sought in November 2020 for the mixed-use development of the site (Ref P/00072/116). As part of the permission, the site underwent remediation in accordance with Buckingham Group Contracting Ltd.'s (BCGL) "*First Panattoni, Former AkzoNobel Site-Slough, Remediation Scheme for Contamination*" (reference BGCL-C19019/001/v5, dated 31 March 2020). The remediation was approved by the regulatory bodies, including the local contaminated land officer and the Environment Agency, and Condition 34 (Contaminated Land Verification Report) of the planning permission was discharged in June 2022.

Planning Permission for the development of Building C (Ref *P/00072/139)* was registered 15th March 2024. This application seeks Reserved Matters approval for the appearance, layout (inc. internal site arrangements), scale, and landscaping associated with the final phase (Phase 2 – Building C) of the approved commercial floorspace pursuant to the Outline Planning Permission granted in November 2020. It also follows the approval of Reserved Matters for Phase 1 (Buildings A and B data centres) in October 2021.

2. Risk Assessment Approach

This ERA uses the following approach for identifying and assessing the risks from the proposed operation:

1. Identify and consider risks for the site, and the sources of the risks.
2. Identify the receptors (people, animals, property that could be affected by the hazard) at risk from the site.
3. Identify the possible pathways from the sources of the risks to the receptors.
4. Assess risks relevant to the site-specific activity and check they are acceptable and can be screened out.
5. State how risks are controlled.

The ERA has identified all potential receptors that are near the site and could reasonably be affected by the proposed activities.

For the purposes of this ERA the following distances have been used to identify potentially sensitive receptors for the data centre site:

- A 10km radius has been adopted in reviewing potentially sensitive receptors of international ecological importance;
- A 2km radius has been adopted in reviewing potentially sensitive receptors of national ecological importance; and
- A radius of 500m has been adopted for all other potentially sensitive receptors (for example residential, commercial, industrial, agricultural and surface water receptors).

2.1 Climate Change Risk Assessment

Environment Agency (EA) guidance Adapting to Climate Change was withdrawn on 31 August 2022. As a result of this the EA has removed the requirement to consider climate change adaptation from the permit application process.

In place of this, operators are required to integrate climate change adaptation into the environmental management system.

The site management plan will be developed to include an assessment of the risks to the installation associated with Climate Change over the expected period of operation. Climate change duties are also specified in the GHG Permit for the site.

2.2 Identifying the risks

The risk assessment approach is based on the potential frequency or probability of the event occurring and the resulting consequence or potential effect of the event on the environment. The EA's guidance requires the following to be considered as 'Risks from your site':

- any discharge, for example sewage or trade effluent to surface or groundwater accidents
- odour (not for standalone water discharge and groundwater activities)
- noise and vibration (not for standalone water discharge and groundwater activities)

- uncontrolled or unintended ('fugitive') emissions, for which risks include dust, litter, pests and pollutants that should not be in the discharge
- visible emissions, for example smoke or visible plumes
- release of bioaerosols, for example from shredding, screening and turning, or from stack or open point source release such as a biofilter

Further, for Installation EP applications the EA guidance *states that assessment of the following additional aspects is required, where applicable:*

- *Risks from air emissions;*
- *Risks to groundwater;*
- *Global Warming Impact;*
- *Risks to surface water from hazardous pollutants;*
- *Risks to surface water from sanitary and other pollutants; and*
- *Installations must also decide how to treat, recycle or dispose of waste.*

The Installation will not produce any process effluent or release bio-aerosols, and there will be no point source emissions to groundwater, surface water or land from the application activities.

There will be several point source emissions to air associated with each diesel-fired generator stack and the potential for visible emissions from these stacks. This report is accompanied by an air quality assessment report from Atkins Realis Ltd "Air Quality Assessment Document reference: 100122494"

Therefore, only the following potential impacts are considered further in this ERA:

- Point source emissions to air;
- Accidents;
- Noise & vibration;
- Visible emissions, for example smoke or visible plumes;
- Fugitive emissions; and
- Global warming potential.

2.2.1 Geology, Hydrogeology and Hydrology

2.2.1.1 Geology

The geology is shown on the British Geological Survey (BGS) map 269 1:50,000 Series and on the BGS website. The site is underlain by between 5m and 9m of the Taplow Gravel Member, underlain by up to 39m thickness of the Lambeth Group. The underlying bedrock is the Seaford and Newhaven Chalk Formation.

Made ground overlies the natural soils in much of the site as a result of previous development and has a thickness of between 1.0 – 1.5m. The lithography of the area is described as "clay, sand and silt with subsidiary lignite" according to the BGS lithological description.

2.2.1.2 Hydrogeology

British Geological Survey provides a Hydrogeology 625K digital hydrogeological map of the UK, from which the following information was obtained. The Rock unit is Lambeth Group, and the Character of the site is described as a low-productivity aquifer. The summary provided is a variable sequence of

clays, shell beds, fine sands, silts and pebble beds giving low yields. Sometimes, in hydraulic continuity with the underlying Chalk aquifer.

The Taplow Gravel Member is currently designated by the Environment Agency as a Secondary A Aquifer, and the Lambeth Group remains classified as a Secondary A Aquifer. The Seaford and Newhaven Chalk is classified as a Principal Aquifer. It is considered that the more cohesive and lower-permeability strata of the Lambeth Group are acting as an aquiclude between the Taplow Gravel Member and the deeper Chalk aquifer.

The site resides within Groundwater Source Protection Zone III (Total Catchment). Updated mapping indicates that SPZ 2 (Outer Protection) lies approximately 540 m from the site, and SPZ 1 (Inner Protection) is around 1.85 km from the site. This was determined using the buffer zone feature in the Environment Agency's Magic Map service (Defra, 2025).

The site has been subject to environmental monitoring as part of site investigations undertaken between 2015 and 2018. Groundwater was encountered at between 0.99m below ground level (mbgl) and 4 mbgl.

Groundwater was identified during drilling of the exploratory holes by Applied Geology with relatively stable resting groundwater levels of between 2.07 mbgl and 2.38 mbgl in Taplow Gravel, levels of between 1.08 mbgl and 2.52 mbgl in Made Ground and water was found in the sandy layer of the Lambeth Group rock formation, at a depth of between 1.65 mbgl and 2.63 mbgl below the ground level where it was measured.

2.2.1.3 Hydrology

According to the EA Flood Map for Planning, the Site is located within a Flood Zone 1. Land within flood zone 1 has a low probability of flooding from rivers and the sea. The chance of surface water flooding at this location could be more than 3.3% (1 in 30) each year. The flood map below shoes the site to outside Flood Zones 2 and 3.

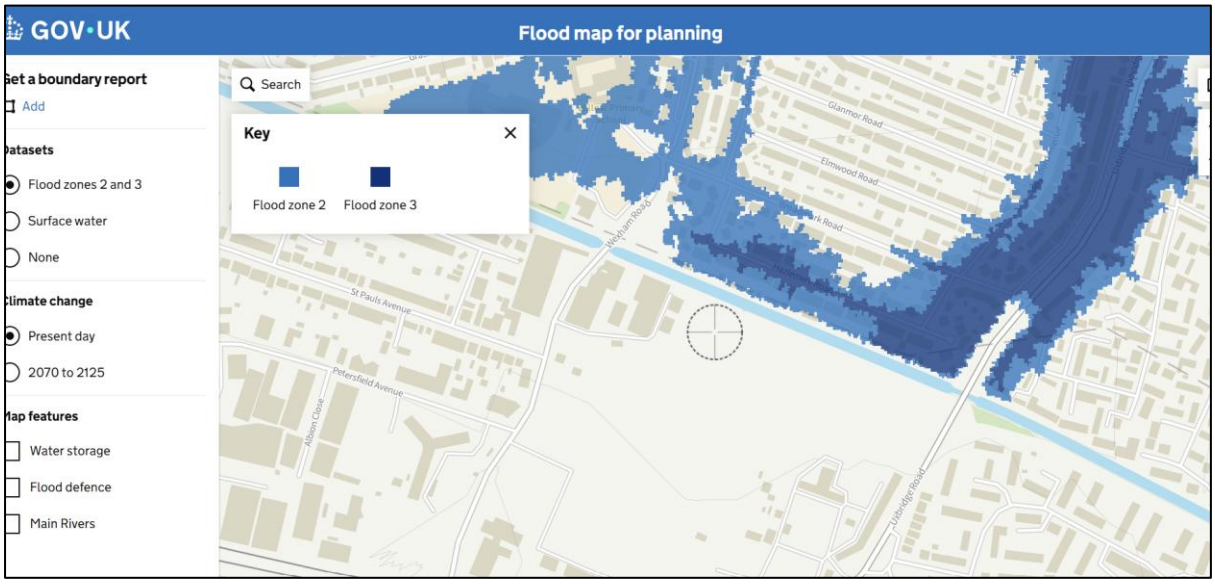


Figure 1 Flood Zone Map

The nearest surface waters to the site are the Grand Union Canal along the northern site boundary and the culverted course of the Dachett Brook, which is understood to be present beneath Uxbridge Road immediately east of the site. The Canal is not considered to be a likely receptor due to its elevated position in relation to the site, coupled with its upgradient location. Similarly, the Dachett Brook is not considered to be a receptor due to its location up-hydraulic gradient from the site.

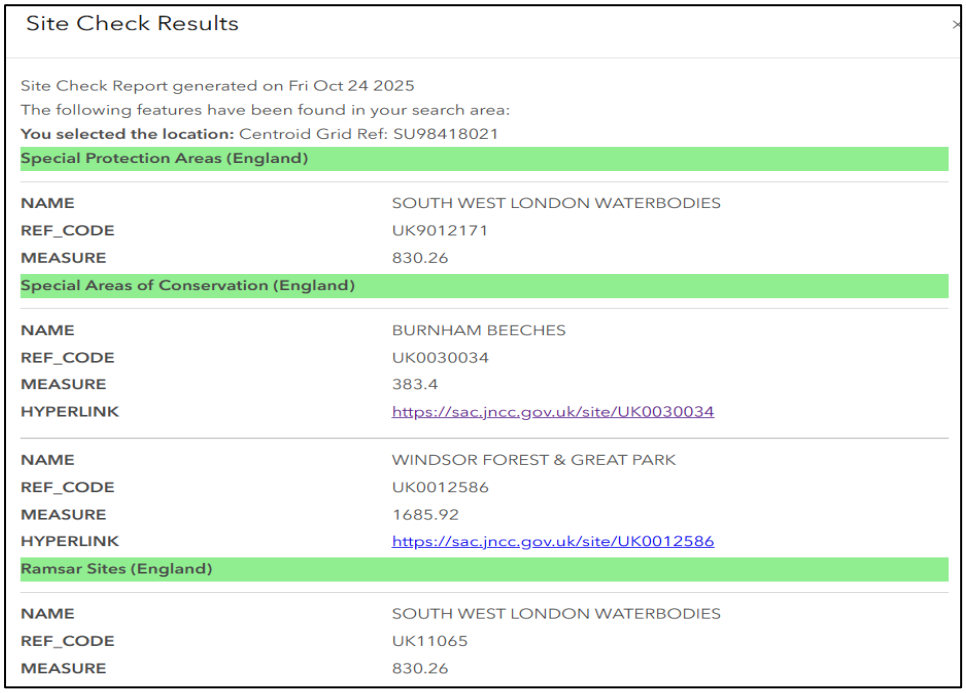
2.2.1.4 Ecology and Cultural Heritage

A Nature and Heritage Conservation Screening Report for LON1X2, was issued by the Environment Agency. A 10km radius was employed in identifying ecological receptors of European/international sites and a 2km radius for all local/national ecological receptors. A search on MAGIC map identified the ecological receptors listed below. Reference has also been made to the EA Nature and Heritage Conservation Screening Report (available as Appendix C to the Permit Application Supporting Information Document.)

European/International Sites

- Ramsar Sites and Special Protection Areas (SPA):

Southwest London Waterbodies are designated as a Ramsar (UK11065) and SPA (Ref Code UK 9012171) with the closest located approximately 4.8km to the southeast of the site.



Site Check Results

Site Check Report generated on Fri Oct 24 2025
The following features have been found in your search area:
You selected the location: Centroid Grid Ref: SU98418021

Special Protection Areas (England)

NAME	SOUTH WEST LONDON WATERBODIES
REF_CODE	UK9012171
MEASURE	830.26

Special Areas of Conservation (England)

NAME	BURNHAM BEECHES
REF_CODE	UK0030034
MEASURE	383.4
HYPERLINK	https://sac.jncc.gov.uk/site/UK0030034
NAME	WINDSOR FOREST & GREAT PARK
REF_CODE	UK0012586
MEASURE	1685.92
HYPERLINK	https://sac.jncc.gov.uk/site/UK0012586

Ramsar Sites (England)

NAME	SOUTH WEST LONDON WATERBODIES
REF_CODE	UK11065
MEASURE	830.26

Figure 2 RAMSAR Sites, SAC and SPA

- Special Areas of Conservation (SAC):

There are SACs within a 10km radius from the site. The closest is Burnham Beeches SAC (UK 0030034) located approximately 5.25km to the northwest. Windsor Forest and Great Park (UK0012586) is located approximately 5.7km to the southwest.

Table 1 Special Protection Areas (England)

Special Protection Areas (England) within 10km	
Name	**Ref Code**
South West London Waterbodies	UK9012171

Table 2 Special Areas of Conservation (England).

Special Areas of Conservation (England) within 10km	
Name	**Ref Code**
Burnham Beeches	UK0030034
Windsor Forest & Great Park	UK0012586

Table 3 Ramsar Sites (England).

Ramsar Sites (England) within 10km	
Name	**Ref Code**
South West London Waterbodies	UK11065

National Ecological Sites

- Sites of Special Scientific Interest (SSSI):

There are SSSI's within a 10km radius from the site. The closest SSSI is Black Park SSSI which is located 3.6km north-east. Wraysbury & Hythe End Gravel Pit (SSSI) is located approximately 5km to the south of the site.

Table 4 Sites of Special Scientific Interest (England) within 10 km.

Sites of Special Scientific Interest (England) within 10km	
Name	**Ref Code**
Kingcup Meadows and Oldhouse Wood SSSI	1000820
Bray Pennyroyal Field SSSI	1000819

Denham Lock Wood SSSI	1000381
Fray's Farm Meadows SSSI	1000333
Littleworth Common SSSI	1000586
Bray Meadows SSSI	1007106
Langham Pond SSSI	1000156
Burnham Beeches SSSI	1000531
South Lodge Pit SSSI	1000563
Old Rectory Meadows SSSI	1000556
Stoke Common SSSI	1000564
Staines Moor SSSI	1000111
Wraysbury Reservoir SSSI	1007245
Black Park SSSI	1000748
Windsor Forest and Great Park SSSI	1000508
Wraysbury & Hythe End Gravel Pits SSSI	1000509
Wraysbury No. 1 Gravel Pit SSSI	1007244

Local Nature Reserve (LNR) within 2km:

- Herschel Park LNR is located approximately 1.1km to the southwest of the site
- Local Wildlife Sites (LWS) within 2km
- Railway Triangle (off Stranraer Gardens) LWS is located approximately 830 m west.
- Upland Court Park LWS is located 1,330 m south.

Searches on the MAGIC map confirmed none of the following are present within a 2km radius of the site:

- National Nature Reserves;
- Areas of Outstanding Natural Beauty;
- Biosphere Reserves; and
- Ancient Woodland.

Table 5 – Nature Reserves

Site Check Report	Features
Ancient Woodland (England)	No Features found
Biosphere Reserves (England)	No Features found
Biosphere Reserves (England) - points	No Features found
National Nature Reserves (England)	No Features found
National Nature Reserves (England) - points	No Features found
Areas of Outstanding Natural Beauty (England)	No Features found

Priority Habitats (England only)

Priority habitats are 'habitats of principle importance for the conservation of wildlife in England' and include:

- protected or priority species;
- nationally and internationally protected species; and
- species of principle importance for conservation of wildlife in England.

The EA Nature and Heritage Conservation Screening Report, identifies one area of potential priority species that may be present within the screening distance for European Water Vole.

Preliminary Ecological Appraisal desk study was completed in support of the application for planning permission. This provided five records of water vole within 2 km of the survey area, the closest was located within the Grand Union Canal adjacent to the northern boundary (the area identified in the EA Nature and Heritage Conservation Screening Report) and it was noted that this canal could also potentially be suitable for otter.

3. Environmental Risk Assessment

3.1 Risk Assessment Methodology

Approach

This ERA has been prepared in accordance with EA guidance. This guidance recommends that the following steps are undertaken in preparing a risk assessment:

1. Identify and consider risks for the site, and the sources of the risks.
2. Identify the receptors (people, animals, property, and anything else that could be affected by the hazard) at risk from the site.
3. Identify the possible pathways from the sources of the risks to the receptors.
4. Assess risks relevant to the specific activity and check they are acceptable and can be screened out.
5. State how risks are controlled if too high.
6. This Risk Assessment shall be submitted as part of the EPR permit application.

Risk scoring This ERA has been completed using the scoring matrix shown in Table 6. The Risk Matrix with definitions for each score are as follow:

Probability of exposure:

High – exposure highly likely to occur

Likely – considered to be likely

Low Likelihood – considered to be unlikely

Unlikely – considered to be highly unlikely / very rare event / mitigation in place

Consequence:

Severe – potential for significant impact requiring mitigation / remediation

Medium – potential for moderate impact which may require mitigation / remediation

Mild – negligible impact that may require mitigated

Negligible – no significant / perceivable impact to receptor

Table 6 -Risk Scoring Matrix

		Consequence			
		Severe	Medium	Mild	Negligible
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/ Low Risk
	Likely	High Risk	Moderate Risk	Moderate/ Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/ Low Risk	Low Risk	Negligible Risk
	Unlikely	Moderate/ Low Risk	Low Risk	Negligible Risk	Negligible Risk

Using the guidance and approach outlined above, the following have been deemed to be identified as potential environmental risks which having potential to cause harm to the environment and / or human receptors:

- Controlled releases to air
- Accidents
- Odour
- Noise and Vibration
- Fugitive Emissions (from uncontrolled sources)
- Visible emissions
- Global warming potential
- Waste

Section 3.2 presents the risk assessment for each of the above including identification of the potential hazard, receptors, pathway, risk management practices, probability of exposure, consequence of exposure and overall risk.

The methodology outlined in Section 3.1 has been employed to score potentially significant environmental risks associated with the installation's activities.

3.2 Environmental Risk Assessment

In completing the assessment, the proposed prevention and control measures are assumed to be in place. Where relevant, details of these measures are identified within the assessment.

The risk assessment has been completed by scoring the hazard areas outlined above using a risk matrix as shown in Table 6 above.

Note on Data centres

There is no hourly limit in environmental standards for acute exposure to nitrogen dioxide. However, we have assessed the short-term environment assessment level for oxides of nitrogen as the data centre backup generators add up to 50MWth or more.

The assessment includes the maximum hourly (100th percentile) nitrogen dioxide predicted environmental concentration (PEC) for:

- maintenance and testing
- a worst-case scenario of loss of on-site power during an emergency event lasting 72 hours

3.2.1 Controlled Releases to Air

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Point source emissions to air- NOx, CO, SO2, PM10 emissions from generator stacks	Site employees, residents from adjacent housing and surrounding commercial and industrial workers, ecological and cultural heritage receptors.	Air borne	An Air Quality impact assessment & Dispersion model has been completed and submitted as part of the On evaluation of the modelled concentrations across the study area (isopleths) and estimated PECs at discrete receptors, the 'most-likely' testing scenario is not considered have a significant effect on existing annual mean NO2 concentrations either at receptors adjacent to the facility, or further afield within declared AQMAs. The achievement of the long-term NO2 AQS objective is therefore unaffected by the operation of the testing regime, despite the conservative assumptions within the modelling. The modelled concentrations for the 'most-likely' testing scenario are not considered to have a significant effect on hourly NO2 concentrations either at receptors adjacent to the facility, or further afield within declared AQMAs. The achievement of the short-term NO2 AQS standard is unaffected, despite the conservative assumptions within the modelling. Please refer to the Air Quality Assessment supplied with the application for further details. The generators are emergency standby plant designed to provide power in the event of grid failure. The probability of this happening is extremely low as such an outage is a 1 in 23 years event. Further calculations using the hypergeometric mean approach have shown that, for 24 hours of power outage in a year, the probability of an exceedance of the AQS objective for a cumulative outage across all sites is below 1%, while the probability of the AEGL-1 being exceeded on more than 4 occasions is less than 2%.. All generators have been fitted with Selective	Low – Maintenance and testing Very low – grid failure	Emissions to air have an adverse impact to human health and ecological receptors in surrounding areas.	Low – Maintenance and testing Low – Grid failure

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
			Catalytic Reduction (SCR) to reduce NOx to 95mgNm3 (at 5% O2) The flues / stacks for all generators terminate vertically at approx. 23m, approx. 1 metre above roof height, and are unimpeded by cowls/caps. The operation of individual generators at the expanded facility for routine testing is concluded not to present a significant adverse effect on the nearest sensitive human health and ecological receptors. During a worst-case emergency outage, the hourly standard for NO2 and the AEGL-1 level for non-disabling health effects may be exceeded; however, the probability of such an event coinciding with the least favourable hours of meteorological data for dispersion is extremely low. It is anticipated that an air quality management plan will be required under the environmental permit, to set out the actions that will be taken and those responsible, in the unlikely event of an emergency power outage in order to prevent adverse effects on public health.			
Visible emissions from diesel fired generator stacks, typically on start-up during cold weather/	Employees, residents, ecological and cultural heritage receptors	Air				

3.2.2 Accidents

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Accidents relating to fuel storage e.g. Spills, overfilling during refuelling / disposal / transfers, failure of secondary containment, pipe ruptures, valve failure, user error, collision.	Groundwater, surface water, sewer system, soils.	Land/ water	Generators and associated tanks will be located internal to main Data Centre building, reducing the risks of spillages entering the environment. Each of the 32 new generator sets has its own dedicated bunded diesel belly tanks. The existing generator sets at Building A and Building B are similarly protected. The receiver fuel tanks are filled by via a locked floor cabinet, fitted with a non-return valve, fuel fill control panel, and manual isolation value (complete with drip tray). The belly tank valves connect to individual overfill protection valves and are located within the bunded generator canopies. Tanks are to be bunded to BS799 Part 5 Type J 2010 specifications. This reduces the risk of accidental impact, theft, vandalism and fugitive emissions. Given the standby nature of the plant means they operate infrequently (~<50hours pa). Fuel delivery, Emergency preparedness and spill response procedures will be implemented once the full site is operational. Suppliers will adhere to procedures. Deliveries will be carried out by competent individual(s) and supervised by site staff. Tertiary containment in the form of petrol interceptors is in place to prevent spilt fuel entering surface water. These are to be inspected regularly. Surrounding area covered in good quality hardstanding. For more information see drainage plan submitted with the application. Spill kits (including drain covers) will be provided in close proximity of fuel storage and fill points. Drip trays to capture spillages from fill points and associated pipework will also be provided. There is a maintenance regime to include visual checks for leaks / spills.	Very low – Bulk Tanks. Low - refuelling	Leaks of fuel or other substances associated with site operations into the surrounding environment can cause adverse impacts to the ground water/land as well as adjacent water courses.	Very low – bulk tanks Medium – refuelling

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Flooding of drainage network and generators	Groundwater, surface water, sewer system	Floodwater, surface waters, drainage system, etc	A Flood Risk Assessment has been completed as part of the development of the site drainage strategy, as well as a Groundsure report. These concluded that the site is predominantly located within a Flood Zone 1 area which is deemed to have less than a 1 in 1000 (0.1%) chance of river or tidal flooding. Other sources of flooding have been investigated and are considered to be low risk (see drainage plan submitted with application). The generators and their fuel tanks are located internal to the Data Centre building which will provide a level of protection from surface water flooding. The surface water drainage system follows performance requirements that ensure all surfaces are suitably graded, so surface water is conveyed to the public drainage system and the drainage systems will adequately convey flows and meet self-cleansing velocities. Routine maintenance of the onsite drainage system will help prevent surface water drains from being obstructed by debris. Emergency procedures (amongst others) are to be developed and implemented once the site is operational.	Very low	Flooding / water damage to the generators could impact resiliency of operations. Flood water pollution from flooded generators could have an adverse impact to the local environment,	Low
Fire	Emissions to Air / Water	Air and Water	Prior to the site becoming operational, all generator enclosures will be fitted with fire detection systems. Generators and tanks are fitted with valves that automatically shut-off in the event of a fire shutting off the fuel supply. Fire suppression systems will rely on mains water to extinguish fires. In the unlikely event of a fire, there is potential for fire water from either site suppression systems / emergency services to enter the environment and cause harm. Emergency preparedness and response plans are to be produced once the site is operational to mitigate this risk.	Very low	Fire would also cause emissions to air, having an adverse impact to the local environment/ receptors. Firewater could infiltrate local water courses, adversely impacting the local environment	Low

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Vandalism	Land / Surface Water / Ground Water / Air	Drainage systems, air, surface/soils.	The site is fully operational and is manned 365 days a year with monitoring by security staff from a security office using an extensive CCTV system. Entry and exit to the site are tightly controlled via a security gate and turnstiles. The palisade security fencing acts as an impenetrable perimeter to prevent unauthorised access to the site.	Very low	Damage arising from vandalism to the generators / storage tanks could impact emergency backup potential /localised pollution from a spill could adversely impact the local environment.	Very low

3.2.3 Odour

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Odour from storage and combustion of fuels.	Employees and local residents	Airborne	The generator sets and associated tanks are located internal to the Data Centre buildings in sealed bulk / day tanks. Emissions are not expected to be significant, and an odour Management Plan is not required. Fuel tank filing will be carried out by trained fuel tanker drivers. This removes any significant risk of vapour release and spillages during deliveries. The complaints procedure will be followed in the event the site receives an odour complaint relating to the permitted activities.	Very low	Nuisance to on-site staff and local residents. May lead to complaints.	Very low

3.2.4 Noise and Vibration

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Noise and Vibration from start-up and operation of generators	Employees, local residents, and adjacent premises / pedestrians / road users immediately surrounding the installation.	Air	A noise impact assessment has been completed and submitted as part of the permit application ("Noise Impact Assessment"). This report concluded that "the noise levels are predicted to achieve the noise limits at the nearest noise sensitive properties and therefore noise impacts are not considered to be significant." Please refer to the noise report submitted with the application for further details. A bespoke generator acoustic canopy, for every generator has been designed to reduce acoustic sound pressure to 75 dBA at 1m from the exterior of the unit at 1.5m above ground level. Significant noise outbreak is not expected as the ESGs operate infrequently as they are emergency standby plant designed to provide power in the event of grid failure. This is a highly rare event given grid reliability. Annual operation is likely to be limited to testing and maintenance. Generators are to be maintained in accordance with manufacturer guidelines as part of a planned preventative maintenance regime. The complaints procedure will be followed in the event the site receives a noise complaint relating to the generators.	Low – Maintenance and testing Very low – Grid failure	Complaints from local residences. Potential harm to human health due to elevated noise levels.	Low – Maintenance and testing Low – Grid failure
Noise from site traffic e.g. fuel deliveries	Employees, local residents, and adjacent premises /pedestrians / road users immediately surrounding the installation.	Air	The data centre is located in the central part of the former AkzoNobel Decorative Coatings, Slough Manufacturing Unit, located at Wexham Rd, Slough SL2 5DS, National Grid Reference SU 98700 80300. Thera are industrial/commercial buildings are in the immediate vicinity of the site, with residential properties to the north and south. The generators are emergency standby plant that is operated infrequently as discussed above. As such fuel consumption is low meaning fuel deliveries by road tankers are infrequent.	Low	Complaints from local residences. Potential harm to human health due to elevated noise levels.	Very low.

3.2.5 Fugitive Emissions (from uncontrolled sources)

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Fuel spills during refuelling / leaks / accidents e.g. damaged tanks /pipework.	Groundwater, surface water, sewer system, soils.	Surface run off / surface waters via drainage or vertical leaching.	Risk management procedures and processes are as Section 3.2.2 (Accidents) above.	Very low – Bulk tanks Low – refuelling	Leaks of fuel or other substances associated with the permitted installation into the surrounding environment can cause adverse impacts to the ground water and very unlikely as well as the adjacent Garnd Union canal.	Very low – bulk tanks Medium – refuelling
VOCs / fumes from storage / delivery of fuel	Employees and local residents,	Air	The fuel tanks are located internal to the Energy Centre building and are containerised in bunded belly tanks. Emissions are not expected to be significant. Fuel volume and leak detection alarms are in place, which will minimise the likelihood of release to the environment. Refuelling activities are carried out by approved suppliers with trained competent individuals that operate in accordance with the site's refuelling procedures which will be developed as part of the sites Environmental Management System (EMS). Deliveries are rare, and best practices are adhered to in order to limit durations which fumes could escape into the environment.	Very low	Emissions to air have an adverse impact to human health and ecological receptors in surrounding areas.	Very low

3.2.6 Visible Emissions

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Visible Emissions from generator stacks	Local residents	Visual	Smoke may be visible during the first 10-15s of operation as the engine starts up. After this time visible plumes are not anticipated due to high exhaust temperatures (approx. 450°C). Visible emissions after this time are to be investigated as part of generator maintenance. Plumes may not be visible due to line of sight, weather conditions, and the timing of generator operation as tests may be outside of working hours. They may also be infrequent therefore are not considered to be likely / significant. The installation of SCR, the site's maintenance regime and regular fuel polishing is intended to remove impurities, and to help ensure the engine burns as cleanly as practicable to reduce visible emissions. The complaints procedure will be followed in the event the site receives complaints relating to the visible emissions from the generators	Low	Potential visual impacts, particularly during generator start-up.	Very low

3.2.7 Global Warming Potential (of the site)

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Global Warming Potential from combustion of fuel by generators.	Global atmosphere.	Airborne	The generators are emergency standby plant designed to provide power in the event of grid failure. This is a highly rare event given grid reliability. Annual operation is likely to be limited to maintenance and testing. This level of operation is not considered to provide a significant global warming impact, with a site total GHG emission load estimated to be less than 2,000 tCO2e per year.	Very low	Contribute to climate change, due to increase in greenhouse. gases present in the atmosphere.	Very low

3.2.8 Waste

Hazard	Receptor	Pathway	Risk Management Controls and Responsibilities	Probability	Consequence	Overall Risk
Waste associated with generators e.g. waste fuels, oil sorbents and rags, lubricants & hydraulic fuels, solid wastes (air filters, packaging and spare parts) and end of life plant.	Ground, soil, ground water, surface water, sewer system.	Land/ water	Small quantities of wastes may be generated from routine generator maintenance activities or in the event of a spillage/leakage. This is likely to be low given the standby nature of the generators and the procedures in place to minimise waste generation. Procedures for licenced and responsible collection of waste oils and other hazardous wastes are to be developed once the site is operational. This will include the retention of relevant Duty of Care information. Contractors are responsible for waste disposal that arises during maintenance activities.	Very low	Potential to contaminate water/ land.	Very low.

4. Conclusion

This ERA has identified and assessed the potential risks and hazards associated with the operation of the facility and from accidents.

This ERA has shown that potential environmental hazards associated with the development have been identified. The risks assessed and mitigation measures have been taken either through design or clearly defined operation procedures such that the potential consequences arising from these hazards is low or very low, in line with a Datacentre Facility of this size, nature and location

Appendix C – Nature & Heritage Conservation Screening Report

Nature and Heritage Conservation

Screening Report: Bespoke installation

Reference	**EPR/NP3829SP/P003**
NGR	**SU 98700 80300**
Buffer (m)	**1500**
Date report produced	**22/07/25**
Number of maps enclosed	**1**

This nature and heritage conservation report

The nature and heritage conservation sites, protected species and habitats, and other features identified in the table below **must be considered in your application**.

In the further information column, there are links which give more information about the site or feature type and indicate where you are able to self-serve to get the most accurate site boundaries or feature locations.

Most designated site boundaries are available on Magic map. Using Magic map allows you to zoom in and see the site boundary or feature location in detail, Magic map also allows you to measure the distance from these sites and features to your proposed boundary. Help videos are available on Magic map to guide you through.

Where information is not publicly available, or is only available to those with GIS access, we have provided a map at the end of this report.

Sites and Features within screening distance	Screening distance (km)	Further Information
Special Areas of Conservation (cSAC or SAC) **Burnham Beeches** **Windsor Forest & Great Park**	10	Joint Nature Conservation Committee and Magic map
Special Protection Area (pSPA or SPA) **South West London Waterbodies**	10	Joint Nature Conservation Committee and Magic map

Ramsar **South West London Waterbodies**	10	Joint Nature Conservation Committee and Magic map
Sites of Special Scientific Interest (SSSI) **[list from screen]**	2	Natural England and Magic map
National Nature Reserve (NNR) **[list from screen]**	2	Natural England and Magic map
Local Nature Reserve (LNR) **LNR**	2	Natural England and Magic map
Local Wildlife Sites (LWS) (see map below) **Railway Triangle (off Stranraer Gardens)** **Upton Court Park Wetland** **Rowley & Gallions Woods** **Fields south of Rogers Lane** **Queen Mother Reservoir**	2	Appropriate Local Record Centre (LRC)
Ancient Woodland **Upton Wood** **Sumptermead Ait** **Walk Wood**	2	Woodland Trust Forestry Commission Natural England and Magic map

Where protected species are present, a licence may be required from Natural England to handle the species or undertake the proposed works.

The relevant Local Records Centre must be contacted for information on the features within local wildlife sites. A small administration charge may also be incurred for this service.

The following nature and heritage conservation sites, protected species and habitats, and other features have been checked for, where they are relevant for the permit type requested, but have not been found within screening distance of your site unless included in the list above.

Special Areas of Conservation (cSAC or SAC), Special Protection Area (pSPA or SPA), Marine Conservation Zone (MCZ), Ramsar, Sites of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Local Nature Reserve (LNR), Local Wildlife Sites (LWS), Ancient Woodland, relevant species and habitats.

Please note we have screened this application for features for which we have information. It is however your responsibility to comply with all environmental and planning legislation, this information does not imply that no other checks or permissions will be required.

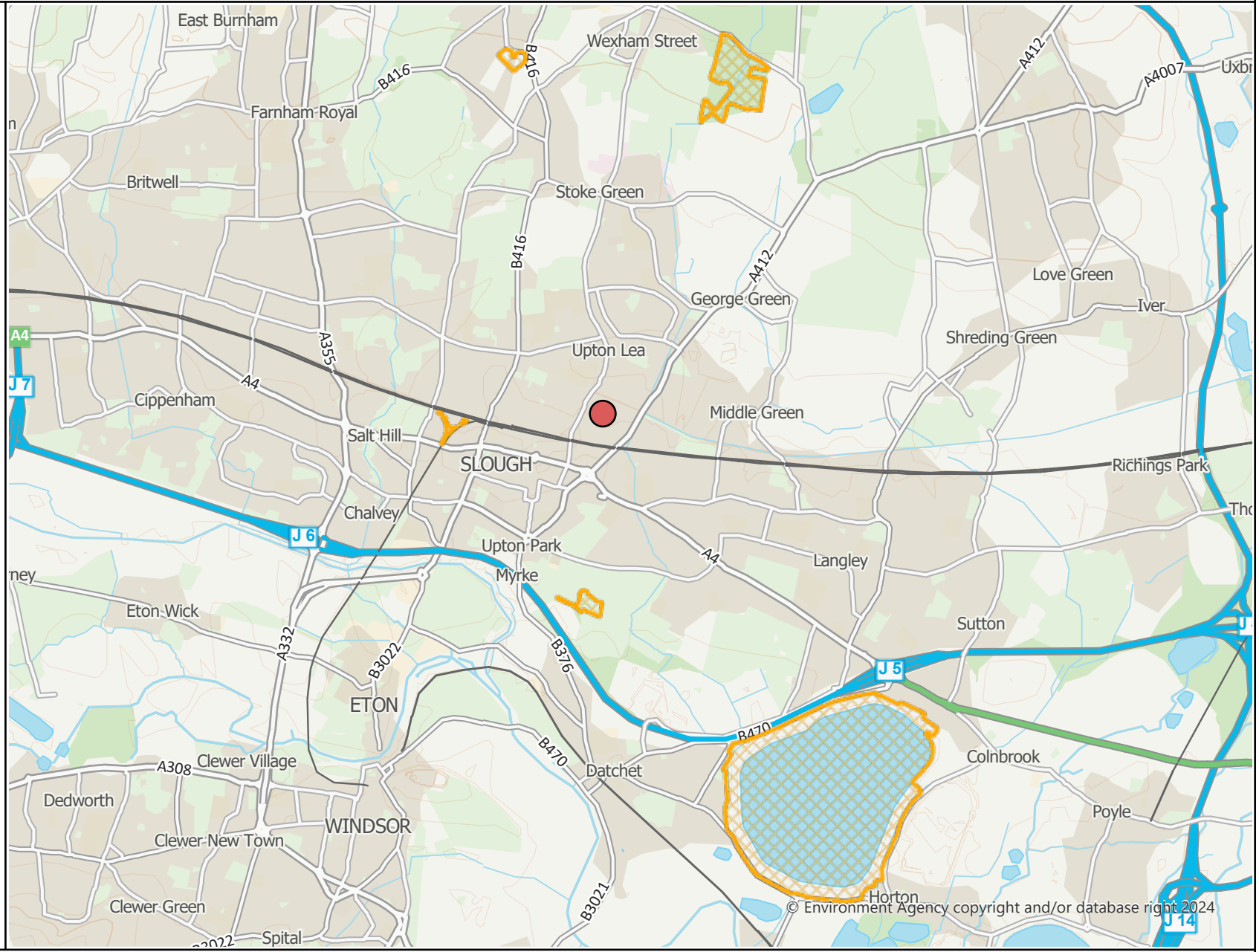
The nature and heritage screening we have conducted as part of this report is subject to change as it is based on data we hold at the time it is generated. We cannot guarantee there will be no changes to our screening data between the date of this report and the submission of the permit application, which could result in the return of an application or requesting further information

Local Wildlife Sites

Environment Agency

Local Wildlife Sites

Local Wildlife Sites



0 5 Kilometer

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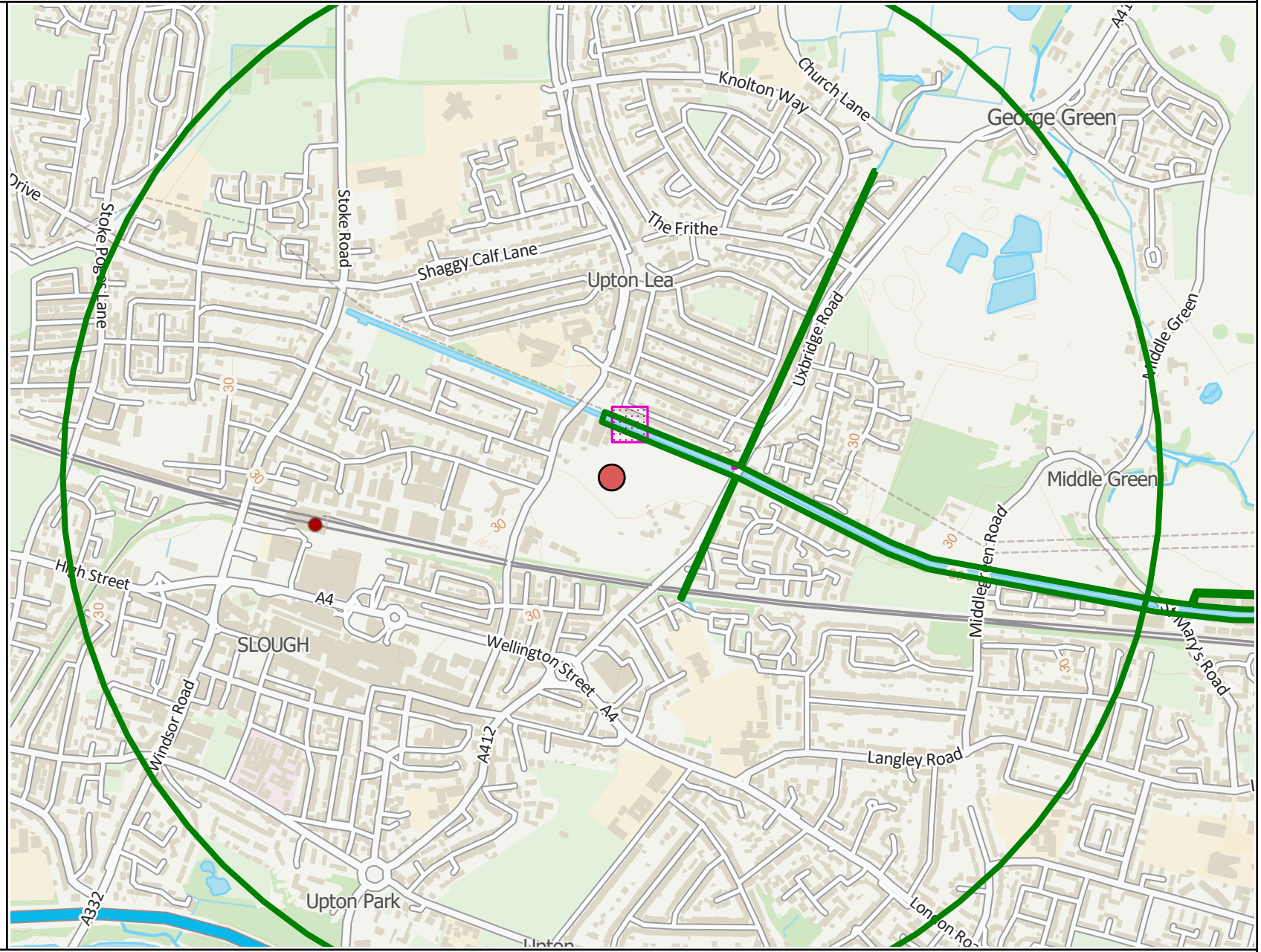
Protected Species

Environment Agency

Protected species, non fish



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Kilometer

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Appendix D - Diesel Generator Specification.

COLLEN SECTION		
Project No & Title:		U011 Yonder LON1X2
Submittal Ref / Description:		LON1X2 – Elec – AVK – DS3300 Generator-Technical Submittal
Revision:		C01
Submittal Issue Date:		14th January 2025
Required Response Date:		24th January 2025
To:	Company: Ampromech, JDA	
	Attention: To Whom it may Concern	
From:	Company: AVK	

☒ **New Submittal** ☐ **Re-Submittal & Revision No:**

Submission Details				
Doc No.	**Description of Item Submitted** (Type, Size, Model Number, Etc.)	**Certification** (CE Cert, Declaration of Performance, Technical Data Sheet, Safety Data Sheet)	**Drawing / Brochure No**	**Status** (A, B, C)
1	DS3300 Generator	EU Declaration of Conformity	LON1X2-AVK-XX-XX-TS-E-0001	
2				
3				
4				

Employers Requirements Specification:

Contractor to confirm compliance with relevant Specifications as listed below:

LON1X2-JDA-XX-XX-SP-E-9057-P03

Contractor to tick relevant box:

☐ YES

☑ NO

If No, Contractor to confirm in detail reason for derogation from Specification:

Refer to Compliance Statement (LON1X2-AVK-XX-XX-TS-E-0002) for clarifications deviations to the specification.

DESIGN TEAM SECTION

Submittal Status:

☐ A. No Comment - Permission to proceed

☐ B. Comments As Noted – Incorporate all comments and proceed

☐ C. Re-Submit – Incorporate all comments and resubmit prior to proceeding

Design Team Comments

Sign off	
Approved by: (Print & Signature)	
On behalf of:	
Date Returned:	

Technical Submittal

LON1X2-AVK-XX-XX-TS-E-0001

Comments & Clarifications on Rev P01

Design Team Comment Raised on Rev P01
BIM model required as part of technical submittals.
AVK Clarification
BIM models have been provided

Design Team Comment Raised on Rev P01
Wiring diagrams required.
AVK Clarification
Please refer to AVK Schematics reference LON1X2-AVK-CZ-XX-DR-E-1001 and LON1X2-AVK-CZ-XX-DR-E-1002.

Design Team Comment Raised on Rev P01
VFC details and quantities required
AVK Clarification
Please refer to AVK Schematics reference LON1X2-AVK-CZ-XX-DR-E-1001 and LON1X2-AVK-CZ-XX-DR-E-1002 for connection details for each generator. With the generator enclosure the following connections are required: - 1. Modbus Connection wired to the Generator Control Panel 2. Modbus Connection wired to the Generator Switchboard. Hardwired Connection from GCP Remote Start Stop Signal wired to the Generator Control Panel. 1. Remote Start = XD100- 34.1 (Gnd), 35.1 (input) 2. Ready For Load = XD100- 53.1 (C), 53.3 (n/o) – N/O status provided by AVK 3. Inhibit = XD100- 55.1 (C), 55.3 (n/o) - N/O status provided by Generator Switchboard local ACB status

Technical Submittal

LON1X2-AVK-XX-XX-TS-E-0001

Comments & Clarifications on Rev P01

Design Team Comment Raised on Rev P01
Will current be limited to sub 4000A given the breaker sizes at the gen and downstream?
AVK Clarification
Yes confirmed. For the site acceptance test the client have confirmed that all load testing and transients will be carried out at 0.8PF using a resistive/reactive load bank terminated to the Generator Loadbank LV switchboard (The generator is de-rated to 2200Kw as engine full load capacity of 2400Kw load at 0.8pf cannot be achieved due to the ACB & busbar rating at 4000A). On completion of the testing the generator is left to align to the building power factor.

Technical Submittal

Generators

1.1 Overview

Supply of 32 no. 3000kVA/2400kW net emissions optimised (NOx) DCC rated, LV diesel generating set. Complete with mechanically driven cooling package and generator mounted controller.
16No. Control Panels on Left Hand side,

16No. Control Panels on Right Hand side,

1.2 Generator

MTU DS3300 diesel generating set with MTU 20V4000G34F NOx turbocharged diesel engine and Leroy Somer LSA53.2 L14 / 4p brushless synchronous alternator.

Generating set sized to support a DCC rated load of 3000kVA/2400kW at 400V, 3-phase, 50Hz, 1500 rev/min, for an unlimited number of operating hours per year with varying load conditions (average load factor < 100%), in accordance with ISO 8528-1 and ISO 3046-1. A 10% overload capacity is available for one hour in twelve.

Generating set designed to performance class G3.

Generating set exceeds ISO8528-5 load step performance G2.

Generating set supplied with:

- Integrated digital automatic voltage regulator (AVR)
- Dual 24V electrical starter motor with battery charging alternator (redundant operation)
- Dual 24V low maintenance lead acid starting batteries
- 24V battery chargers
- Air, fuel and lube oil filters
- Electronic engine management
- Common rail electronic injection system
- Low lube oil pressure protection switch
- High water temperature protection switch
- Low coolant level alarm
- Common skid frame with rubber type anti-vibration pads between engine/alternator and skid to give approximately 80-85% isolation.
- Thermostatically controlled water jacket heater and circulating pump.
- Flanged exhaust bellows
- CE label

See the following appendices for further details:

Appendix 01 – Generator Datasheet

Appendix 02 – Engine Datasheet

Appendix 03 – Alternator Datasheet

1.2.1 Engine

In-line, liquid-cooled, four-stroke MTU 20V4000G34F emissions optimised turbocharged diesel engine. Electronically controlled common rail fuel injection system with low and high-pressure fuel pumps, fuel pressure accumulator, high pressure fuel lines, duplex fuel filter and fuel priming pump for initial system filling and venting.

Forced-feed lubrication system with piston cooling, lube oil circulation pump with safety valve, automatic lube oil make-up system, lube oil multi-stage filter, lube oil heat exchanger, oil filler neck and oil dipstick for measurement on non-running engine and closed crankcase venting system. Hand pump included for manual lube oil extraction.

Thermostatically controlled water jacket heater with coolant circulation pump and coolant thermostat for charge air cooling circuit.

Engine warranted to operate using the fluids and lubricants specified in Appendix 04 – MTU Fluids and Lubricants.

See the following appendices for further details:

Appendix 02 – Engine Datasheet

Appendix 04 – MTU Fluids and Lubricants

Appendix 05 – Emissions Datasheet

Appendix 10 – HVO Confirmation Letter

1.2.2 Alternator

Leroy Somer LSA 53.2 L14 / 4p brushless self-excited, self-regulating, double bearing, IP23 drip proof, class H alternator sized to support a DCC rated load of 3000kVA/2400kW at 400V, 3-phase, 50Hz, 1500 rev/min, for an unlimited number of operating hours per year with varying load conditions (average load factor < 100%), in accordance with ISO 8528-1 and ISO 3046-1. A 10% overload capacity is available for one hour in twelve.

Integrated digital type automatic voltage regulator (AVR) included to maintain alternator output voltage of 400V ±5% from no load to full load, unity to 0.8 lagging power factor, 3-phase, 50 Hz, 400V, 1500 rev/min and a total harmonic distortion (THD) of < 3.5%.

Excitation based upon PMG

See the following appendices for further details:

Appendix 03 – Alternator Datasheet

Appendix 06 – AVR Datasheet

1.2.3 Radiator

The generating set is supplied with a set mounted two-circuit type radiator assembly complete with expansion tank & cap and mechanically driven cooling fan.

Specifications:

Cooling ambient design - 40°C

Radiator Airflow - 48.35m^3/s

Engine coolant capacity - 205 litres (+/- 10%)

Intercooler coolant capacity - 50 litres

Coolant Type - Glycol-Ethylene 35/65

Thermostat - 79-92°C

1.2.4 Starting System

The generating set starting system comprises:

24V 15kW electrical starter motor and redundant starter motor

24V dual set low maintenance lead acid starting batteries (each sized for maximum 3 x genset starting attempts, 6 total crank cycles of 10 seconds with redundant operation)

Battery charging alternator

Dual battery chargers fed from auxiliary supply

See the following appendices for further details:

Appendix 07 – Battery Datasheet

1.2.5 Earthing

Earthing points are provided on the generator base frame.

1.2.6 Generator Controller

The generating sets are controlled via ComAp IntelliSys controllers located within the generator control panel mounted on the bedframe of the generator set. The ComAp controller provides individual set control and monitoring. The control panel is fed from the 24V DC battery backed generator supply and is operated with an 8-inch ergonomic touch screen.

The ComAp control panel provides:

- Control of the genset in both automatic and manual mode
- Testing of the generating set both on/off load
- Display of genset measurement values (electrical and mechanical)
- Status of generating set (both current and historical)
- Time-stamped event display with log for up to defined amount of events
- Adjustment of genset parameters with appropriate user level (i.e. timer settings)
- Automatic cooldown periods with user defined time settings
- Engine oil pressure
- Engine water temperature
- Engine oil temperature
- Engine speed
- Hours run
- Number of start attempts
- Battery voltage

Event-based history (up to 1000 records) with customer-selectable list of stored values; RTC; statistic values. See the following appendices for further details:

Appendix 08 – ComAp Datasheet

Appendix 09 – ComAp HMI Datasheet

2.0 – Interfaces and Dependencies Schedule

Auxiliary Supply Required	Detail	Quantity Required	Provided By	Final Connection By
1 x 100A TP+N 400V AC supply	Maintained Generator Auxiliary Supply	1 per generating set	Others	Others
1 x 32A TP+N 400V AC	Generator Control System	1 per generating set	AVK	AVK
	Battery Charger 1 – 10A			
	Battery Charger 2 – 10A			
	Jacket Water Heater – 20A			
	Anti-Condensation Heater – 10A			
	Internal Socket – 13A			
1 x 32A SP+N 230V AC	Container sockets	1 per container	AVK	AVK
1 x 6A SP+N 230V AC	Internal Container lights	1 per container	AVK	AVK
1 x 6A SP+N 230V AC	External Container lights	1 per container	AVK	AVK
1 x 6A SP+N 230V AC	Container tubular heater	1 per container	AVK	AVK
1 x 6A SP+N 230V AC	Fuel Polisher	1 per container	AVK	AVK
High Level Interface	Generator alarm monitoring (Modbus)	1 per generating set	Others	Others
Low Level Interface	Generator alarm monitoring (VFC's)	TBC	Others	Others

3.0 – Appendices

Item	Document Name
01	Generator Datasheet
02	Engine Datasheet
03	Alternator Datasheet
04	MTU Fluids and Lubricants
05	Emissions Datasheet & Letter & Emissions Statement
06	AVR Datasheet
07	Battery Datasheet
08	ComAp Datasheet
09	ComAp HMI Datasheet
10	HVO Confirmation Letter

Appendix 01 - Generator Datasheet

Diesel Generator Set

mtu 20V4000 DS3300

380V – 11 kV/50 Hz/data center continuous power/ NOx emission optimized/20V4000G34F/water charge air cooling

*Project Specific Datasheet LON1X2 Build C

Optional equipment and finishing shown. Standard may vary.

Product highlights

Benefits
- Low fuel consumption
- Optimized system integration ability
- High reliability
- High availability of power
- Long maintenance intervals

Support
- Global product support offered

Standards
- Engine-generator set is designed and manufactured in facilities certified to standards ISO 2008:9001 and ISO 2004:14001
- Generator set complies to ISO 8528
- Generator meets NEMA MG1, BS 5000, ISO, DIN EN and IEC standards
- NFPA 110

Power rating
- System ratings: 3020 kVA - 3130 kVA
- Accepts rated load in one step per NFPA 110*
- Generator set complies to G3 according to ISO 8528-5
- Generator set exceeds load steps according to ISO 8528-5*

Performance assurance certification (PAC)
- Engine-generator set tested to ISO 8528-5 for transient response
- 100% load factor
- Verified product design, quality and performance integrity
- All engine systems are prototype and factory tested

Complete range of accessories available
- Control panel
- Power panel
- Circuit breaker/power distribution
- Fuel system
- Fuel connections with shut-off valve mounted to base frame
- Starting/charging system
- Exhaust system
- Mechanical and electrical driven radiators
- Medium and oversized voltage alternators

Emissions
- NOx emission optimized

Certifications
- CE certification option
- Unit certificate acc. to VDE-AR-N 4110

* Changes to the standard parameter sets (alternator-regulator and genset-controller) are necessary

A Rolls-Royce solution

Application data [1)]

Engine	
Manufacturer	*mtu*
Model	20V4000G34F
Type	4-cycle
Arrangement	20V
Displacement: l	95.4
Bore: mm	170
Stroke: mm	210
Compression ratio	16.4
Rated speed: rpm	1500
Engine governor	ECU 9
Max power: kWm	2590
Air cleaner	dry

Fuel system	
Maximum fuel lift: m	5
Total fuel flow: l/min	27

Fuel consumption [2)]	l/hr	g/kwh
At 100% of power rating:	689.6	221
At 75% of power rating:	510.2	218
At 50% of power rating:	335.5	215

Liquid capacity (lubrication)	
Total oil system capacity: l	390
Engine jacket water capacity: l	205
Intercooler coolant capacity: l	50

Combustion air requirements	
Combustion air volume: m^3/s	3.7
Max. air intake restriction: mbar	50

Cooling/radiator system	
Coolant flow rate (HT circuit): m^3/hr	80
Coolant flow rate (LT circuit): m^3/rh	32.5
Heat rejection to coolant: kW	1100
Heat radiated to charge air cooling: kW	660
Heat radiated to ambient: kW	105
Fan power for electr. radiator (40°C): kW	70

Exhaust system	
Exhaust gas temp. (after turbocharger): °C	535
Exhaust gas volume: m^3/s	10.3
Maximum allowable back pressure: mbar	85
Minimum allowable back pressure: mbar	30

Standard and optional features

System ratings (kW/kVA)

Generator model	Voltage	NOx emission optimized					
		without radiator			with mechanical radiator		
		kWel	kVA*	AMPS	kWel	kVA*	AMPS
~~Leroy Somer LSA53.2 M12 (Low voltage Leroy Somer standard)~~	~~380 V~~	~~2488~~	~~3110~~	~~4725~~	~~2424~~	~~3030~~	~~4604~~
	~~400 V~~	~~2488~~	~~3110~~	~~4489~~	~~2424~~	~~3030~~	~~4373~~
	~~415 V~~	~~2488~~	~~3110~~	~~4327~~	~~2424~~	~~3030~~	~~4215~~
~~Marathon 1030FDL7094 (Low voltage Marathon)~~	~~380 V~~	~~2496~~	~~3120~~	~~4740~~	~~2416~~	~~3020~~	~~4588~~
	~~400 V~~	~~2488~~	~~3110~~	~~4489~~	~~2416~~	~~3020~~	~~4359~~
	~~415 V~~	~~2488~~	~~3110~~	~~4327~~	~~2416~~	~~3020~~	~~4201~~
~~Marathon 1040FDH7102 (Medium volt. marathon)~~	~~11 kV~~	~~2496~~	~~3120~~	~~164~~	~~2416~~	~~3020~~	~~159~~
~~Leroy Somer LSA54.2 XL11 (Med. volt. Leroy Somer)~~	~~11 kV~~	~~2504~~	~~3130~~	~~164~~	~~2424~~	~~3030~~	~~159~~

* cos phi = 0.8

Leroy Somer LSA53.2 L14 (12% volt. Leroy Somer)	400V	2488	3110	4489	2424	3030	4373

1 All data refers only to the engine and is based on ISO standard conditions (25°C and 100m above sea level).

2 Values referenced are in accordance with ISO 3046-1. Conversion calculated with fuel density of 0.83 g/ml. All fuel consumption values refer to rated engine power.

Standard and optional features

Engine

- ■ 4-cycle
- ■ Standard single stage air filter
- ■ Oil drain extension & shut-off valve
- ■ Closed crankcase ventilation improved oil seperator
- ■ Governor-electronic isochronous
- ■ Common rail fuel injection
- ■ NOx emission optimized engine
- ■ Centrifugal oil filter

Generator

- ■ 4 pole three-phase synchronous generator
- ■ Brushless, self-excited, self-regulating, self-ventilated
- ■ Digital voltage regulator
- ■ Anti condensation heater
- ■ Stator winding Y-connected, accessible neutral (brought out)
- ■ Protection IP23
- ■ Insulation class H, utilization acc. to H
- ■ Radio suppression EN 55011, group 1, cl. B
- ■ Short circuit capability 3xIn for 10sec
- ■ Winding and bearing RTDs (without monitoring)
- ■ Excitation by AREP
- ■ Mounting of CT´s: 2 core CT´s
- ■ Winding pitch: 2/3 winding
- ■ Voltage setpoint adjustment ± 10%
- ■ Meets NEMA MG-1, BS 5000, IEC 60034-1, VDE 0530, DIN EN 12601, AS 1359 and ISO 8528-3 requirements
- ■ Leroy Somer low voltage generator
- □ Marathon low voltage generator
- □ Oversized generator
- □ Medium voltage generator

Cooling system

- ■ Jacket water pump
- ■ Thermostat(s)
- ■ Water charge air cooling
- □ Mechanical radiator
- □ Electrical driven front-end cooler
- □ Jacket water heater

Control panel

- ■ Unit cabling with coded plugs for easy connection of customer-specific controls (V0)
- □ Pre-wired control cabinet for easy application of customized controller (V1+)
- □ Island operation (V2)
- □ Automatic mains failure operation with ATS (V3a)
- □ Automatic mains failure operation incl. control of generator and mains breaker (V3b)
- □ Island parallel operation of multiple gensets (V4)
- □ Automatic mains failure operation with short (< 10s) mains parallel overlap synchronization (V5)
- □ Mains parallel operation of a single genset (V6)
- □ Mains parallel operation of multiple gensets (V7)
- □ Basler controller
- □ Deif controller
- □ Complete system metering
- ■ Digital metering
- ■ Engine parameters
- ■ Generator protection functions
- ■ Engine protection
- ■ SAE J1939 engine ECU communications
- ■ Parametrization software
- ■ Multilingual capability
- ■ Multiple programmable contact inputs
- ■ Multiple contact outputs
- ■ Event recording
- □ IP 54 front panel rating with integrated gasket
- □ Different expansion modules
- □ Remote annunciator
- □ Daytank control
- □ Generator winding temperature monitoring
- □ Generator bearing temperature monitoring
- □ Modbus TCP-IP

Connectivity

The engine system automatically collects and transfers engine data to the manufacturer from time to time. The data is used by the manufacturer for the purposes of product development and improvement as well as service optimization. Users can log in or register via https://mtu-go.com and also gain insight into the data.

■ Represents standard features
□ Represents optional features

Standard and optional features

Power panel

- ☐ Supply electrical driven radiator from 45kW – 75kW

Circuit breaker/power distribution

- ☐ 3-pole circuit breaker
- ☐ 4-pole circuit breaker
- ☐ Electrical-actuated circuit breaker
- ☐ Base frame mounted GCB, pre-wired with generator, ready for commissioning

Fuel system

- ■ Flexible fuel connectors mounted to base frame
- ☐ Fuel filter with water separator
- ☐ Fuel filter with water separator heavy-duty
- ☐ Switchable fuel filter with water separator
- ☐ Switchable fuel filter with water separator heavy-duty
- ☐ Seperate fuel cooler
- ☐ Fuel cooler integrated into cooling equipment

Starting/charging system

- ■ 24V starter
- ☐ Redundant starting system
- ☐ Starter batteries, cables, rack, disconnect switch (lockable)
- ☐ Battery charger
- ☐ Alternator

Mounting system

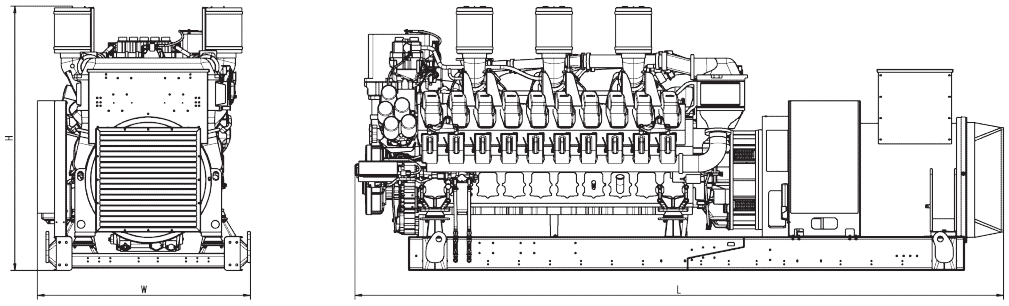
- ■ Welded base frame
- ■ Resilient engine and generator mounting
- ■ Modular base frame design
- ☐ Base frame mounting on foundation/base plate with using clamping brackets

Exhaust system

- ☐ Exhaust bellows with connection flange
- ☐ Exhaust silencer with 10 dB(A) sound attenuation
- ☐ Exhaust silencer with 30 dB(A) sound attenuation
- ☐ Exhaust silencer with 40 dB(A) sound attenuation
- ☐ Y-connection-pipe

■ Represents standard features
☐ Represents optional features

Weights and dimensions



Drawing above for illustration purposes only, based on a standard open power 400 Volt engine-generator set. Lengths may vary with other voltages. Do not use for installation design. See website for unit specific template drawings.

System	Dimensions (LxWxH)	Weight (dry/less tank)
Open power unit (OPU)	5760 x 1887 x 2332 mm	15819 kg

Weights and dimensions are based on open power units and are estimates only. Consult the factory for accurate weights and dimensions for your specific engine-generator set.

Sound data

— Consult your local ***mtu*** distributor for sound data.

Emissions data

— Consult your local ***mtu*** distributor for emissions data.

Rating definitions and conditions

— Data center continuous power ratings (DCP) apply to data center installations where a reliable utility power is available and comply with Uptime Institute Tier III and IV requirements. At constant or varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO 8528-1, ISO 3046-1, BS 5514 and AS 2789. Average load factor: ≤ 100%.
— Consult your local ***mtu*** distributor for derating information.

Subject to change. | 3238931 | Edition 01/22 | BMC 2021-12.

Appendix 02 - Engine Datasheet

Technical Sales Document

- Product Data -

A Rolls-Royce solution

Name	20V4000G34F	**Speed [rpm]**	1500
Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

Reference conditions

No.	Description	Index	Value	Unit
6	Intake air temperature		25	°C
7	Charge-air coolant temperature		55	°C
8	Barometric pressure		1000	mbar
9	Site altitude above sea level		100	m
10	Raw-water inlet temperature		-	°C

[BL] **Reference value: fuel stop power**
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Engine power that can be run continuously under standard conditions

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		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

0. Data-relevant engine design configuration

No.	Description	Index	Value	Unit
12	Engine with sequential turbocharging (turbochargers with cut-in/cut-out control)		-	-
13	Engine without sequential turbocharging (turbochargers without cut-in/cut-out control)		X	-

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

1. Power-related data

No.	Description	Index	Value	Unit
1	Engine rated speed	A	1500	rpm
2	Reduction gear - Output speed	A	-	rpm
3	Mean piston speed		10.5	m/s
4	Continuous power ISO 3046 (10% overload capability) (design power DIN 6280, ISO 8528)	A	2590	kW
5	Fuel stop power ISO 3046	A	2849	kW
8	Mean effective pressure (MEP) (Continuous power ISO 3046)		21.7	bar
9	Mean effective pressure (MEP) (Fuel stop power ISO 3046)		23.9	bar
18	Performance map No.		-	-
38	Performance map No. (cont.)		-	-
20	Performance map, amendment index		-	-

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		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

2. General Conditions (for maximum power)

No.	Description	Index	Value	Unit
46	Individual power calculation (ESCM) required for maximum power		X	-
1	Intake air depression (new filter)	A	15	mbar
2	Intake air depression, max.	L	50	mbar
51	Exhaust overpressure (total pressure against atmosphere)	A	30	mbar
52	Exhaust overpressure, max. (total pressure against atmosphere)	L	85	mbar
5	Fuel temperature at fuel feed connection	R	25	°C
9	Fuel temperature at fuel feed connection, max. (w/o power reduction)	L	55	°C
10	Fuel temperature at fuel feed connection, max.	L	55	°C
18	Fuel temperature at fuel feed connection, min.	L	-	°C

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		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

3. Consumption

No.	Description	Index	Value	Unit
17	Specific fuel consumption (be) - 100 % CP (+ 5 %; EN 590; 42.8 MJ/kg)	R	221	g/kWh
18	Specific fuel consumption (be) - 75 % CP (+ 5 %; EN 590; 42.8 MJ/kg)	R	218	g/kWh
19	Specific fuel consumption (be) - 50 % CP (+ 5 %; EN 590; 42.8 MJ/kg)	R	215	g/kWh
20	Specific fuel consumption (be) - 25 % CP (+ 5 %; EN 590; 42.8 MJ/kg)	R	225	g/kWh
21	Specific fuel consumption (be) - FSP (+ 5 %; EN 590; 42.8 MJ/kg)	R	209	g/kWh
56	Specific fuel consumption (be) - 100 % FSP (+ 5 %; EN 590; 42.8 MJ/kg)	R	-	g/kWh
57	Specific fuel consumption (be) - 75 % FSP (+ 5 %; EN 590; 42.8 MJ/kg)	R	-	g/kWh
58	Specific fuel consumption (be) - 50 % FSP (+ 5 %; EN 590; 42.8 MJ/kg)	R	-	g/kWh
59	Specific fuel consumption (be) - 25 % FSP (+ 5 %; EN 590; 42.8 MJ/kg)	R	-	g/kWh
73	No-load fuel consumption	R	38	kg/h
92	Lube oil consumption after 100 h of operation (B = fuel consumption per hour) Guideline value does not apply for the design of EGAT systems. Please consult the Applications Center with regard to the layout of EGA systems.	R	0.3	% of B
62	Lube oil consumption after 100 h of operation, max. (B = fuel consumption per hour)	L	1.0	% of B

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

4. Model-related data (basic design)

No.	Description	Index	Value	Unit
1	Naturally aspirated engine		-	-
2	Engine with exhaust turbocharger (ETC)		-	-
3	Engine with exhaust turbocharger (ETC) and intercooler		X	-
4	Exhaust piping, non-cooled		X	-
5	Exhaust piping, liquid-cooled		-	-
33	Working method: four-cycle, diesel, single-acting		X	-
34	Combustion method: direct injection		X	-
36	Cooling system: conditioned water		X	-
37	Direction of rotation: c.c.w. (facing driving end)		X	-
6	Number of cylinders		20	-
7	Cylinder configuration: V angle		90	degrees (°)
8	Cylinder configuration: in-line vertical		-	-
10	Bore		170	mm
11	Stroke		210	mm
12	Displacement, cylinder		4.77	liter
13	Displacement, total		95.4	liter
14	Compression ratio		16.4	-
40	Cylinder heads: single-cylinder		X	-
41	Cylinder liners: wet, replaceable		X	-
42	Piston design: composite piston		-	-
49	Piston design: solid-skirt piston		X	-
21	Number of piston compression rings		2	-
22	Number of piston oil control rings		1	-

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

24	Number of inlet valves, per cylinder		2	-
25	Number of exhaust valves, per cylinder		2	-
15	Number of turbochargers		6	-
16	Number of L.P. turbochargers		6	-
17	Number of H.P. turbochargers		-	-
18	Number of intercoolers		1	-
19	Number of L.P. intercoolers		1	-
20	Number of H.P. intercoolers		-	-
28	Standard flywheel housing flange (engine main PTO)		00	SAE
50	Static bending moment at standard flywheel housing flange, max.	L	15	kNm
51	Dynamic bending moment at standard flywheel housing flange, max.	L	75	kNm
29	Standard flywheel housing flange (reduction gearbox main PTO)		-	SAE
43	Flywheel interface (DISC)		21	-

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

5. Combustion air / exhaust gas

No.	Description	Index	Value	Unit
8	Charge-air pressure before cylinder - CP	R	3.6	bar abs
27	Charge-air pressure before cylinder - FSP	R	3.6	bar abs
9	Combustion air volume flow - CP	R	3.7	m³/s
10	Combustion air volume flow - FSP	R	3.6	m³/s
11	Exhaust volume flow (at exhaust temperature) - CP	R	10.3	m³/s
12	Exhaust volume flow (at exhaust temperature) - FSP	R	10.3	m³/s
13	Exhaust temperature before turbocharger - CP	R	725	°C
14	Exhaust temperature before turbocharger - FSP	R	730	°C
15	Exhaust temperature after turbocharger - CP	R	535	°C
16	Exhaust temperature after turbocharger - FSP	R	540	°C
17	Exhaust temperature after engine - CP	R	515	°C
18	Exhaust temperature after engine - FSP	R	515	°C

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

6. Heat dissipation

No.	Description	Index	Value	Unit
10	Heat dissipated by engine coolant - FSP with oil heat	R	-	kW
12	Heat dissipation by engine coolant - FSP with oil heat, with charge-air heat	R	-	kW
62	Heat dissipated by engine coolant - FSP (high-temperature circuit)	R	-	kW
63	Heat dissipated by engine coolant - FSP (low-temperature circuit)	R	-	kW
14	Heat dissipated by engine coolant - FSP without oil heat, with charge-air heat	R	-	kW
15	Heat dissipated by engine coolant - CP with oil heat, without charge-air heat	R	1100	kW
16	Heat dissipated by engine coolant - FSP with oil heat, without charge-air heat	R	1130	kW
18	Heat dissipated by engine coolant - FSP without oil heat, without charge-air heat	R	-	kW
23	Heat dissipated by oil - FSP	R	-	kW
26	Charge-air heat dissipation - CP	R	660	kW
27	Charge-air heat dissipation - FSP	R	670	kW
39	Heat dissipated by exhaust gas - FSP	R	-	kW
31	Heat dissipated by return fuel flow - CP	R	7.5	kW
32	Heat dissipated by return fuel flow - FSP	R	-	kW
33	Radiation and convection heat, engine - CP	R	105	kW
34	Radiation and convection heat, engine - FSP	R	-	kW
36	Radiation and convection heat, genset - FSP (engine + generator + 10m insulated exhaust pipework)	R	-	kW

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7. Coolant system (high-temperature circuit)

No.	Description	Index	Value	Unit
9	Coolant temperature (at engine outlet to cooling equipment; with max. 40% antifreeze)	A	-	°C
17	Coolant temperature (at engine outlet to cooling equipment)	A	100	°C
57	Coolant temperature differential after/before engine, from	R	9	K
58	Coolant temperature differential after/before engine, to	R	11	K
23	Coolant temperature differential after/before engine	L	13	K
20	Coolant temperature after engine, limit 1	L	102	°C
21	Coolant temperature after engine, limit 2	L	104	°C
25	Coolant antifreeze content, max.	L	50	%
30	Cooling equipment: coolant flow rate	A	80	m³/h
31	Coolant pump: pressure differential	R	2.3	bar
35	Coolant pump: inlet pressure, min.	L	0.5	bar
36	Coolant pump: inlet pressure, max.	L	2.5	bar
39	Engine: coolant pressure differential with thermostat	R	1.7	bar
41	Pressure loss in off-engine cooling system, max.	L	0.7	bar
72	Pressure loss in off-engine cooling system, min.	L	0.55	bar
43	Pressure loss in off-engine cooling system, max. without thermostat	L	0.7	bar
70	Pressure loss in off-engine cooling system, min. without thermostat	L	0.55	bar
47	Breather valve (expansion tank) opening pressure (excess pressure)	R	1.0	bar
54	Cooling equipment: height above engine, max.	L	15	m

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Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

53	Cooling equipment: operating pressure	A	2.5	bar
73	Coolant level in expansion tank, below min. alarm	L	-	-
74	Coolant level in expansion tank, below min. shutdown	L	X	-
50	Thermostat, starts to open	R	79	°C
51	Thermostat, bypass closed	R	92	°C
52	Thermostat, fully open	R	92	°C
48	Breather valve (expansion tank) opening pressure (depression)	R	-0.1	bar
49	Pressure in cooling system, max.	L	5.0	bar

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Engine power that can be run continuously under standard conditions

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Technical Sales Document

- Product Data -

A Rolls-Royce solution

Name	20V4000G34F	**Speed [rpm]**	1500
Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

8. Coolant system (low-temperature circuit)

No.	Description	Index	Value	Unit
53	Coolant temperature (at engine outlet to cooling equipment)	R	75	°C
9	Coolant temperature before intercooler (at engine inlet from cooling equipment)	A	55	°C
14	Coolant temperature before intercooler, limit 1	L	75	°C
61	Coolant temperature before intercooler, shutdown	L	-	°C
15	Coolant temperature before intercooler, limit 2	L	-	°C
54	Coolant temperature differential after/before intercooler, min.	L	13	K
55	Coolant temperature differential after/before intercooler, max.	L	17	K
13	Coolant antifreeze content, max.	L	50	%
17	Charge-air temperature after intercooler, max.	L	80	°C
76	Temperature differential between intake air and charge-air coolant before intercooler	A	30	K
75	Temperature differential between intake air and charge-air coolant before intercooler, max.	L	32	K
56	Coolant pump: flow rate	A	32.5	m³/h
18	Coolant pump: flow rate (± 5 %)	R	32.5	m³/h
20	Cooling equipment: coolant flow rate	A	32.5	m³/h
21	Intercooler: coolant flow rate	R	32.5	m³/h
22	Coolant pump: pressure differential	R	1.7	bar
24	Coolant pump: inlet pressure, min.	L	0.5	bar
25	Coolant pump: inlet pressure, max.	L	2.5	bar
29	Pressure loss in off-engine cooling system, max.	L	0.7	bar
62	Pressure loss in off-engine cooling system, min.	L	0.55	bar

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

31	Pressure loss in off-engine cooling system, max. without thermostat	L	0.7	bar
63	Pressure loss in off-engine cooling system, min. without thermostat	L	0.55	bar
43	Cooling equipment: height above engine, max.	L	15	m
36	Breather valve (expansion tank) opening pressure (excess pressure)	R	1.0	bar
37	Breather valve (expansion tank) opening pressure (depression)	R	-0.1	bar
42	Cooling equipment: operating pressure	A	2.5	bar
67	Coolant level in expansion tank, below min. alarm	L	-	-
68	Coolant level in expansion tank, below min. shutdown	L	X	-
39	Thermostat, starts to open	R	38	°C
40	Thermostat, bypass closed	R	51	°C
41	Thermostat, fully open	R	51	°C

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Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

10. Lube oil system

No.	Description	Index	Value	Unit
1	Lube oil operating temp. before engine, from	R	88	°C
2	Lube oil operating temp. before engine, to	R	98	°C
3	Lube oil operating temp. after engine, from	R	98	°C
4	Lube oil operating temp. after engine, to	R	108	°C
5	Lube oil temperature before engine, limit 1	L	99	°C
6	Lube oil temperature before engine, limit 2	L	101	°C
7	Lube oil operating pressure before engine (measuring block)	R	5.2	bar
8	Lube oil operating press. bef. engine, from	R	4.5	bar
9	Lube oil operating press. bef. engine, to	R	7.3	bar
10	Lube oil pressure before engine, alarm	L	-	bar
33	Lube oil pressure before engine, limit 1(speed-related value, consult Rolls-Royce Solutions GmbH)	L	3.5	bar
11	Lube oil pressure before engine, shutdown	L	-	bar
34	Lube oil pressure before engine, limit 2 (speed-related value, consult Rolls-Royce Solutions GmbH)	L	3.2	bar
17	Lube oil pump(s): oil flow, total	R	835	liter/min
19	Lube oil fine filter (main circuit): number of units		1	-
20	Lube oil fine filter (main circuit): number of elements per unit		5	-
21	Lube oil fine filter (main circuit): particle retention	R	0.014	mm
32	Lube oil fine filter (main circuit): pressure differential, max.	L	1.5	bar
35	Lube oil fine filter (main circuit): make (standard): MANN & HUMMEL		X	-

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

11. Fuel system

No.	Description	Index	Value	Unit
1	Fuel pressure at engine fuel feed connection, min. (when engine is starting)	L	-0.1	bar
2	Fuel pressure at engine fuel feed connection, max. (when engine is starting)	L	1.5	bar
65	Fuel pressure at engine fuel feed connection, max. (when engine is running)	L	0.5	bar
4211	Max. fuel supply volume Normal mode	A	20.1	liter/min
4212	Fuel supply volume, max. Fault mode	A	22.6	liter/min
4	Fuel pressure before injection pump, from (high-pressure pump)	R	6.0	bar
5	Fuel pressure before injection pump, to (high-pressure pump)	R	11.0	bar
6	Fuel pressure before injection pump, min. (high-pressure pump)	L	5.0	bar
7	Fuel pressure before injection pump with engine not running, max. (high-pressure pump)	L	1.5	bar
4213	Max. fuel return volume Normal mode	A	5.5	liter/min
4214	Fuel return volume, max. Fault mode	A	21.8	liter/min
10	Fuel pressure at return connection on engine, max.	L	0.5	bar
12	Fuel temperature differential before/after engine	R	30	K
38	Fuel temperature after high-pressure pump, alarm	L	100	°C
15	Fuel prefilter: number of units	A	-	-
16	Fuel prefilter: number of elements per unit	A	-	-
17	Fuel prefilter: particle retention	A	-	mm
29	Fuel prefilter: make (standard): MANN & HUMMEL		-	-

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Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

18	Fuel fine filter (main circuit): number of units	A	1	-
19	Fuel fine filter (main circuit): number of elements per unit	A	1	-
20	Fuel fine filter (main circuit): particle retention	A	0.005	mm
21	Fuel fine filter (main circuit): pressure differential, max.	L	1.0	bar
32	Fuel fine filter (main circuit): make (standard): MANN & HUMMEL		X	-

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
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Exhaust Regulations NOx emission optimized ;

12. General operating data

No.	Description	Index	Value	Unit
1	Cold start capability: air temperature (w/o starting aid, w/o preheating) - (case A)	R	10	°C
2	Additional condition (to case A): engine coolant temperature	R	10	°C
3	Additional condition (to case A): lube oil temperature	R	10	°C
4	Additional condition (to case A): lube oil viscosity	R	15W40	SAE
9	Cold start capability: air temperature (w/o starting aid, w/ preheating) - (case C)	R	0	°C
10	Additional condition (to case C): engine coolant temperature	R	40	°C
11	Additional condition (to case C): lube oil temperature	R	-10	°C
12	Additional condition (to case C): lube oil viscosity	R	15W40	SAE
21	Coolant preheating, heater performance (standard)	R	9	kW
22	Coolant preheating, preheating temperature, min.	L	32	°C
3506	Coolant preheating, preheating temperature, max.	L	55	°C
23	Lube oil priming pump: flow rate	R	N	liter/min
24	Lube oil priming pump: pressure	R	N	bar
25	Lube oil priming pump: rated power	R	N	kW
26	Lube oil priming pump: cut-in interval pump cut-in every ... minutes	R	N	min
27	Lube oil priming pump: cut-in duration	R	N	min
28	Breakaway torque (without driven machinery) coolant temperature +5°C	R	2600	Nm
30	Breakaway torque (without driven machinery) coolant temperature +40°C	R	2200	Nm
29	Cranking torque at firing speed (without driven machinery) coolant temperature +5°C	R	1400	Nm

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
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Exhaust Regulations NOx emission optimized ;

31	Cranking torque at firing speed (without driven machinery) coolant temperature +40°C	R	1100	Nm
96	Starting is blocked if the engine coolant temperature is below		0	°C
92	Run-up period to rated speed (without driven machinery)	R	N	s
93	Run-up period to rated speed (with driven machinery) (* at general conditions)	R	N	s
37	High idling speed, max. (static)	L	1700	rpm
38	Limit speed for overspeed alarm / emergency shutdown	L	1950	rpm
39	Limit speed for overspeed alarm	L	1950	rpm
42	Firing speed, from	R	80	rpm
43	Firing speed, to	R	120	rpm
44	Engine coolant temperature before starting full-load operation, recommended min. (for emergency/standby sets with coolant preheating the minimum preheating temperature referred to extended property No.22 is sufficient)	R	60	°C
3515	Minimum continuous load (operation > 10h)	R	30	kW/cyl
49	Extended low or no-load operation possible (consultation required)		X	-
50	Engine mass moment of inertia (without flywheel)	R	24.6	kgm²
52	Standard flywheel mass moment of inertia	R	10.2	kgm²
51	Engine mass moment of inertia (with standard flywheel)	R	34.8	kgm²
69	Speed droop (with electronic governor) adjustable, from	R	0	%
70	Speed droop (with electronic governor) adjustable, to	R	7	%
95	Number of starter ring-gear teeth on engine flywheel		182	-

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

13. Starting (electric)

No.	Description	Index	Value	Unit
2309	Manufacturer		Delco	-
4101	Type		50MT	-
2310	Number of starter		2	-
2312	Starter electrically redundant		-	-
2313	Rated power per starter	R	9	kW
2314	Starter, rated voltage	R	24	VDC
2315	Rated short-circuit current per starter	L	1900	A
2316	Power consumption per starter (at an engine speed of 100 rpm)	R	580	A
2317	Internal resistance of power supply + line resistance per starter	A	0.008	Ω
2318	Manufacturer		Bosch	-
4118	Type		HEP	-
2319	Number of starter		2	-
2320	Starter electrically redundant		-	-
2321	Rated power per starter	R	11.3	kW
2322	Starter, rated voltage	R	24	VDC
2323	Rated short-circuit current per starter	L	2190	A
2324	Power consumption per starter (at an engine speed of 100 rpm)	R	750	A
2325	Internal resistance of power supply + line resistance per starter	A	0.0047	Ω
2326	Manufacturer		Prestolite	-
4119	Type		S-152	-
2327	Number of starter		1	-
2328	Starter electrically redundant		-	-

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

2329	Rated power per starter	R	15	kW
2330	Starter, rated voltage	R	24	VDC
2331	Rated short-circuit current per starter	L	3000	A
2332	Power consumption per starter (at an engine speed of 100 rpm)	R	1400	A
2333	Internal resistance of power supply + line resistance per starter	A	0.0049	Ω
2334	Manufacturer		Prestolite	-
4120	Type		S-152	-
2335	Number of starter		2	-
2336	Starter electrically redundant		X	-
2337	Rated power per starter	R	15	kW
2338	Starter, rated voltage	R	24	VDC
2339	Rated short-circuit current per starter	L	3000	A
2340	Power consumption per starter (at an engine speed of 100 rpm)	R	1400	A
2341	Internal resistance of power supply + line resistance per starter	A	0.0049	Ω
4104	Manufacturer		Prestolite	-
4105	Type		M128R	-
4106	Number of starter		2	-
4107	Starter electrically redundant		-	-
4108	Rated power per starter	R	9.4	kW
4109	Starter, rated voltage	R	24	VDC
4110	Rated short-circuit current per starter	L	2000	A
4111	Power consumption per starter (at an engine speed of 100 rpm)	R	600	A
4112	Power consumption per starter (at an engine speed of 100 rpm, SAE0)	R	-	A
4113	Power consumption per starter (at an engine speed of 100 rpm, SAE1)	R	-	A

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

~~4114~~	~~Internal resistance of power supply + line resistance per starter~~	~~A~~	~~0.008~~	~~Ω~~
2347	Generally valid data for starter		X	-
2342	Rated starting-attempt Duration (at +20°C ambient temperature with battery full)	R	5	s
2343	Interval between starts (at rated starting-attempt duration), min.	L	20	s
2345	Maximum acceptable starting-attempt duration	L	15	s
2344	Interval between starts (when starting-attempt duration > rated starting-attempt duration)	R	60	s
2346	Starting attempts within 30 minutes (at +20°C ambient temperature with battery full), max.	L	6	-
3565	Disengagement of starter pinion at engine Speed Note: Exceeding the guideline value of the disengagement speed will reduce the life cycle of the starter depending on how often and how much the speed has been exceeded	R	400	rpm
3566	Disengagement of starter pinion at engine speed, max.	L	500	rpm

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Name	20V4000G34F	**Speed [rpm]**	1500
Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

14. Starting (air in cylinder)

No.	Description	Index	Value	Unit
1	Starting air pressure before engine, min.	R	-	bar
2	Starting air pressure before engine, max.	R	-	bar
3	Starting air pressure before engine, min.	L	-	bar
4	Starting air pressure before engine, max.	L	-	bar
20	Start attempt duration (engine preheated)	R	-	s
21	Start attempt duration (engine not preheated)	R	-	s
22	Start attempt duration	L	-	s
23	Air consumption / start attempt (engine preheated)	R	-	m³n
24	Air consumption / start attempt (engine not preheated)	R	-	m³n
25	Starting air tank for 3 start attempts (max. 40 bar) (engine preheated)	R	-	liter
26	Starting air tank for 3 start attempts (max. 30 bar) (engine preheated)	R	-	liter
27	Starting air tank for 6 start attempts (max. 40 bar) (engine preheated)	R	-	liter
28	Starting air tank for 6 start attempts (max. 30 bar) (engine preheated)	R	-	liter
29	Starting air tank for 10 start attempts (max. 40 bar) (engine preheated)	R	-	liter
30	Starting air tank for 10 start attempts (max. 30 bar) (engine preheated)	R	-	liter
31	Starting air tank for 3 start attempts (max. 40 bar) (engine not preheated)	R	-	liter
32	Starting air tank for 3 start attempts (max. 30 bar) (engine not preheated)	R	-	liter
33	Starting air tank for 6 start attempts (max. 40 bar) (engine not preheated)	R	-	liter

[BL] **Reference value: fuel stop power**
Maximum engine power that cannot be run continuously on some applications (stabilization reserve)
[DL] **Reference value: continuous power**
Engine power that can be run continuously under standard conditions

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Technical Sales Document

- Product Data -

A Rolls-Royce solution

Name	20V4000G34F	**Speed [rpm]**	1500
Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

34	Starting air tank for 6 start attempts (max. 30 bar) (engine not preheated)	R	-	liter
35	Starting air tank for 10 start attempts (max. 40 bar) (engine not preheated)	R	-	liter
36	Starting air tank for 10 start attempts (max. 30 bar) (engine not preheated)	R	-	liter

Technical Sales Document

- Product Data -

A Rolls-Royce solution

Name	20V4000G34F	**Speed [rpm]**	1500
Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

15. Starting (pneumatic/oil pressure starter)

No.	Description	Index	Value	Unit
35	Pneumatic starter: make Gali		-	-
36	Pneumatic starter: make TDI		X	-
5	Starting air pressure before starter motor, min.	R	8	bar
6	Starting air pressure before starter motor, max.	R	9	bar
7	Starting air pressure before starter motor, min.	L	8	bar
8	Starting air pressure before starter motor, max.	L	9	bar
18	Start attempt duration (engine preheated)	R	3	s
19	Start attempt duration (engine not preheated)	R	5	s
20	Start attempt duration, max.	L	-	s
114	Air consumption/start attempt (engine preheated) Engine without generator Control with engine controller	R	1.4	m³n
115	Air consumption/start attempt (engine not preheated) Engine without generator Control with engine controller	R	1.6	m³n
116	Air consumption with external control for air-starter (per second	R	0.7	m³n
23	Starting air tank for 3 start attempts (max. 40 bar) (engine preheated)	R	-	liter
24	Starting air tank for 3 start attempts (max. 30 bar) (engine preheated)	R	-	liter
25	Starting air tank for 6 start attempts (max. 40 bar) (engine preheated)	R	-	liter
26	Starting air tank for 6 start attempts (max. 30 bar) (engine preheated)	R	-	liter
27	Starting air tank for 10 start attempts (max. 40 bar) (engine preheated)	R	-	liter

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Maximum engine power that cannot be run continuously on some applications (stabilization reserve)
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Engine power that can be run continuously under standard conditions

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Technical Sales Document

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A Rolls-Royce solution

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

~~28~~	~~Starting air tank for 10 start attempts (max. 30 bar) (engine preheated)~~	~~R~~	~~-~~	~~liter~~
~~29~~	~~Starting air tank for 3 start attempts (max. 40 bar) (engine not preheated)~~	~~R~~	~~N~~	~~liter~~
~~30~~	~~Starting air tank for 3 start attempts (max. 30 bar) (engine not preheated)~~	~~R~~	~~N~~	~~liter~~
~~31~~	~~Starting air tank for 6 start attempts (max. 40 bar) (engine not preheated)~~	~~R~~	~~N~~	~~liter~~
~~32~~	~~Starting air tank for 6 start attempts (max. 30 bar) (engine not preheated)~~	~~R~~	~~N~~	~~liter~~
~~33~~	~~Starting air tank for 10 start attempts (max. 40 bar) (engine not preheated)~~	~~R~~	~~N~~	~~liter~~
~~34~~	~~Starting air tank for 10 start attempts (max. 30 bar) (engine not preheated)~~	~~R~~	~~N~~	~~liter~~

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

16. Inclinations - standard oil system (ref.: waterline)

No.	Description	Index	Value	Unit
15	Longitudinal inclination, continuous max. driving end down (Option: max. operating inclinations)	L	5	degrees (°)
16	Longitudinal inclination, temporary max. driving end down (Option: max. operating inclinations)	L	-	degrees (°)
17	Longitudinal inclination, continuous max. driving end up (Option: max. operating inclinations)	L	5	degrees (°)
18	Longitudinal inclination, temporary max. driving end up (Option: max. operating inclinations)	L	-	degrees (°)
19	Transverse inclination, continuous max. (Option: max. operating inclinations)	L	10	degrees (°)
20	Transverse inclination, temporary max. (Option: max. operating inclinations)	L	-	degrees (°)

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- Product Data -

A Rolls-Royce solution

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

17. Inclinations - special oil system (ref.: waterline)

No.	Description	Index	Value	Unit
1	Longitudinal inclination, continuous max.	L	-	degrees (°)
7	Transverse inclination, continuous max.	L	-	degrees (°)

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

18. Capacities

No.	Description	Index	Value	Unit
1	Engine coolant capacity (without cooling equipment)	R	205 *	liter
10	Intercooler coolant capacity	R	50	liter
11	On-engine fuel capacity	R	9	liter
14	Engine oil capacity, initial filling (standard oil system) (Option: max. operating inclinations)	R	390 *	liter
20	Oil change quantity, max. (standard oil system) (Option: max. operating inclinations)	R	340 *	liter
28	Oil pan capacity, dipstick mark min. (standard oil system) (Option: max. operating inclinations)	L	268	liter
29	Oil pan capacity, dipstick mark max. (standard oil system) (Option: max. operating inclinations)	L	315	liter

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Technical Sales Document

- Product Data -

A Rolls-Royce solution

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

19. Masses / dimensions

No.	Description	Index	Value	Unit
9	Engine mass, dry (basic engine configuration acc. to scope of supply specification)	R	9290	kg

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

21. Exhaust emissions

No.	Description	Index	Value	Unit
1947	Emissions data sheet: “TA-Luft” - CP		X	-

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NOx emission optimized ;		

22. Acoustics

No.	Description	Index	Value	Unit
101	Exhaust noise, unsilenced - CP (free-field sound-pressure level Lp, 1m distance, ISO 6798, +3dB(A) tolerance)	R	116	dB(A)
201	Exhaust noise, unsilenced - CP (sound power level LW, ISO 6798, +3dB(A) tolerance)	R	129	dB(A)
102	Exhaust noise, unsilenced - FSP (free-field sound-pressure level Lp, 1m distance, ISO 6798, +3dB(A) tolerance)	R	-	dB(A)
202	Exhaust noise, unsilenced - FSP (sound power level LW, ISO 6798, +3dB(A) tolerance)	R	-	dB(A)
103	Exhaust noise, unsilenced - CP (free-field sound-pressure level Lp, 1m distance, ISO 6798) Spectrum No.	R	735830e	-
203	Exhaust noise,unsilenced - CP (sound power level LW, ISO 6798) Spectrum No.	R	N	-
104	Exhaust noise, unsilenced - FSP (free-field sound-pressure level Lp, 1m distance, ISO 6798) Spectrum No.	R	-	-
204	Exhaust noise,unsilenced - FSP (sound power level LW, ISO 6798) Spectrum No.	R	-	-
109	Engine surface noise with attenuated intake noise (filter) - CP (free-field sound-pressure level Lp, 1m distance, ISO 6798, +2dB(A) tolerance)	R	109	dB(A)
209	Engine surface noise with attenuated intake noise (filter) - CP (sound power level LW, ISO 6798, +2dB(A) tolerance)	R	128	dB(A)

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

110	Engine surface noise with attenuated intake noise (filter) - FSP (free-field sound-pressure level Lp, 1m distance, ISO 6798, +2dB(A) tolerance)	R	-	dB(A)
210	Engine surface noise with attenuated intake noise (filter) - FSP (sound power level LW, ISO 6798, +2dB(A) tolerance)	R	-	dB(A)
111	Engine surface noise with attenuated intake noise (filter) - CP (free-field sound-pressure level Lp, 1m distance, ISO 6798) Spectrum No.	R	738 662e	-
211	Engine surface noise with attenuated intake noise (filter) - CP (sound power level LW, ISO 6798) Spectrum No.	R	N	-
112	Engine surface noise with attenuated intake noise (filter) - FSP (free-field sound-pressure level Lp, 1m distance, ISO 6798) Spectrum No.	R	-	-
212	Engine surface noise with attenuated intake noise (filter) - FSP (sound power level LW, ISO 6798) Spectrum No.	R	-	-
132	Engine surface noise, without intake noise - FSP (free-field sound-pressure level Lp, 1m distance, ISO 6798, +2dB(A) tolerance)	R	-	dB(A)
232	Engine surface noise, without intake noise - FSP (sound power level LW, ISO 6798, +2dB(A) tolerance)	R	-	dB(A)
134	Engine surface noise, without intake noise - FSP (free-field sound-pressure level Lp, 1m distance, ISO 6798) Spectrum No.	R	-	-
234	Engine surface noise, without intake noise - FSP (sound power level LW, ISO 6798) Spectrum No.	R	-	-
118	Intake noise, unsilenced - FSP (free-field sound-pressure level Lp, 1m distance, ISO 6798)	R	-	dB(A)

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Application Group	3F	**Nominal power [kW]**	2590
Dataset	Ref. 25°C/55°C	**Nominal power [bhp]**	3473
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50

Exhaust Regulations NOx emission optimized ;

218	Intake noise, unsilenced - FSP (sound power level LW, ISO 6798)	R	-	dB(A)
120	Intake noise, unsilenced - FSP (free-field sound-pressure level Lp, 1m distance, ISO 6798) Spectrum No.	R	-	-
220	Intake noise, unsilenced - FSP (sound power level LW, ISO 6798) Spectrum No.	R	-	-
125	Structure borne noise at engine mounting brackets in vertical direction above resilient engine mounts - CP Spectrum No.	R	735852e	-
126	Structure borne noise at engine mounting brackets in vertical direction above resilient engine mounts - FSP Spectrum No.	R	-	-
128	Structure born noise, vertically below the resilient engine mounts - FSP Spectrum No.	R	-	-

Appendix 03 - Alternator Datasheet

ALTERNATOR TECHNICAL DESCRIPTION
LSA 53.2 L14 / 4p

LS Reference: DW902-06-2022-1

Date: 13.06.2022

V6.08 - 08/2021

Project Manager : MB.13.06.2022

Nidec ACIM Germany GmbH
Electric Power Generation
Eschborner Landstrasse 166 - 60489 Frankfurt am Main

daniel.werder@mail.nidec.com
+49 (0) 69 780708-52
DW

Main data					C
Generator type:	**LSA 53.2 L14 / 4p**				
Power:	3 050	kVA	2 440 kWe	2 523 kWm	
Voltage:	400	V	Star serial		
Rated voltage range:	+5/-5%				
Power factor - Lagging:	0,8				
Frequency:	50	Hz			
Speed:	1 500	rpm			
Nominal current:	4 402	A			
Winding type:	p2/3				
Classes (Insulation / Temperature Rise):	H / H				
Ambient temperature:	40	°C			
Altitude:	1 000	m			

Installation	IEC	Quantity	32
Client:	Rolls-Royce Solutions GmbH		
Project:	Yondr Frankfurt 012270066		
Site:	to define		
Prime mover:	Reciprocating engine		
Manufacturer:	MTU		
Type:	to defne		
Duty:	Base Rating		
Industry:	Construction		

Mechanical construction			IM1101
Type of construction:	Two bearing		
Mounting arrangement:	Horizontal Axis		
Direction of rotation:	Clockwise (seen when facing the drive end - DE)		
Bearing type:	Anti-friction		
Bearing Lubrication:	Regreasable		
Bearing insulation:	Not insulated		
Shaft end type:	Cylindrical with keyway		
Balancing - Class (ISO 1940/1):	Half key - G2,5 (std)		
Flange:	None / without		
Shaft height:	500	mm	
Width:	1 150	mm	

Additional specificities		
Stabilized Runaway speed:	1 800	rpm - 2 min.

ALTERNATOR TECHNICAL DESCRIPTION
LSA 53.2 L14 / 4p

LS Reference: DW902-06-2022-1

Cooling Method — IC01

Degree of protection:	IP23
Coolant:	Air / Temperature: 40 °C
Air quality:	Clean
Ventilation (internal):	Self-ventilated
Filters:	Without
Ducting for air inlet:	No
Ducting for air outlet:	No

Connection, Excitation & Regulation

Parallel operation:	With mains (3F) - use of measuring CT
Excitation:	Self-excited - Brushless - Type: PMG
Sustained 3-phase Isc:	> 3 x FLC for 10s.
AVR type:	Leroy Somer - D550 - Digital
AVR location:	In terminal box
Alternator Voltage sensing:	In terminal box
Additional features:	
	Three-phase sensing
	Diode failure detector

Terminal box

Power connection:	4 connectors (brought out neutral)
Main terminal box location:	1 terminal box on the top
Line side outlet:	Left hand side (seen when facing the drive end - D)
Gland plate:	Non magnetic, Undrilled
Auxiliaries	In main terminam box
	-

Protection and measurement accessories

Temperature detection

Stator windings:	6 x 3-wire PT100 RTDs
Combined guide and thrust bearing - DE:	1 x 3-wire PT100 RTD
Guide bearing - NDE:	1 x 3-wire PT100 RTD

Anti-condensation heating

Voltage: 230 V - 1Ph / Power: 500 W

Transformers (Client use)

LS Supply — *Transformers' curve & test report required*

Set of 3 x CTs (measuring and/or protection):

			I Primary / I Secondary / Power / Class
Preliminary	Neutral side	S1	4500 / 1A / 10VA / Cl. 0,5 FS5
		S2	4500 / 1A / 10VA / Cl. 5P10

Various items

Paint:	C3M-P - Polyurethane - RAL code acc. to RRS request
Documentation:	PDF manual
Documentation Language:	English

ALTERNATOR TECHNICAL DESCRIPTION
LSA 53.2 L14 / 4p

LS Reference: DW902-06-2022-1 1

-

Controls

QUAL/INES/006 001	Measurement of winding resistance	1
QUAL/INES/006 021	Insulation check on sensors (when fitted)	1
QUAL/INES/006 002	Voltage balance and phase order check	1
QUAL/INES/006 007	Overspeed test (according to test bench limitation)	1
QUAL/INES/006 009	High potential test	1
QUAL/INES/006 010	Insulation resistance measurement	1

-

-

ALTERNATOR ELECTRICAL DATA
LSA 53.2 L14 / 4P

LS Reference: DW902-06-2022-1

Date: 13.06.2022 V6.08 - 08/2021

Main data: C

Power:	**3 050**	kVA	**2 440** kWe	**2 523**	kWm	1
Voltage:	**400**	V	Frequency:	**50**	Hz	1
Rated voltage range:	+5% / -5%		Speed:	1500	rpm	1
Power factor - Lagging:	0,8					1
Nominal current:	4 402	A	Phases	3		
Insulation / Temperature rise:	H / H		Connexion	Star serial		1
Cooling:	**IC01**		Winding type:	p2/3		1
			Winding:	- 6 Wires		1
Ambient temperature:	40	°C				1
Altitude:	1000	m	Overspeed (rpm)	1800		1
Duty: Base Rating			Total Harmonic Distortion (THD) < 3,5%			1

Efficiency (Base 2440 kWe) IEC

	25%	50%	75%	**100%**	110%	
Power factor - Lagging: 0,8	93,6	96,0	96,6	**96,7**	96,7	1
Power factor - Lagging: 1	94,0	96,6	97,3	**97,5**	97,6	1

Reactances (%) - (Base 3050 kVA)

Unitary impedance (1 per unit) = 0,052459 ohms

		Direct axis *Unsaturated*	Direct axis *Saturated*		Quadrature axis *Unsaturated*	Quadrature axis *Saturated*	
Synchronous reactance	Xd	218	143	Xq	111	73	1
Transient reactance	X'd	21,7	18,5	X'q	111	73	1
Subtransient reactance	X"d	11,4	9,7	X"q	12,1	10,3	1
Negative sequence reactance	X2	11,8	10,0				

X0	1,9	Zero sequence reactance	1
Xl	5,7	Stator leakage reactance	
Xr	17,3	Rotor leakage reactance	
Kc	**0,70**	Short-circuit ratio	1

Time constants (s)

	Direct axis		Quadrature axis		
Open circuit transient time constant	T'do	3,43	T'qo	NA	1
Short-circuit transient time constant	T'd	0,341	T'q	NA	1
Open circuit subtransient time constant	T"do	0,038	T"qo	0,166	1
Subtransient time constant	T"d	0,020	T"q	0,018	1

Ta	0,039	Armature time constant	1

Resistances (%)

Ra	1,0	Armature resistance	R0	0,6	Zero sequence resistance	1
X/R	10,1	X/R ratio (without unit)	R2	2,4	Negative sequence resistance	

Voltage accuracy: 0,25%
Maximum inrush current for a voltage dip of 15%: 2750 kVA
when starting an AC motor having a starting power factor between 0 and 0.4

Rating is provided for the specified temperature rise, by resistance measurement according to IEC60034-1
According to: I.E.C. 60034.1 - 60034.2 - NEMA MG 1-32
Products and materials shown in this catalogue may, at any time, be modified in order to follow the latest technological developments,

ALTERNATOR MAIN CURVES
LSA 53.2 L14 / 4P

LS Reference: DW902-06-2022-1

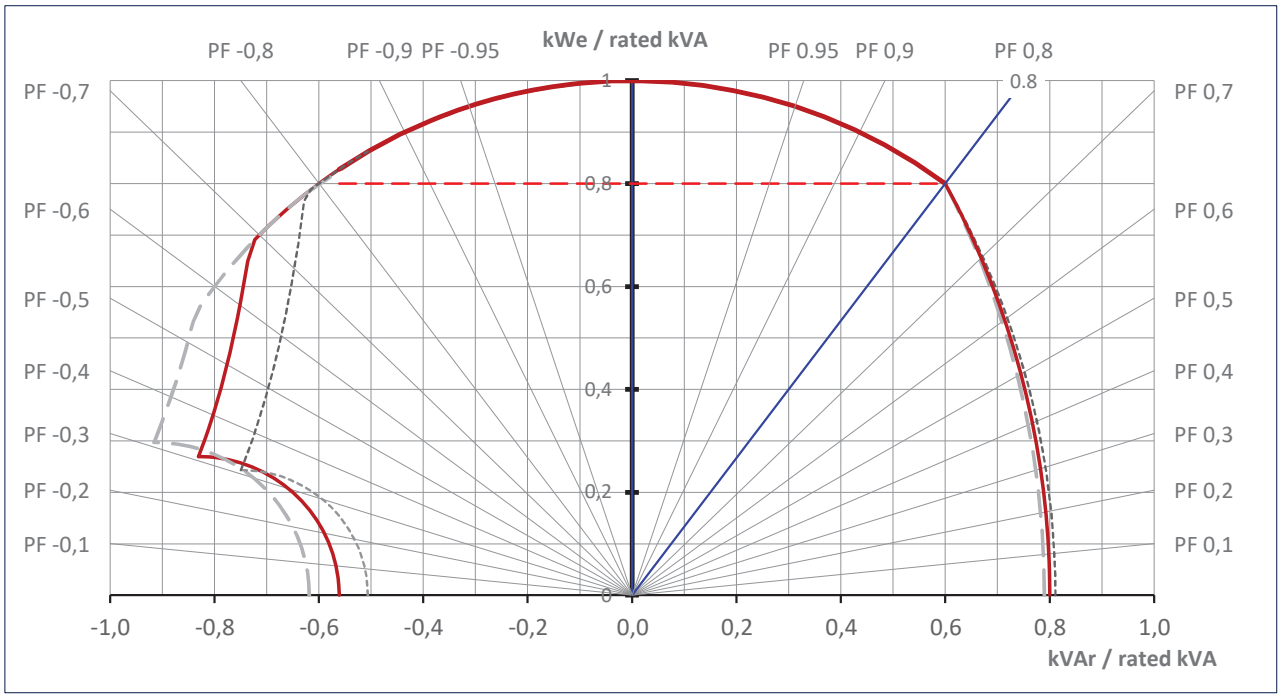
Date: 13.06.2022

3050kVA - 400V - 50 Hz

V6.08 - 08/2021

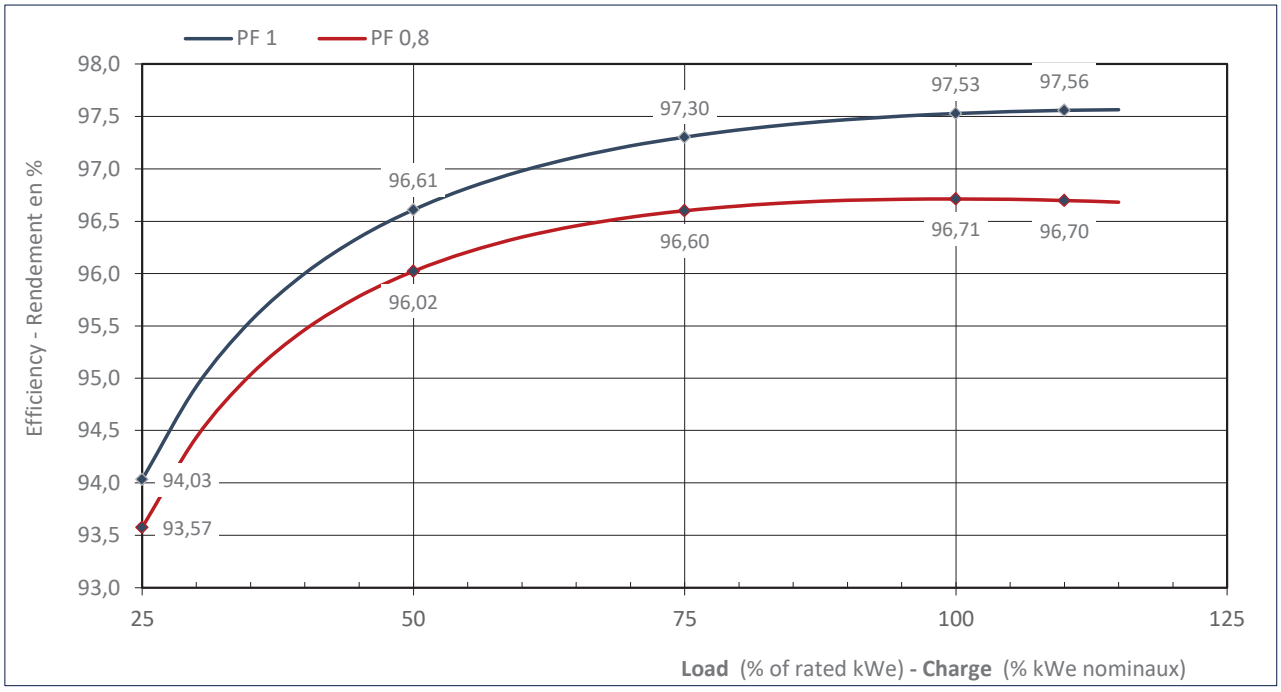
Capability Curve

Umax	+ 5%	420	V
Un		**400**	V
Umin	- 5%	380	V



Efficiency Curves

According to: IEC

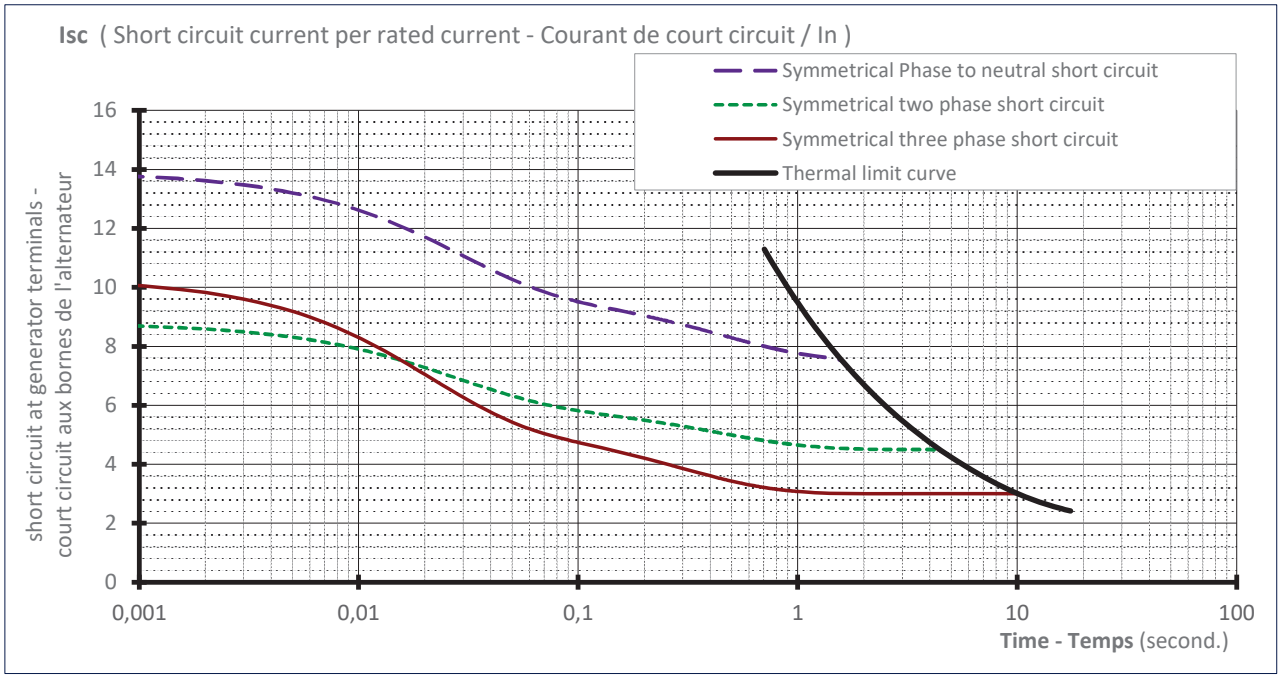


ALTERNATOR MAIN CURVES
LSA 53.2 L14 / 4P

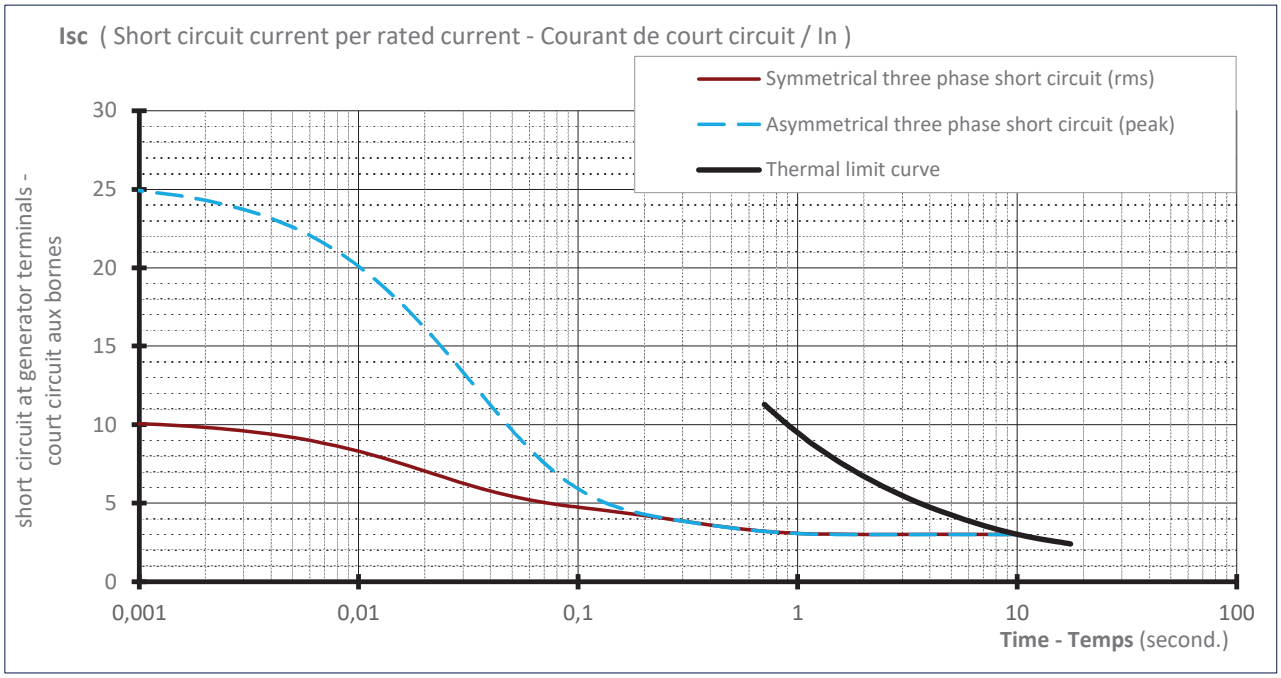
LS Reference: DW902-06-2022-1

Stator Current decrement curves

Symmetrical phase to neutral short-circ	initial	60 575	A	13,8 x In	In =	**4402** A
Symmetrical two phase short-circuit	max	38 253	A	8,7 x In		
Symmetrical three phase short-circuit	value	44 289	A	10,1 x In		
Thermal Limit						



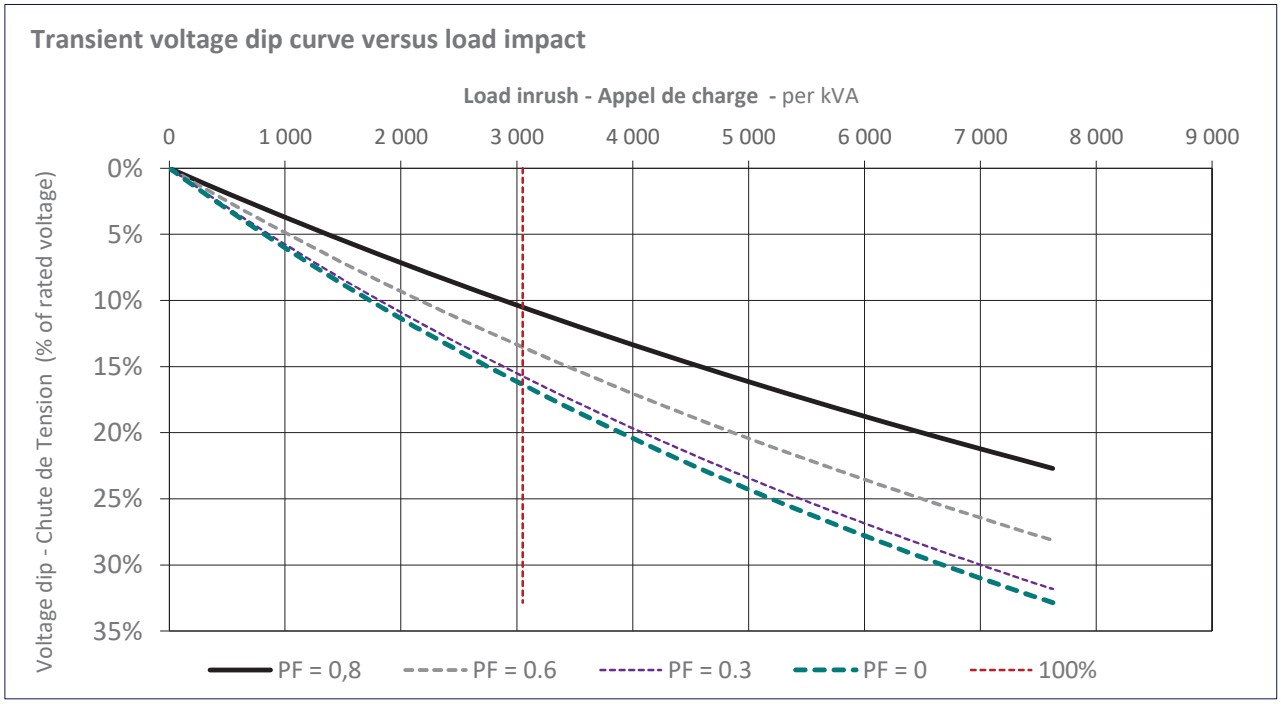
Asymmetrical three phase short-circuit	IP	108 655	A	24,7 x In

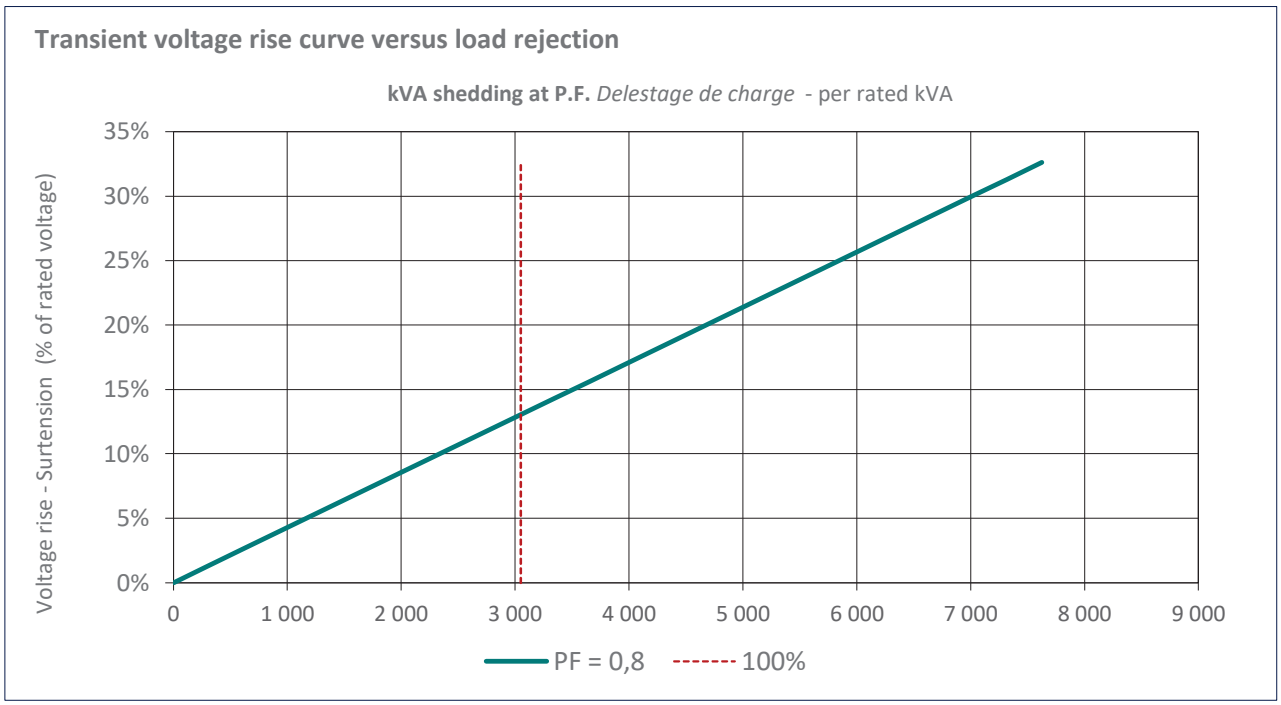


ALTERNATOR MAIN CURVES
LSA 53.2 L14 / 4P

LS Reference: DW902-06-2022-1

Transient Voltage Variation

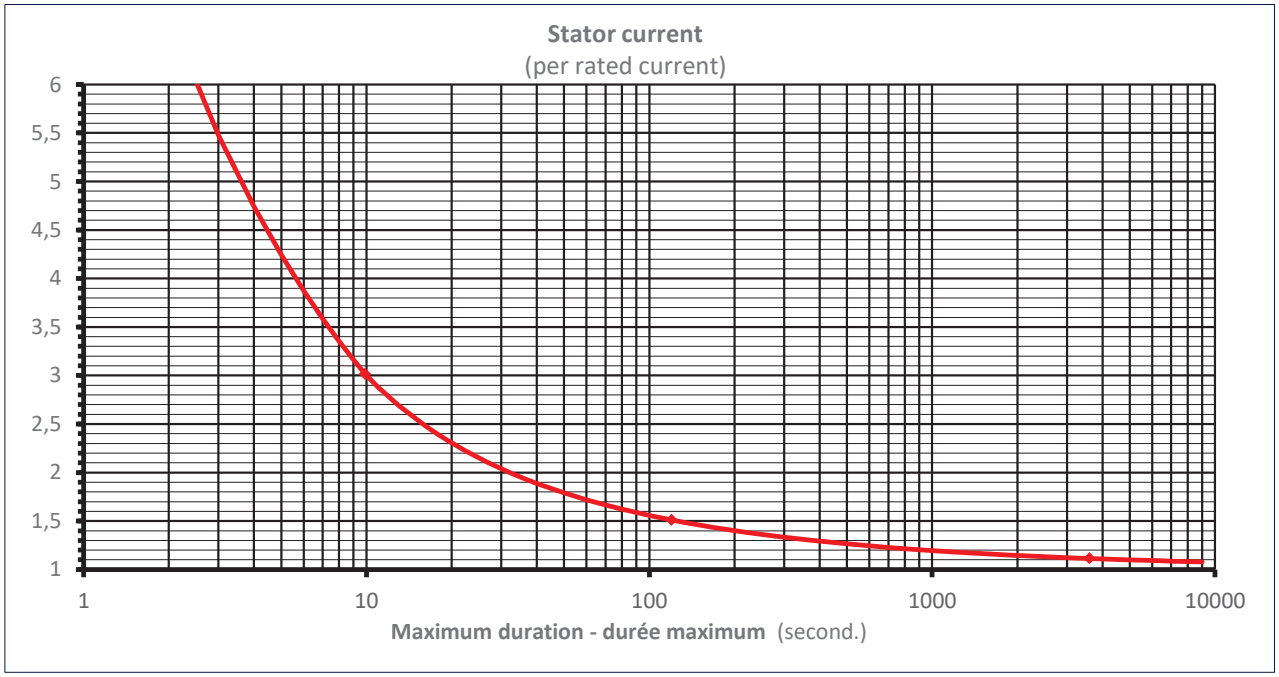




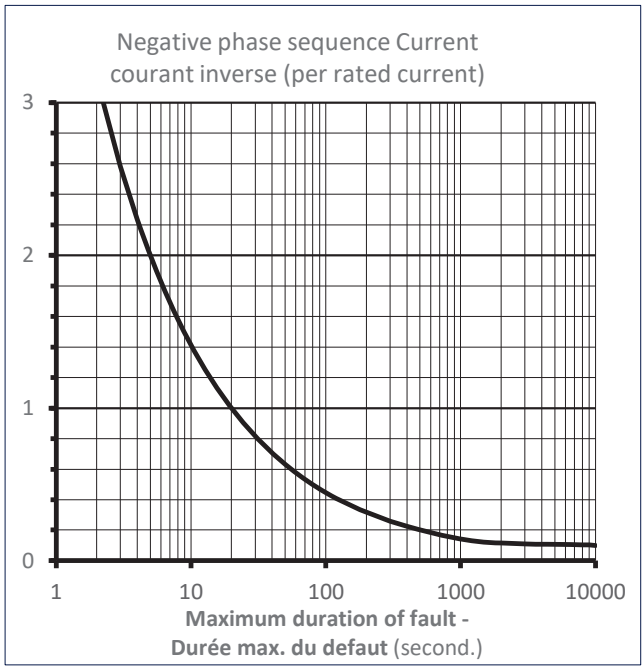
ALTERNATOR MAIN CURVES
LSA 53.2 L14 / 4P

LS Reference: DW902-06-2022-1

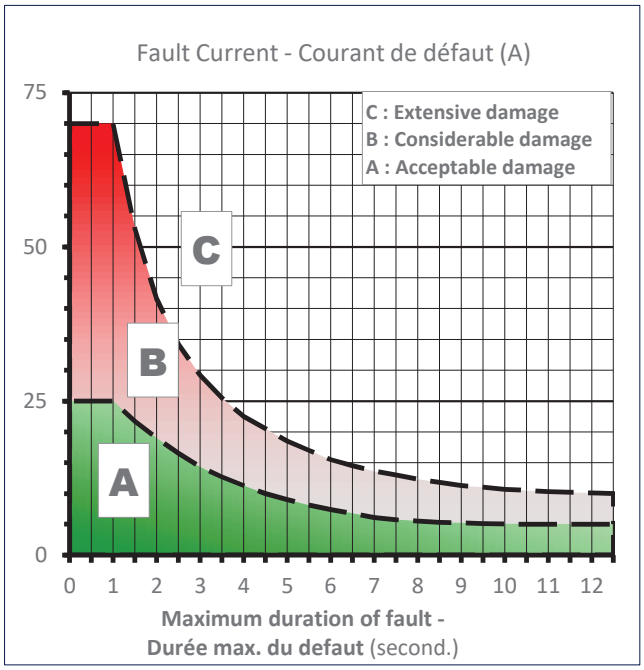
Thermal Damage Curve



Unbalance Load Curve



Stator Earth Fault Current



Appendix 04 - MTU Fluids and Lubricants

Fluids and Lubricants Specifications

Diesel engine-generator sets
with Series 2000 and 4000 MTU engines

A001064/09E

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1 Preface

1.1 General information

Used symbols and means of representation

The following instructions are highlighted in the text and must be observed:

Important
This field contains product information which is important or useful for the user. It refers to instructions, work and activities that have to be observed to prevent damage or destruction to the material.

Note:

A note provides special instructions that must be observed when performing a task.

Fluids and lubricants

The service life, operational reliability and function of the drive systems are largely dependent on the fluids and lubricants employed. The correct selection and treatment of these fluids and lubricants are therefore extremely important.

Test standard	Designation
DIN	Federal German Standards Institute
EN	European Standards
ISO	International Standards Organization
ASTM	American Society for Testing and Materials
IP	Institute of Petroleum

Applicability of this document

These Fluids and Lubricants Specifications define the fluids and lubricants for diesel engine-generator sets from MTU Onsite Energy with the following MTU engines:

- Series 2000Gx5
- Series 2000Gx6
- Series 4000Gx3, application groups 3B, 3D, 3E, 3F, 3G
- Series 4000Gx4

Note: Please ignore references to other series in this document.

Up-to-dateness of this document

The Fluids and Lubricants Specifications are revised or supplemented as required. Before using them, make sure you have the latest version (publication number A001064/..). The latest version is available at: www.mtuonsiteenergy.com in the area "Parts and Service" under "MTU ValueCare for Diesel Generator Sets" > "Technical Documentation".

Warranty

Use of the approved fluids and lubricants, either under the brand name or in accordance with the specifications given in this publication, constitutes part of the warranty conditions.

The supplier of the fluids and lubricants is responsible for the worldwide standard quality of the named products.

TIM-ID: 0000066018 - 004

Important

Fluids and lubricants for diesel engine-generator sets can be hazardous materials. Certain regulations must be obeyed when handling, storing and disposing of these substances.

These regulations are contained in the manufacturers' instructions, legal requirements and technical guidelines valid in the individual countries. Great differences can apply from country to country and a generally valid guide to applicable regulations for fluids and lubricants is therefore not possible within this publication.

Users of the products named in these specifications are therefore obliged to inform themselves of the locally valid regulations. MTU accepts no responsibility whatsoever for improper or illegal use of the fluids and lubricants which it has approved.

MTU Onsite Energy recommends consultation with the suppliers of all fluids and lubricants to request the relevant safety data sheets prior to storing, handling and using these fluids and lubricants.

Safe disposal

Important

To prevent environmental pollution and infringements of statutory requirements, used fluids and lubricants must be disposed of in accordance with local regulations.
Never dispose of or burn the used oil in the fuel tank.

The regulations for the disposal of fluids and lubricants differs from place to place. Environmental protection is one of the fundamental corporate objectives of MTU Onsite Energy. We therefore recommend the recycling of fluids and lubricants wherever possible. If recycling is not possible, MTU Onsite Energy recommends consulting the local waste-disposal authorities before disposing of fluids and lubricants to determine the best option. Users of the products named in these specifications are therefore obliged to inform themselves of the locally valid regulations. MTU accepts no responsibility whatsoever for improper or illegal use of the fluids and lubricants which it has approved.

Registered trademarks

All brand names are registered trademarks of the manufacturer concerned.

Preservation

The document "Preservation and Represervation Specifications" (publication number A001070/..) contains all information on:

- Preservation
- Represervation and de-preservation
- Permissible preservatives

The latest version is available at: www.mtuonsiteenergy.com in the area "Parts and Service" under "MTU ValueCare for Diesel Generator Sets" > "Technical Documentation".

TIM-ID: 0000066018 - 004

2 Lubricants

2.1 Engine oils – General information

Important

Dispose of used fluids and lubricants in accordance with local regulations.
Used oil must never be disposed of via the combustion engine!

Requirements of the engine oils for MTU approval

MTU conditions for the approval of engine oils for diesel engines are defined in the MTU standards and available under these numbers:

- MTL 5044: Engine oils for diesel engines; Requirements
- MTL 5051: Initial operation and corrosion inhibitor oil for internal preservation of engines

Manufacturers of engine oils are notified in writing if their product is approved.

Approved engine oils are divided into the following MTU quality groups:

- Oil category 1: Standard quality / Single and multigrade oils
- Oil category 2: Higher quality / Single and multigrade oils
- Oil category 2.1: Multigrade oils with a low ash-forming additive content (low SAPS oils)
- Oil category 3: Highest quality / Multigrade oils
- Oil category 3.1: Multigrade oils with a low ash-forming additive content (low SAPS oils)

Low SAPS oils are oils with a low sulfur and phosphor content and an ash-forming additive content of ≤1%.

They are only approved if the sulfur content in the fuel does not exceed 50 mg/kg. When using diesel particulate filters, it is advisable to use these oils to avoid fast coating of the filter with ash particles.

Selection of a suitable engine oil is based on fuel quality, projected oil drain interval and on-site climatic conditions. At present there is no international industrial standard which alone takes into account all these criteria.

Important

The use of engine oils not approved by MTU can mean that statutory emission limits can no longer be observed. This can be a punishable offense.

Important

Mixing different engine oils is strictly prohibited!
Changing to another oil grade can be done together with an oil change. The remaining oil quantity in the engine oil system is not critical in this regard.
This procedure also applies to MTU's own engine oils in the regions Europe, Middle East, Africa, America and Asia.

Important

When changing to an engine oil in Category 3, note that the improved cleaning effect of these engine oils can result in the loosening of engine contaminants (e.g. carbon deposits).
It may be necessary therefore to reduce the oil change interval and oil filter service life (one time during change).

TIM-ID: 0000060885 - 005

Special features

MTU engine oils for diesel engines

At MTU, the following single and multigrade oils are available in the individual regions:

Manufacturer & sales region	Product name	SAE grade	Oil category	Part No.
MTU Friedrichshafen Europe Middle East Africa	Diesel Engine Oil DEO SAE 15W-40	15W-40	2	20 l canister: X00070830 210 l barrel: X00070832 IBC: X00070833 Loose items: X00070835 (only on request)
	Power Guard ® DEO SAE 40	40	2	20 l canister: X00062816 210 l barrel: X00062817 IBC: X00064829
MTU America America	Power Guard ® SAE 15W-40 Off Highway Heavy Duty	15W-40	2.1	5 gallons: 800133 55 gallons: 800134 IBC: 800135
	Power Guard ® SAE 40 Off Highway Heavy Duty	40	2	5 gallons: 23532941 55 gallons: 23532942
MTU Asia Asia	Diesel Engine Oil DEO SAE 15-W40	15W-40	2	18 l canister: 64247/P 200 l barrel: 65151/D
MTU Asia China	Diesel Engine Oil - DEO 15W-40	15W-40	2	20 l canister: 64242/P 205 l barrel: 65151/D
	Diesel Engine Oil - DEO 10W-40	10W-40	2	20 l canister: 60606/P
	Diesel Engine Oil - DEO 5W-30	5W-30	3	20 l canister: 60808/P
MTU Asia Indonesia	Diesel Engine Oil - DEO 15W-40	15W-40	2	20 l canister: 64242/P 205 l barrel: 65151/D
MTU India Pvt. Ltd. India	Diesel Engine Oil - DEO 15W-40	15W-40	2	20 l canister: 63333/P 205 l barrel: 65151/P
	Diesel Engine Oil - DEO 40	40	2	20 l canister: 73333/P 205 l barrel: 75151/D

Restrictions for certain applications

- Series 2000 Gx6
- Series 4000 Gx3, application groups 3F, 3G

Important
Oils in oil category 1 must not be used!

Selection of viscosity grades

Selection of the viscosity grade is based primarily on the ambient temperature at which the engine is to be started and operated. If the relevant performance criteria are observed the engines can be operated both with single grade and multigrade oils, depending on the application. Guide values for the temperature limits of the individual viscosity classes, see (→ Figure 1).

If the prevailing temperature is too low, the engine oil must be preheated.

TIM-ID: 0000060885 - 005

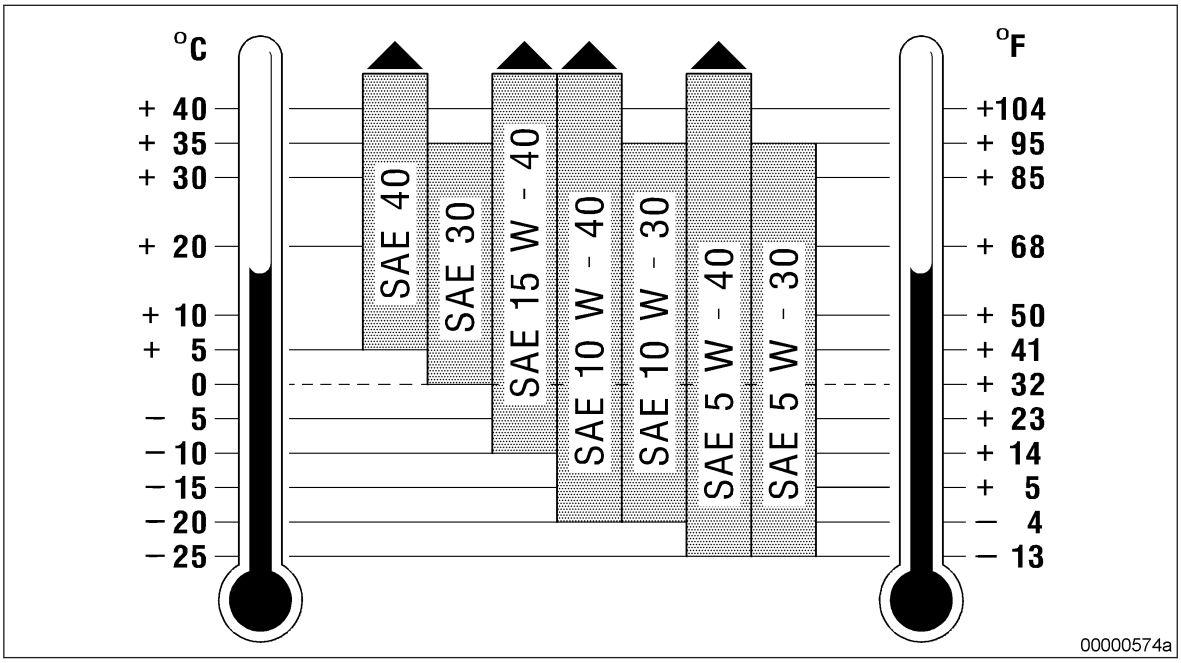

Figure 1: Viscosity grade chart

Oil drain intervals for diesel engines

Engine oil drain intervals depend on the engine-oil quality, its conditioning, the operating conditions and the fuel used.

The intervals quoted (Table) are guide values based on operational experience and are valid for applications with a standard load profile.

Transmission fluid change intervals

Oil category	Without centrifugal oil filter	With centrifugal oil filter or by-pass filter
1	250 operating hours	500 operating hours
2	500 operating hours	1000 operating hours
2.1[1)]	500 operating hours	1000 operating hours
3	750 operating hours	1500 operating hours
3.1[1)]	750 operating hours	1500 operating hours

Table 1:

[1)] = To be used in conjunction with fuels with max. 50 mg/kg sulfur content.

Important
The oil drain intervals in the table (→ Table 1) are recommended guide values when using diesel fuels with < 0.5 % sulfur content. The defined limit values for the used oil (→ Table 2) must be observed. The numbers of operating hours quoted for oils must be confirmed by means of oil analysis.

The oil drain intervals must be determined by oil analysis if one or more of the following difficult operating conditions are encountered:

- Extreme climatic conditions
- High engine startup frequency
- Frequent and prolonged idling or low-load operation
- High fuel sulfur content of 0.5 to 1.5% by weight (see "Use of High-Sulfur Fuel")

For applications involving low runtimes, the engine oil must be changed every two years at the latest irrespective of its category.

TIM-ID: 0000060885 - 005

Where engine oils with higher-grade corrosion-inhibiting characteristics are in use (→ Page 13), a change must be carried out every 3 years at the latest.

In individual cases the service life of the engine oil can be optimized by regular laboratory analysis and appropriate engine inspections in consultation with the MTU service point responsible:

- The first oil sample should be taken from the engine as a “basic sample” after the engine has run for approximately 1 hour after being filled with fresh oil.
- Further samples are to be analyzed at specific intervals (see "Laboratory Analysis").
- The appropriate engine inspections are to be carried out before and after the oil analyses.
- After completion of all analyses, and depending on the findings, special agreements can be reached for individual cases.
- Oil samples must always be taken under the same conditions and at the point provided for that purpose (see Operating Instructions).

Special additives

Engine oils approved have been specially developed for diesel engines and have all necessary properties. Further additives are therefore superfluous and may even be harmful.

Laboratory analysis

Spectrometric oil analysis

Analysis of the engine oil's additive-metal content is carried out by the MTU laboratory to determine the brand of oil.

MTU does not generally analyze the oil's wear-metal contents in order to determine the degree of engine wear. These content levels are very much dependent on the following factors, among others:

- Individual engine equipment status
- Tolerance scatter
- Operating conditions
- Duty profile
- Fluids and lubricants
- Miscellaneous assembly materials

Unambiguous conclusions as to the wear status of the engine components involved are therefore not possible. This means that no limit values can be given for wear-metal contents.

Used-oil analysis

In order to check the used oil, it is recommended that regular oil analyses be carried out. Oil samples should be taken and analyzed at least once per year and during each oil change and under certain conditions, depending on application and the engine's operating conditions, sampling / analysis should take place more frequently.

The specified test methods and limit values (Analytical Limit Values for Used Diesel Engine Oils) (→ Table 2) indicate when the results of an individual oil sample analysis are to be regarded as abnormal.

An abnormal result requires immediate investigation and remedy of the abnormality.

The limit values relate to individual oil samples. When these limit values are reached or exceeded, an immediate oil change is necessary. The results of the oil analysis do not necessarily give an indication of the wear status of particular components.

In addition to the analytical limit values, the engine condition, its operating condition and any operational faults are decisive factors with regard to oil changes.

Some of the signs of oil deterioration are:

- Abnormally heavy deposits or precipitates in the engine or engine-mounted parts such as oil filters, centrifugal oil filters or separators, especially in comparison with the previous analysis
- Abnormal discoloration of components

TIM-ID: 0000060885 - 005

Analytical limit values for used diesel engine oils

Characteristics of the engine oil	Test method	Limit values	
Viscosity at 100 °C max. mm²/s	ASTM D445 DIN 51562	SAE 30 SAE 5W-30 SAE 10W-30	15.0
		SAE 40 SAE 5W-40 SAE 10W-40 SAE 15W-40 SAE 20W-40	19.0
min. mm²/s		SAE 30 SAE 5W-30 SAE 10W-30	9.0
		SAE 40 SAE 5W-40 SAE 10W-40 SAE 15W-40 SAE 20W-40	10.5
Flashpoint °C (COC)	ASTM D92 DIN EN ISO 2592	Min. 190	
Flashpoint °C (PM)	ASTM D93 ISO 2719	min. 140	
Soot content (by weight %)	DIN 51452 CEC-L-82-A-97	Max. 3.0 (Oil category 1) Max. 3.5 (Oil category 2, 2.1, 3 and 3.1)	
Total base number (mg KOH/g)	ASTM D2896 ISO 3771 DIN 51639	Min. 50% of new-oil value	
Proportion of water (vol. %)	ASTM D6304 EN 12937 ISO 6296	max. 0.2	
Oxidation (A/cm)[1)]	DIN 51453[1)]	Max. 25	
Ethylene glycol (mg/kg)	ASTM D2982	max. 100	

Table 2:

[1)] = only possible if there are no ester compounds

Use of high-sulfur diesel fuel

The following measures must be taken in the case of diesel fuels with a sulfur content above 0.5%:
- Use of an engine oil with a total base number (TBN) of more than 8 mgKOH/g
- Shorten oil draining intervals (see oil change intervals)
- Series 4000: TBO (Time Between Overhaul) for cylinder head: Shorten time between overhauls (→ Page 36)

Figure (→ Figure 2) shows the recommended minimum total base numbers for new and used oils depending on the sulfur content of the diesel fuel.

For the total base numbers (TBN) of the approved engine oil, see (→ Page 13).

TIM-ID: 0000060885 - 005

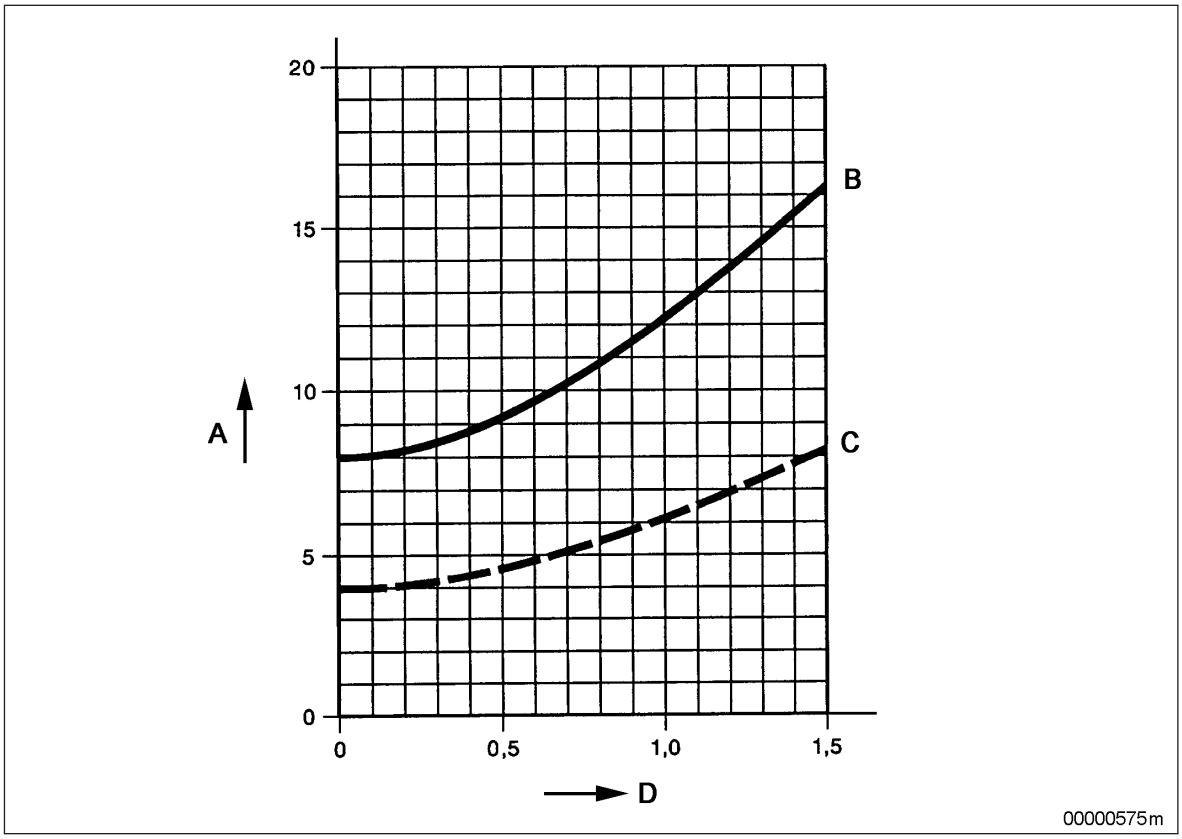

Figure 2: Engine oil Total Base Numbers depending on the Diesel Fuel's Sulfur Content

A Total base number in mgKOH/g, ISO 3771
B Recommended minimum total base number for fresh oil
C Minimum total base number for used oil
D Sulfur content of fuel in % weight

Use of low-sulfur diesel fuel

The use of diesel fuels with low sulfur content (< 0.5%) does not influence the oil drain intervals.

Minimum requirements for operational checks

Oil analyses can be carried out using the MTU Test Kit. The Test Kit contains all the equipment required as well as instructions for use.

The following checks can be performed:
- Determination of oil dispersing capacity (spot test)
- Determination of diesel fuel content in oil
- Determination of water content in oil

Test Package for North America

The MTU Advanced Fluid Management System is available in North America, which contributes to preventive maintenance through innovative diagnostics.

MTU Advanced Fluid Management System for engine oils, see (→ Page 16).

TIM-ID: 0000060885 - 005

2.2 Series-based usability for engine oils

Series-based usability of engine oils in MTU oil categories

Series	Approved engine oils		
	MTU oil category 1	MTU oil category 2 and 2.1 (Low Saps)	MTU oil category 3 and 3.1 (Low Saps)
2000Gx5	• Single-grade oils (→ Page 67) • Multigrade oils (→ Page 69)	• Single-grade oils (→ Page 70) • Multigrade oils (→ Page 73) • Multigrade oils (Low SAPS) (→ Page 82)	• Multigrade oils (→ Page 85) • Multigrade oils (Low SAPS) (→ Page 90)
2000Gx6	Not approved	• Single-grade oils (→ Page 70) • Multigrade oils (→ Page 73) • Multigrade oils (Low SAPS) (→ Page 82)	• Multigrade oils (→ Page 85) • Multigrade oils (Low SAPS) (→ Page 90)
4000Gx3, application groups 3B, 3D, 3E	• Single-grade oils (→ Page 67) • Multigrade oils (→ Page 69)	• Single-grade oils (→ Page 70) • Multigrade oils (→ Page 73) • Multigrade oils (Low SAPS) (→ Page 82)	• Multigrade oils (→ Page 85) • Multigrade oils (Low SAPS) (→ Page 90)
4000Gx3, application groups 3F, 3G	Not approved	• Single-grade oils (→ Page 70) • Multigrade oils (→ Page 73) • Multigrade oils (Low SAPS) (→ Page 82)	• Multigrade oils (→ Page 85) • Multigrade oils (Low SAPS) (→ Page 90)
4000Gx4	• Single-grade oils (→ Page 67) • Multigrade oils (→ Page 69)	• Single-grade oils (→ Page 70) • Multigrade oils (→ Page 73) • Multigrade oils (Low SAPS) (→ Page 82)	• Multigrade oils (→ Page 85) • Multigrade oils (Low SAPS) (→ Page 90)

TIM-ID: 0000063210 - 003

2.3 Fluorescent dyestuffs for detecting leaks in the lube oil circuit

The fluorescent dyestuffs listed below are approved for detection of leaks in the lube oil circuit.

Manufacturer	Product name	Concentration for use	Part No.	Container size	Storage stability[1)]
Chromatech Europe B.V.	D51000A Chromatint Fluorescent Yellow 175	0.04 % - 0.07 %	X00067084	16 kg	2 years
Cimcool, Cincinnati	Producto YFD-100	0.5 % - 1.0 %		5 gallons (canister) 55 gallons (barrel)	6 months

Table 3:

[1)] = ex works delivery, based on original and hermetically sealed containers in frost-free storage (> 5 °C).

The fluorescence (light-yellow color tone) of both dyestuffs is made visible with a UV lamp (365 nm).

TIM-ID: 0000055616 - 002

2.4 Lubricating greases

Requirements

The MTU conditions for lubricating-grease approval are specified in the MTU Factory Standard MTL 5050, which can be ordered under this reference number.

Grease manufacturers are notified in writing if their product is approved by MTU.

Lubricating greases for general applications

Lithium-saponified greases are to be used for all lubrication points with the exception of:
- Emergency-air shutoff flaps fitted between turbocharger and charge-air cooler (see Special-purpose lubricants)
- Coupling internal centering

Lubricating greases for applications at high temperatures

High-temperature grease (up to 250 °C) must be used for emergency-air shutoff flaps located between turbocharger and intercooler:
- Aero Shell Grease 15
- Optimol Inertox Medium

General purpose greases suffice for emergency-air shutoff flaps located before the turbocharger or after the intercooler.

Greases for internal centerings of couplings

Greases for internal centerings:
- Esso Unirex N3 (stable up to approx. 160 °C)

Special-purpose lubricants

Oil for turbochargers

Exhaust turbochargers with integrated oil supply are generally connected to the engine oil system.

For ABB turbochargers which are not connected to the engine lube oil system, mineral-based turbine oils with viscosity grade ISO-VG 68 must be used.

Lubricating greases for curved tooth couplings

Depending on the application, the following lubricants have been approved for curved tooth couplings:
- - Klüber: Structovis BHD MF (highly viscous lubricating oil)
- - Klüber: Klüberplex GE11–680 (adhesive transmission lubricant)

Guidelines on use and service life are contained in the relevant Operating Instructions and Maintenance Schedules.

TIM-ID: 0000018561 - 002

2.5 MTU Advanced Fluid Management System for engine oils – Test package for North America

A sophisticated system for diagnostics and preventive maintenance is available in North America. This system allows the following:

- Optimized oil change intervals
- Extended engine service life
- Detection of minor problems before they become major problems
- Maximization of diesel engine-generator set's reliability
- Higher resale value of diesel engine-generator set

For full information on the MTU Advanced Fluid Management System available in North America, please contact an authorized MTU Onsite Energy service partner.

The following test packages from MTU Advanced Fluid Management System can be ordered from authorized MTU Onsite Energy service partners in North America:

- BMP32
  Extended test – monitoring of wear and contamination
- AMP51R
  Extended Test Plus – extension of the oil change intervals

The following engine oil parameters can be determined:

Engine oil parameters	BMP32	AMP51R
24 elementary metals *	✔	✔
percent water *	✔	✔
Viscosity at 40 °C for ISO engine oils	✔	✔
Viscosity at 100 °C for SAE engine oils	✔	✔
Percent fuel dilution **	✔	✔
Percent soot **	✔	✔
Oxidation/nitration	–	✔
Total base number **	–	✔
Total acid number	–	✔

*** Samples of non-engine oils submitted with Order No. BMP32, are only examined spectrometrically for metals and the proportion of water and viscosity are determined.**
**** Samples of non-engine oils submitted with Order No. AMP51R are not examined for fuel dilution, soot content and base number.**

The MTU Advanced Fluid Management System with trend analysis provides information for maximizing system reliability. The following guidelines must be followed to obtain the best results.

Samples must be taken:

- While the engine is operating under normal conditions or immediately after stopping the engine while the engine is still at operating temperature
- Every 250 hours at the same point
- By means of suction pump via dipstick tube or sampling cock in filter return

Note: The software offered by MTU for online reporting with trend analyses shows the procedure for optimizing evaluation of the gathered information after completion of the analysis.

Note: The MTU Advanced Fluid Management System works together with independent test laboratories accredited according to ISO 17025 A2LA. This accreditation is the highest level of quality obtainable by a test laboratory in North America.

TIM-ID: 0000063387 - 002

3 Coolants

3.1 Coolants – General information

Coolant

Definition

Coolant	= coolant additive (concentrate) + fresh water to predefined mixing ratio Ready for use in engine

The corrosion-inhibiting effect of coolant is only ensured with the coolant circuit fully filled.

Apart from that, only the corrosion inhibitors approved for internal preservation of the coolant circuit provide proper corrosion protection when the medium was drained. This means that after draining the coolant the cooling circuit must be preserved if no more coolant is to be filled. The procedure is described in the Preservation and Represervation Specifications for MTU Onsite Energy (publication number A001070/..).

Coolants must be prepared from suitable fresh water and an MTU-approved coolant additive. Conditioning of the coolant takes place outside the engine.

Important

Mixtures of various coolant additives and supplementary additives (also in coolant filters and filters downstream of plant components) are not permitted!

The conditions for the approval of coolant additives are specified in the following MTU works standards (MTL):
- MTL 5048: Corrosion inhibiting antifreeze
- MTL 5049: Water-soluble corrosion inhibitor

Coolant manufacturers are informed in writing if their product is approved by MTU.

To prevent cooling system damage:

- When topping up (following loss of coolant) it must be ensured that not only water but also concentrate is added. The specified antifreeze and/or corrosion inhibitor concentration must be maintained.
- Flushing with water is required at every change to a different coolant product. For flushing and cleaning specifications for engine coolant circuits, see (→ Page 117).
- The corrosion inhibitor concentration must not exceed 55 % by volume (max. antifreeze) corrosion inhibitor. Concentrations in excess of this reduce antifreeze protection and heat dissipation. Only exception: BASF G206 (special application)
- The coolant must not contain any oil or copper residue (in solid or dissolved form).
- The majority of corrosion inhibitors currently approved for internal coolant circuit preservation are water-soluble and do not provide antifreeze protection. Make sure that the engine is stored safe from frost, because a certain amount of coolant remains in the engine after draining.
- A coolant circuit can not usually be drained completely, i.e. residual quantities of used coolant or fresh water from a flushing procedure remain in the engine. These residual quantities can result in the dilution of a coolant to be filled (mixed from a concentrate or use of a ready mixture). This dilution effect is higher the more add-on components there are on the engine. Check the coolant concentration in the coolant circuit and adapt it if necessary.

Important

All coolants approved in these Fluids and Lubricants Specifications generally relate only to the coolant circuit of MTU engines. In the case of complete propulsion plants, the operating fluids approvals of the component manufacturer must be observed!

TIM-ID: 0000060890 - 004

Important
For corrosion-related reasons, it is not permissible to operate an engine with pure water without the addition of an approve corrosion inhibitor!

Special features

MTU coolants

The following coolant additives are available from MTU:

Manufacturer & sales region	Product name	Type
MTU Friedrichshafen and MTU Asia Europe Middle East Africa Asia	**Antifreeze**	
	Coolant AH 100 Antifreeze Concentrate	X00057231 (20 l) X00057230 (210 l) X00068202 (1000 l)
	Coolant AH 50/50 Antifreeze Premix	X00070528 (20 l) X00070530 (210 l) X00700527 (1000 l) (sales region: England)
	Coolant AH 40/60 Antifreeze Premix	X00070533 (20 l) X00070531 (210 l) X00700532 (1000 l) (sales region: England, Spain)
	Coolant RM 30 Readmix Coolant 40/60	X00073922 (20 l) X00073916 (205 l) X00073923 (1000 l)
	Coolant AH 35/65 Antifreeze Premix	X00069382 (20 l) X00069383 (210 l) X00069384 (1000 l) (sales region: Italy)
	Coolant without antifreeze	
	Coolant CS 100 Corrosion Inhibitor Concentrate	X00057233 (20 l) X00057232 (210 l) X00070455 (1000 l)
	Coolant CS 10/90 Corrosion Inhibitor Premix	X00069385 (20 l) X00069386 (210 l) X00069387 (1000 l) (sales region: Italy)

TIM-ID: 0000060890 - 004

Manufacturer & sales region	Product name	Type
MTU America America	**Antifreeze**	
	Power Cool ® Off-Highway Coolant 50/50 Premix	23533531 (5 gallons) 23533532 (55 gallons)
	Power Cool ® Universal 50/50 mix	800069 (1 gallon) 800071 (5 gallons) 800084 (55 gallons)
	Power Cool ® Universal 35/65 mix	800085 (5 gallons) 800086 (55 gallons)
	Power Cool ® 3149 Concentrate	23528572 (55 gallons) 23528571 (1000 l)
	Coolant without antifreeze	
	Power Cool ® Plus 6000 Concentrate	23533526 (1 gallon) 23533527 (5 gallons) colored green

Note

For ready mixtures, the proportion of coolant additive (concentrate) is always named first.

Example:

- Coolant AH 40/60 Antifreeze Premix = 40 % coolant additive by volume / 60 % fresh water by volume

TIM-ID: 0000060890 - 004

3.2 Operational monitoring

Inspection of the fresh water and continuous monitoring of the coolant are essential for trouble-free engine operation. Fresh water and coolant should be inspected at least once per year and with each fill-up. Inspections can be carried out using the MTU Test Kit which contains the necessary equipment, chemicals and instructions for use.

The following tests can be conducted with the MTU Test Kit:
- Determination of total hardness (°d)
- pH value
- Chloride content of fresh water
- Corrosion-inhibiting oil content
- Determination of antifreeze content
- Determination of the concentration of coolant without antifreeze

Orders for fresh water and coolant analysis may be placed with MTU. Samples of min. 0.25 l must be supplied.

Important information

In the 4000-04-05 Series, an additional exhaust gas cooler is installed and the cooling system reacts more sensitively. A regular check of the coolant is therefore very important to ensure trouble-free engine operation. This check must be carried out annually or after 3000 operating hours and every time the coolant is filled.
The concentration, pH value and silicon content (only with coolant that contain Si) must be within the values specified in the MTU Fluids and Lubricants Specifications.

Important information

Due to thermal stress of the coolant in plants with preheating, a semi-annual analysis of the coolant is recommended.

Permissible concentrations

	Minimum				Maximum
Emulsifiable corrosion inhibitor oils without antifreeze	1% by volume	–	–	–	2% by volume
Antifreeze on ethylene glycol basis	35% by volume	40% by volume	45% by volume	50% by volume	55% by volume
with antifreeze protection up to*	-20 °C	-25 °C	-31 °C	-37 °C	-45 °C
Antifreeze on propylene glycol-basis	35% by volume	–	–	–	50% by volume
with antifreeze protection up to*	-18 °C	–	–	–	-32 °C
BASF G206	65% by volume for application at outside temperatures of up to -65 °C in arctic regions				

Table 4:

* = antifreeze specifications determined as per ASTM D 1177

TIM-ID: 0000018575 - 005

Operational monitoring for permissible concentrations, coolant without antifreeze

Permissible concentration range	Manufacturer	Brand name	Reading on hand refractometer) at 20 °C (= degrees Brix)					
		vol%	7	8	9	10	11	12
9 to 11% by volume	MTU Friedrichshafen	Coolant CS 100 Corrosion Inhibitor Concentrate	3.5	4.0	4.5	5.0	5.5	6.0
		Coolant CS 10/90 Corrosion Inhibitor Premix	3.5	4.0	4.5	5.0	5.5	6.0
	MTU America	Power Cool® Plus 6000	3.5	4.0	4.5	5.0	5.5	6.0
	Arteco	Freecor NBI	Please use test kit of manufacturer					
	BASF SE	Glysacorr G93 green	3.5	4.0	4.5	5.0	5.5	6.0
	BP Lubricants	Castrol Extended Life Corrosion Inhibitor	4.9	5.6	6.3	7.0	7.7	8.4
	CCI Corporation	A 216	4.9	5.6	6.3	7.0	7.7	8.4
	CCI Manufacturing IL Corporation	A 216	4.9	5.6	6.3	7.0	7.7	8.4
	Chevron	Texcool A -200	Please use test kit of manufacturer					
	Detroit Diesel Corporation	Power Cool Plus 6000	4.9	5.6	6.3	7.0	7.7	8.4
	Drew Marine	Drewgard XTA	3.5	4.0	4.5	5.0	5.5	6.0
	ExxonMobil	Mobil Delvac Extended Life Corrosion Inhibitor	4.9	5.6	6.3	7.0	7.7	8.4
	Ginouves	York 719	3.5	4.0	4.5	5.0	5.5	6.0
	Old World Industries Inc.	Final Charge Extended Life Corrosion Inhibitor (A 216)	4.9	5.6	6.3	7.0	7.7	8.4
	Valvoline	Zerex G-93	3.5	4.0	4.5	5.0	5.5	6.0
7 to 11% by volume	Arteco	Havoline Extended Life Corrosion Inhibitor XLI [EU 32765]	2.6	3.0	3.4	3.7	4.1	4.4
	Nalco	Alfloc (Maxitreat) 3443	1.75	2.0	2.25	2.5	2.75	3.0
		Alfloc (Maxitreat) 3477	1.75	2.0	2.25	2.5	2.75	3.0
	PrixMax Australia Pty. Ltd.	PrixMax RCP	2.6	3.0	3.4	3.7	4.1	4.4
	Total	WT Supra	2.6	3.0	3.4	3.7	4.1	4.4
5 to 6% by volume	Fleetguard	DCA-4L	Please use test kit of manufacturer					
	Detroit Diesel Corporation	Power Cool 3000						
	Penray	Pencool 3000						

TIM-ID: 0000018575 - 005

Permissible concentration range	Manufacturer	Brand name	Reading on hand refractometer[1] at 20 °C (= degrees Brix)					
		vol%	7	8	9	10	11	12
3 to 4% by volume	Detroit Diesel Corporation	Power Cool 2000	Please use test kit of manufacturer					
	Nalco	Alfloc 2000						
		Nalco 2000						
		Nalcool 2000						
		Trac 102						
	Penray	Pencool 2000						

Table 5:

[1] = concentration determination by means of suitable hand refractometer

Calibrate the hand refractometer with clean water at coolant temperature. The coolant temperature should be 20 °C. Observe the specifications of the manufacturer.

Operational monitoring of permissible concentrations, antifreeze on ethylene glycol basis

The concentration is determined using a suitable glycol refractometer and direct reading of the scale value in % by vol.

Calibration table for antifreeze for special applications

Reading on hand refractometer at 20 °C (= degrees Brix)		Corresponds to a concentration of
I. Propylene glycol antifreeze	II. BASF G206	
26.3	24.8	35% by volume
26.9	25.5	36% by volume
27.5	26.1	37% by volume
28.2	26.7	38% by volume
28.8	27.4	39% by volume
29.5	28.0	40% by volume
30.1	28.6	41% by volume
30.8	29.2	42% by volume
31.3	29.8	43% by volume
31.9	30.4	44% by volume
32.5	30.9	45% by volume
33.1	31.5	46% by volume
33.7	32.1	47% by volume
34.2	32.6	48% by volume
34.8	33.2	49% by volume
35.3	33.8	50% by volume
	34.4	51% by volume

TIM-ID: 0000018575 - 005

Reading on hand refractometer at 20 °C (= degrees Brix)		
I. Propylene glycol antifreeze	II. BASF G206	Corresponds to a concentration of
	34.9	52% by volume
	35.5	53% by volume
	36.1	54% by volume
	36.7	55% by volume
	37.2	56% by volume
	37.8	57% by volume
	38.3	58% by volume
	38.9	59% by volume
	39.4	60% by volume
	39.9	61% by volume
	40.5	62% by volume
	41.0	63% by volume
	41.5	64% by volume
	42.0	65% by volume

Table 6:

TIM-ID: 0000018575 - 005

3.3 Series-based usability of coolant additives

All details are based on the coolant circuit on the engine side, no allowance is made for external add-on components.

Important
In the case of an engine coolant circuit with no light metal elements but with external add-on components containing light metal (e.g. cooling system or preheater), the coolant approvals for cooling systems containing light metal shall apply. If you have any doubts about a coolant application, consult your contact person at MTU.

For details and special information, see section “Coolants” (→ Page 17)

Any deviating special agreements between the customer and MTU-Friedrichshafen shall remain valid.

Series	Cooling system containing light metals	Coolant without antifreeze
2000Gx5 2000Gx6	Yes	• Concentrates for cooling systems containing light metal, see (→ Page 96) • Ready mixtures for cooling systems containing light metal, see (→ Page 98)
4000Gx3 4000Gx4	No *	• Concentrates for cooling systems containing light metal, see (→ Page 99) • Ready mixtures for cooling systems containing light metal, see (→ Page 101)

Series	Cooling system containing light metals	Antifreeze	
2000Gx5 2000Gx6	Yes	• Concentrates for cooling systems containing light metal, see (→ Page 102) • Concentrates for special applications, see (→ Page 105) • Ready mixtures for cooling systems containing light metal, see (→ Page 106)	• Concentrates based on ethylene glycol (suitable for series with and without light metal), see (→ Page 115)
4000Gx3 4000Gx4	No *	• Concentrates for cooling systems containing light metal, see (→ Page 108) • Concentrates for special applications, see (→ Page 111) • Ready mixtures for cooling systems containing light metal, see (→ Page 112)	• Ready mixture based on propylene glycol for series free of light metal, see (→ Page 116)

* In the case of an engine coolant circuit with no light metal elements but with external add-on components containing light metal (e.g. cooling system or preheater), the coolant approvals for cooling systems containing light metal shall apply.

TIM-ID: 0000063206 - 004

3.4 Unsuitable materials in the coolant circuit

Components made of copper, zinc and brass materials

Unless various preconditions are observed, components made of copper, zinc and brass materials in the coolant circuit can cause an electrochemical reaction in conjunction with base metals (e.g. aluminum). As a result, components made of base metals are subject to corrosion or even corrosive pitting. The coolant circuit becomes leaky at these points.

Requirements

Based on current knowledge, the following materials and coatings must not be used in an engine coolant circuit because negative mutual reactions can occur even with approved coolant additives.

Metallic materials

- No galvanized surfaces
  The entire cooling system must be free of zinc components. This also applies to coolant supply and drain lines as well as to storage containers.
- No copper-based alloys as material with the use of coolant containing nitrite, with the exception of the following two alloys:
  - CuNi10Fe1Mn corresponds to CW-352-H
  - CuNi30Mn1Fe corresponds to CW-354-H
- Do not use components containing brass in the coolant circuit (e.g. coolers made of CuZn30) if exposed to ammoniacal solutions (e.g. amines, ammonium, ...) and solutions containing nitrite or sulfide. Stress-corrosion cracking is possible in the presence of tensile stress and a critical potential area. "Solutions" refer to cleaning agents, coolants and similar substances.

Non-metallic materials

- Do not use EPDM or silicone elastomers if emulsifiable corrosion inhibitor oils are used or other oils are introduced to the coolant circuit.

Coolant filter / filter downstream of plant components

- If such filters are used, only products that do not contain additives may be used.
  Supplementary additives such as silicates, nitrites etc. can diminish the protective effect or service life of a coolant and, possibly, attack the materials installed in the coolant circuit.

Information:

In case of doubt about the use of materials on the engine and add-on components / components in coolant circuits, consultation with the respective MTU specialist department must be held.

TIM-ID: 0000052845 - 003

3.5 Fresh water requirements

For preparation of coolant without antifreeze protection

Only clean, clear water with values in accordance with those in the following table must be used for preparing the coolant. If the limit values for the water are exceeded, de-mineralized water can be added to reduce the hardness or mineral content.

Parameters	Minimum	Maximum
Sum of alkaline earth metals *) (Water hardness)	0 mmol/l 0°d	2.7 mmol/l 15°d
pH value at 20 °C	5.5	8,0
Chloride ions		100 mg/l
Sulphate ions		100 mg/l
Anions total		200 mg/l
Bacteria		10^3CFU (colony forming unit)/ml
Fungi, yeasts	are not permitted!	

*) Common designations for water hardness in various countries:

1 mmol/l = 5.6°d = 100 mg/kg $CaCO_3$

- 1°d = 17.9 mg/kg $CaCO_3$, USA hardness
- 1°d = 1.79° French hardness
- 1°d = 1.25° English hardness

TIM-ID: 0000060895 - 003

3.6 Antifreeze

The preceding MTU Fluids and Lubricants Specifications used the designation "Corrosion inhibiting antifreeze". This designation will be replaced with immediate effect to "Antifreeze".

Antifreezes are necessary for engines without heating facilities and operating in areas where below-freezing temperatures may occur.

Most of the antifreezes approved at MTU are based on ethylene glycol.

Exceptions:
- Ready mixture Fleetguard PG XL based on propylene glycol (→ Page 116)
- Concentrate BASF G206 as a mixture of ethylene glycol and propylene glycol

Provided that they are used in approved concentrations, antifreezes approved by MTU provide effective protection against corrosion, see section "Operational monitoring" (→ Page 20).

The antifreeze concentration must be determined not only in accordance with the minimum anticipated temperatures but also with the corrosion protection requirements.

Important

For the coolant additives approved for the individual series, see (→ Page 24).

Special approvals presently in effect remain valid.

Important

Coolant additives containing nitrite must not be used in conjunction with coolers that contain brass!

Note:

- Propylene glycol-based antifreezes are stipulated for use in some types of applications. These products have a lower thermal conductivity than the usual ethylene glycol products. This brings about a higher temperature level in the engine.
- The product BASF G206 is available for use at extremely low temperatures (< -40 °C).
- Flushing with water is required at every change to a different coolant product. For flushing and cleaning specifications for engine coolant circuits, see (→ Page 117).

TIM-ID: 0000060891 - 003

3.7 Coolant without antifreeze

The preceding MTU Fluids and Lubricants Specifications used the designation "water-soluble corrosion inhibiting antifreeze". This designation will be replaced with immediate effect with "coolant without antifreeze".

Engine coolant without antifreeze is required in the case of higher coolant temperatures or larger temperature gradients in heat exchangers, e.g. .in TB systems (with plate-core heat exchanger) and TE systems.

Provided that they are used in adequate concentration, coolants without antifreeze approved by MTU provide effective corrosion protection. The relevant concentration range for use is listed in the section on operational monitoring.

Important

For approved coolant additives for the individual engine series, refer to section "Approved coolants" (→ Page 24).

Special arrangements presently in effect remain valid.

Important

Coolant additives containing nitrite must not be used in conjunction with coolers that contain brass!

Flushing with water is required at every change to a different coolant product. For preserved engines (new engines, field engines, reserve stock engines, etc.), a flushing run must be carried out prior to filling with engine coolant if the engines were preserved with an emulsifiable corrosion inhibitor. The necessary work is described in the section "Flushing and cleaning specifications for engine coolant circuits" (→ Page 117).

TIM-ID: 0000060893 - 003

3.8 Emulsifiable corrosion-inhibiting oils

Emulsifiable corrosion-inhibiting oils must not be used with the following Series:

- Series 2000
- Series 4000

Special approval presently in effect remain valid.

TIM-ID: 0000063425 - 002

3.9 Limit values for coolants

pH value when using:		
– Emulsifiable corrosion inhibiting oil	Min. 7.5	Max. 9.5
– Antifreeze	Min. 7.5	Max. 9.0
– Coolant without antifreeze for engines containing light metal	Min. 7.5	Max. 9.0
– Coolant without antifreeze for engines free of light metal	Min. 7.5	Max. 11.0
Silicon (valid for coolants containing Si)	Min. 25 mg/l	

Table 7:

The coolant must be changed in case of non-compliance with the above specifications.

Note:

For a holistic appraisal of a coolant function, apart from the above-mentioned limit values the respective coolant-specific characteristic data and the fresh water quality used must be taken into consideration.

TIM-ID: 0000018576 - 005

3.10 Storage capability of coolant concentrates

The storage capability specifications refer to coolant concentrates in original, hermetically sealed packing with storage temperatures up to max. 30 °C.

The instructions of the manufacturer must also be observed.

Coolant concentrate	Limit value	Brand name / Comments
Emulsifiable corrosion-inhibiting oil	6 months	
Antifreeze	Approx. 3 years	Observe manufacturer's specifications
Products containing propylene glycol	3 years	BASF G206
Coolant without antifreeze	6 months	Nalco Trac 102
	1 year	Detroit Diesel Corp. Power Cool 3000 Penray Pencool 3000
	2 years	Arteco Freecor NBI Chevron Texcool A-200 – Nalco Alfloc 2000 Nalco Nalcool 2000 Nalco Nalco 2000 Detroit Diesel Corp. Power Cool 2000 Penray Pencool 2000 PrixMax RCP
	3 years	BASF Glysacorr G93 green Drew Marine Drewgard XTA Ginouves York 719 MTU Friedrichshafen Coolant C150 MTU America Power Cool® Plus 6000 Nalco Alfloc (Maxitreat) 3477 Valvoline ZEREX G-93
	5 years	Arteco Havoline Extended Life Corrosion Inhibitor XLI [EU 032765] BP Castrol Extended Life Corrosion Inhibitor CCI Corporation A216 CCI Manufacturing IL A216 Chevron Texaco Extended Life Corrosion Inhibitor Nitrite Free [US 236514] Detroit Diesel Corp. Power Cool Plus 6000 ExxonMobil Mobil Delvac Extended Life Corrosion Inhibitor Fleetguard DCA-4L Old World Industries Final Charge Extended Life Corrosion Inhibitor (A216) Total WT Supra

Table 8:

Note:

For reasons of corrosion protection, do not store in galvanized bins. Take this requirement into account when coolant must be transferred.

Containers must be hermetically sealed and stored in a cool, dry place. Frost protection must be provided in winter.

TIM-ID: 0000018577 - 006

Further information can be obtained from the product and safety data sheets for the individual coolants.

TIM-ID: 0000018577 - 006

3.11 Color additives for detection of leaks in the coolant circuit

The following listed fluorescent dyes are approved as additives for coolant without antifreeze for the detection of leaks.

Manufacturer	Product name	Part No.	Container size	Storage stability[1)]
Chromatech Inc. Chromatech Europe B.V.	D11014 Chromatint Uranine Conc	X00066947	20 kg	2 years

Table 9: Approved dye additives

[1)] = based on original and hermetically sealed containers in frost-free storage (> 5 °C)

Application:

Approx. 40 g dye must be added to 180 l coolant.

This dye quantity is already very generous and must not be exceeded.

The fluorescence (yellow color tone) is easily recognizable in daylight. In dark rooms, UV light can be used with a wave length of 365 nm.

TIM-ID: 0000053354 - 004

3.12 MTU Advanced Fluid Management System for coolant – Test package for North America

A sophisticated system for diagnostics and preventive maintenance is available in North America. This system allows the following:

- Optimization of the coolant change intervals
- Evaluation of metal migration
- Evaluation of the coolant's corrosive properties
- Detection of the causes of problems in the cooling system in connection with blown cylinder-head gaskets, electrical ground problems, localized overheating and contaminants within and outside the system

For full information on the MTU Advanced Fluid Management System available in North America, please contact an authorized MTU Onsite Energy service partner.

The following test packages from MTU advanced Fluid Management System can be ordered from authorized MTU Onsite Energy service partners in North America:

- C-P92
  Basic test – For monitoring the corrosivity of the coolant and for detecting metal migration
- C-P94
  Extended test – Identification of the causes of leaks in the combustion system, grounding problems and contamination in the plant
- C-P93
  Extended Test Plus – Monitoring of corrosivity and metal migration plus HPLC analysis and IC analysis for confirmation of the determined contamination of the corrosion inhibitor

The following coolant parameters can be determined:

Coolant parameters	C-P92	C-P94	C-P93
15 elementary metals	✔	✔	✔
Glycol percentage	✔	✔	✔
Freezing point	✔	✔	✔
Boiling point	✔	✔	✔
pH value	✔	✔	✔
Total hardness	✔	✔	✔
SCA number	✔	✔	✔
Nitrite	✔	✔	✔
Specific conductivity	✔	✔	✔
Carboxylic acid	✔	✔	✔
Sensory parameters (color, oil, fuel, magnetic precipitation, amagnetic precipitation, odor and foam)	✔	✔	✔
Contamination and corrosion inhibitor through IC (chloride, sulfate, nitrite, nitrate, phosphate and glycolate)	–	✔	✔
HPCL	–	–	✔

The MTU Advanced Fluid Management System with trend analysis provides information for maximizing system reliability. The following guidelines must be followed to obtain the best results.

Samples must be taken:

- While the engine is operating under normal conditions or immediately after stopping the engine while the engine is still at operating temperature
- Every 250 hours at the same point

Note: The software offered by MTU for online reporting with trend analyses shows the procedure for optimizing evaluation of the gathered information after completion of the analysis.

TIM-ID: 0000063398 - 002

Note: The MTU Advanced Fluid Management System works together with independent test laboratories accredited according to ISO 17025 A2LA. This accreditation is the highest level of quality obtainable by a test laboratory in North America.

TIM-ID: 0000063398 - 002

4 Liquid Fuels

4.1 Diesel fuels – General information

Important
Dispose of used fluids and lubricants in accordance with local regulations. Used oil must never be disposed of via the combustion engine!

Selection of a suitable diesel fuel

The quality of the fuel is very important for satisfactory engine performance, long engine service life and acceptable exhaust emission levels.

Important
Diesel fuels are not available worldwide in the quality required according to (→ Table 10). The fuel properties depend on many factors, in particular, region, time of year and storage.

Unsuitable fuel usually leads to a reduced service life of engine components and can also cause engine damage.

Further details on fuel qualities, tank care and filtration are available in the publication "Useful information on fuels, tank systems and filtration" (publication number A060631/..).

Characteristics of the fuel		Test method		Limit values
		ASTM		
Composition				The diesel fuel must be free of inorganic acids, visible water, solid foreign matter and chlorine compounds.
Total contamination (= elements insoluble in fuel)	max.	D6217	EN 12662	24 mg/kg
Density at 15 °C	min.	D1298 D4052	EN ISO 3675 EN ISO 12185	0.820 g/ml
	max.			0.860 g/ml
API gravity at 60 °F	min.	D287		41
	max.			33
Viscosity at 40 °C	min.	D445	EN ISO 3104	1.5 mm²/s
	max.			4.5 mm²/s
Flashpoint (closed crucible)	min.	D93	EN ISO 2719	55 °C
Boiling curve:		D86	EN ISO 3405	
– Initial boiling point				160 to 220 °C
– Volume share at 250 °C	max.			65% by volume
Recovery at 350 °C	min.			85% by volume
– Residue and loss	max.			3% by volume

[1] Filter plugging point or Cold Filter Plugging Point (CFPP) denotes the temperature at which a test filter is blocked under defined conditions by precipitated paraffins. This characteristic is used for diesel fuels as per DIN EN 590 to describe the climatic requirements (e.g. summer and winter diesel).
[2] The cloud point is the temperature at which a liquid product becomes turbid in the test glass due to precipitation of paraffin. This must not be higher than the ambient temperature.
Note: 1% by weight = 10000 mg/kg = 10000 ppm

TIM-ID: 0000060900 - 005

Characteristics of the fuel		Test method		Limit values
		ASTM		
Fatty acid methyl ester content (FAME) ("Biodiesel")	max.		EN 14078 Internal MTU procedure	7.0% by volume
Proportion of water: (absolute, no free water)	max.	D6304	EN ISO 12937	200 mg/kg
Carbon residue from 10% distillation residue	max.	D189	EN ISO 10370	0.30% by weight
Oxide ash:	max.	D482	EN ISO 6245	0.01% by weight (100 mg/kg)
Sulfur content: 2000Gx5, 4000Gx3, 4000Gx4	max.	D5453, D2622	EN ISO 20846, EN ISO 20884	0.5% by weight (5000 mg/kg)
Sulfur content: 2000Gx6				0.05% by weight (500 mg/kg)
Cetane number	min.	D613	EN ISO 5165, EN ISO 15195	45
Cetane index	min.	D976	EN ISO 4264	42
Copper corrosion 3 hrs at 50 °C	Max. degree of corrosion	D130	EN ISO 2160	1 a
Oxidation stability(Rancimat)	min.		EN 15751	20 hours
Oxidation stability	max.	D2274	EN ISO 12205	25 g/m³
Lubricity at 60 °C (HFRR value)	max.	D6079	EN ISO 12156-1	520 µm
Filter plugging point (CFPP)		D6371	DIN EN 116	See [1]
Cloud Point		D2500	DIN EN 23015	See [2]
Neutralization number	max.	D974		0.2 mg KOH/g

[1] Filter plugging point or Cold Filter Plugging Point (CFPP) denotes the temperature at which a test filter is blocked under defined conditions by precipitated paraffins. This characteristic is used for diesel fuels as per DIN EN 590 to describe the climatic requirements (e.g. summer and winter diesel).
[2] The cloud point is the temperature at which a liquid product becomes turbid in the test glass due to precipitation of paraffin. This must not be higher than the ambient temperature.
Note: 1% by weight = 10000 mg/kg = 10000 ppm

Table 10:

The fuel supplier must ensure that the fuel can still be used at extremely low temperatures and correct engine operation can be guaranteed. Extremely low temperatures must be noted, which can be expected under the given geographical and other local conditions.

The operator must ensure that fuel necessary for the corresponding climatic requirements is used.

Note:

The engines are certified for operation with the fuels approved in the MTU Fluids and Lubricants Specifications.

The component TBO specified in the maintenance schedule relates to operation of the engine with diesel fuel as per DIN EN 590.

For operation with a high sulfur content in the fuel, the following must be observed:

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Series 4000

When a fuel with sulfur content > 1500 mg/kg is used, the times specified in the maintenance schedule for component TBO of the cylinder head may be reduced, see following table (→ Page 38)

TBO cylinder head as a function of sulfur content in the fuel

Sulfur content in fuel (mg/kg)	TBO cylinder head (h)
<1500	According to maintenance schedule
1500 to 3000	12000[1)]
3000 to 4000	7000[1)]
4000 to 5000	5000[1)]

Table 11:

[1)]= If the TBO cylinder head specified in the maintenance schedule is shorter, the shorter TBO shall always apply.

Important
If the sulfur content in the fuel is > 0.5% by weight (> 5000 ppm), please consult with the MTU-Friedrichshafen (application engineering).

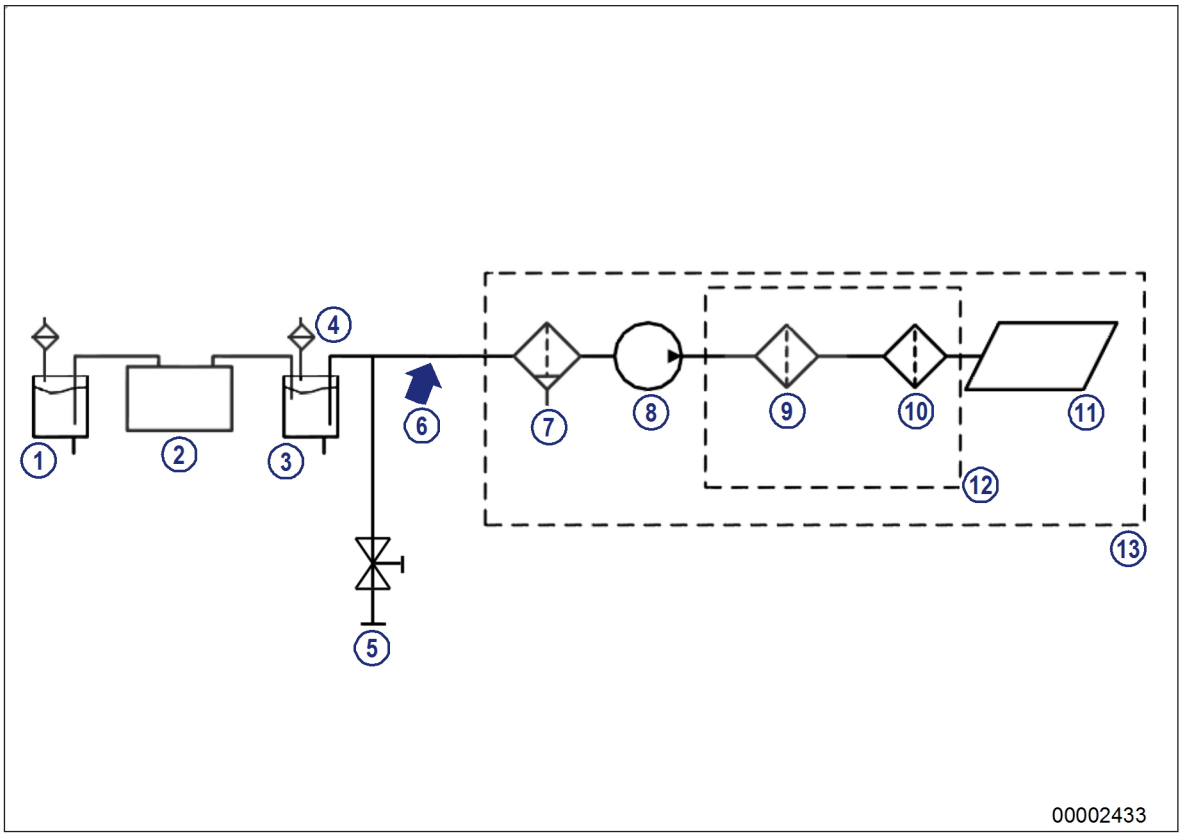

Figure 3: Fuel system

1 Fuel tank
2 Fuel conditioning (option)
3 Last tank before engine
4 Tank ventilation filter
5 Sample extraction
6 Interface for fuel specification
7 Fuel prefilter with water separator (option)
8 Fuel low-pressure pump
9 Intermediate filter (option)
10 Main filter
11 Injection system
12 Engine filter
13 Engine scope

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Note:

The limit values named in the table (→ Table 10) must be observed at the interface [(→ Figure 3), item 6] at the latest to guarantee safe and efficient engine operation. This applies in particular to water and total contamination.

Important
In addition to the limit values listed in the table (→ Table 10), a particle distribution in the fuel in acc. with ISO 4406 must be observed, see (→ Table 12).

Particle distribution for fuels

Particle distribution	Test method ASTM		Limit values	
			Series 2000 Gx6, Series 4000 Gx3, Series 4000 Gx4	Series 2000 Gx5
Particle distribution for fuel between last tank before engine and prefilter [(→ Figure 3), item 6]	D7619 D7647	Coding of number of particles as per ISO 4406	max. ISO Code 18/17/14 for 4/6/14 µm particle size	max. ISO Code 21/20/17 for 4/6/14 µm particle size

Table 12:

Important
The limit values named in the table (→ Table 12) must already be observed in the feed between the last tank before the engine and the prefilter (if necessary, with water separator).

For plants without a prefilter, this refers to the feed between the last tank and the MTU equipment. For the analysis of the fuel quality, an interface (sample extraction cock) must be provided for sample extraction during operation.

For existing plants without an accessible feed, a sample extraction point in the last tank before the MTU equipment is permissible.

Note:

With poorer particle distribution, it is necessary to integrate further / more-optimized filter stages in the fuel system to achieve the operational life of fuel filters and components of the injection system.

For the limit values named for the interface, it has been validated that MTU-approved prefilters provide sufficient filtration.

MTU Friedrichshafen GmbH shall not provide warranty cover for damage and impairment to engine caused by the following usage:

- Fuel grades not approved by MTU (see (→ Table 10), (→ Table 12), (→ Page 41))
- Prefilters not approved by MTU

.

Laboratory analysis

An order for fuel analysis can be placed with MTU.

The following data is required:

- Fuel specifications
- Sampling point
- Serial number of engine from which fuel sample was taken

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Submit the following:
- 0.5 liters of fuel
- 1.5 liters of fuel (with additional determination of cetane number)

Test Package for North America

The MTU Advanced Fluid Management System is available in North America, which contributes to preventive maintenance through innovative diagnostics.

MTU Advanced Fluid Management System for fuels, see (→ Page 65).

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4.2 Series-dependent approval of fuel grades for MTU engines

4.2.1 Distillate fuels according to DIN EN 590 and ASTM D975

Commercially available diesel fuels meeting the following specifications are approved for use:

Approved fuels Fuel specifications	Series 2000 2000Gx5	 2000Gx6
DIN EN 590: 2014-4 • Summer and winter quality • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Approved
ASTM D975-16 • Grade 1-D • S 15, S 500, S 5000 • Density: 0.820 to 0.860 g/ml • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Viscosity min. 1.5 mm^2/s • Cetane number min. 45 or centane index min. 42 • Sulfur content max. 500 mg/kg	Approval issued if: • Viscosity min. 1.5 mm^2/s • Cetane number min. 45 or centane index min. 42 • Sulfur content max. 500 mg/kg
ASTM D975-16 • Grade 2-D • S 15, S 500, S 5000 • Density: 0.820 to 0.860 g/ml • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Cetane number min. 45 or centane index min. 42 • Sulfur content max. 500 mg/kg	Approval issued if: • Cetane number min. 45 or centane index min. 42 • Sulfur content max. 500 mg/kg

TIM-ID: 0000063330 - 004

Approved fuels Fuel specifications	Series 4000 4000Gx3	 4000Gx4
DIN EN 590: 2014-4 • Summer and winter quality • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Approved
ASTM D975-16 • Grade 1-D • S 15, S 500, S 5000 • Density: 0.820 to 0.860 g/ml • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Viscosity min. 1.5 mm^2/s • Cetane number min. 45 or centane index min. 42	Approval issued if: • Viscosity min. 1.5 mm^2/s • Cetane number min. 45 or centane index min. 42
ASTM D975-16 • Grade 2-D • S 15, S 500, S 5000 • Density: 0.820 to 0.860 g/ml • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Cetane number min. 45 or centane index min. 42	Approval issued if: • Cetane number min. 45 or centane index min. 42

TIM-ID: 0000063330 - 004

4.2.2 British Standard 2869

Commercially available diesel fuels meeting the following specifications are approved for use:

Approved fuels Fuel specifications	Series 2000 2000Gx5	 2000Gx6
BS 2869:2010 • Part 1 Class A2 • Density: max. 860 kg/m^3 • Viscosity: max. 4.5 mm^2/s. If viscosity min. 4.5 mm^2/s: Preheating required • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Not approved	Not approved
BS 2869:2010 • Part 2 Class D • Density: max. 860 kg/m^3 • Viscosity: max. 4.5 mm^2/s. If viscosity min. 4.5 mm^2/s: Preheating required • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Not approved	Not approved

Approved fuels Fuel specifications	Series 4000 4000Gx3	 4000Gx4
BS 2869:2010 • Part 1 Class A2 • Density: max. 860 kg/m^3 • Viscosity: max. 4.5 mm^2/s. If viscosity min. 4.5 mm^2/s: Preheating required • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Not approved
BS 2869:2010 • Part 2 Class D • Density: max. 860 kg/m^3 • Viscosity: max. 4.5 mm^2/s. If viscosity min. 4.5 mm^2/s: Preheating required • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Not approved

TIM-ID: 0000080024 - 001

4.2.3 Chinese distillate fuels as per GB 19147-2013

Commercially available diesel fuels meeting the following specifications are approved for use:

Approved fuels	Series 2000	
Fuel specifications	2000Gx5	2000Gx6
GB 19147-2013 • Grade 0 • III: S max. 350 mg/kg • IV: S max. 50 mg/kg • V: S max. 10 mg/kg • Density: 0.820 to 0.860 g/ml* * deviating values: Approval possible project-specifically. If the density is too low, this can result in a power reduction. In the framework of power readjustment, it is possible that the engine operational values change • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36) • Neutralization number: Max 0.2 mgKOH/g • Viscosity at 40 °C: 1.5 to 4.5 mm^2)/s	Approved	Approved

Approved fuels	Series 4000	
Fuel specifications	4000Gx3	4000Gx4
GB 19147-2013 • Grade 0 • III: S max. 350 mg/kg • IV: S max. 50 mg/kg • V: S max. 10 mg/kg • Density: 0.820 to 0.860 g/ml* * deviating values: Approval possible project-specifically. If the density is too low, this can result in a power reduction. In the framework of power readjustment, it is possible that the engine operational values change • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36) • Neutralization number: Max 0.2 mgKOH/g • Viscosity at 40 °C: 1.5 to 4.5 mm^2)/s	Approved	Not approved

TIM-ID: 0000080029 - 002

4.2.4 Heating oil

Commercially available diesel fuels meeting the following specifications are approved for use:

Heating oil

Approved fuels	Series 2000	
Fuel specifications	2000Gx5	2000Gx6
DIN 51603-1:2011-09, heating oil EL Standard • Cetane number min. 45 or centane index min. 42 • Lubricity max. 520 µm • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Density at 15 °C min. 0.820 g/ml • Sulfur content max. 500 mg/kg	Approval issued if: • Sulfur content max. 500 mg/kg
DIN 51603-1:2011-09, heating oil EL low-sulfur • Cetane number min. 45 or centane index min. 42 • Lubricity max. 520 µm • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Approved
DIN 51603-6:2011-09, heating oil EL alternative	Not approved	Not approved

Approved fuels	Series 4000	
Fuel specifications	4000Gx3	4000Gx4
DIN 51603-1:2011-09, heating oil EL Standard • Cetane number min. 45 or centane index min. 42 • Lubricity max. 520 µm • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Not approved
DIN 51603-1:2011-09, heating oil EL low-sulfur • Cetane number min. 45 or centane index min. 42 • Lubricity max. 520 µm • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Not approved
DIN 51603-6:2011-09, heating oil EL alternative	Not approved	Not approved

TIM-ID: 0000080025 - 002

4.2.5 Marine distillate fuels in accordance with ISO 8217:2013-12

Commercially available diesel fuels meeting the following specifications are approved for use:

Approved fuels Fuel specifications	Series 2000 2000Gx5	 2000Gx6
DMX • Proportion of water: 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Not approved	Not approved
DMZ • Proportion of water: 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Not approved	Not approved
DMA • Proportion of water: 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Not approved	Not approved
DMB	Not approved	Not approved

Approved fuels Fuel specifications	Series 4000 4000Gx3	 4000Gx4
DMX • Proportion of water: 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Viscosity > 4.5 mm^2/s: Preheating required	Not approved
DMZ • Proportion of water: 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Viscosity 1.5 to 4.5 mm^2/s • Outside the limit range between 1.5 and 4.5 mm^2/s: Approval following coordination with MTU possible • Density 0.820 to 0.870 g/ml • Cetane number min. 45 or centane index min. 42	Not approved

TIM-ID: 0000080026 - 001

Approved fuels Fuel specifications	Series 4000 4000Gx3	 4000Gx4
DMA • Proportion of water: 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Viscosity 1.5 to 4.5 mm^2/s • Outside the limit range between 1.5 and 4.5 mm^2/s: Approval following coordination with MTU possible • Density 0.820 to 0.870 g/ml • Cetane number min. 45 or centane index min. 42	Not approved
DMB	Not approved	Not approved

TIM-ID: 0000080026 - 001

4.2.6 Aviation turbine fuels

Commercially available diesel fuels meeting the following specifications are approved for use:

Approved fuels Fuel specifications	Series 2000 2000Gx5	 2000Gx6
F-34 / F-35 • JP-8	Generally not approved, approval upon request	Generally not approved, approval upon request
F-44 • JP-5	Generally not approved, approval upon request	Generally not approved, approval upon request
F-63 • In accordance with DCSEA 108/A	Generally not approved, approval upon request	Generally not approved, approval upon request

Approved fuels Fuel specifications	Series 4000 4000Gx3	 4000Gx4
F-34 / F-35 • JP-8	Generally not approved, approval upon request	Generally not approved, approval upon request
F-44 • JP-5	Generally not approved, approval upon request	Generally not approved, approval upon request
F-63 • In accordance with DCSEA 108/A	Approved	Generally not approved, approval upon request

TIM-ID: 0000080027 - 002

4.2.7 NATO diesel fuels

Commercially available diesel fuels meeting the following specifications are approved for use:

Diesel fuel NATO Code F-54

Approved fuels Fuel specifications	Series 2000 2000Gx5	 2000Gx6
NATO Code F-54 in accordance with TL 9140-0001 Edition 8 • Approval if fuel corresponds to diesel fuel DIN EN 590:2014-04 • Total contamination: Max. 24 mg/kg • Lubricity: Max. 520 µm • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Sulfur content max. 500 mg/kg	Approval issued if: • Sulfur content max. 500 mg/kg
NATO Code F-54 in accordance with STANAG 7090 Edition 4 • Approval if fuel corresponds to diesel fuel DIN EN 590:2014-04 • Density: min. 0.820 g/ml • Total contamination: Max. 24 mg/kg • Lubricity: Max. 520 µm • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Sulfur content max. 500 mg/kg	Approval issued if: • Sulfur content max. 500 mg/kg

Approved fuels Fuel specifications	Series 4000 4000Gx3	 4000Gx4
NATO Code F-54 in accordance with TL 9140-0001 Edition 8 • Approval if fuel corresponds to diesel fuel DIN EN 590:2014-04 • Total contamination: Max. 24 mg/kg • Lubricity: Max. 520 µm • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Not approved
NATO Code F-54 in accordance with STANAG 7090 Edition 4 • Approval if fuel corresponds to diesel fuel DIN EN 590:2014-04 • Density: min. 0.820 g/ml • Total contamination: Max. 24 mg/kg • Lubricity: Max. 520 µm • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Not approved

TIM-ID: 0000080028 - 002

Diesel fuel NATO Code F-75

Approved fuels Fuel specifications	Series 2000 2000Gx5	 2000Gx6
NATO-Code F-75 in accordance with TL 9140-0003 • Reduced power possible due to min. density of 0.815 g/ml • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Not approved	Not approved
NATO-Code F-75 in accordance with STANAG 1385 • Possible power reduction and increase due to density range of 0.815 to 0.880 g/ml • max. sulfur content 1.0 % • Adapt oil and oil change interval • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Not approved	Not approved

Approved fuels Fuel specifications	Series 4000 4000Gx3	 4000Gx4
NATO-Code F-75 in accordance with TL 9140-0003 • Reduced power possible due to min. density of 0.815 g/ml • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Not approved
NATO-Code F-75 in accordance with STANAG 1385 • Possible power reduction and increase due to density range of 0.815 to 0.880 g/ml • max. sulfur content 1.0 % • Adapt oil and oil change interval • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Cetane number min. 45 or centane index min. 42	Not approved

TIM-ID: 0000080028 - 002

Diesel fuel NATO Code F-76

Approved fuels Fuel specifications	Series 2000 2000Gx5	 2000Gx6
NATO Code F-76 in accordance with STANAG 1385 Edition 6 • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Generally not approved, approval upon request	Generally not approved, approval upon request
NATO-Code F-76 in accordance with DEF-STAN 91-4 Issue 8 • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Generally not approved, approval upon request	Generally not approved, approval upon request
NATO-Code F-76 in accordance with MIL-DTL-16884N • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Generally not approved, approval upon request	Generally not approved, approval upon request

Approved fuels Fuel specifications	Series 4000 4000Gx3	 4000Gx4
NATO Code F-76 in accordance with STANAG 1385 Edition 6 • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Cetane number min. 45 or centane index min. 42	Not approved
NATO-Code F-76 in accordance with DEF-STAN 91-4 Issue 8 • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approved	Not approved
NATO-Code F-76 in accordance with MIL-DTL-16884N • Proportion of water: Max. 200 mg/kg • Total contamination: Max. 24 mg/kg • Particle distribution in accordance with table "Particle distribution for fuel", see chapter (→ Page 36)	Approval issued if: • Cetane number min. 45 or centane index min. 42	Not approved

TIM-ID: 0000080028 - 002

4.2.8 Paraffinic diesel fuel according to DIN EN 15940

Selected paraffinic diesel fuels according to DIN EN 15940 are currently in the qualification phase.

Important information
Project-specific approval from MTU-Friedrichshafen GmbH is possible upon request.

TIM-ID: 0000071312 - 002

4.2.9 B20 diesel fuel

B20 diesel fuel is a diesel fuel with a biodiesel share of 20%.

Important information
Project-specific approval from MTU-Friedrichshafen GmbH is possible upon request.

The following section provides additional information on B20 diesel fuel.

Use of B20 diesel fuels

Biodiesel mixtures consist of fuels which are obtained from biological raw materials and mixed with conventional diesel fuel. For instance, B20 denotes a mixture comprising 20% biodiesel and 80% fuel based on crude oil/mineral oil. MTU engines were not specially designed to be operated with biodiesel mixtures. For this reason, the use of biodiesel mixtures may have negative effects in terms of engine power, service and maintenance requirements, emissions and service life.

Operators of MTU engines therefore need to be clear about the effects that biodiesel may have on their engines, and must take all of the necessary measures to ensure the reliability and safety of their engines. This letter provides MTU customers with important information on the use of biodiesel mixtures in MTU engines, and explains the potential impact these fuels may have on the MTU warranty. Please read this information carefully before using biodiesel mixtures in MTU engines.

1. Regarding the use of approved biodiesel mixtures

At present, only biodiesel mixtures with up to 7% biodiesel (in accordance with DIN EN 590) or 5% biodiesel (in accordance with ASTM D 975) are approved for use in the MTU Fluids and Lubricants Specifications.

Although biodiesel mixtures with up to 20% biodiesel (B20) are not yet approved in the MTU Fluids and Lubricants Specifications at present, they can be used in the engines listed below in section 6, AS LONG AS the following requirements are met:

- The biodiesel complies with DIN EN 14214 or ASTM D 6751.
- The B20 fuel grade corresponds with DIN EN 16709.
- The distilled diesel fuel added to the biodiesel is approved in the latest version of the MTU Fluids and Lubricants Specifications.
- The operator complies with the operating requirements given in section 2 and the additional maintenance recommendations from section 5.

Important information

The provisions with regard to requirements placed on fuel may differ depending on legislation and application of the engine. The operator is responsible for ensuring that only fuels which comply with the applicable provisions are used in the engines.

2. Operating requirements for the use of B20

The following operating requirements must be met when biodiesel mixtures are used in MTU engines:

a For engines used in emergency generators, an additive must be used to improve the oxidation stability of the biodiesel.

b All engines used in fire pumps, fire-extinguishing equipment or police equipment must be thoroughly rinsed with pure, high-quality distilled diesel fuel which complies with the MTU Fluids and Lubricants Specifications each time they are operated with a biodiesel mixture. Furthermore, an additive must be used in these engines to improve the oxidation stability of the biodiesel.

c All engines which are only used seasonally or which are not operated for extended periods between uses must be thoroughly rinsed with pure, high-quality distilled diesel fuel which complies with the MTU Fluids and Lubricants Specifications before they are decommissioned.

d Biodiesel mixtures cannot be used in engines equipped with an exhaust gas after-treatment system (e.g. catalytic converters, particle filters (DPF) and/or systems for reducing NOx emissions, e.g. SCR systems).

TIM-ID: 0000072504 - 003

3. Impact on the MTU warranty

The manufacturer shall not be responsible for breakdowns which can be attributed to the use of fuels not approved in the MTU Fluids and Lubricants Specifications and such breakdowns shall therefore not be covered by the MTU warranty. MTU shall reject all warranty claims connected to the use of biodiesel mixtures with a biodiesel content of more than 7% (in accordance with DIN EN 590) or 5% (in accordance with ASTM D 975) if the operator is unable to prove that the operating requirements and recommendations contained in this letter were met and strictly followed. Regardless of this, MTU shall on no account be liable for providing compensation for costs arising from the effects described below in section 4.

Important information

All properties guaranteed by MTU in terms of engine power and/or availability in operation only apply to the cases in which fuels approved by MTU are used and the engine demonstrates no defects or damage arising from operation with fuels not approved in the MTU Fluids and Lubricants Specifications.

4. Effects of biodiesel on engines/exclusion of liability

The biodiesel contained in biodiesel mixtures is a natural product and therefore undergoes natural aging processes. These may have a negative effect on the engines in which the biodiesel mixtures are used. The effects that biodiesel may have on engines are explained below.

TIM-ID: 0000072504 - 003

Important: THESE EFFECTS ARE NOT FAULTS CAUSED BY THE ENGINE MANUFACTURER. THEY ARE THEREFORE EXCLUDED FROM THE MTU WARRANTY. MTU SHALL NOT ASSUME ANY LIABILITY FOR COSTS ARISING FROM THE EFFECTS DESCRIBED BELOW.

- The formation of deposits may cause components to become "sticky", which potentially restricts their movement. On engines with long downtimes, this can result in a situation where the engine can no longer be started. This is why additives for improving the oxidation stability of the biodiesel must be employed when biodiesel mixtures are used in emergency generators. MTU SHALL ACCEPT NO LIABILITY IN THE EVENT THAT THE ENGINE IN AN EMERGENCY GENERATOR CAN NOT BE STARTED AS A RESULT OF THE FORMATION OF DEPOSITS.
- The formation of deposits may have an adverse effect on the interaction of components inside the unit. This results in an increased risk of components failing, and even the breakdown of entire cylinders. The high operating temperatures in the surroundings encourage the formation of mineral deposits, other deposits and encrustations which may render the valve unable to correctly regulate the fuel supply. This means that it is not longer possible for the quantity of fuel required at full load to be injected into the engine, thereby reducing the maximum engine power.
- The viscosity properties of biodiesel are less favorable at low temperatures. The use of biodiesel at low temperatures may therefore cause the fuel filter to become blocked.
- On all engines, lubricating the piston skirts with oil leads to a small amount of fuel entering the engine oil. This is generally of little importance with conventional diesel fuels in accordance with the MTU Fluids and Lubricants Specifications since the fuel evaporates quickly upon reaching the operating temperature. On the other hand, biodiesel evaporates much less effectively, with the result that more biodiesel accumulates in the oil. Aging of the biodiesel can therefore cause residues to form, filters to become clogged and ultimately cause the engine to come to a stop, resulting in significantly shorter oil change intervals.
- Compared to conventional diesel fuels according to the MTU Fluids and Lubricants Specifications, biodiesel has a lower energy density. Operating the engine with B20 results in a power reduction of approximately 2% and an increase in fuel consumption of around 3%.
- Biodiesel contains chemical components which can interact with the sensors in the exhaust gas recirculation system in such a way that incorrect data is reported to the engine control system. This can have consequences such as engine operation being adapted to the wrong values and emissions therefore no longer complying with the applicable provisions. This is why biodiesel must not be used in engines which feature exhaust gas recirculation (EGR) and/or exhaust gas after-treatment systems.
- Compared to conventional diesel fuels according to the MTU Fluids and Lubricants Specifications, biodiesel has a higher water solubility, meaning that a higher proportion of water should be expected depending on the fuel temperature. This can lead to increased corrosion and faster microbe growth in the fuel system. Due to the higher proportion of water in biodiesel, reduced water separator performance must be expected.
- Biodiesel is a solvent. After switching over to a biodiesel mixture, impurities and certain deposits may become loose in the tank and lines, causing the fuel filter to be subjected to an increased accumulation of these. Biodiesel mixtures may also strip paint when they come into contact with painted surfaces.
- On engines with exhaust gas aftertreatment systems, the functioning of the catalytic converter may be impaired as biodiesel mixtures can contain a higher proportion of trace elements (e.g. calcium, magnesium, sodium, potassium and phosphorus) than conventional diesel fuels according to the MTU Fluids and Lubricants Specifications. This means that the legally prescribed emission limits are not complied with and the operating license becomes invalid. Furthermore, legally prescribed technologies for checking emissions on these engines (e.g. NOx monitoring diagnostics) lead to a significant decrease in engine power. The aforementioned trace elements may also result in excess ash formation and accumulations in the soot filters and catalytic converters. Excess ash formation results in a constantly rising exhaust back pressure and can therefore cause a slow reduction in engine power.

The aforementioned points do not constitute a complete risk assessment. MTU is unable to assess all biodiesel variants and their long-term effects on MTU products.

TIM-ID: 0000072504 - 003

5. Additional maintenance recommendations

The following requirements must be met to ensure the quality and availability of your engine:

- Select the highest possible content of distilled fuel. Only use fuels approved in the MTU Fluids and Lubricants Specifications.
- After switching over to a biodiesel mixture, replace the fuel filters after 50 operating hours at the latest (in order to remove the impurities which become loose from the tank and lines).
- The fuel filters and fuel prefilters must be renewed every 250.
- Install a fuel preheating system if the engine is operated at temperatures below 0 °C (32 °F). This can reduce the negative effect on the fuel supply.
- Follow the recommendations below with regard to engine oil and maintenance:
  - If biodiesel mixtures are used, the change intervals for engine oil and filters must be halved in comparison to the intervals stated in the MTU Fluids and Lubricants Specifications.
  - The TO for the LP fuel pump, the O-rings in the LP fuel system as well as the valves in the fuel filter head is shortened to TBO/3.
  - In addition to changing the oil and filters on time, the engine oil and filters must be analyzed regularly in order to ensure that the oil quality is correct. Interval: Every 100 operating hours or every three months, depending on which comes first. A decision must be made to either further reduce or extend the change intervals on the basis of the results.
  - The oil and oil filter must be replaced before biodiesel is used.
  - High-quality engine oil must be used. Operating the engine without high-quality category 2 oil leads to a deterioration in oil quality. The MTU Fluids and Lubricants Specifications contain a list of approved oil types.
- Use a suitable tank and line system:
  - Do not use any components which contain zinc, copper or NBR seals.
  - Ensure that the system can be filled up to the fill line.
  - Minimize the entry of atmospheric oxygen through the tank vent in the event of temperature fluctuations, etc. (e.g. by installing a pressure relief valve and filter; contact your tank supplier to do this).
  - It is recommended to use a tank vent with humidity separator.
- For systems without a water separator: Retrofit a water separator to reduce the risk of microbe growth and corrosion in the fuel system.
- Regular maintenance of the water separator is mandatory. Separated water must be drained off daily, depending on the water quantity.
- Avoid relatively long engine downtimes and temporary decommissioning (more than one week). If downtimes cannot be avoided, you must use a suitable additive to improve oxidation stability. In Q4/2013, MTU approved an additive specially certified for MTU diesel engines. When this additive is used, B20 can be stored for up to four months, depending on the storage conditions and quality of the biodiesel. Prior to this point, we provided an additive on request.
- For engines used seasonally, we strongly recommend rinsing the fuel system, including the fuel tank, with pure, high-quality distilled diesel fuel in accordance with the MTU Fluids and Lubricants Specifications before the engine is decommissioned for a relatively long period (more than one week).
- Prevent biodiesel from coming into contact with painted surfaces to avoid damaging and stripping the paint.
- You must also always comply with the latest version of the MTU Fluids and Lubricants Specifications.

More extensive preventative measures are additionally required for some applications. Our Customer Service department is available to answer any questions you may have on this topic.

6. Affected engines

This customer information applies to the following engine series:

TIM-ID: 0000072504 - 003

Series	Remarks
S1600Gx0	All years of manufacture
S2000Gx2	All years of manufacture
S2000Gx3	With metal low-pressure fuel lines
S2000Gx4	All years of manufacture
S2000Gx5	All years of manufacture
S2000Gx6	All years of manufacture
S4000Cx0	All years of manufacture
S4000Cx1	All years of manufacture
S4000Gx1	With metal low-pressure fuel lines
S4000Gx2	All years of manufacture
S4000Gx3	All years of manufacture

Table 13:

Should you have any questions about this customer information, please contact your on-site MTU representative.

TIM-ID: 0000072504 - 003

4.3 Biodiesel – Biodiesel admixture

The standardized general term "FAME", (Fatty Acid Methyl Esters) is used here to designate biodiesel fuels.

General information

- We can make no comment with regard to the level of FAME resistance of the fuel system, which is not part of our scope of supply.
- FAME is an extremely effective solvent. Any contact with paint, for example, must therefore be avoided.
- The characteristic smell of FAME exhaust, especially during long periods of idling, may be perceived as unpleasant. The nuisance caused by smell can be reduced by an oxidation catalyst which may be installed by the vehicle / equipment manufacturers at their own risk.

Important information
Our company accepts no responsibility for and provides no warranty in respect of any fault or damage connected in any way with the use of FAME of a lower quality or resulting from noncompliance with our specifications on operation using FAME. All resultant irregularities and consequential damage lie outside our responsibility.

Use of B20 fuels

Important information
Information on the use of B20 fuels can be obtained from the chapter (→ Page 53).

The following engines are approved/not approved for operation with 100% FAME in compliance with DIN EN 14214:2014-06.

Approved/non-approved engines for operation with 100% FAME

Series	Approved / Not approved	Conversion necessary
SUN	No approval	
700	No approval	
750	No approval	
OM 457 LA	From series introduction	no
460	From series introduction	no
900	From series introduction	no
500	From series introduction	no
S40	No approval	
S50	No approval	
S60	No approval	
183	No approval	
2000	No approval	
396	No approval	
4000	No approval	
538	No approval	
595	No approval	
956	No approval	

TIM-ID: 0000057609 - 004

Series	Approved / Not approved	Conversion necessary
1163	No approval	
8000	No approval	

Table 14:

Important information
Diesel fuel with a FAME content of max. 7% in compliance with DIN EN 590:2014-04 may be used. Such fuel may also be used in engines which have not been approved for operation with FAME, without affecting oil drain intervals.

Fuel

- The fuel must comply with DIN EN 14214:2014-06. Operation with fuels of lower quality can lead to damage and malfunctions.
- Either FAME or diesel fuel may be used. The various mixtures of FAME and normal diesel fuel, which may occur in the fuel tank as a result, present no problems.

Engine oil and servicing

- For operation using 100% FAME, engine oils are to be preferred which comply with MB Fluids and Lubricants Specifications, Sheet 228.5 or Oil Category 3 in accordance with MTU Fluids and Lubricants Specifications. Engine oils in accordance with Sheet 228.3 or Oil Category 2 as per MTU Fluids and Lubricants Specifications may also be used provided that oil drain intervals are reduced.
- A certain amount of fuel always finds its way into the engine oil via the pistons and cylinders. Its high boiling point means that FAME does not evaporate but remains in the engine oil in its entirety. Under certain conditions chemical reactions may take place between FAME and the engine oil. This can lead to engine damage.
- For this reason, engine oil and filter change intervals must be shortened for operation both with pure FAME and with FAME-diesel mixtures.
- For Series 457, 460, 900 and 500 engines, special equipment is available which facilitates an increase in the engine oil change intervals for operation with 100% FAME (→ Table 15). This involves fitting the engines with special equipment Code MK21 (special unit pump) and Code MK04 (fuel prefilter with heated water separator).

Effects on the engine oil change interval with operation with 100% FAME

Engine version	Engine oil change interval
Engines not fitted with special equipment for operation with FAME	Reduction of engine oil change interval to 30% of the standard interval required for operation with fossil diesel fuels
Engines fitted with special equipment Code MK21 and Code MK04	Reduction of engine oil change interval to 50% of the standard interval required for operation with fossil diesel fuels

Table 15:

Important information
The relevant engine oil change intervals must be complied with without fail! Exceeding the engine oil change intervals can cause engine damage!

TIM-ID: 0000057609 - 004

- Operation with 100% FAME requires shortened fuel filter change intervals. A new fuel filter must be fitted each time the engine oil is changed.
- FAME has a high cleaning effect, which results in a risk of clogging by loosened deposits.
  If a switch has been made to FAME, a fuel filter and engine oil change should therefore be carried out after approx. 25 operating hours.
- Over longer periods, fuel filter service life may be reduced as a result of old residues being carried into the filter from the fuel system. A special, approved fuel prefilter can be installed as an improvement. This fuel prefilter with heated water separator is already installed on engines fitted with special equipment Code MK04.

Engine power and engine standstill

- Due to its calorific value, operation with 100% FAME involves a reduction of approx.8% to 10% in engine power. This leads to a corresponding increase in fuel consumption as compared to operation with diesel fuel. Engine power corrections are not permissible.
- Prior to any extended period out of operation, the fuel system must be flushed out in order to prevent congestion. For flushing, the engine must be operated for at least 30 minutes on FAME-free diesel fuel.

Vegetable oils as an alternative to diesel fuel

Important information
The use of pure vegetable oils as an alternative to diesel fuel or FAME is strictly prohibited due to the absence of standardization and to negative experience (engine damage caused by coking, deposits in the combustion chambers and oil sludge)!

Diesel fuels in winter operation

At low outdoor temperatures, the diesel fuel's fluidity can be inadequate on account of paraffin precipitation.

In order to prevent operational problems (e.g. clogged filters) during the winter months, diesel fuel with suitable cold-flow characteristics is available on the market. Deviations are possible during transitional periods and in individual countries.

TIM-ID: 0000057609 - 004

4.4 Heating oil EL

Heating oil differs from diesel fuel mainly because of the following non-specified characteristics:

– Cetane number

– Sulfur content

– Oxidation stability

– Corrosion effect on copper

– Lubricity

– Low temperature behavior

If the heating requirements comply with the specifications of the diesel fuel DIN EN 590:2014-04 (summer and winter quality), there are no technical reasons why it can not be used in the diesel engine

TIM-ID: 0000018623 - 003

4.5 Supplementary fuel additives

Supplementary fuel additives

The engines are designed such that satisfactory operation with normal, commercially available fuels is ensured. Many of these fuels already contain performance-enhancing additives.

The additives are added by the supplier as the agent responsible for product quality.

The anti-wear additives and biocides represent an exception(→ Page 62).

Important information
Attention is drawn to the fact that the use of diesel fuels or additives other than those stipulated in the MTU Fluids and Lubricants Specifications is always the responsibility of the operator.

Diesel fuels with sulfur content < 500 mg/kg

On Series 362, 396, 538, 652, 595, 956, 1163-02 and -03 engines with cylinder heads not fitted with valve seat inserts, the use of low-sulfur fuel (< 500 mg/kg) can lead to increased valve seat wear. If anti-wear additives are mixed in, this wear can be reduced. The approved supplementary additives must be mixed with the fuel in the predefined concentration. The additive must be filled before every refueling.

Microorganisms in fuel

Bacterial attack and sludge formation may occur in the fuel under unfavorable conditions. In such cases, the fuel must be treated with biocides in accordance with the manufacturer's specifications. Overconcentration must always be avoided.

The biocides approved at MTU are listed in table (→ Table 17).

Approved anti-wear additives

Manufacturer	Brand name	Concentration for use
The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092 USA Tel. 01 440-943-4200	ADX 766 M	250 to 350 mg/kg
Tunap Industrie GmbH Bürgermeister-Seidl-Str. 2 82515 Wolfratshausen Tel. +49 (0) 8171 1600-0 Fax. +49 (0) 8171 1600-91	Tunadd PS	250 to 350 mg/kg

Table 16:

Important information
The use of anti-wear additives is not permitted on engines/plants with exhaust aftertreatment!

Approved biocides

Biocides should have a pure hydrocarbon structure, i.e. should only consist of the following components:

- Carbon
- Hydrogen
- Oxygen
- Nitrogen

TIM-ID: 0000018624 - 005

They must not contain inorganic substances because they can cause damage to the engine. The use of halogenated biocides is prohibited due to their effects on the engine system and the environment.

A release for biocides that meet the above requirements is possible upon request.

Manufacturer	Brand name	Concentration for use
ISP Biochema Schwaben GmbH Ashland Specialty Ingredients Luitpoldstrasse 32 87700 Memmingen Tel. +49 (0)8331 9580 0 Fax. +49 (0)8331 9580 51	Bakzid	100 ml / 100 l
Maintenance Technologies Paddy's Pad 1056 CC t/a Maintenance Technologies Tel. +27 21 786 4980 Cell +27 82 598 6830	Dieselcure Fuel Decontainment	1 : 1200 (833 mg/kg)
Adolf Würth GmbH & Co. KG Reinhold Würth-Straße 12-17 74653 Künzelsau Tel. +49 (0) 7940 15-2248	Dieselcure Fuel Decontainment	1 : 1200 (833 mg/kg)
Schülke und Mayr 22840 Norderstedt Tel. +49 (0) 40 52100-00 Fax. +49 (0) 40 52100-244	grotamar 71 grotamar 82 StabiCor 71	0.5 l / ton 1.0 l / 1000 l 0.5 l / ton
Supafuel Marketing CC PO Box 1167 Allens Nek 1737 Johannesburg South Africa Tel. +27 83 6010 846 Fax. +27 86 6357 577	Dieselfix / Supafuel	1:1200 (833 mg/kg)
Wilhelmsen Ships Service AS Willem Barentszstraat 50 3165 AB Rotterdam-Albrtandswaard Tel. +31 10 487 7777 Fax. +31 10 487 7888 Netherlands	DieselPower MAR 71 (Biocontrol MAR 71)	333 ml / ton

Table 17:

Flow improvers

Flow improvers can not prevent paraffin precipitation but they do influence the size of the crystals and thus allow the diesel fuel to pass through the filter.

The effectiveness of the flow improvers is not guaranteed for every fuel.

Certainty is only assured after laboratory testing of the filtering capability.

Required quantities and mixing procedures must be carried out according to the manufacturer's instructions.

TIM-ID: 0000018624 - 005

4.6 Unsuitable materials in the diesel fuel circuit

Components made of copper and zinc materials

The use of components made of copper and zinc materials in the fuel circuit is prohibited. They can cause chemical reactions in the fuel and thus lead to formation of a coating in the fuel system.

Requirements

Based on current knowledge, the following materials and coatings must not be used in a diesel fuel circuit because negative mutual reactions can occur even with approved coolant additives.

Metallic materials

- Zinc, also as surface protection
- Zinc-based alloys
- Copper
- Copper-based alloys with the exception of CuNi10 and CuNi30 (e.g. seawater cooler)
- Tin, also as surface protection
- Magnesium-based alloys

Non-metallic materials

- Elastomers: Nitrile rubber, natural rubber, chloroprene rubber, butyl rubber, EPDM
- Silicone elastomer
- Fluorosilicone elastomer
- Polyurethane
- Polyvinyl

Information:

In case of doubt about the use of materials on the engine and add-on components / components in coolant circuit, consultation with the respective MTU specialist department must be held.

TIM-ID: 0000052849 - 003

4.7 MTU Advanced Fluid Management System for fuels – Test package for North America

A sophisticated system for diagnostics and preventive maintenance is available in North America. This system allows the following:

For full information on the MTU Advanced Fluid Management System available in North America, please contact an authorized MTU Onsite Energy service partner.

The following test packages from MTU Advanced Fluid Management System can be ordered from authorized MTU Onsite Energy service partners in North America:

- F-PDFM1
  Basic test – For checking the degree of contamination of the diesel fuel.
  The test determines existing metallic elements and examines the proportion of water and contamination with bacteria and particles.
- F-PDFM2
  Extended test – Includes the basic test plus an examination for determination of the degree of contamination, any possible filter contamination and ignition behavior of the engine.
- F-PDFM3
  Extended Test Plus – Includes the extended text plus a lubricity analysis.
  Maintenance of the correct lubricity has a positive effect on the service life of the components of the engine fuel system.

The following fuel parameters can be determined:

Fuel parameter	F-PDFM1	F-PDFM2	F-PDFM3
24 elementary metals	✔	✔	✔
Viscosity at 40 °C	–	✔	✔
Percent sulfur	–	✔	✔
Water and sediment	✔	✔	✔
Pour point	✔	✔	✔
Thermal stability	✔	✔	✔
Bacteria, fungi and mildew	✔	✔	✔
Flashpoint according to Pensky-Marten	–	✔	✔
Calculated centane index	–	✔	✔
Distillation	–	✔	✔
Cloud point	–	✔	✔
Percentage of water according to Karl Fischer	✔	✔	✔
Particle content	✔	✔	✔
Density according to API	–	✔	✔
Lubricity	–	–	✔

The MTU Advanced Fluid Management System with trend analysis provides information for maximizing system reliability. The following guidelines must be followed to obtain the best results.

Samples must be taken:

- While the engine is operating under normal conditions or immediately after stopping the engine while the engine is still at operating temperature
- Every 250 hours at the same point

Note: The software offered by MTU for online reporting with trend analyses shows the procedure for optimizing evaluation of the gathered information after completion of the analysis.

TIM-ID: 0000063400 - 002

Note: The MTU Advanced Fluid Management System works together with independent test laboratories accredited according to ISO 17025 A2LA. This accreditation is the highest level of quality obtainable by a test laboratory in North America.

TIM-ID: 0000063400 - 002

5 Approved Engine Oils and Lubricating Greases

5.1 Single-grade oils – Category 1, SAE grades 30 and 40 for diesel engines

For details and special features, see chapter "Lubricants for four-cycle engines" (→ Page 7)

Single-grade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Addinol Lube Oil	Addinol Marine MS4011	40	X			
	Addinol Turbo Diesel MD305	30		X		
	Addinol Turbo Diesel MD405	40		X		
Aegean Oil SA	Vigor Super D	40	X			
Avia	Avia Special HDC	30, 40	X			
Castrol Ltd.	Castrol MLC	30, 40		X		
Cepsa Lubricantes	Cepsa Rodaje Y Proteccion	30	X			Increased corrosion protection
Cyclon Hellas	Cyclon D Prime	30, 40	X			
Gulf Oil International	Gulf Superfleet	40	X			
Motor Oil (Hellas)	EMO Turbo Champion Plus	30, 40	X			
Petrobras Distribuidora S.A.	Marbrax CCD-310	30		X		
	Marbrax CCD-410	40		X		
PT. Pertamina Lubricants	Meditiran SMX	40	X			
PTT Public Comp.	PTT Navita MTU Type 1	40	X			
Repsol Lubricantes y Especialidades, S.A.	Repsol Serie 3	30, 40		X		
	Repsol Marino 3	30		X		
	Repsol Marino 3 SAE 40	40			X	
SRS Schmierstoff Vertrieb GmbH	SRS Rekord	30, 40		X		
Shell International Petroleum Company	Shell Gadinia S	30, 40		X		
	Shell Rimula R3	30, 40	X			
	Shell Rimula R3+	30	X			
	Sirius	30	X			
	Shell Sirius Monograde	30, 40	X			
SK Lubricants	SD 5000	40	X			
Total	Total Caprano TD 30	30		X		
	Total Caprano TD 40	40		X		

TIM-ID: 0000018628 - 005

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
United Oil	XD 7000 Extra Duty-3U		X			
	XD 7000 Extra Duty-4U		X			

Table 18:

TIM-ID: 0000018628 - 005

5.2 Multigrade oils - Category 1, SAE grades 15W-40 for diesel engines

For details and special features, see chapter "Lubricants for four-cycle engines" (→ Page 7)

Important information
[1] = These multigrade oils can only be used if crankcase ventilation is routed to atmosphere. [2] = Engine oils marked [2] are also permitted for the "Series 60"

Multigrade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Addinol Lube Oil	Addinol Super Star MX 1547	15W-40		X		
Advanced Lubrication Specialties	Translub 15W40 CI-4	15W-40		X		
BP p.l.c.	BP Vanellus Multi	15W-40	X			
ENI S.p.A	eni i-Sigma universal DL	15W-40	X			
Exxon Mobil Corporation	Mobil Delvac Super 1400E	15W-40	X			
Exxon Mobil Corporation	Mobil Delvac XHP	15W-40	X			
Gulf Oil International	Gulf Superfleet	15W-40	X			
Manufacture Zavod imeni Shaumyana	M5z/14D_2CE	15W-40			X	
Petróleos de Portugal, Petrogal S.A.	Galp Galaxia Super 15W-40	15W-40	X			
Singapore Petroleum Company Limited	SPC SDM 801	15W-40	X			
SRS Schmierstoff Vertrieb GmbH	SRS Primalub	15W-40	X			
Total	Total Caprano TD	15W-40	X			
Unil Opal	Intercooler 400	15W-40	X			
United Oil	XD 9000 Ultra Diesel-U	15W-40	X			

Table 19:

TIM-ID: 0000018950 - 005

5.3 Single-grade oils – Category 2, SAE-grades 30 and 40 for diesel engines

For details and special features, see chapter "Lubricants for four-cycle engines" (→ Page 7)

MTU single-grade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Comments / material number
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
MTU Friedrichshafen GmbH	Power Guard® DEO SAE 40	40	X			20 l container: X00062816 210 l container X00062817 IBC: X00064829
MTU America	Power Guard® SAE 40 Off-Highway Heavy Duty	40		X		5 gallons: 23532941 55 gallons: 23532942 Approved for Series 8000 [(→ Table 20), note] available through MTU America Not approved for Series 2000 M72
MTU India Pvt Ltd.	Diesel Engine Oil DEO SAE 40	40		X		20 l container: 73333/P 205 l container: 75151/D Sale of Indian oil only intended in Indian market

Table 20:

Important information
For Series 8000 engines, the approved SAE class 40 engine oils may only be used in combination with preheating and oil priming (T_{oil}> 30 °C).

Further single-grade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Addinol Lube Oil GmbH	Addinol Turbo Diesel MD 407	40	X			
Adnoc Distribution	ADNOC Voyager Plus 40 CF/SL	40	X			
Atak Madeni Yag Lubricants	Protector MX 30	30			X	
	Protector MX 40	40			X	

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
BayWa AG	Tectrol HD 30	30		X		
	Tectrol HD 40	40		X		
Belgin Madeni Yaglar	Lubex Marine M	30		X		
	Lubex Marine M	40		X		
	Lubex Marine LTM-30	30		X		
	Lubex Marine LTM-40	40		X		
Bucher AG Langenthal	Motorex Monolube	30		X		
Castrol Ltd.	Castrol HLX	30, 40		X		Approved for fast commercial vessels up to 1500 h, Series 595, 1163
Cepsa Lubricants	Cepsa Petrel HDL 40	40			X	
Chevron Lubricants (Texaco)	Ursa Premium TDX	40		X		
	Delo 400	30, 40		X		
	Delo Gold	40		X		
Chevron – Lyteca – (Texaco)	Ursa Premium TDX	40		X		
Cyclon Hellas	Cyclon D Super	40		X		
Delek	Delkol Super Diesel	40		X		
	Delkol Super Diesel MT Mono	40	X			
ENI S.p.A.	Agip Sigma GDF	40		X		
ENOC Marketing L.L.C.	ENOC Strata Super Duty	40		X		
Exxon Mobil Corporation	Mobil Delvac 1630	30		X		Not approved for Series 2000 M72
	Mobil Delvac 1640	40		X		Not approved for Series 2000 M72
Fuchs Europe Schmierstoffe GmbH	Titan Universal HD	30, 40	X			
	Titan Universal HD 30 MTU	30	X			Increased corrosion protection
Gulf Oil International	Gulf Superfleet Plus	40	X			
Gulf Western Oil, Australia	Turboil	40			X	
GS Caltex Corporation	Kixx D1 40	40	X			
Hyrax Oil Sdn Bhd	Hyrax Top Deo	40	X			
Koçak Petrol Ürünleri San. ve. TIC. Ltd.	Speedol Ultra HDX 30 TBN 12	30		X		
	Speedol Ultra HDX 40 TBN 12	40		X		
	Speedol Deniz Dizel Motor Yaĝi	30, 40		X		
	Speedol Ultra HDX	30, 40	X			
Kuwait Petroleum	Q8 T 750	30, 40	X			

TIM-ID: 0000018996 - 006

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Manufacture Zavod imeni Shaumyana Ltd.	M-14D2CE	40			X	
Motor Oil, Hellas	EMO SHPD Plus	30, 40		X		
OOO Lukoil International	Lukoil Avantgarde M 40	40	X			
Oryx Energies	Supreme RR	40			X	
Panolin AG	Panolin Extra Diesel	40	X			
Paz Lubricants & Chemicals	Pazl Marine S 40	40	X			
Petrobras Distribuidora S.A.	Marbrax CCD-310-AP	30		X		
	Marbrax CCD-410-AP	40		X		
Petroleos de Portugal, Petrogal S.A.	Galp Galaxia 40	40		X		
Prista Oil Holding EAD	Prista SHPD 40	40			X	
PTT Public Comp.	PTT Navita MTU Type 2	40		X		
	Navita Plus, SAE 40	40		X		
Repsol Lubricantes y Especialidades, S.A.	Repsol Diesel Serie 3 MT	40			X	
Shell International Petroleum Company	Shell Sirius X	30			X	
	Shell Sirius X	40			X	
Singapore Petroleum Company Limited	SPC SDM 900, SAE30	30		X		
	SPC SDM 900, SAE40	40		X		
Sonol	Seamaster 40	40	X			
SRS Schmierstoff Vertriebs GmbH	SRS Rekord plus 30	30		X		
	SRS Rekord plus 40	40		X		
	SRS Antikorrol M plus	30		X		Increased corrosion protection Only permitted for run-in and series acceptance
	SRS Motorenöl O-278	40		X		
Total	Total Caprano MT 30	30			X	
	Total Caprano MT 40	40			X	
	Total Disola MT 30	30	X			
	Total Disola MT 40	40	X			
	Total Rubia MT 30	30			X	
	Total Rubia MT 40	40			X	
Viva Energy Australia	Penske Power Systems Premium	40			X	

Table 21:

TIM-ID: 0000018996 - 006

5.4 Multigrade oils - Category 2 of SAE grades 10W-40, 15W-40 and 20W-40 for diesel engines

For details and special features, see chapter "Lubricants for four-cycle engines" (→ Page 7)

Important information
[2] Engine oils marked [2] are also approved for "Series 60"

MTU multigrade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
MTU Friedrichshafen GmbH	Diesel Engine Oil DEO SAE 15W-40	15W-40		X		20 l container: X00070830 210 l container: X00070832 IBC: X00070833 Loose items: X00070835 (only on request)
MTU Asia	Diesel Engine Oil - DEO 15W-40	15W-40		X		20 l container: 64247/P 200 l container: 65151/D
MTU Asia China	Diesel Engine Oil - DEO SAE 15W-40	15W-40		X		20 l canister: X00064242/P 205 l barrel: 65151/D
	Diesel Engine Oil - DEO SAE 10W-40	10W-40		X		20 l canister: 60606/P
MTU India Pvt. Ltd.	Diesel Engine Oil - DEO 15W-40	15W-40		X		20 l canister: 63333/P[2] 205 l barrel: 65151/D Sale only intended in Indian market

Table 22:

Further multigrade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
Adnoc Distribution	Adnoc Voyager Plus	15W-40		X		[2]
Aegean Oil S.A.	Vigor Turbo SD 15W-40	15W-40	X			[2]
Addinol Lube Oil	Addinol Super Longlife MD1047	10W-40		X		[2]
	Addinol Diesel Longlife MD1548	15W-40		X		[2]

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
Anomina Petroli Italiana	IP Tarus	15W-40	X			
	IP Tarus Turbo	15W-40	X			
	IP Tarus Turbo Plus	15W-40	X			2)
Arabi Enertech KSC	Burgan Ultra Diesel CH-4	15W-40		X		2)
Aral AG	Aral Turboral 10W-40	10W-40		X		
	Aral Turboral 15W-40	15W-40		X		2)
Atak Madeni Yag Lubricants	Alpet Turbot Fleetmax 1540	15W-40		X		2)
Auto-Teile-Ring GmbH	Cartechnic Motorenöl SAE 15W-40	15W-40	X			
Avista Oil Refining & Trading Deutschland GmbH	Avista Advantage SHPD	15W-40	X			
	Avista Advantage UHPD	15W-40	X			
	Pennasol Turbo Super	15W-40		X		2)
	MOTOR GOLD Turbotec	15W-40		X		2)
Bahrain Petroleum Company B.S.C.	Frontier Megatek	10W-40	X			
	Frontier Super Plus	15W-40		X		2)
	Frontier Turbo	15W-40		X		
	Frontier Turbo LD	10W-40		X		
BayWa AG	Tectrol Turbo 4000	10W-40		X		
Belgin Madeni Yaglar	Lubex Marine M	15W-40		X		
BP p.l.c.	BP Vanellus C6 Global Plus	10W-40		X		
	BP Vanellus Multi-Fleet	15W-40			X	2)
	BP Multi Mine	15W-40	X			2)
	BP Mine Multi 15W-40	15W-40		X		2)
	BP Vanellus Longdrain	15W-40		X		2)
	BP Vanellus Multi A	10W-40		X		2)
	BP Vanellus Agri	10W-40		X		2)
	BP Vanellus Multi A	15W-40	X			2)
	BP Vanellus Agri	15W-40	X			2)
	BP Vanellus Max Extra	15W-40			X	2)
Bucher AG Langenthal	Motorex Universal	10W-40		X		

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
Castrol Ltd.	Castrol CRB Multi 10W-40 CI-4/E7	10W-40		X		
	Castrol CRB Multi 15W-40 CI-4/E7	15W-40		X		2)
	Castrol CRB Turbo 15W-40 CH-4/E7	15W-40	X			2)
	Castrol Rivermax CRB 15W-40 CI-4/E7	15W-40		X		2)
	Castrol Rivermax RX+ 15W-40	15W-40	X			2)
	Castrol Vecton 15W-40 DH-1	15W-40			X	2)
	Castrol RX Diesel	15W-40	X			
	Castrol RX Diesel 15W-40 CI-4/E7	15W-40		X		2)
	Castrol Vecton	10W-40		X		
	Castrol Vecton 15W-40 CI-4/E7	15W-40		X		2)
	Castrol Vecton 15W-40 CI-4/E7	15W-40			X	2)
Cepsa	Cepsa Euromax SHPD	15W-40		X		2)
Champion Chemicals N.V.	Champion New Energy	15W-40		X		2)
Chevron Lubricants (Caltex)	Delo SHP Multigrade	15W-40		X		
	Delo Gold Multigrade	15W-40	X			
	Delo Gold Ultra	15W-40		X		
	Delo Gold Ultra E	10W-40		X		
	Delo Gold Ultra E	15W-40	X			2)
	Delo 400 Multigrade	15W-40			X	2)
	OEC SAE 15W-40	15W-40		X		
Chevron Lubricants (Texaco)	Ursa Super TD	15W-40		X		2)
	Ursa Premium TDX	15W-40		X		2)
	Ursa Premium TDX Plus	15W-40		X		2)
	Ursa Heavy Duty	15W-40	X			
CPC Corporation, Taiwan	CPC Superfleet CG4 Motor Oil	15W-40	X			
Cubalub	Cubalub Extra Diesel MX	15W-40			X	2)
	Cubalub Extra Diesel	15W-40	X			
Cyclon Hellas	Cyclon D Super	15W-40	X			2)
Delek	Delkol Super Diesel	15W-40	X			
Delek Industries Ltd.	Super Diesel	15W-40		X		
Dunwell Petro-Chemical Co., Ltd.	Apex Super Motor Oil SL/CI-4, 15W-40	15W-40		X		2)
EKO A.B.E.E.	Eko Forza plus	15W-40	X			
Engen Petroleum Ltd.	Engen Dieselube 600 Super	15W-40	X			2)
	Engen Dieselube 700 Super	15W-40		X		2)

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
eni S.p.A.	Agip Blitum T	15W-40	X			
	eni i-Sigma super fleet	15W-40		X		
	eni i-Sigma performance E3	15W-40	X			
	eni i-Sigma performance E7	15W-40		X		2)
	eni i-Sigma performance E7	15W-40	X			2)
Exol Lubricants Ltd.	Taurus Extreme M	15W-40	X			2)
	Taurus Extreme HST	15W-40		X		2)
Exxon Mobil Corporation	Mobilgard 1 SHC	20W-40			X	Approved for fast commercial vessels up to 1500 h, 396, 1163
	Mobil Delvac Super 1400	15W-40	X			
	Mobil Delvac MX	15W-40		X		
	Mobil Delvac MX Extra	15W-40		X		
	Mobil Delvac Advanced City Logistics	15W-40	X			
Finke Mineralölwerk GmbH	AVIATICON Turbo Super Plus	15W-40	X			2)
Fuchs Europe Schmierstoffe GmbH	Fuchs Titan Truck Plus	15W-40		X		2)
	Titan Unimax Ultra MC	10W-40		X		
	Titan Formel Plus	15W-40		X		
	Fuchs Titan Truck	15W-40	X			2)
	Titan Unimax Plus MC	10W-40		X		
	Fuchs Titan Universal HD	15W-40	X			
Fuchs Lubrifiants France	Cofran Plura Super	15W-40		X		2)
Fuchs Petrolub SE	Fuchs Max Way	15W-40		X		2)
	Fuchs Titan Truck Plus	10W-30		X		
	Fuchs Titan Truck Plus	15W-40		X		
Gazpromneft Lubricants Ltd.	Belaz G-Profi Mining	15W-40		X		2)
	Belaz G-Profi Mining FF	15W-40		X		2)
	G-Profi MSI 10W-40	10W-40		X		
	G-Profi MSI 15W-40	15W-40		X		
	G-Profi MSH 15W-40	15W-40	X			
	G-Profi MSI Plus	15W-40		X		2)
	Gazpromneft Diesel Premium	15W-40	X			2)

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
German Mirror Lubricants and Greases Co. FZE	Mirr Turbo Plus Diesel Engine Oil API CI-4 SAE 10W-40	10W-40		X		
	Mirr Turbo Plus Diesel Engine Oil API CI-4 SAE 15W-40	15W-40	X			2)
	Mirr Turbo Diesel Engine Oil API CH-4 SAE 15W-40	15W-40	X			2)
Ginouves Georges SAS	York 849	15W-40		X		2)
GS Caltex India Private Limited	Kixx Dynamic Gold	15W-40		X		2)
GS Caltex Corporation	Kixx HD 1	10W-40		X		
	Kixx HD 1	15W-40		X		2)
Gulf Oil International	Gulf Super Duty VLE	15W-40	X			
	Gulf Superfleet LE	10W-40		X		
	Gulf Superfleet LE	15W-40	X			2)
	Gulf Superfleet Supreme	10W-40		X		
	Gulf Superfleet Supreme	15W-40		X		2)
	Gulf Superfleet Plus	15W-40	X			
Gulf Western Oil, Australia	TOP DOG XDO	15W-40	X			2)
HAFA France	Stradex 1800	10W-40		X		
Hessol Lubrication GmbH	Hessol Turbo Diesel	15W-40		X		2)
	Hessol Super Longlife	10W-40		X		
High Industrial Lubricants & Liquids Corporation (HILL)	Fastroil Force F300 Diesel	15W-40		X		2)
	Fastroil Force F500 Diesel	15W-40		X		2)
	Fastroil Force F700 Diesel Pro	10W-40		X		
Hitachi Construction Machinery CO., Ltd.	Hitachi Premium Orange	15-W40	X			
Huiles Berliet S.A.	RTO Maxima RD	15W-40	X			2)
	RTO Maxima RLD	15W-40		X		2)
Hyrax Oil Sdn Bhd	Hyrax Admiral 15W-40	15W-40	X			2)
INA Maziva Ltd.	INA Super Max	15W-40		X		2)
Indian Oil Corporation	Servo Premium (N)	15W-40		X		
Ipiranga Produtos des Petróleo S.A.	Ipiranga Brutus Alta Performance	15W-40		X		2)
Kuwait National Lube Oil MfgCo (KNLOC)	Burgan Ultra Diesel CH-4	15W-40		X		2)
Kuwait Petroleum	Q8 T 750	15W-40	X			2)
	Q8 T 800	10W-40	X			2)
Kocak Petrol Ürünleri San	Speedol SHPD Tirot 15W-40	15W-40		X		

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
Liqui Moly	Liqui Moly Marine 4T Motor Oil	15W-40		X		2)
	Liqui Moly Touring High Tech SHPD	15W-40	X			
Lotos Oil	Turdus Powertec CI-4 15W-40	15W-40		X		2)
	Turdus Powertec 1000	15W-40		X		2)
LPC S.A.	Cyclon Granit Maximum	15W-40		X		2)
Lubricantes de América	Generac Aceite	15W-40		X		
	Lubral Nano Diesel	15W-40		X		
Lubricating Specialties Company (LSC)	Top 1 Transport	15W-40		X		2)
Lubrisa	Gulf Superfleet Supreme	15W-40		X		2)
Lukoil Lubricants Europe Oy	Teboil Power Plus	15W-40	X			
	Tepoil Super HPD	15W-40		X		
	Tepoil Super HPD C	10W-40		X		
Mega Lube Marketers cc.	Megalube Diesel Engine Oil	15W-40		X		
Meguin GmbH	megol Motorenoel SHPD	15W-40	X			
Modriča Oil Refinery	Maxima Turbo	15W-40		X		
MOL-LUB Kft..	MOL Dynamic MK9	15W-40		X		
	MOL Mk-9	15W-40		X		
	Mol Dynamic Super Diesel	15W-40	X			
	Mol Dynamic Transit	10W-40		X		2)
	Mol Dynamic Transit	15W-40		X		2)
	MOL Super Diesel	15W-40	X			
Motor Oil, Hellas	EMO SHPD Plus	15W-40		X		
MPM International Oil Company B.V.	Motor Oil 15W-40 Super High Performance	15W-40		X		2)
NetLube Iran	Max Turbo	15W-40		X		2)
NSL OilChem Trading Pte Ltd	Liquid Gold D-Flo X4	15W-40		X		2)
Oman Oil Marketing Company SAOG	Omanoil Maximo Super 15W40 CH-4	15W-40	X			2)
Orlen Oil	Mogul Diesel DTT Extra	15W-40			X	2)
	Platinum Ultor	15W-40	X			2)
	Platinum Ultor Plus	15W-40			X	2)

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
OOO “LLK-International”	BELAZ CI-4	15W-40	X			2)
	Lukoil Avantgarde Extra	15W-40	X			
	Lukoil Avantgarde Ultra	15W-40		X		
	Lukoil Avantgarde NP	15W-40		X		
	Lukoil Avantgarde Ultra Plus	10W-40		X		
Oryx Energies	Enduro 600	15W-40		X		
Panolin AG	Panolin Universal SFE	10W-40		X		
	Panolin Diesel Synth	10W-40		X		
PDVSA CA	PDV Ultradiesel	15W-40		X		2)
Pertamina	Meditran SX Plus	15W-40		X		2)
Petrobras Colombia Combustibles	Petrobras Top Turbo T2	15W-40	X			
Petrobras Distribuidora S.A.	Lubrax Nautica Diesel	15W-40		X		2)
Petro-Canada Lubricants	Duron	15W-40		X		2)
	Duron XL	15W-40		X		2)
Petroleos de Portugal, Petrogal S.A.	Galp Galaxia LD star	15W-40		X		
Petron Corporation	Petron Rev-x Premium Multi Grade	15W-40		X		2)
Petronas Lubricants International	Petronas Urania 3000	15W-40		X		2)
	Petronas Urania LD7	15W-40		X		
	Petronas Urania LD 7	10W-40	X			
	Petronas Urania Supremo CI-4	10W-40	X			2)
	Petronas Urania Supremo CI-4	15W-40	X			2)
Petromin Corporation	Petromin Turbomaster XD	15W-40		X		2)
Phillips 66 Lubricants	Conoco Hydroclear Power D	15W-40			X	
Prista Oil AD	Prista Turbo Diesel	15W-40	X			
PTT Public Limited	Navita Plus SAE 15W-40	15W-40	X			
Qatar Lubricants Company Ltd.	QALCO Topaz HMF	15W-40	X			
Qingdao Copton Technology Co., LTD.	Copton CH-4 Diesel Engine Oil	15W-40	X			
Raloy Lubricantes, S.S. de C.V.	Raloy Diesel Power	15W-40		X		2)
Raj Petro Specialities P Ltd.	Zoomol Rforce 3100 RF1	15W-40	X			2)
	Zoomol Rforce 3100 RF4	15W-40		X		2)
Ravensberger Schmierstoffvertrieb GmbH	RAVENOL Expert SHPD	10W-40		X		
	RAVENOL Mineralöl Turbo Plus SHPD	15W-40	X			2)

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
Repsol Lubricantes y Especialidades, S.A.	Repsol Diesel Super Turbo SHPD	15W-40	X			2)
	Repsol Neptuno S-Turbomar	15W-40	X			2)
RN-Lubricants, LLC	Rosneft Revolux D2	15W-40	X			
	Rosneft Revolux D3	15W-40		X		2)
	Rosneft Revolux D5	15W-40		X		
ROWE Mineralölwerk GmbH	ROWE Hightec Formula GT SAE 10W-40 HC	10W-40		X		2)
S.A.E.L.	Gulf Gulfleet Long Road	15W-40	X			
Shell International Petroleum Company	Shell Rimula MV	15W-40	X			
	Shell Rimula R3 MV	15W-40	X			2)
	Shell Rimula R3 X	15W-40		X		2)
	Shell Rimula R4	15W-40		X		2)
	Shell Rimula R4 X	15W-40		X		2)
	Shell Rimula RT4	15W-40		X		2)
	Shell Rimula RT4 X	15W-40		X		2)
	Shell Rimula T3	15W-40		X		2)
	Shell Rimula T4	15W-40		X		2)
	Shell Rimula X	15W-40		X		
	Shell Rotella T2	15W-40		X		
	Shell Rotella T Multigrade	15W-40		X		2)
	Shell Sirius	15W-40		X		2)
	Eicher Premium Plus Diesel Engine Oil	15W-40		X		2)
Shanghai HIRI Lubricants R & D Centre	HIRI	15W-40	X			
Singapore Petroleum Company Limited	SDM 900 SAE 15W40	15W-40		X		
Sinopec Lubricant Co., Ltd.	Sinopec Tulux T500	15W-40		X		2)
SK Lubricants Co. Ltd.	ZIC X5000 10W-40	10W-40		X		
	ZIC X5000	15W-40	X			2)
	ZIC X7000 CI-4 10W-40	10W-40		X		
	ZIC X7000 CI-4	15W-40	X			2)

TIM-ID: 0000019001 - 006

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
SRS Schmierstoff Vertrieb GmbH	SRS Motorenöl O-236	15W-40	X			[2] enhanced corrosion protection
	SRS Multi-Rekord top	15W-40		X		[2]
	SRS Multi Rekord plus	15W-40	X			
	SRS Turbo Rekord	15W-40	X			[2]
	SRS Cargolub TFX	10W-40		X		
Tesla Technoproducts FZE	Denebola Saheli Ultra XS 1120	15W-40		X		[2]
Total Lubrifiants	Antar Milantar PH	15W-40	X			[2]
	Antar Milantar PX	15W-40	X			[2]
	Fina Kappa Optima	15W-40		X		[2]
	Fina Kappa Extra Plus	15W-40	X			[2]
	Total Caprano Energy FE	15W-30		X		
	Total Caprano TDH	15W-40		X		[2]
	Total Caprano TDI	15W-40		X		[2]
	Total Disola W	15W-40		X		
	Total Genlub TDX	15W-40	X			
	Total Rubia TIR 6400	15W-40	X			
	Total Rubia Works 1000	15W-40		X		[2]
	Hitachi Genuine Engine Oil 15W40 DH-1	15W-40		X		[2]
Unil Opal	Medos 700	15W-40	X			[2]
Valvoline EMEA	All-Fleet Extra SAE 15W-40	15W-40	X			[2]
	All-Fleet Plus	15W-40	X			[2]
	NextGen All-Fleet extra	15W-40		X		[2]
	Premium Blue Classic	15W-40		X		[2]
	Valvoline Premium Blue 7800	15W-40		X		
Viscolube	Revivoil - Re Refined High-Tech HD Motoroil	15W-40	X			[2]
Viva Energy Australia	Penske Power Systems Premium	15W-40	X			[2]
Wolf Oil Corporation NV.	Wolf Vitaltech 15W40	15W-40		X		[2]
Wunsch Öle GmbH	Wunsch Rekord TLM-TU 10W-40	10W-40		X		

Table 23:

TIM-ID: 0000019001 - 006

5.5 Multigrade oils – Category 2.1 (Low SAPS oils) of SAE grades 0W-30, 10W-30, 5W-40, 10W-40 and 15W-40

For details and special features, see chapter "Lubricants for four-cycle engines" (→ Page 7)

Important information
[2] Engine oils marked [2] are also approved for "Series 60"

MTU multigrade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
MTU America	Power Guard® SAE 15W-40 Off-Highway Heavy Duty	15W-40	X			5 gallons: 800133 55 gallons: 800134 IBC: 800135 available through MTU America [2]

Table 24:

Further multigrade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Bucher AG Langenthal	Motorex Focus CF	15W-40	X			[2]
BP p.l.c.	BP Vanellus Eco	15W-40	X			[2]
Castrol Ltd.	Castrol CRB Mining 15W-40	15W-40	X			[2]
	Castrol CRB Mining 15W-40 CK-4		X			[2]
	Castrol CRB Turbo G4 15W-40	15W-40	X			[2]
	Castrol Hypuron	10W-30		X		
Champion Chemicals N.V.	Champion OEM Specific 15W40 MS	15W-40	X			
Chevron Lubricants (Caltex)	Delo 400 LE	15W-40	X			[2]

TIM-ID: 0000019003 - 005

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Chevron Lubricants (Chevron)	Delo 400 LE	15W-40	X			2) also approved for Series 4000-04 T
	Delo 400 MGX	15W-40	X			2)
	Delo 400 SDE	15W-40	X			2)
	Delo 400 XLE	10W-30		X		
	Delo 400 XLE	15W-40		X		2)
Chevron Lubricants (Texaco)	Ursa Ultra LE	15W-40	X			2)
ExxonMobil Corporation	Mobil Delvac 1 ESP	0W-30	X			
	Mobil Delvac 1 ESP	5W-40		X		
	Mobil Delvac 1300 Super F2	15W-40	X			
	Mobil Fleet	15W-40	X			2)
eni S.P.A.	eni i-Sigma top MS	15W-40	X			2)
Fuchs Europe	Fuchs Titan Cargo	15W-40	X			2)
Fuchs Petrolub SE	Fuchs Titan Cargo	10W-30	X			
	Fuchs Titan Cargo	15W-40	X			2)
Gulf Oil International	Gulf Supreme Duty XLE	15W-40	X			2)
	Gulf Supreme Duty XLE	10W-30	X			
Hitachi	Hitachi Genuine Engine Oil 10W-40 DH-2	10W-40	X			
Kuwait Petroleum	Q8 T 760	10W-30	X			
Lotos Oil	Turdus Powertec 1100	15W-40	X			2)
Morris Lubricants	Versimax HD6	15W-40	X			2)
MPM International Oil Company B.V.	Motor Oil 15W-40 Extra High Performance	15W-40	X			2)
OOO "LLK-International"	Lukoil Avantgarde Professional LA	10W-30	X			
	Lukoil Avantgarde Professional LA	10W-40	X			
	Lukoil Avantgarde Professional LA	15W-40	X			2)
Panolin AG	Panolin Universal LA-X	15W-40	X			2)
Pennzoil Products	Pennzoil Long-Life Gold	15W-40		X		2)
Petro-Canada	Duron -E	15W-40	X			2)
Phillips 66 Lubricants	Fleet Supreme EC	15W-40	X			2) also approved for Series 4000-04 C
	Guardol ECT	15W-40	X			2)
	Kenndall Super-D XA	15W-40	X			2)

TIM-ID: 0000019003 - 005

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Prolube Lubricants	Prolube Ultraplus	15W-40	X			2)
Repsol Lubricantes Y Especialidades, S.A.	Repsol Diesel Turbo THPD Mid Saps	15W-40	X			2)
Shell International Petroleum Company	Shell Rimula Super	15W-40		X		2)
	Shell Rimula RT4L	15W-40		X		2)
	Shell Rotella T	15W-40		X		2)
	Shell Rotella T3	15W-40		X		2)
	Shell Rotella T5	10W-30	X			
	Shell Rotella T5	10W-40	X			
	Shell Rotella T6	5W-40		X		
	Shell Rimula R5 LE	10W-30	X			
	Shell Rimula R5 LE	10W-40	X			
	Shell Rotella T Triple Protection	15W-40		X		
	Shell Rimula R4 MV	15W-40	X			2)
	Shell Rimula R4 L	15W-40	X			2)
SK energy	ZIC XQ 5000	15W-40	X			2)
SRS Schmierstoff Vertrieb GmbH	SRS Turbo Rekord plus	15W-40	X			2)
	SRS Turbo Rekord plus FE	10W-40	X			
Total Lubrifiants	Total Rubia TIR 7900	15W-40	X			
	Total Rubia Works 2000	10W-40	X			
	Total Max Star FE	10W-30	X			
	Total Rubia Works 2000 FE 10W-30	10W-30	X			
Trinidad & Tobago National Petroleum Marketing Company Ltd. (NPMC)	Ultra Duty 15W-40 Engine Oil	15W-40	X			2)
Valvoline EMEA	Valvoline All Fleet Extra LE SAE 15W-40	15W-40	X			2)
	All-Fleet Extra LE NTI	15W-40	X			2)
	Premium Blue 8100 15W-40	15W-40	X			2)
Valvoline USA	All Fleet Plus	15W-40	X			2)
Verco International	April Superpro RXL 1 Gold Plus	15W-40	X			2)

Table 25:

TIM-ID: 0000019003 - 005

5.6 Multigrade oils – Category 3 of SAE grades 5W-30, 5W-40 and 10W-40 for diesel engines

For details and special features, see chapter "Lubricants for four-cycle engines" (→ Page 7)

MTU multigrade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	> 12 gKOH/g	
MTU Asia China	Diesel Engine Oil - DEO 5W-30	5W-30			X	20 l canister: 60808/P available through MTU Suzhou

Table 26:

Further multigrade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Addinol Lube Oil GmbH	Addinol Commercial 1040 E4	10W-40		X		
	Addinol Ultra Truck MD 0538	5W-30			X	
	Addinol Super Truck MD 1049	10W-40			X	
Aral AG	Aral Mega Turboral	10W-40			X	
	Aral Mega Turboral 10W-40	10W-40			X	
	Aral Super Turboral	5W-30			X	
Avia Mineralöl AG	Avia Turbosynth HT-E	10W-40			X	
	Avia Turbosynth HT-U	5W-30			X	
BayWa AG	Tectrol Super Truck 530	5W-30			X	
	Tectrol Super Truck 1040	10W-40		X		
Bucher AG Langenthal - Motorex Schmiertechnik	MC Power Plus SAE 10W/40	10W-40			X	
BP p.l.c.	BP Energol IC-MT 10W-40	10W-40			X	
	BP Vanellus Max	5W-30			X	

TIM-ID: 0000019006 - 005

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Castrol Ltd.	Castrol CRB Turbomax 10W-40 E4/E7	10W-40			X	
	Castrol Enduron MT	10W-40			X	
	Castrol Enduron Plus	5W-30			X	
	Castrol Elixion HD	5W-30			X	
	Castrol Vectron 10W-40 E4/E7	10W-40			X	
	Castrol Vectron Long Drain	10W-40			X	
	Castrol Vectron Long Drain 10W-40 E4/E7	10W-40			X	
	Castrol Vectron 5W-30 Arctic	5W-30			X	
	Castrol Vectron Fuel Saver 5W-30	5W-30			X	
	Castrol Vectron Fuel Saver E7	5W-30			X	
Cepsa	Cepsa Eurotrans SHPD	5W-30			X	
	Cepsa Eurotrans SHPD	10W-40		X		
Champion Chemicals N.V.	Champion New Energy 10W40 Ultra	10W-40			X	
Chemicis Khavremianeh Kohan	Chemicis Excel Plus	10W-40			X	
Chevron Lubricants (Caltex)	Delo Gold Ultra T	10W-40			X	
	Delo XLD Multigrade	10W-40			X	
Chevron Lubricants (Texaco)	Ursa HD	10W-40			X	
	Ursa Premium FE	5W-30			X	
	Ursa Super	10W-40		X		
	Ursa Super TDX	10W-40			X	
	Ursa TDX	10W-40			X	
Deutsche Ölwerke Lubmin GmbH	AVENO HC PT Diesel	10W-40			X	
eni S.P.A.	Agip Sigma Trucksint TFE	5W-40			X	
	Agip Sigma Super TFE	10W-40			X	
	eni i-Sigma top	10W-40			X	
Enoc Marketing LLC	Enoc Vulcan 770 SLD	10W-40		X		
	Enoc Vulcan SLD	10W-40			X	
Exxon Mobil Corporation	Mobil Delvac XHP Extra	10W-40			X	
	Mobil Delvac XHP Ultra 5W-30	5W-30			X	
	Mobil Delvac 1 SHC 5W-40	5W-40			X	
Exol Lubricants Ltd.	Taurus Extreme M3	10W-40			X	
Fabrika Maziva, FAM AD	Fenix Ultra Sint	10W-40			X	
Finke Mineralölwerk GmbH	AVIATICON Finko Truck LD	10W-40			X	
Fuchs Europe Schmierstoffe GmbH	Titan Cargo SL	5W-30			X	
	Titan Cargo MC	10W-40			X	

TIM-ID: 0000019006 - 005

Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Fuchs Lubricants France	Cofran Marathon	10W-40			X	
	Fuchs Max Way E4	10W-40				
	Fuchs Max Way Ultra	5W-30				
Gulf Oil International	Gulf Fleet Force synth.	5W-30			X	
	Gulf Superfleet ELD	10W-40			X	
	Gulf Superfleet XLD	10W-40			X	
	Gulf Superfleet Synth ELD	10W-40			X	
High Industrial Lubricants & Liquids Corporation	Fastroil Force Ultra High Performance Diesel (UHPD)	10W-40			X	
Huiles Berliet S.A.	RTO Extensia RXD ECO	5W-30			X	
Iranol Oil Co.	Iranol D40000-EIII	10W-40			X	
Kuwait Petroleum	Q8 T 860	10W-40		X		
	Q8 T 860 D	10W-40			X	
	Q8 T 860 S	10W-40			X	
	Q8 T 905	10W-40	X			
Lotos Oil	Turdus Powertec 3000	10W-40			X	
	Turdus Powertec Synthetic	5W-30			X	
Lukoil Lubricants Europe Oy	Teboil Super XLD-2	5W-30			X	
Meguin	Megol Motorenöl Super LL Dimo Premium	10W-40			X	
MOL-LUB Kft	MOL Synt Diesel	10W-40		X		
	MOL Dynamic Synt Diesel E4	10W-40			X	
Orlen Oil Sp.o.o.	Platinum Ultor Max	5W-30			X	
OOO LLK International	Lukoil Avantgarde Professional	5W-30			X	
	Lukoil Avantgarde Professional	10W-40			X	
	Lukoil Avantgarde Professional M5	10W-40			X	
	Lukoil Avantgarde Professional M6	10W-40			X	
	Lukoil Avantgarde Ultra M3	15W-40			X	
Panolin	Panolin Diesel HTE	10W-40			X	
Petroleos de Portugal, Petrogal S.A.	Galp Galaxia Extreme	5W-30		X		
	Galp Galaxia Ultra XHP	10W-40			X	
Petromin Corporation	Petromin Turbo Master LD	10W-40			X	

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Petronas Lubricants International	Petronas Akros Synt Gold	10W-40			X	
	Arexons HD-Truck E7	10W-40			X	
	Urania Maximo	10W-40			X	
	Petronas Urania Optimo	10W-40			X	
	Urania 100 K	10W-40			X	
	Urania 5000 F	5W-30			X	
	Urania 5000 LD	10W-40			X	
	Urania FE	5W-30			X	
	Petronas Urania Maximo	5W-30			X	
PHI OIL GmbH	Motordor Silver 10W40	10W-40			X	
Raj Petro Specialities P Ltd.	Zoomol Rforce 8200 RF1	10W-40			X	
Ramoil S.p.A.	Duglas Oil Ultra HC 10W-40 UHPDO	10W-40			X	
Ravensberger Schmierstoff Vertrieb GmbH	RAVENOL Super Performance Truck	5W-30			X	
	RAVENOL Performance Truck	10W-40			X	
Repsol Lubricantes y Especialidades S.A.	Repsol Turbo UHPD	10W-40			X	
	Repsol Diesel Turbo VHPD	5W-30			X	
	Repsol Diesel Turbo UHPD Urban	10W-40			X	
RN-Lubricants, LLC	Rosneft Revolux D4	10W-40			X	
ROWE Mineralölwerk GmbH	ROWE Hightec Formula GT SAE 10W-40 HC	10W-40			X	
SCT Vertriebs GmbH	Fanfaro TRD E4 UHPD	10W-40		X		
	Mannol TS-6 UHPD Eco	10W-40		X		
	Pemco Diesel G-6 Eco UHPD	10W-40		X		
Shell International Petroleum Company	Shell Rimula R5 M	10W-40			X	
	Shell Rimula R6 M	10W-40			X	
	Shell Rimula R6 ME	5W-30			X	
	Shell Rimula R6 MS	10W-40			X	
SK Lubricants Co.	ZIC X7000	5W-30			X	
SRS Schmierstoff Vertrieb GmbH	SRS Cargolub TFF	10W-40			X	
	SRS Cargolub TFL	5W-30			X	
	SRS Cargolub TFG	10W-40			X	
	SRS Cargolub TFG plus	10W-40			X	
Tedex SA	Tedex Diesel Truck UHPD (S) Motor Oil	10W-40			X	
Total Lubrifiants	Gulf Gulfleet Highway 10W-40	10W-40			X	
	RTO Extensia ECO	5W-30			X	
	Total Rubia TIR 9200 FE	5W-30			X	

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Manufacturer	Brand name	SAE viscosity class	TBN			Remarks
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Transnational Blenders B. V.	Engine Oil Super EHPD	10W-40			X	
Unil Opal	Unil Opal LCM 800	10W-40			X	
Valvoline EMEA	All Fleet Superior	10W-40			X	
	Profleet	10W-40			X	
	Valvoline All-Fleet Extreme NTI	10W-40		X		
Wolf Oil Corporation N.V.	Wolf Vitaltech 10W40 Ultra	10W-40			X	
	Champion New Energy 10W40 Ultra	10W-40			X	

Table 27:

TIM-ID: 0000019006 - 005

5.7 Multigrade oils – Category 3.1 (Low SAPS oils) of SAE grades 5W-30, 10W-30 and 10W-40

For details and special features, see chapter "Lubricants for four-cycle engines" (→ Page 7)

Important information
[2)] Engine oils marked [2)] are also approved for "Series 60"

Multigrade oils

Manufacturer	Brand name	SAE viscosity class	TBN			Comments / material number
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Addinol Lube Oil	Addinol Extra Truck MD 1049 LE	10W-40	X			
Aral AG	Aral Mega Turboral LA	10W-40	X			
	Aral Super Turboral LA	5W-30	X			
BayWa AG	Tectrol Super Truck Plus XL 1040	10W-40	X			
Bucher AG Langenthal	Motorex Focus QTM	10W-40	X			
	Motorex Nexus FE SAE 5W-30	5W-30	X			
BP p.l.c.	BP Vanellus Max Drain Eco	10W-40			X	
	BP Vanellus Max Eco 10W-40	10W-40			X	
BVG Vertriebsgesellschaft AG	Alpha Advanced Eco-Efficiency low SAPS	10W-40	X			
Castrol Ltd.	Castrol Vecton Long Drain10W-30 E6/E9	10W-30	X			
	Castrol Vecton Long Drain10W-40 E6/E9	10W-40	X			
	Castrol Vecton Fuel Saver 5W-30 E6/E9	5W-30	X			
Cepsa Comercial Petroleo, SA	Cepsa Eurotech LS 10W40 Plus	10W-40			X	
Champion Chemilcals N.V.	Champion OEM Specific 10W40 Ultra MS	10W-40		X		
Chevron Lubricants (Caltex)	Delo XLE Multigrade	10W-40	X			
Chevron Lubricants (Chevron)	Delo 400 RDE	10W-30		X		
	Delo 400 RDS	10W-40		X		
	Delo 400 XLE	15W-40	X			
	Delo 400 XLE HD	5W-30			X	
	Delo 400 XLE HD	10W-40			X	
	Delo 400 XLE SYN-HD	10W-40			X	
	Delo 400 XLE Synthetic	5W-30	X			
	Delo 400 LE Synthetic	5W-30	X			
Chevron Lubricants (Texaco)	Ursa Ultra X	10W-30		X		

TIM-ID: 0000019019 - 005

Manufacturer	Brand name	SAE viscosity class	TBN			Comments / material number
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
CONDAT Lubrifiants	Vicam Planet 10W40	10W-40			X	
Deutsche Ölwerke Lubmin GmbH	AVENO Universal UHPD	10W-40				
De Oliebron B.V.	Tor Turbosynth LSP Plus	10W-40			X	
eni S.p.a.	eni i-Sigma top MS	10W-40	X			
Enoc Marketing L.L.C.	Enoc Vulkan Green	10W-40			X	
Exxon Mobil Corporation	Mobil Delvac 1 ESP	5W-30		X		
	Mobil Delvac 1 LE	5W-30	X			
	Mobil Delvac HD	10W-40		X		
	Mobil Delvac XHP ESP M	10W-40			X	
	Mobil Delvac XHP LE	10W-40			X	55 gallons: 800141
	Mobil Delvac XHP Ultra LE	5W-30		X		
Finke Mineralölwerk GmbH	AVIATICON Finko Super Truck LA Plus	10W-40		X		
Fuchs Petrolub SE	Titan Cargo Maxx	5W-30			X	
	Titan Cargo Maxx	10W-40			X	
	Fuchs Titan Cargo EU6	5W-30	X			
Fuchs Schmierstoffe GmbH	Fuchs Titan Cargo LA	5W-30	X			
Gulf Oil International	Gulf Superfleet Synth ULE	5W-30	X			
	Gulf Superfleet XLE	10W-40	X			
	Gulf Superfleet Synth XLE	10W-30		X		
	Gulf Superfleet Synth XLE	10W-40	X			
	Gulf Superfleet Universal	10W-40			X	
Helios Lubeoil	Helios Premium KMXX 10W-40	10W-40	X			
Huiles Berliet S.A.	RTO Extensia FP	10W-40	X			
Igol	PRO 200 X	10W-40	X			
INA Maziva d.o.o.	INA Super 2009 5W-30	5W-30	X			
	INA Super 2009	10W-40			X	
Kuwait Petroleum R&T	Q8 905	10W-40	X			
	Q8 T 904	10W-40		X		
	Q8 T 904 FE	10W-30	X			
	Q8 T 905	10W-40	X			
	Q8 T 910	5W-30	X			
	Q8 Formula Truck 8500 FE	10W-30	X			
	Q8 Formula Truck 8700 FE	5W-30	X			
LLK finland Oy	Teboil Super XLD-2	5W-30			X	
Meguin GmbH & Co. KG	megol Motorenoel Low Saps	10W-40		X		

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Manufacturer	Brand name	SAE viscosity class	TBN			Comments / material number
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Morris Lubricants	Ring Free Ultra	10W-40		X		
	Fendt Power Grade 10W-40	10W-40		X		
MPM International Oil Company B.V.	Motor Oil 10w-40 Premium Synthetic Ultra High Performance Diesel	10W-40		X		
Oel-Brack AG	Midland maxtra	10W-40		X		
OMV Petrol Ofisi A.Ş	Maximus HD-E	5W-30	X			
OOO LLK International	Lukoil Avantgarde CNG	10W-40	X			
	Lukoil Avantgarde Professional LE	5W-30			X	
	Lukoil Avantgarde Professional LS	5W-30	X			
	Lukoil Avantgarde Professional LS	10W-40			X	
	Lukoil Avantgarde Professional LS5	5W-30	X			
	Lukoil Avantgarde Professional LS5	10W-40	X			
Orlen Oil	Platinum Ultor Complete	10W-40	X			
	Platinum Ultor Optimo	10W-30	X			
	Platinum Ultor Progress	10W-40		X		
	Mogul Diesel L-SAPS	10W-40		X		
Panolin	Panolin Diesel Synth EU-4	10W-40	X			
	Panolin Ecomot	5W-30		X		
	Panolin Ecomot	10W-30	X			
	Panolin Ecomot	10W-40	X			
Petro-Canada Lubricants Inc.	Duron UHP 5W30	5W-30	X			
	Duron UHP E6 10W40	10W-40	X			
Petróleos de Portugal	Galp Galaxia Ultra LS	10W-40	X			
Petronas Lubricants International	Petronas Urania 5000 E	5W-30			X	
	Petronas Urania 5000 E	10W-40			X	
	Petronas Urania FE LS	5W-30			X	
	Petronas Urania Ecotech	10W-40			X	
PHI OIL GmbH	Motodor LSP Gold 5W30	5W-30			X	
	Motodor LSP Silver	10W-40		X		
Prista Oil Ad	Prista UHPD	10W-40	X			
Ravensberger Schmierölvertrieb GmbH	Ravenol Euro VI Truck	10W-40	X			
Repsol Lubricantes y Especialidades, S.A.	Repsol Diesel Turbo UHPD MID SAPS	10W-40	X			
	Repsol DieselTurbo VHPD Mid Saps	5W-30		X		
Rowe Mineralölwerk GmbH	Rowe Hightec Truckstar SAE 10W-40 HC-LA	10W-40		X		

TIM-ID: 0000019019 - 005

Manufacturer	Brand name	SAE viscosity class	TBN			Comments / material number
			8 to 10 mgKOH/g	10 to 12 mgKOH/g	>12 mgKOH/g	
Shell International Petroleum Company	Shell Rimula R6 LM	10W-40	X			Increased corrosion protection
	Shell Rimula R6 LME	5W-30		X		
	Shell Rimula Ultra	5W-30			X	
SK energy	ZIC XQ 5000	10W-40	X			
SRS Schmierstoff Vertrieb GmbH	SRS Antikorrol MLA	10W-40		X		Increased corrosion protection
	SRS Cargolub TLA	10W-40	X			
	SRS Cargolub TLS	5W-30			X	
	SRS Cargolub TLS plus	5W-30		X		
	SRS Turbo Diesel LA	10W-40	X			
	SRS Cargolub low-friction engine oil LA	10W-40		X		
	SRS Turbo-Rekord top FE	10W-40		X		
	SRS Turbo-Rekord ultra FE	10W-40	X			
Statoil Lubricants	MaxWay Ultra E6 10W-40	10W-40			X	
Total Lubrifiants	Total Rubia TIR 8900	10W-40	X			
	Total Rubia Works 2500	10W-40	X			
Transnational Blenders B. V.	Engine Oil Synthetic UHPD E6	10W-30		X		
	Engine Oil Synthetic UHPD E6	10W-40		X		
	Motor oil SCR	10W-40	X			
Valvoline EMEA	Valvoline ProFleet LS	5W-30			X	
	Valvoline ProFleet LS	10W-40	X			
	ProFleet LS NTI	10W-40	X			
Wibo Schmierstoffe GmbH	Wibokraft Ultra AF 10W40	10W-40		X		
Wolf Oil Corporation N.V.	Wolf Officialtech 10W40 Ultra MS	10W-40		X		
	Champion OEM Specific 10W40 Ultra MS	10W-40		X		
Yacco SAS	Yacco Transpo 65	10W-40			X	

Table 28:

TIM-ID: 0000019019 - 005

5.8 Lubricating Greases

5.8.1 Lubricating greases for general applications

For details and special features, see chapter "Lubricating greases"(→ Page 15)

Manufacturer	Brand name	Notes
Aral AG	Mehrzweckfett Arallub HL2	
BP p.l.c.	Energrease LS2	
Castrol Ltd.	Spheerol AP2	
Chevron	Multifak EP2	
SRS Schmierstoff Vertrieb GmbH	SRS Wiolub LFK2	
Shell Deutschland GmbH	Shell Gadus S2 V220 2	
Total	Total Multis EP2	
Veedol International	Multipurpose	

Table 29:

TIM-ID: 0000019094 - 004

5.8.2 Lubricating greases for diesel engine-generator set components

Important
Mixtures of different greases are not permitted!

Manufacturer	Brand name	Notes
Exxon Mobil Corporation	Mobil Polyrex EM	High-temperature grease: Lubricity in the range from -30 to 250 °C (-22 to 482 °F) For: • Generator bearings of Marathon generators • Generator bearings of Leroy-Somer generators*) • Fan wheel and belt pulley bearing on electrically driven coolant cooler, Series 4000
Shell	GADUS S3 V220C	For generator bearings of Leroy-Somer generators*)
SKF	Mehrzweckfett LGMT2	For generator bearings of HM generators
ROCOL Limited	Rocol RTD-Compound	For belt tensioner on electrically driven coolant cooler, Series 4000
ASCO Power Technologies	Lubrication Kit 75-100	For automatic transfer switch (ATS) ASCO

*) NOTE: For information about the applicable lubricating greases for Leroy-Somer generators, refer to the nameplate on the generator.

For information about lubricating greases for generators made by other manufacturers, please contact MTU Onsite Energy service partners.

TIM-ID: 0000038781 - 008

6 Approved Coolants

6.1 Coolants without antifreeze for cooling systems containing light metal

6.1.1 Coolant without antifreeze – Concentrates for cooling systems containing light metal

For details and special features, see chapter on “Coolants” (→ Page 17)

Important information
For the marine engine Series 1163-03 and 1163-04, only coolants marked with an asterisk * in the brand name can be used!

Coolants without antifreeze – concentrates

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
MTU Friedrichshafen GmbH	Coolant CS100 Corrosion Inhibitor Concentrate*		X				6000 / 2	X00057233 (20 l) X00057232 (210 l) X00070455 (1000 l) also available through MTU Asia
MTU America Inc.	Power Cool® Plus 6000 Concentrate*		X				6000 / 2	colored green 23533526 (1 gallon) 23533527 (5 gallons) available through MTU America
Arteco NV	Freecor NBI		X				6000 / 2	
BASF SE	Glysacorr G93 green*		X				6000 / 2	X00054105 (barrel) X00058062 (canister)
BP Lubricants	Castrol Extended Life Corrosion Inhibitor	X				X	6000 / 2	
CCI Corporation	A 216	X				X	6000 / 2	
CCI Manufacturing IL Corporation	A 216	X				X	6000 / 2	X00051509 (208 l)
Chevron Corp.	Texcool A – 200		X				6000 / 2	
Detroit Diesel Corp.	Power Cool Plus 6000	X				X	6000 / 2	colored red
Drew Marine	Drewgard XTA*		X				6000 / 2	
ExxonMobil	Mobil Delvac Extended Life Corrosion Inhibitor	X				X	6000 / 2	
Old World Industries Inc.	Final Charge Extended Life Corrosion Inhibitor (A 216)	X				X	6000 / 2	

TIM-ID: 0000019105 - 006

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
Valvoline	ZEREX G-93*		X				6000 / 2	
YORK SAS	York 719*		X				6000 / 2	

Table 30:

TIM-ID: 0000019105 - 006

6.1.2 Coolant without antifreeze – Ready mixtures for cooling systems containing light metal

For details and special features, see chapter on “Coolants” (→ Page 17)

Important information
For the marine engine Series 1163-03 and 1163-04, only coolants marked with an asterisk * in the brand name can be used

Coolant without antifreeze, ready mixtures

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
MTU Friedrichshafen GmbH	Coolant CS10/90 Corrosion Inhibitor Premix*		X				6000 / 2	X00069385 (20 l) X00069386 (210 l) X00069387 (1000 l) (sales region: Italy)

Table 31:

TIM-ID: 0000054558 - 004

6.2 Coolants without antifreeze for cooling systems free of light metal

6.2.1 Coolants without antifreeze - Concentrates for cooling systems free of light metal

For details and special features, see chapter on “Coolants” (→ Page 17)

Coolants without antifreeze – concentrates

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
MTU Friedrichshafen GmbH	Coolant CS100 Corrosion Inhibitor Concentrate		X				6000 / 2	X00057233 (20 l) X00057232 (210 l) X00070455 (1000 l) also available through MTU Asia
MTU America Inc.	Power Cool®Plus 6000 Concentrate		X				6000 / 2	colored green 23533526 (1 gallon) 23533527 (5 gallons) available through MTU America
Arteco NV	Freecor NBI		X				6000 / 2	
	Havoline Extended Life Corrosion Inhibitor [EU Code 32765] (XLI)	X					6000 / 2	
BASF SE	Glysacorr G93 green		X				6000 / 2	X00054105 (barrel) X00058062 (canister)
BP Lubricants	Castrol Extended Life Corrosion Inhibitor	X				X	6000 / 2	
CCI Corporation	A 216	X				X	6000 / 2	
CCI Manufacturing IL Corporation	A 216	X				X	6000 / 2	X00051509 (208 l)
Chevron Corp.	Texcool A – 200		X				6000 / 2	
Detroit Diesel Corp.	Power Cool Plus 2000		X	X			6000 / 2	
	Power Cool Plus 6000	X				X	6000 / 2	colored red
Drew Marine	Drewgard XTA		X				6000 / 2	
ExxonMobil	Mobil Delvac Extended Life Corrosion Inhibitor	X				X	6000 / 2	
Fleetguard	DCA-4L		X	X	X		2000 / 1	

TIM-ID: 0000019146 - 005

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
Nalco	Alfloc (Maxitreat) 3477	X					6000 / 2	
	Alfloc 2000		X	X			6000 / 2	
	Nalco 2000		X	X			6000 / 2	
	Nalcool 2000		X	X			6000 / 2	
	Trac 102		X	X			6000 / 2	
Old World Industries Inc.	Final Charge Extended Life Corrosion Inhibitor (A 216)	X				X	6000 / 2	
Penray	Pencool 2000		X	X			6000 / 2	
PrixMax Australia Pty. Ltd.	PrixMax RCP	X					6000 / 2	
Total	Total WT Supra	X					6000 / 2	
Valvoline	Zerex G-93		X				6000 / 2	
YORK SAS	York 719		X				6000 / 2	

Table 32:

TIM-ID: 0000019146 - 005

6.2.2 Coolant without antifreeze – Ready mixtures for cooling systems free of light metal

For details and special features, see chapter on “Coolants” (→ Page 17)

Coolant without antifreeze, ready mixtures

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
MTU Friedrichshafen GmbH	Coolant CS 10/90 Corrosion Inhibitor Premix		X				6000 / 2	X00069385 (20 l) X00069386 (210 l) X00069387 (1000 l) (sales region: Italy)
Nalco	Alfloc (Maxitreat) 3443 (7 %)	X					6000 / 2	

Table 33:

TIM-ID: 0000019147 - 005

6.3 Antifreezes for cooling systems containing light metal

6.3.1 Antifreeze – Concentrates for cooling systems containing light metal

For details and special features, see chapter on “Coolants” (→ Page 17)

Antifreeze, concentrates

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
MTU Friedrichshafen GmbH	Coolant AH100 Antifreeze Concentrate	X	X				9000 / 5	X00057231 (20 l) X00057230 (210 l) X00068202 (1000 l) also available through MTU Asia
Avia Mineralöl AG	Antifreeze APN	X	X				9000 / 5	
	Antifreeze APN - S	X					9000 / 3	
BASF SE	Glysantin G05		X	X			9000 / 5	
	Glysantin G48 blue green	X	X				9000 / 5	X00058054 (25 l) X00058053 (210 l)
	Glysantin G30 pink	X					9000 / 3	X00058072 (canister) X00058071 (barrel)
BayWa AG	Tectrol Coolprotect	X	X				9000 / 5	
BP Lubricants	Aral Antifreeze Extra	X	X				9000 / 5	
	Castrol Heavy Duty Extended Life Coolant	X				X	9000 / 3	
Bucher AG Langenthal	Motorex Coolant G48	X	X				9000 / 5	
Castrol	Castrol Radicool NF	X	X				9000 / 5	
CCI Corporation	L 415	X				X	9000 / 3	
CCI Manufacturing IL Corporation	C 521	X				X	9000 / 3	
Clariant	Genantin Super		X	X			9000 / 5	
Classic Schmierstoff GmbH + Co KG	Classic Kolda UE G48	X	X				9000 / 5	
Comma Oil & Chemicals Ltd.	Comma Xstream® G30® Antifreeze Coolant Concentrate	X					9000 / 3	
	Comma Xstream® G48® Antifreeze Coolant Concentrate	X	X				9000 / 5	
Detroit Diesel Corp.	Power Cool Antifreeze		X	X			9000 / 3	
	Power Cool Plus Coolant	X				X	9000 / 3	
	Power Cool Diesel Engine Coolant		X	X			9000 / 3	

TIM-ID: 0000019149 - 007

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
ExxonMobil	Mobil Delvac Extended Life Coolant	X				X	9000 / 3	
	Mobil Antifreeze Advanced	X					9000 / 3	
	Mobil Antifreeze Extra	X	X				9000 / 5	
	Mobil Antifreeze Special		X	X			9000 / 5	
	Mobil Heavy Duty Coolant		X	X			9000 / 3	
	Mobil Mining Coolant		X	X			9000 / 3	
	Esso Antifreeze Advanced	X					9000 / 3	
	Esso Antifreeze Extra	X	X				9000 / 5	
Finke Mineralölwerk GmbH	AVIATICON Finkofreeze F30	X					9000 / 3	
	AVIATICON Finkofreeze F48	X	X				9000 / 5	
Fuchs Petrolub SE	Maintain Fricofin	X	X				9000 / 5	
	Maintain Fricofin G12 Plus	X					9000 / 3	X00058074 (canister) X00058073 (barrel)
Gazpromneft Lubricants Ltd.	Belaz G-Profi Antifreeze Red	X					9000 / 3	
Krafft S.L.U.	Refrigerante ACU 2300		X	X			9000 / 3	X00058075 (barrel)
Kuttenkeuler GmbH	Kuttenkeuler Antifreeze ANF KK48	X	X				9000 / 5	
	Glycostar®ST48	X	X				9000 / 5	
INA Maziva Ltd.	INA Antifriz Al Super	X	X				9000 / 5	
Mitan Mineralöl GmbH	Alpine C48	X	X				9000 / 5	
Nalco	Nalcool 5990	X	X				9000 / 3	
Nalco Australia	Nalcool NF 48 C	X	X				9000 / 5	
Old World Industries Inc.	Blue Mountain Heavy Duty Extended Life Coolant	X				X	9000 / 3	
	Fleet Charge SCA Pre-charged Coolant / Anti-freeze		X	X			9000 / 3	
	Final Charge Global Extend-ed Life Coolant Antifreeze	X				X	9000 / 3	
OMV	OMV Coolant Plus	X	X				9000 / 5	
	OMV Coolant SF	X					9000 / 3	
Panolin AG	Panolin Anti-Frost MT-325	X	X				9000 / 5	
Penske Power Systems	Power Cool - HB500 Cool-ant Concentrate	X	X				9000 / 3	
Raloy Lubricantes	Antifreeze Long Life NF-300 Concentrate	X	X				9000 / 5	
Recochem Inc.	R542	X	X				9000 / 3	

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Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
SMB - Sotagal / Mont Blanc	Antigel Power Cooling Concentrate	X	X				9000 / 5	
Total	Glacelf MDX	X	X				9000 / 5	
Valvoline	Zerex G-05		X	X			9000 / 5	
	Zerex G-48	X	X				9000 / 5	
	Zerex G-30	X					9000 / 3	
YORK SAS	York 716	X	X				9000 / 5	
ZAO Obninskorgsintez	Lukoil Antifreeze HD G12 K	X					9000 / 3	

Table 34:

TIM-ID: 0000019149 - 007

6.3.2 Antifreeze – Concentrates for special applications

For details and special features, see chapter on “Coolants” (→ Page 17)

Concentrates for special applications

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
BASF SE	G206	X	X				9000 / 3	For use in arctic regions (< -40 °C)

Table 35:

TIM-ID: 0000019151 - 006

6.3.3 Antifreeze – Ready mixtures for cooling systems containing light metals

For details and special features, see chapter on “Coolants” (→ Page 17)

Ready mixtures for cooling systems containing light metals

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
MTU Friedrichshafen GmbH	Coolant AH 35/65 Antifreeze Premix	X	X				9000 / 5	X00069382 (20 l) X00069383 (210 l) X00069384 (1000 l) (sales region: Italy)
	Coolant AH 40/60 Antifreeze Premix	X	X				9000 / 5	X00070533 (20 l) X00070531 (210 l) X00070532 (1000 l) (sales region: England, Spain)
	Coolant AH 50/50 Antifreeze Premix	X	X				9000 / 5	X00070528 (20 l) X00070530 (210 l) X00070527 (1000 l) (sales region: England)
	Coolant RM30 (40 %)	X					9000 / 3	X00073922 (20 l) X00073916 (205 l) X00073923 (1000 l)
MTU America Inc.	Power Cool®Universal 35/65 mix	X	X				9000 / 5	800085 (5 gallons) 800086 (55 gallons)
	Power Cool®Universal 50/50 mix	X	X				9000 / 5	800071 (5 gallons) 800084 (55 gallons)
	Power Cool® Off-Highway Coolant 50/50 Premix		X	X			9000 / 5	23533531 (5 gallons) 23533532 (55 gallons)
Bantleon	Avilub Antifreeze Mix (50 %)	X	X				9000 / 5	X00049213 (210 l)
BayWa AG	Tectrol Coolprotect Mix 3000	X					9000 / 3	Antifreeze protection up to -24 °C
BP Lubricants	Castrol Heavy Duty Extended Life Prediluted Coolant (50/50)	X				X	9000 / 3	
Bucher AG Langenthal	Motorex Coolant G48 ready to use (50/50)	X	X				9000 / 5	
Castrol	Castrol Radicool NF Premix (45%)	X	X				9000 / 5	
CCI Corporation	L 415 (50%)	X				X	9000 / 3	
CCI Manufacturing IL Corporation	C 521 (50%)	X				X	9000 / 3	
Cepsa Comercial Petróleo S.A.U.	XTAR Super Coolant Hybrid NF 50%	X	X				9000 / 5	

TIM-ID: 0000019156 - 005

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
Detroit Diesel Corp.	Power Cool Plus Prediluted Coolant (50/50)	X				X	9000 / 3	
	Power Cool Prediluted 50/50 Diesel Engine Coolant		X	X			9000 / 3	
Exxon Mobil	Mobil Delvac Extended Life Prediluted Coolant (50/50)	X				X	9000 / 3	
Finke Mineralölwerk GmbH	AVIATICON Finkofreeze F48 RM 50/50	X	X				9000 / 5	
	AVIATICON Finkofreeze F30 RM 40:60 +	X					9000 / 3	
Old World Industries Inc.	Blue Mountain Heavy Duty Extended Life Prediluted Coolant (50/50)	X				X	9000 / 3	
	Final Charge Global Extended Life Prediluted Coolant/ Antifreeze (50/50)	X				X	9000 / 3	
	Fleet Charge SCA Precharged 50/50 Prediluted Coolant		X	X			9000 / 3	
Penske Power Systems	Power Cool - HB500 Premix 50/50	X	X				9000 / 3	
Raloy Lubricantes	Antifreez Long Life NF-300 Ready-to-Use (50:50)	X	X				9000 / 5	
SMB - Sotragal / Mont Blanc	L.R.-30 Power Cooling (44%)	X	X				9000 / 5	
	L.R.-38 Power Cooling (52%)	X	X				9000 / 5	
Tosol-Sintez	Glysantin Alu Protect G30 Ready Mix	X					9000 / 3	
	Glysantin Alu Protect Plus G48 Ready Mix	X	X				9000 / 5	
Total	Coolelf MDX (-26 °C)	X	X				9000 / 5	
Valentin Energie GmbH	Valentin Coolant Plus -25 °C Ready	X					9000 / 3	
Valvoline	Zerex G-05 50/50 Mix		X	X			9000 / 5	
ZAO Obninskorgsintez	Lukoil Antifreeze HD G12 (50%)	X					9000 / 3	

Table 36:

TIM-ID: 0000019156 - 005

6.4 Antifreezes for cooling systems free of light metal

6.4.1 Antifreeze – Concentrates for cooling systems free of light metal

For details and special features, see chapter on “Coolants” (→ Page 17)

Important information

For the Series 4000-04 and 4000-05, only coolants marked with an asterisk * in the brand name can be used!

Antifreeze, concentrates

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
MTU Friedrichshafen GmbH	Coolant AH100* Antifreeze Concentrate	X	X				9000 / 5	X00057231 (20 l) X00057230 (210 l) X00068202 (1000 l) also available through MTU Asia
Arteco NV	Havoline Extended Life Coolant XLC [EU Code 30379]	X					9000 / 3	
Avia Mineralöl AG	Antifreeze APN*	X	X				9000 / 5	
	Antifreeze APN - S*	X					9000 / 3	
BASF SE	Glysantin G05		X	X			9000 / 5	
	Glysantin G48 blue green*	X	X				9000 / 5	X00058054 (25 l) X00058053 (210 l)
	Glysantin G30 pink*	X					9000 / 3	X00058072 (canister) X00058071 (barrel)
BayWa AG	Tectrol Coolprotect*	X	X				9000 / 5	
BP Lubricants	ARAL Antifreeze Extra*	X	X				9000 / 5	
	Castrol Heavy Duty Extended Life Coolant*	X				X	9000 / 3	
Bucher AG Langenthal	Motorex Coolant G48*	X	X				9000 / 5	
Caltex	Caltex Extended Life Coolant [AP Code 510614] (XLC)	X					9000 / 3	
Castrol	Castrol Radicool NF*	X	X				9000 / 5	
CCI Corporation	L415*	X				X	9000 / 3	
CCI Manufacturing IL Corporation	C521*	X				X	9000 / 3	
Chevron Corp.	Havoline Dexcool Extended Life Antifreeze [US Code 227994]	X					9000 / 3	
Clariant	Genantin Super		X	X			9000 / 3	

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Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
Classic Schmierstoff GmbH + Co. KG	Classic Kolda UE G48*	X	X				9000 / 5	
Comma Oil & Chemicals Ltd.	Comma Xstream® G30®* Antifreeze Coolant Concentrate	X					9000 / 3	
	Comma Xstream® G48®* Antifreeze Coolant Concentrate	X	X				9000 / 5	
Detroit Diesel Corp.	Power Cool Antifreeze		X	X			9000 / 3	
	Power Cool Plus Coolant*	X				X	9000 / 3	
	Power Cool Diesel Engine Coolant		X	X			9000 / 3	
ExxonMobil	Mobil Delvac Extended Life Coolant*	X				X	9000 / 3	
	Mobil Antifreeze Advanced*	X					9000 / 3	
	Mobil Antifreeze Extra*	X	X				9000 / 5	
	Mobil Antifreeze Special		X	X			9000 / 5	
	Mobil Heavy Duty Coolant		X	X			9000 / 3	
	Mobil Mining Coolant		X	X			9000 / 3	
	Esso Antifreeze Advanced*	X					9000 / 3	
	Esso Antifreeze Extra*	X	X				9000 / 5	
Finke Mineralölwerk GmbH	AVIATICON Finkofreeze F30*	X					9000 / 3	
	AVIATICON Finkofreeze F48*	X	X				9000 / 5	
Fuchs Petrolub SE	Maintain Fricofin*	X	X				9000 / 5	
	Maintain Fricofin G12 Plus*	X					9000 / 3	X00058074 (canister) X00058073 (barrel)
	Maintain Fricofin HDD [Oilcode T-AF3-1]		X	X		X	9000 / 3	
Gazpromneft Lubricants Ltd.	Belaz G-Profi Antifreeze Red*	X					9000 / 3	
	G - Energy Antifreeze SNF	X					9000 / 3	
Krafft S.L.U	Refrigerante ACU 2300		X	X			9000 / 3	X00058075 (barrel)
Kuttenkeuler GmbH	Kuttenkeuler Antifreeze ANF KK48*	X	X				9000 / 5	
	Glycostar® ST48*	X	X				9000 / 5	
INA Maziva Ltd.	INA Antifriz Al Super*	X	X				9000 / 5	
Mitan Mineralöl GmbH	Alpine C48*	X	X				9000 / 5	
MOL-Lub Kft.	EVOX Premium concentrate	X					9000 / 3	

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Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
Nalco	Nalcool 4070	X	X	X			9000 / 3	
	Nalcool 5990	X	X				9000 / 3	
Nalco Australia	Nalcool NF 48 C*	X	X				9000 / 5	
OAO Technoform	Cool Stream Premium C	X					9000 / 3	
Old World Industries Inc.	Blue Mountain Heavy Duty Extended Life Coolant*	X				X	9000 / 3	
	Fleetcharge SCA Pre-charged Coolant / Anti-freeze		X	X			9000 / 3	
	Final Charge Global Extend-ed Life Coolant Antifreeze*	X				X	9000 / 3	
OMV	OMV Coolant Plus*	X	X				9000 / 5	
	OMV Coolant SF*	X					9000 / 3	
Panolin AG	Panolin Anti-Frost MT-325*	X	X				9000 / 5	
Penske Power Systems	Power Cool - HB500	X	X				9000 / 3	
	Power Cool - HB800	X	X	X			9000 / 3	
Raloy Lubricantes	Antifreeze Long Life NF-300 Concentrate*	X	X				9000 / 5	
Recochem Inc.	R542	X	X				9000 / 3	
	R824M	X	X	X			9000 / 3	
Shell	Shell HD Premium N		X	X			9000 / 3	
SMB - Sotragal / Mont Blanc	Antigel Power Cooling Con-centrate*	X	X				9000 / 5	
Total	Glacelf Auto Supra	X					9000 / 3	
	Glacelf MDX*	X	X				9000 / 5	
	Glacelf Supra	X					9000 / 3	
Valvoline	Zerex G-05		X	X			9000 / 5	
	Zerex G-48*	X	X				9000 / 3	
	Zerex G-30*	X					9000 / 5	
YORK SAS	York 716*	X	X				9000 / 5	
ZAO Obninskorgsintez	Lukoil Antifreeze HD G12 K*	X					9000 / 3	

Table 37:

TIM-ID: 0000019158 - 005

6.4.2 Antifreeze – Concentrates for special applications

For details and special features, see chapter on “Coolants” (→ Page 17)

Concentrates for special applications

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
BASF SE	G206	X	X				9000 / 3	For use in arctic regions (< -40 °C) No approval for Series 4000-04

Table 38:

TIM-ID: 0000019157 - 006

6.4.3 Antifreeze – Ready mixtures for cooling systems free of light metals

For details and special features, see chapter on “Coolants” (→ Page 17)

Important information
For the Series 4000-04 and 4000-05, only coolants marked with an asterisk * in the brand name can be used!

Antifreeze, ready mixtures

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
MTU Friedrichshafen GmbH	Coolant AH 35/65 Anti-freeze Premix*	X	X				9000 / 5	X00069382 (20 l) X00069383 (210 l) X00069384 (1000 l) (sales region: Italy)
	Coolant AH 40/60 Anti-freeze Premix*	X	X				9000 / 5	X00070533 (20 l) X00070531 (210 l) X00070532 (1000 l) (sales region: England, Spain)
	Coolant AH 50/50 Anti-freeze Premix*	X	X				9000 / 5	X00070528 (20 l) X00070530 (210 l) X00070527 (1000 l) (sales region: England)
	Coolant RM 30 (40 %)*	X					9000 / 3	X00073922 (20 l) X00073916 (205 l) X00073923 (1000 l)
MTU America Inc.	Power Cool® Universal 35/65 mix*	X	X				9000 / 5	800085 (5 gallons) 800086 (55 gallons)
	Power Cool® Universal 50/50 mix*	X	X				9000 / 5	800071 (5 gallons) 800084 (55 gallons)
	Power Cool® Off-Highway Coolant 50/50 Premix		X	X			9000 / 5	23533531 (5 gallons) 23533532 (55 gallons)
Arteco NV	Havoline Extended Life Coolant + B2 50/50 OF01 [EU Code 33073] (50 %)	X					9000 / 3	
	Havoline Extended Life Coolant + B2 40/60 OF01 [EU Code 33069] (40 %)	X					9000 / 3	
	Havoline Extended Life Coolant + B2 35/65 OF01 [EU Code 33074] (35 %)	X					9000 / 3	
Bantleon	Avilub Antifreeze Mix (50 %)*	X	X				9000 / 5	X00049213 (210 l)
BayWa AG	Tectrol Coolprotect Mix 3000*	X					9000 / 3	Antifreeze protection up to -24 °C

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Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
BP Lubricants	Castrol Heavy Duty Extended Life Prediluted Coolant (50/50)*	X				X	9000 / 3	
Bucher AG Langenthal	Motorex Coolant G48 ready to use (50/50)*	X	X				9000 / 5	
Caltex	Caltex Extended Life Coolant Pre-Mixed 50/50 [AP Code 510609] (50 %)	X					9000 / 3	
Castrol	Castrol Radicool NF Premix (45 %)*	X	X				9000 / 5	
CCI Corporation	L 415 (50 %)*	X				X	9000 / 3	
CCI Manufacturing IL Corporation	C 521 (50 %)*	X				X	9000 / 3	
Cepsa Comercial Petróleo S.A.U.	Xtar Super Coolant Hybrid NF 50%*	X	X				9000 / 5	
Chevron Corp.	Havoline Dexcool Extended Life Predilluted 50/50 Antifreeze Coolant [US Code 227995]	X					9000 / 3	
Detroit Diesel Corp.	Power Cool Plus Prediluted Coolant (50/50)*	X				X	9000 / 3	
	Power Cool Prediluted 50/50 Diesel Engine Coolant		X	X			9000 / 3	
ExxonMobil	Mobil Delvac Extended Life Prediluted Coolant (50/50)*	X				X	9000 / 3	
Finke Mineralölwerk GmbH	AVIATICON Finkofreeze F48 RM 50/50*	X	X				9000 / 5	
	AVIATICON Finkofreeze F30 RM 40:60 +	X					9000 / 3	
Fuchs Petrolub SE	Maintain Fricofin HDD Premix 50/50 [Oilcode T-AF3-2]		X	X		X	9000 / 3	
Nalco	Nalcool 4100 (50 %)	X	X	X			9000 / 3	
Old World Industries Inc.	Blue Mountain Heavy Duty Extended Life Prediluted Coolant (50/50)*	X				X	9000 / 3	
	Final Charge Global Extended Life Predilluted Coolant / Antifreeze (50/50)*	X				X	9000 / 3	
	Fleet Charge SCA Precharged 50/50 Prediluted Coolant		X	X			9000 / 3	

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Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
Penske Power Systems	Power Cool - HB500 Premix 50/50	X	X				9000 / 3	
	Power Cool - HB800 Premix 50/50	X	X	X			9000 / 3	
Raloy Lubricantes	Antifreeze Long Life NF-300 Ready-to-Use (50:50)*	X	X				9000 / 5	
SMB - Sotragal / Mont Blanc	L.R.-30 Power Cooling (44 %)*	X	X				9000 / 5	
	L.R.-38 Power Cooling (52%)*	X	X				9000 / 5	
Total	Coolelf MDX (-26 °C)*	X	X				9000 / 5	
	Coolelf Supra (40%)	X					9000 / 3	
	Coolelf GF NP (50%)	X					9000 / 3	
Tosol-Sinzez	Glysantin Alu Protect/G30 Ready Mix*	X					9000 / 3	
	Glysantin Protect Plus/G48 Ready Mix*	X	X				9000 / 5	
Valentin Energie GmbH	Valentin Coolant Plus -25 °C Ready*	X					9000 / 3	
Valvoline	Zerex G-05 50/50 Mix		X	X			9000 / 5	
ZAO Obninskorgsintez	Lukoil Antifreeze HD G12 (50%)*	X					9000 / 3	

Table 39:

TIM-ID: 0000019159 - 006

6.5 Coolant Additives with Limited Series Approval

6.5.1 Antifreeze – Concentrates and ready mixtures on ethylene-glycol basis for series with and without light metal

Antifreeze, concentrates

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
BASF SE	Glysantin®G40 pink (concentrate)	X	X				9000 / 3	X00066724 (20 l) X00066725 (210 l) Concentration for use: 40 to 50% by volume
Bucher AG Langenthal	Motorex Coolant M 4,0 Concentrate	X	X				9000 / 3	Antifreeze protection up to -38 °C
Valvoline	ZEREX G40 (concentrate)	X	X				9000 / 3	Concentration for use: 40 to 50% by volume Material number (USA): 800180 (Drum)

Table 40:

Antifreezes - ready mixtures

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
Bucher AG Langenthal	Motorex Coolant M 4,0 Ready to use	X	X				9000 / 3	Antifreeze protection up to -38 °C

Table 41:

TIM-ID: 0000053736 - 004

6.5.2 Antifreeze – Ready mixtures based on propylene glycol for series free of light metal

Antifreeze, ready mixture

Manufacturer	Brand name	Inhibitors					Operating time Hour / Year	Comments / Material number
		Organic	Silicon	Nitrite	Phosphatized	Molybdate		
Fleetguard	PG XL (40%) ready mixture		X	X	X		9000 / 3	

Table 42:

TIM-ID: 0000053738 - 004

7 Flushing and Cleaning Specifications for Engine Coolant Circuits

7.1 General information

In the course of time, sludge deposits from aging coolant additives can accumulate in the coolant circuits. Reduced cooling capacity, clogged vent lines and drain points and dirty coolant level sight-glasses can result.

Below-standard water quality or incorrect coolant preparation can also heavily contaminate the system.

If such conditions occur, the coolant circuit is to be flushed out with fresh water, repeatedly if necessary.

If these flushing sequences are insufficient or if the system is too heavily contaminated, the coolant circuit and all affected parts must be cleaned.

Only clean, fresh water (no river or sea water) must be used for flushing.

Only products approved by MTU or corresponding products at the specified concentrations may be used for cleaning, see (→ Page 118). The specified cleaning procedure is to be complied with.

Immediately after flushing or cleaning, fill the coolant circuits with treated engine coolant as stipulated in the current MTU Fluids and Lubricants Specifications. Otherwise there is a danger of corrosion!

Important

Fluids and lubricants (e.g. treated engine coolant), used flushing water, cleaning agents and cleaning solutions can be hazardous materials. Certain regulations must be obeyed when handling, storing and disposing of these substances.
These regulations are contained in the manufacturer's instructions, legal requirements and technical guidelines valid in the individual countries. Considerable differences can apply from country to country so that no generally valid statement on the applicable regulations for fluids and lubricants etc. can be made in this publication.
Users of the products named in these specifications are therefore obliged to inform themselves of the locally valid regulations. MTU accepts no responsibility whatsoever for improper or illegal use of the fluids and lubricants / cleaning agents which it has approved.

Important

Scrap oil heat exchangers from engines with bearing or piston seizures or friction damage!

Test equipment, auxiliary materials and fluids and lubricants

MTU test kit or electric pH-value measuring instrument

Required auxiliary materials:
- Compressed air
- Superheated steam

Required fluids and lubricants:
- Fresh water
- Prepared engine coolant

TIM-ID: 0000068301 - 003

7.2 Approved cleaning agents

Manufacturer	Product name	Concentration for use		Order No.
For coolant systems:				
Kluthe	Hakutex 111 [1, 5)]	2% by volume	Liquid	X00065751
	Hakupur 50-706-3 [10)]	2% by volume	Liquid	X00055629
For subassemblies:				
Henkel	Bonderite C-AK FD [2)]	1 to 10% by weight	Powder	[7)]
	Bonderite C-MC 11120 [3)]	2 to 10% by weight	Powder	[7)]
Kluthe	Hakutex 60 MTU	100% by volume	Liquid	X00070585 (25 kg)
For coolant systems contaminated with bacteria, fungi or yeast (so-called system cleaners):				
Schülke & Mayr GmbH	Grotan WS Plus [5)]	0.15% by volume	Liquid	X00065326 (10 kg)
	Grotanol SR2 [6)]	0.5% by volume	Liquid	X00069827 (10 kg)
For external cooler on air side:				
Kluthe	Hakupur 50 K [9)]	0.5 to 5% by volume	Liquid	X00070940[7)]
For painted, contaminated surfaces:				
Kluthe	Hakupur 449 [9)]	1% by volume	Liquid	X00071179[7)]

Table 43:

[1)] For light lime deposits, light corrosion

[2)] For greasy lime deposits

[3)] Preferred for heavy lime deposits

[4)] For heavy lime deposits

[5)] Bacteria contamination up to 10^4

[6)] Bacteria contamination up to > 10^4, contamination with fungi and yeast

[7)] Not stocked by MTU

[8)] With serious corrosion; not permitted for aluminum materials

[9)] Cleaning agent for cleaning with high-pressure cleaning device (parameter: Pressure: 15 bar, gentle spray jet, cleaning agent temperature: 80 °C)

[10)] Not suitable for galvanized surfaces

Important information
The technical data sheets and safety data sheets of the product must be observed!

TIM-ID: 0000019197 - 011

7.3 Engine coolant circuits – Flushing

1. Drain engine coolant.
2. Measure pH-value of the fresh water using the MTU test kit or electric pH-value measuring device.
3. Fill coolant circuit with fresh water.

Important information
Never pour cold water into a hot engine!

4. Preheat, start and run engine until warm.
5. Run engine for approx. 30 minutes at increased speed.
6. Take flush-water sample at engine-coolant-sample extraction cock.
7. Shut down engine.
8. Drain flush water.
9. Measure pH value of flush-water sample using the MTU test kit or electric pH value measuring device and compare with the pH value of the fresh water.
   a) pH value difference < 1: Fill system with treated coolant and start engine.
   b) pH value difference > 1: Fill system with fresh flush water and repeat flushing process.
   c) If the pH value difference is still > 1 after 4 to 5 flushing operations: The coolant circuit must be cleaned, see (→ Page 120). The assemblies may also have to be cleaned, see (→ Page 121).

Important information
Refer to the engine operating instructions for additional information.

TIM-ID: 0000037747 - 006

7.4 Engine coolant circuits – Cleaning

1. Cleaning agents for coolant circuits are prepared in warm, fresh water as a concentrated solution, see (→ Page 118).
2. In the case of powdered products, stir until the cleaning agent is completely dissolved and without sediment.
3. Pour solution together with fresh water into coolant circuit.
4. Start engine and run until warm.
5. Select temperature and duration of residence time according to the specifications of the technical data sheets of the manufacturer.
6. Shut down engine.
7. Drain off cleaning agents and flush the engine coolant circuit with fresh water.
8. Take flush-water sample at engine-coolant-sample extraction cock.
9. Measure pH value of flush-water sample using the MTU test kit or electric pH value measuring device and compare with the pH value of the fresh water.
   a) pH value difference < 1: Fill system with treated coolant and start engine.
   b) pH value difference > 1: Clean assemblies, see (→ Page 121).

Important information
Refer to the engine operating instructions for additional information.

TIM-ID: 0000037713 - 007

7.5 Assemblies - Cleaning

1. Remove, disassemble and clean assemblies that are exposed to heavy sludge deposits e.g. expansion tanks, preheating units, heat exchangers (coolant cooler, oil heat-exchanger, charge-air cooler, charge-air preheater, fuel preheater etc.) and lower sections of pipework.
2. Before cleaning, examine degree of contamination on water sides.
3. If greasy lime deposits are found, first degrease the water side.
4. Deposits in charge-air coolers caused by oil mist can be removed using Kluthe Hakutex 60.
5. Remove hard lime deposits with a decalcifying product. In the event of stubborn lime deposits, if necessary a 10% inhibited hydrochloric acid solution may have to be used.
6. Dissolve deposits on and in heat-exchanger elements in a heated cleaning bath. Observe the manufacturer's specifications and use only approved detergents in the permissible concentration, see (→ Page 118)

Important information
Deposits on the oil side can also be dissolved in a kerosene bath. The dwell time in the cleaning bath depends on the type and degree of contamination, as well as the temperature and activity of the bath.

7. Clean individual components such as housings, covers, pipes, sight glasses, heat-exchanger elements with superheated steam, a nylon brush (soft) and a powerful water jet.

Important information
In order to avoid damage: Do not use hard or sharp-edged tools (steel brushes, scrapers, etc.) (oxide protective layer). Do not set the pressure of the water jet too high (may damage cooler fins, for example).

8. After cleaning, blow through the heat exchanger elements with low-pressure steam in the direction opposite to operational flow, rinse with clear water (until pH-value difference is < 1) and blow dry with compressed or hot air.
9. Check that all components are in perfect condition, repair or replace as necessary.
10. Flush oil and engine coolant sides of heat-exchanger elements with corrosion-inhibiting oil. This step may be omitted if the heat exchanger is installed and taken into service immediately after cleaning.
11. After installing all assemblies, flush engine coolant circuit once, see (→ Page 119).
12. Check coolant system for leaks during initial operation of engine.

Important information
For further information, see the Maintenance Manual for the engine in question.

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7.6 Coolant circuits contaminated with bacteria, fungi or yeast

System cleaning

The system cleaner must flow a sufficiently long time through the complete cooling system to ensure effective cleaning and disinfection.

Therefore, the predefined amount of the approved system cleaner must be added to the contaminated coolant in the system, see (→ Page 118). Use a circulating pump to provide continuous mixture flow through the coolant system for at least 24 hours or max. 48 hours.

Flushing

When the coolant and system cleaner have been drained, the cooling circuit must be flushed with fresh water. Flushing must be carried out until no more contaminants are visible and the flushing liquid has the same pH-value as the fresh water used (max. pH-value difference < 1).

Refill

Before refilling the circuit, make sure the system is free of contaminants.

Refill must be performed directly after flushing to avoid the risk of corrosion!

TIM-ID: 0000019202 - 006

8 Revision Overview

8.1 Revision overview from version A001064/08 to version A001064/09

Seq. No.	Section	Subject	Page	Action
1	2.1	Engine oils – General information	(→ Page 7)	Revised
2	3.2	Operational monitoring	(→ Page 20)	Revised
3	3.5	Fresh water requirements	(→ Page 26)	Revised
4	3.9	Limit values for coolants	(→ Page 30)	Revised
5	3.10	Coolant concentrates – Storage capability	(→ Page 31)	Revised
6	4.1	Diesel fuels – General information	(→ Page 36)	Revised
7	4.2.1	Distillate fuels according to DIN EN 590 and ASTM D975	(→ Page 41)	Revised
8	4.2.3	Chinese distillate fuels according to GB 19147-2013 and 252-2011	(→ Page 44)	Revised
9	4.2.4	Heating oil	(→ Page 45)	Revised
10	4.2.6	Aviation turbine fuel	(→ Page 48)	Revised
11	4.2.7	NATO diesel fuels	(→ Page 49)	Revised
12	4.2.9	B20 diesel fuel	(→ Page 53)	Revised
13	4.5	Unsuitable materials in diesel fuel circuit	(→ Page 64)	Revised
14	5.1	Single-grade oils – Category 1, SAE grades 30 and 40 for diesel engines	(→ Page 67)	Revised
15	5.2	Multigrade oils – Category 1, SAE grades 15W-40 for diesel engines	(→ Page 69)	Revised
16	5.3	Single-grade oils – Category 2, SAE-grades 30 and 40 for diesel engines	(→ Page 70)	Revised
17	5.4	Multigrade oils – Category 2 of SAE grades 10W-40, 15W-40 and 20W-40 for diesel engines	(→ Page 70)	Revised
18	5.5	Multigrade oils – Category 2.1 (Low SAPS oils) of SAE grades 0W-30, 10W-30, 5W-40, 10W-40 and 15W-40	(→ Page 82)	Revised
19	5.6	Multigrade oils – Category 3 of SAE grades 5W-30, 5W-40 and 10W-40 for diesel engines	(→ Page 85)	Revised

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Seq. No.	Section	Subject	Page	Action
20	5.7	Multigrade oils – Category 3.1 (Low SAPS oils) of SAE grades 5W-30, 10W-30 and 10W-40	(→ Page 90)	Revised
21	6.1.1	Coolant without antifreeze – Concentrates for cooling systems containing light metal	(→ Page 96)	Revised
22	6.2.1	Coolants without antifreeze – Concentrates for cooling systems free of light metal	(→ Page 99)	Revised
23	6.3.1	Antifreeze – Concentrates for cooling systems containing light metal	(→ Page 102)	Revised
24	6.3.3	Antifreeze – Ready mixtures for cooling systems containing light metals	(→ Page 106)	Revised
25	6.4.1	Antifreeze – Concentrates for cooling systems free of light metal	(→ Page 108)	Revised
26	6.4.3	Antifreeze – Ready mixtures for cooling systems free of light metals	(→ Page 112)	Revised
27	6.5.1	Antifreeze – Concentrates and ready mixtures on ethylene-glycol basis for series with and without light metal	(→ Page 115)	Revised
28	7.2	Approved cleaning agents	(→ Page 118)	Revised

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Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
Data Set	XZ59654100943				
Fuel sulphur content [ppm]	5				

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Unterschriftenweg	EDS erstellt	TETC Teamleiter	TET Leiter Org.-Einheit	Baureihen - Teamleiter	Baureihen Leiter Org.-Einheit	Freigabe im Windchill
Datum	19.04.2018	-	-	20.04.2018	20.04.2018	24.04.2018
Org.-Einheit	TKF	-	-	TKF	TKF	TKM
Name	Khakholka	-	-	Dr. Kneifel	Dr. Baumgarten	Link

MTU Friedrichshafen GmbH

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WORD	Datum/ Date	Name
Erstell. Drawn	2018-02-12 15:38:29	link
Bearb. Change	2018-04-25 10:28:05	link
Inhalt Content	19.04.2018	Khakholk
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Motortyp / Engine Type: **20V4000G34F**

Projekt-/Auftrags-Nr. Project/Order No.

Verwendbar f.Typ Applicable to Model

Format/Size: **A3**

Material-Nr./Material No.: **EDS 4000 1236**

Benennung/ Title: **EMISSIONSDATENBLATT**

EMISSION DATA SHEET

Zeichnungs-Nr./Drawing No.: **ZNG00013285**

Blatt/ Sheet: **1** von/of **7**

Beschreibung/Description

Aenderungsbeschreibung/Description of Revision — Kommt vor/Frequency

Freigabe

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.2	PR028476	Released

Revision *Change index*						

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G34F 6ETC				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	measured				

See also page 18

Motor Rohemissionen*

*Engine raw emissions**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1,10	1,00	0,75	0,50	0,25	0,10		
Power	[kW]	2849	2590	1942	1295	647	259		
Speed (n/nN)	[-]	1	1	1	1	1	1		
Speed	[rpm]	1500	1500	1500	1500	1500	1500		
Exhaust temperature after turbine	[°C]	523	516	486	450	351	232		
Exhaust massflow	[kg/h]	15488	15474	11998	8404	5723	4778		
Exhaust back pressure	[mbar]	23	20	14	6	2	1		
NOx	[g/kWh]	5,1	4,5	4,3	4,5	6,1	10,6		
	[mg/mN³]	1389	1111	1032	1024	992	817		
CO	[g/kWh]	0,8	0,7	0,6	0,5	1,3	3,2		
	[mg/mN³]	199	173	143	102	202	230		
HC	[g/kWh]	0,06	0,07	0,08	0,11	0,19	0,66		
	[mg/mN³]	15	16	17	24	30	47		
O2	[%]	9,0	9,4	10,2	10,8	13,1	16,2		
Particulate measured	[g/kWh]	-	-	-	-	-	-		
	[mg/mN³]	-	-	-	-	-	-		
Particulate calculated	[g/kWh]	0,06	0,07	0,07	0,06	0,15	0,19		
	[mg/mN³]	15	15	14	12	21	13		
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-	-		
FSN	[-]	0,4	0,4	0,4	0,3	0,7	0,3		
NO/NO2**	[-]	-	-	-	-	-	-		
CO2	[g/kWh]	658,5	695,4	674,1	669,8	706,6	888,4		
	[mg/mN³]	169083	161994	151161	142427	108667	64175		
SO2	[g/kWh]	0,002	0,002	0,002	0,002	0,002	0,003		
	[mg/mN³]	0,5	0,5	0,5	0,5	0,3	0,2		

* Emission data measurement procedures are consistent with the respective emission evaluation process. Noncertified engines are measured to sales data (TVU/TEN) standard conditions.
These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information.
Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.
All data applies to an engine in new condition. Over extended operating time deterioration may occur which might have an impact on emission.
Exhaust temperature depends on engine ambient conditions.

** No standard test. To be measured on demand.

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Inhalt Content		19.04.2018	Khakholk
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Motortyp / Engine Type: **20V4000G34F**

Projekt-/Auftrags-Nr. Project/Order No.

Verwendbar f.Typ Applicable to Model

Format/Size: **A3**

Material-Nr./Material No.: **EDS 4000 1236**

Benennung/ Title: **EMISSIONSDATENBLATT**

EMISSION DATA SHEET

Zeichnungs-Nr./Drawing No.: **ZNG00013285**

Blatt/ Sheet: **2** von/of **7**

Beschreibung/Description

Aenderungsbeschreibung/Description of Revision	Kommt vor/Frequency
Freigabe	

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.2	PR028476	Released

Revision *Change index*						

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G34F 6ETC				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	5				

Motor Rohemissionen*

*Engine raw emissions**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1,10	1,00	0,75	0,50	0,25	0,10		
Power	[kW]	2849	2590	1942	1295	647	259		
Speed (n/nN)	[-]	1	1	1	1	1	1		
Speed	[rpm]	1500	1500	1500	1500	1500	1500		
Exhaust temperature after turbine	[°C]	523	516	486	450	351	232		
Exhaust massflow	[kg/h]	15488	15474	11998	8404	5723	4778		
Exhaust back pressure	[mbar]	23	20	14	6	2	1		
NOx	[g/kWh]	5,1	4,5	4,3	4,5	6,1	10,6		
	[mg/mN³]	1846	1537	1534	1612	2022	2743		
CO	[g/kWh]	0,8	0,7	0,6	0,5	1,3	3,2		
	[mg/mN³]	265	239	213	160	411	773		
HC	[g/kWh]	0,06	0,07	0,08	0,11	0,19	0,66		
	[mg/mN³]	20	22	26	37	60	159		
O2	[%]	9,0	9,4	10,2	10,8	13,1	16,2		
Particulate measured	[g/kWh]	-	-	-	-	-	-		
	[mg/mN³]	-	-	-	-	-	-		
Particulate calculated	[g/kWh]	0,06	0,07	0,07	0,06	0,15	0,19		
	[mg/mN³]	20	21	21	19	43	42		
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-	-		
FSN	[-]	0,4	0,4	0,4	0,3	0,7	0,3		
NO/NO2**	[-]	-	-	-	-	-	-		
CO2	[g/kWh]	658,5	695,4	674,1	669,8	706,6	888,4		
	[mg/mN³]	224590	224021	224625	224182	221385	215397		
SO2	[g/kWh]	0,002	0,002	0,002	0,002	0,002	0,003		
	[mg/mN³]	0,7	0,7	0,7	0,7	0,7	0,7		

* Emission data measurement procedures are consistent with the respective emission evaluation process. Noncertified engines are measured to sales data (TVU/TEN) standard conditions.
These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information.
Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.
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Exhaust temperature depends on engine ambient conditions.

** No standard test. To be measured on demand.

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Projekt-/Auftrags-Nr. Project/Order No.

Verwendbar f.Typ Applicable to Model

Format/Size **A3**

Material-Nr./Material No.

EDS 4000 1236

Benennung/ Title

EMISSIONSDATENBLATT

EMISSION DATA SHEET

Motortyp / Engine Type

20V4000G34F

Zeichnungs-Nr./Drawing No. **ZNG00013285**

Blatt/ Sheet **3** von/of **7**

Beschreibung/Description

Aenderungsbeschreibung/Description of Revision	Kommt vor/Frequency
Freigabe	

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.2	PR028476	Released

Revision *Change index*					

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G34F 6ETC				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	15				

Motor Rohemissionen*

*Engine raw emissions**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1,10	1,00	0,75	0,50	0,25	0,10		
Power	[kW]	2849	2590	1942	1295	647	259		
Speed (n/nN)	[-]	1	1	1	1	1	1		
Speed	[rpm]	1500	1500	1500	1500	1500	1500		
Exhaust temperature after turbine	[°C]	523	516	486	450	351	232		
Exhaust massflow	[kg/h]	15488	15474	11998	8404	5723	4778		
Exhaust back pressure	[mbar]	23	20	14	6	2	1		
NOx	[g/kWh]	5,1	4,5	4,3	4,5	6,1	10,6		
	[mg/mN³]	692	576	575	605	758	1029		
CO	[g/kWh]	0,8	0,7	0,6	0,5	1,3	3,2		
	[mg/mN³]	99	90	80	60	154	290		
HC	[g/kWh]	0,06	0,07	0,08	0,11	0,19	0,66		
	[mg/mN³]	8	8	10	14	23	60		
O2	[%]	9,0	9,4	10,2	10,8	13,1	16,2		
Particulate measured	[g/kWh]	-	-	-	-	-	-		
	[mg/mN³]	-	-	-	-	-	-		
Particulate calculated	[g/kWh]	0,06	0,07	0,07	0,06	0,15	0,19		
	[mg/mN³]	7	8	8	7	16	16		
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-	-		
FSN	[-]	0,4	0,4	0,4	0,3	0,7	0,3		
NO/NO2**	[-]	-	-	-	-	-	-		
CO2	[g/kWh]	658,5	695,4	674,1	669,8	706,6	888,4		
	[mg/mN³]	84221	84008	84234	84068	83019	80774		
SO2	[g/kWh]	0,002	0,002	0,002	0,002	0,002	0,003		
	[mg/mN³]	0,3	0,3	0,3	0,3	0,3	0,3		

* Emission data measurement procedures are consistent with the respective emission evaluation process. Noncertified engines are measured to sales data (TVU/TEN) standard conditions.
These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information.
Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.
All data applies to an engine in new condition. Over extended operating time deterioration may occur which might have an impact on emission.
Exhaust temperature depends on engine ambient conditions.

** No standard test. To be measured on demand.

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Revision *Change index*					

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G34F 6ETC				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	measured				

Not to exceed Werte*

*not to exceed values**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1,00	0,75	0,50	0,25				
Power	[kW]	2590	1942	1295	647				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1500	1500	1500	1500				
Exhaust back pressure	[mbar]	20	14	6	2				
NOx	[g/kWh]	5,8	5,6	5,9	9,1				
	[mg/mN³]	1444	1342	1331	1489				
CO	[g/kWh]	1,3	1,1	0,9	2,6				
	[mg/mN³]	294	244	193	403				
HC	[g/kWh]	0,12	0,13	0,21	0,39				
	[mg/mN³]	27	30	45	59				
O2	[%]	9,4	10,2	10,8	13,1				
Particulate calculated	[g/kWh]	0,11	0,11	0,09	0,22				
	[mg/mN³]	23	23	18	31				

* Calculated values are not proven by tests and therefore the accuracy cannot be guaranteed.

Emissions data measurement procedures are consistent with those described in the applicable rules and standards.

The NOx, CO, HC and PM emission data tabulated here were taken from a single new engine under the test conditions shown above and are valid for the following conditions:

- Ambient air pressure 1 bar
- Air intake temperature approx. 25°C
- Rel. Humidity 30%-60%
- New Engine
- New standard- air filter
- Exhaust gas back pressure according the given value in this EDS
- Fuel according to EN 590 or US EPA 40CFR89
- Coolant and Lubricants according MTU Fuels and Lubricants Specification
- measured after combined exhaust streams.

The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on single operating points and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle. Emissions data may vary depending on the type of exhaust gas aftertreatment that may be installed on the engine, therefore it is suggested that the engine manufacturer be contacted directly for further information.

Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures, and instrumentation. Over time deterioration may occur which may have an impact on emission levels. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

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Aenderungsbeschreibung/Description of Revision	Kommt vor/Frequency
Freigabe	

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.2	PR028476	Released

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Motortyp / Engine Type

20V4000G34F

Projekt-/Auftrags-Nr. Project/Order No.

Verwendbar f.Typ Applicable to Model

Format/Size **A3**

Material-Nr./Material No.

EDS 4000 1236

Benennung/ Title

EMISSIONSDATENBLATT

EMISSION DATA SHEET

Zeichnungs-Nr./Drawing No. **ZNG00013285**

Beschreibung/Description

Blatt/ Sheet **5** von/of **7**

Revision *Change index*					

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G34F 6ETC				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	5				

Not to exceed Werte*

*not to exceed values**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1,00	0,75	0,50	0,25				
Power	[kW]	2590	1942	1295	647				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1500	1500	1500	1500				
Exhaust back pressure	[mbar]	20	14	6	2				
NOx	[g/kWh]	5,8	5,6	5,9	9,1				
	[mg/mN³]	1998	1994	2096	3033				
CO	[g/kWh]	1,3	1,1	0,9	2,6				
	[mg/mN³]	406	362	304	821				
HC	[g/kWh]	0,12	0,13	0,21	0,39				
	[mg/mN³]	38	44	71	121				
O2	[%]	9,4	10,2	10,8	13,1				
Particulate calculated	[g/kWh]	0,11	0,11	0,09	0,22				
	[mg/mN³]	32	34	29	64				

* Calculated values are not proven by tests and therefore the accuracy cannot be guaranteed.

Emissions data measurement procedures are consistent with those described in the applicable rules and standards.

The NOx, CO, HC and PM emission data tabulated here were taken from a single new engine under the test conditions shown above and are valid for the following conditions:

- Ambient air pressure 1 bar
- Air intake temperature approx. 25°C
- Rel. Humidity 30%-60%
- New Engine
- New standard- air filter
- Exhaust gas back pressure according the given value in this EDS
- Fuel according to EN 590 or US EPA 40CFR89
- Coolant and Lubricants according MTU Fuels and Lubricants Specification
- measured after combined exhaust streams.

The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on single operating points and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle. Emissions data may vary depending on the type of exhaust gas aftertreatment that may be installed on the engine, therefore it is suggested that the engine manufacturer be contacted directly for further information.

Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures, and instrumentation. Over time deterioration may occur which may have an impact on emission levels. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

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Motortyp / Engine Type: **20V4000G34F**

Projekt-/Auftrags-Nr. Project/Order No.

Verwendbar f.Typ Applicable to Model

Format/Size: **A3**

Material-Nr./Material No.: **EDS 4000 1236**

Benennung/ Title: **EMISSIONSDATENBLATT**

EMISSION DATA SHEET

Zeichnungs-Nr./Drawing No.: **ZNG00013285**

Blatt/ Sheet: **6** von/of **7**

Beschreibung/Description

Aenderungsbeschreibung/Description of Revision	Kommt vor/Frequency
Freigabe	

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.2	PR028476	Released

Revision *Change index*					

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G34F 6ETC				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	15				

Not to exceed Werte*

*not to exceed values**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1,00	0,75	0,50	0,25				
Power	[kW]	2590	1942	1295	647				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1500	1500	1500	1500				
Exhaust back pressure	[mbar]	20	14	6	2				
NOx	[g/kWh]	5,8	5,6	5,9	9,1				
	[mg/mN³]	749	748	786	1137				
CO	[g/kWh]	1,3	1,1	0,9	2,6				
	[mg/mN³]	152	136	114	308				
HC	[g/kWh]	0,12	0,13	0,21	0,39				
	[mg/mN³]	14	16	27	45				
O2	[%]	9,4	10,2	10,8	13,1				
Particulate calculated	[g/kWh]	0,11	0,11	0,09	0,22				
	[mg/mN³]	12	13	11	24				

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Emissions data measurement procedures are consistent with those described in the applicable rules and standards.
The NOx, CO, HC and PM emission data tabulated here were taken from a single new engine under the test conditions shown above and are valid for the following conditions:

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- Rel. Humidity 30%-60%
- New Engine
- New standard- air filter
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- Fuel according to EN 590 or US EPA 40CFR89
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Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures, and instrumentation. Over time deterioration may occur which may have an impact on emission levels. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.
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Aenderungsbeschreibung/Description of Revision	Kommt vor/Frequency
Freigabe	

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-.2	PR028476	Released

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WORD	Datum/ Date	Name
Erstell. Drawn	2018-02-12 15:38:29	link
Bearb. Change	2018-04-25 10:28:05	link
Inhalt Content	19.04.2018	Khakholk
Gepr. Checked	2018-04-25 10:28:05	kneifel al

Motortyp / Engine Type

20V4000G34F

Projekt-/Auftrags-Nr. Project/Order No.

Verwendbar f.Typ Applicable to Model

Format/Size **A3**

Material-Nr./Material No.

EDS 4000 1236

Benennung/ Title

EMISSIONSDATENBLATT

EMISSION DATA SHEET

Zeichnungs-Nr./Drawing No. **ZNG00013285**

Beschreibung/Description

Blatt/ Sheet **7** von/of **7**

Rolls-Royce Solutions GmbH
Maybachplatz 1
88045 Friedrichshafen
Germany
T +49 7541 90-0

To whom it may concern

Contact: Robert Welz
e-Mail: robert.welz2@ps.rolls-royce.com
Tel. No.: +49 7541 904675
Fax No.:
Date: 23 March 2022
Ref.:

Explanation Nominal Emissions and Not to Exceed Emissions in the Emission Data Sheets

Nominal emission values are the result of one specific measurement on one single engine. These measurements have been done under standard conditions on test benches in Friedrichshafen. Because it's a single measurement of one single engine it doesn't show engine to engine variations, nor measurement to measurement variations.

Based on experience, our development team defines safety margins for each load point covering such effects. These safety margins are then added to the nominal emission values. As a result, we have the "not to exceed (NTE)" values in our EDS, which will be valid for all engines out of the series production – as long as the conditions are standard conditions.

These NTE- values will cover any tolerances, deviations etc. and therefore we consider all engines will be within the NTE- emission values under the conditions stated on the Emission Data Sheet.

Sincerely,

Digitale Unterschrift - Original abgelegt bei TSF.

i.V. Michael Koliwer
Director of PG Engineering
Rolls Royce Solutions GmbH

Digital Signature - Original filed at TSL

i.A. Robert Welz
Senior Manager of PG Engineering
Rolls Royce Solutions GmbH

Board of Management: Andreas Schell (President and CEO), Dr. Thelse Godewerth, Dr. Otto Preiss.
Chairwoman of the Supervisory Board: Jasmin Staiblin. Domicile: Friedrichshafen. Register Court: Ulm, Nr. I No. HRB 630 227.
Bank Details: Deutsche Bank AG Stuttgart: (all currencies) SWIFT/BIC DEUTDESSXXX, IBAN DE35 6007 0070 0162 9039 00.
Commerzbank AG Friedrichshafen: (EUR) SWIFT/BIC COBADEFF651, IBAN DE68 6514 0072 0170 0038 00.
V.A.T. No. DE 811121844

Luke Spenst | AVK

From: James.Pidding@ps.rolls-royce.com
Sent: 23 June 2022 16:32
To: George Close | AVK
Cc: Ben Pritchard | AVK; Myles.Osborn@ps.rolls-royce.com; Luke Spenst | AVK
Subject: Yondr - DS3300 NOx Emissions Statement

Hi George,

I can confirm that the Rolls-Royce mtu DS3300 3F NOx optimised genset will comply to 2g TA-Luft or <2000mg NOx as required by the UK Environment Agency.

Mit freundlichen Grüßen / Kind regards

James Pidding
Key Account Manager – PowerGen Sales

James.Pidding@ps.rolls-royce.com
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Company registration number: 04691779

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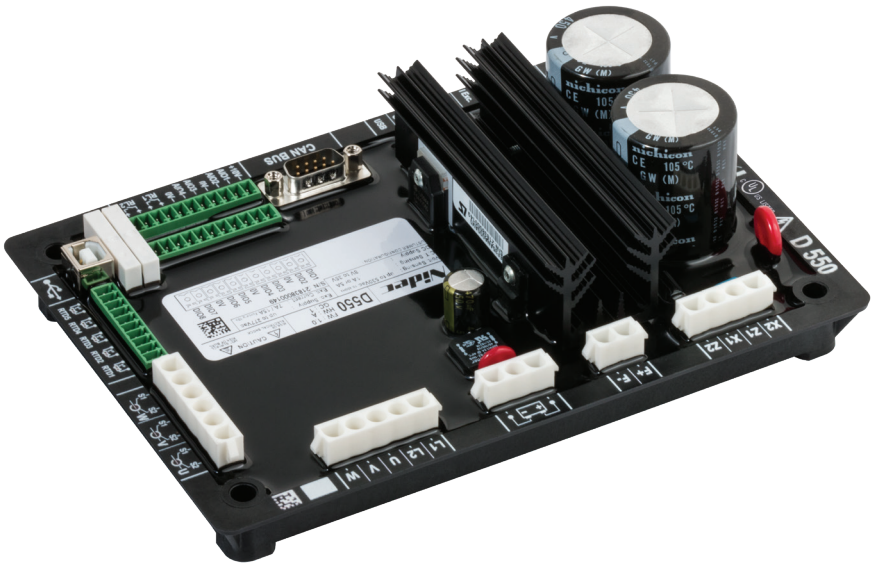
Appendix 06 - AVR Datasheet

Nidec
All for dreams

LEROY-SOMER™
KATO ENGINEERING™

DATASHEET

D550 DIGITAL AVR
FOR ALTERNATORS WITH SHUNT, AREP OR PMG EXCITATION



The D550 is a digital automatic voltage regulator (AVR) for alternators with rated field current up to 8 A at 55°C.

It offers a vast array of regulation modes suitable for all power generation applications, including grid-connected configurations.

The D550 also integrates a visual interface through the EasyReg Advanced software, which allows the user to read the configuration values and parameters. It can also be configured directly via USB without external power supply.

The D550 also includes several protections and functions to keep the alternator running in full safe operation, in particular settings to comply with public network connection instructions (grid code).

The communication port is CANJ1939 compatible.

KEY FEATURES

- **Regulation modes:**
  - Voltage regulation accuracy: -/+ 0.25%
  - Field current (manual mode)
  - Generator power factor
  - Grid power factor
  - Generator kVAr
- **Regulation features:**
  - Voltage equalization
  - Droop management
  - Cross current compensation
  - Soft start
  - Load Acceptance Module (L.A.M.) function to assist during heavy load application events
  - Negative field forcing
- **kW, kVAr, kVA and PF calculation**
- **Protections & Limitations:**
  - Under and over field current limitation
  - Loss of field sensing
  - Generator under/over voltage
  - Loss of sensing
  - V/Hz regulation mode
  - Diode fault monitor
- **Data logger** (option)
- **Synchronization monitoring**
- **Events log**

ELECTRICAL FEATURES

- **Generator voltage measurement:**
  - 3-phase, 2-phase
  - Range: 0-230-530 VAC
  - Consumption: < 2 VA
- **Grid voltage measurement:**
  - 2-phase
  - Range: 0-230-530 VAC
  - Consumption: < 2 VA
- **Generator current measurement:**
  - 1 or 3-phase
  - Secondary range: 1 or 5 A
  - Consumption: < 2 VA
- **AC supply input:**
  - PMG, AREP, SHUNT
  - Range: 50-277 VAC
- **Excitation:**
  - Rated field current (continuous):
    7 A at 70°C
    8 A at 55°C
  - Field forcing current (10s max):
    15 A at 70°C
  - Recommended field resistance:
    > 4 ohms
- **Auxiliary supply:** 8-35 VDC
  - Consumption: < 1 A
- **Frequency range:** 30-400 Hz
- **Storage temperature range:**
  -55°C +85°C
- **Operating temperature range:**
  -40°C +70°C

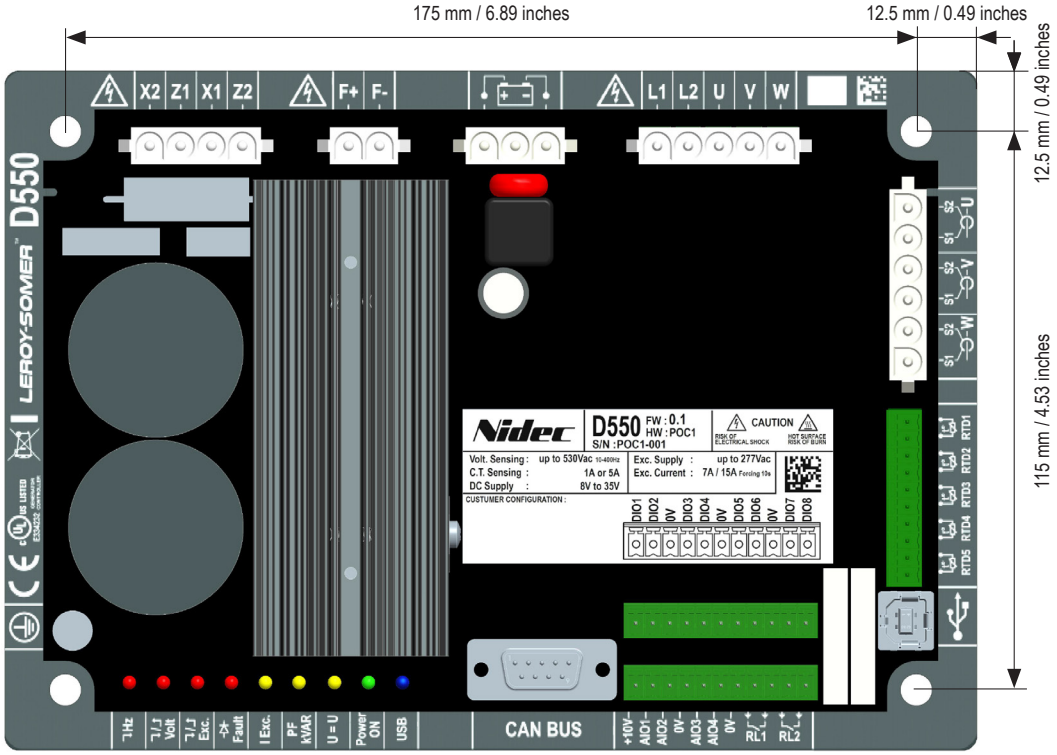
INPUTS / OUPUTS

- **8 programmable digital inputs & outputs:**
  - Output specification: 150 mA - 30 VDC
- **4 programmable analog inputs & outputs:**
  - 4-20 mA / ±10 V / 0-10 V / potentiometer (1 kΩ)
- **2 relay outputs:**
  - Specifications: 125 VAC - 5 A
- **5 temperature sensings:**
  - Type: Pt100/CTP
  - Programmable threshold

COMMUNICATION AND SETTINGS

- Software configuration (PC tool)
- USB port (self powered)
- CAN J1939 and Proprietary (Nidec Leroy-Somer protocol)

DIMENSIONS



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Appendix 07 - Battery Datasheet

OPTIMA® YellowTop S 5,5

Battery Model: YT S 5,5
Part Number: 851 187 000 888 2
Nominal Voltage: 12 volts
NSN: 6140 01 502 4973
Description: High power, dual purpose engine start and deep cycle, sealed lead acid battery

Physical Characteristics:

Plate Design: High purity lead-tin alloy. Wound cell configuration utilizing proprietary SPIRALCELL® technology.
Electrolyte: Sulfuric acid, H_2SO_4
Case: Polypropylene
Color: Case: Light Gray
Cover: "OPTIMA" Yellow
Group Size: BCI: 31

	Standard	Metric
Length:	12.813"	325 mm
Width:	6.500"	165 mm
Height:	9.375"	238 mm (height at the top of the terminals)
Weight:	59.8 lb	26.5 kg

Terminal Configuration: SAE / BCI automotive.

Performance Data:

Open Circuit Voltage (fully charged): 13.1 volts
Internal Resistance (fully charged): 0.0025 ohms
Capacity: 75 Ah (C/20)
Reserve Capacity: BCI: 155 minutes
(25 amp discharge, 80°F (26.7°C), to 10.5 volts cut-off)

Power:

CCA (EN -18°C): 975 amps
MCA (BCI 0°C): 1125 amps

Recommended Charging:

The following charging methods are recommended to ensure a long battery life: (Always use a voltage regulated charger with voltage limits set as described below.)

Model: YT S 5,5
These batteries are designed for starting and deep cycling applications and for use in vehicles with large accessory loads.

OPTIMA® YellowTop S 5,5

Recommended Charging Information:

Alternator:	13.65 to 15.0 volts
Battery Charger (Constant Voltage):	13.8 to 15.0 volts; 10 amps maximum; 6-12 hours approximate
Float Charge:	13.2 to 13.8 volts; 1 amp maximum (indefinite time at lower voltages)
Rapid Recharge: (Constant voltage charger)	Maximum voltage 15.6 volts. No current limit as long as battery temperature remains below 50°C (125°F). Charge until current drops below 1 amp.
Cyclic or Series String Applications:	14.7 volts. No current limit as long as battery temperature remains below 50°C (125°F). When current falls below 1 amp, finish with 3 amp constant current for 1 hour. **All limits must be strictly adhered to.**

Recharge Time: (example assuming 100% discharge – 10.5 volts)

Current	Approx. time to 90% charge
100 amps	52 minutes
50 amps	112 minutes
25 amps	210 minutes

Recharge time will vary according to temperature and charger characteristics. When using Constant Voltage chargers, amperage will taper down as the battery becomes recharged. When amperage drops below 1 amp, the battery will be close to a full state charge.

(All charge recommendations assume an average room temperature of 25°C, 77°C)

Always wear safety glasses when working with batteries.

Always use a voltage regulated battery charger with limits set to the above ratings. Overcharging can cause the safety valves to open and battery gases to escape, causing premature end of life. These gases are flammable! You cannot replace water in sealed batteries that have been overcharged. Any battery that becomes very hot while charging should be disconnected immediately.

Not fully charging a battery can result in poor performance and a reduction in capacity.

Shipping and Transportation Information:

OPTIMA batteries can be shipped by AIR. The battery is nonspillable and is tested according to ICAO Technical Instructions DOC. 9284-AN/905 to meet the requirements of Packing Instructions No. 806 and is classified as non-regulated by IATA Special Provision A-48 and A-67 for UN2800. Terminals must be protected from short circuit.

Manufacturing Location:

OPTIMA Batteries
17500 East 22nd Avenue
Aurora, CO 80011
United States of America
Phone: 303-340-7400
Fax: 303-340-7474

BCI = Battery Council International

Appendix 08 - ComAp Datasheet

ComAp
The heart of smart control

InteliSys NTC BaseBox

Order code: IS-NTC-BB

Gen-set controller

Datasheet

Product description

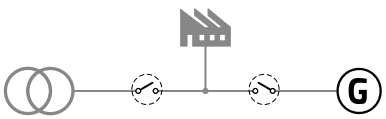
- Comprehensive paralleling gen-set controller
- Parallel operation up to 32 gen-sets
- High level control for complex systems
- CHP and gas engine controller

Key features

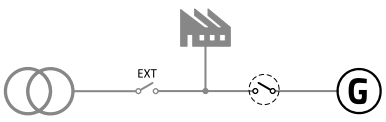
- Load sharing and VAr sharing via CAN
- Virtual shared inputs and outputs via CAN
- Support of wide range of applications
  - Single or multiple gen-sets in parallel to mains operation with automatic back up function, multiple island operation
- Advanced power management function
- Customizable load control in parallel to mains
- Wide range of ECU support
- Extended communication capabilities
  - Built-in web server
  - Full Modbus slave support
  - GPS and AirGate support and more
- Highly configurable
  - Timers,Extended internal PLC , Force values and more
- Compatible with ComAp's InteliVision displays
- Active e-mail messaging and SMS
- Extensive built-in protection functions
  - Standard protections
  - User configurable protection
- Extendable with ComAp's extension modules
- True RMS (TRMS) is used with Voltage, Current and Power measurement

Application overview

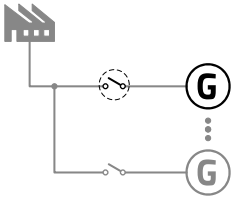
SPtM
Mains & Generator Circuit Breaker



SPI
Generator Circuit Breaker



MINT
Generator Circuit Breaker



Technical data

Power supply

Power supply range	8-36 VDC
Power consumption	0.4 A / 8 VDC 0.15 A / 24 VDC 0.1 A / 36 VDC
RTC battery	10 years (replaceable by official service)
Fusing	2 A (without BOUT consumption)

Operating conditions

Operating temperature	-40°C to +70°C
Storage temperature	-40°C to +80°C
Operating humidity	95% w/o condensation
Vibration	5-25 Hz, ±1.6 mm 25-100 Hz, a=4 g
Shocks	a=200 m/s^2

Voltage measurement

Measurement inputs	3 ph-n Gen voltage 3 ph-n Mains/Bus voltage
Measurement range	110V / 277V
Max allowed voltage	125 %
Accuracy	1 % of 110V / 277V
Frequency range	40-70 Hz (at accy 0.1 Hz)
Input impedance	0.6 MΩ ph-ph 0.3 MΩ ph-n

Current measurement

Measurement inputs	3 ph Gen current 1 ph Mains current
Measurement range	1 A / 5 A
Max allowed continuous current	200 % / 200 %
Accuracy	2 % of 1 A / 5 A
Input impedance	<0.1 Ω

Binary inputs

Number	16 non-isolated
Input resistance	4.7 kΩ
Close/Open indication	0-2 VDC close contact >4 VDC open contact

Binary outputs

Number	16 non-isolated
Max current	0.5 A (2 A per group)
Switching to	negative/positive supply terminal

Analog inputs

Number	4 non-isolated
Type	Switchable (Voltage, Resistance, Current)
Resolution	10 bits, max 4 decimals
Range	0-5 VDC/0-2500 Ω/0-20 mA
Input impedance	>100 kΩ/>100 kΩ/180 Ω
Accuracy	±1 % of meas. value ±1 mV ±2 % of meas value ±2 Ω ±1 % of meas value ±0.5 mA

Analog outputs

Number	1
Type	Switchable (Voltage, Current)
Range	0-10 VDC/0-20 mA
Max current/load	5 mA/500 Ω
Accuracy	±0.5 % of output value ±20 mV ±0.5 % of output value ±100 µA

Magnetic pick-up

Voltage input range	2 Vpk-pk to 50 Veff
Frequency input range	4 Hz to 15 kHz
Frequency measurement tolerance	0.2 %

Voltage regulator output

Type	5 V TTL PWM / ± 10 VDC with IG-AVRi interface

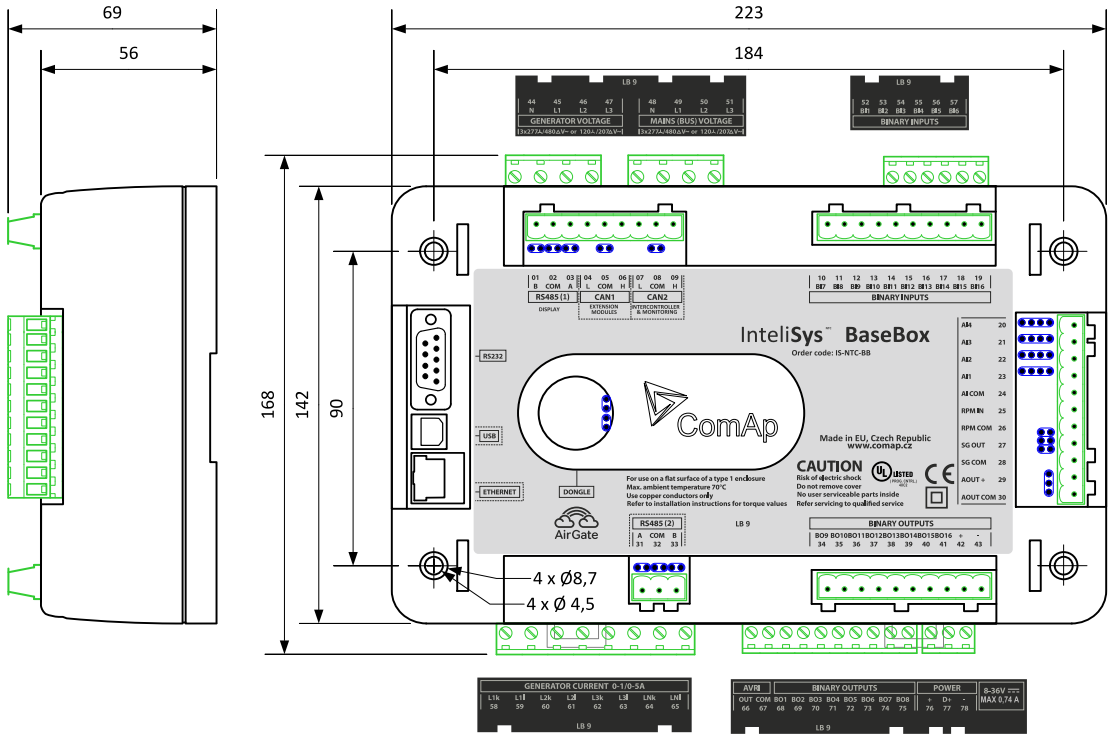
Speed governor output

Voltage output	± 10 VDC / max.15 mA
Voltage output via resistor	± 10 VDC via 10 kΩ resistor / max . 1 mA
PWM	500÷3000 Hz / 5V / max. 10mA

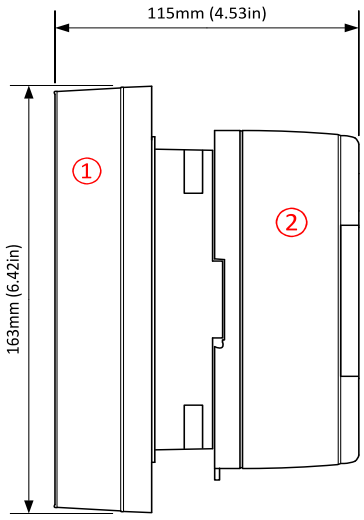
Communications

RS232	Direct/Modbus, non-isolated
RS485	Direct/Modbus, isolated
Display port	non-isolated RS485, only terminal connection
USB port	Direct, isolated
Ethernet port	LAN/Internet, Modbus TCP, SNMP, WebServer, AirGate
CAN1	External modules 250 kbps, max 200 m, Isolated
CAN2	Intercontroller and comm extensions 250/50 kbps, max 200/1000 m, Isolated

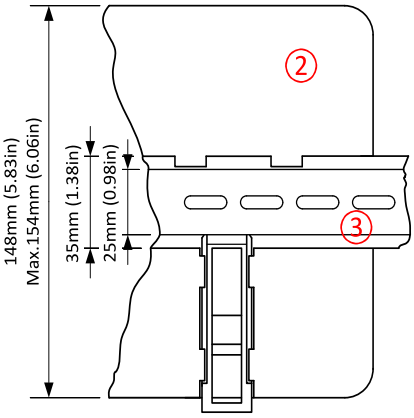
Dimensions, terminals and mounting



Panel door mounting with InteliVision 5

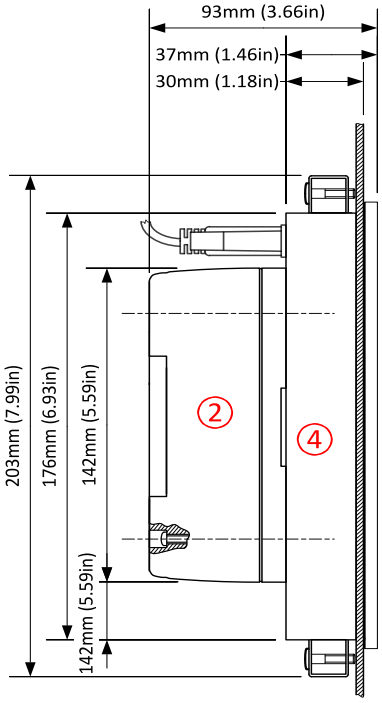


DIN-rail mounting



① InteliVision5
② InteliSys^{NTC} BaseBox
③ DIN-rail
④ InteliVision 8

Panel door mounting with InteliVision 8



Note: *InteliSys^{NTC} BaseBox can be mounted on a standard DIN rail or, in combination with InteliVision 5 or InteliVision 8, it can be door mounted. InteliVision 5 features mounting rail for direct mounting. Mounting in combination with InteliVision 8 uses four screws provided in the InteliSys^{NTC} BaseBox package.*

Available extension modules

Product	Description	Order code
Inteli IO8/8	8 Binary inputs, 8 Binary outputs and 2 Analog outputs packed in a small unit (HW switchable to IO16/0)	I-IO8/8
Inteli IO8/8	HW switchableto IO16/0 - 16 Binary inputs packed in a small unit	I-IO8/8
Inteli AIN8	8 Analog inputs (R, I, V) and 1 pulse/frequency input in a small unit	I-AIN8
Inteli AIN8TC	8 Thermocouple Analog inputs in a small unit	I-AIN8TC
Inteli AIO9/1	9 Analog inputs (4x DC, 4x thermocouples, 1x R) in a small unit	I-AIO9/1
IS-AIN8	8 Analog inputs packed in a rugged metal unit	IS-AIN8
IGS-PTM	8 Binary inputs, 8 Binary outputs, 4 Analog inputs and 1 Analog output in a unit	IGS-PTM
IGL-RA15	15 Binary LED output (3 colors) packed in a rugged metal unit	IGL-RA15
I-AOUT8	8 Analog outputs packed in a rugged metal unit	I-AOUT8
InternetBridge-NT	Multiple Internet connections (PC and Modbus) to all controllers on CAN2 or RS485	IB-NT
I-LB+	Direct connection (PC) to all controllers on CAN2 or RS485	I-LB+

Related products

Product	Description	Order code
InteliVision 5	Color 5.6" display for monitoring and control	INTELIVISION 5
InteliVision 8	Color 8" display for advanced monitoring, control & trending, USB capable	INTELIVISION 8
InteliVision 12Touch	Color 12" touch display for advanced monitoring, control & trending, USB capable	RD1IV12TBZH
InteliVision 17Touch	Color 17“ touchscreen display designed for complete monitoring and control of multiple controllers or cogeneration installation.	IV17T2
ECON-4	Digital speed governor dedicated for speed control of gas or diesel engines.	ECON-4

Functions and protections

The described product fully supports the following functions and protections as defined by ANSI (American National Standards Institute):

Description	ANSI code	Description	ANSI code
Synchronism check	25	Earth fault current	50N+64
Undervoltage	27	Overcurrent (IDMT)	51
Overload	32	Earth fault current IDMT	51N+64
Load shedding	32P	Power factor	55
Reverse power	32R	Overvoltage	59
Undercurrent	37	Gas (fuel) level	71
Excitation loss	40	Vector shift	78
Current unbalance	46	AC reclosing	79
Voltage asymmetry and phase sequence	47	Overfrequency	81H
Temperature monitoring	49T	Underfrequency	81L
Generator overcurrent	50	ROCOF	81R

Certificates and standards

This product is CE compliant.

- EN 60068-2-6 ed.2:2008; EN 60068-2-27 ed.2:2010; EN 60068-2-30, May 2000
- EN 60068-2-64; EN 61010-1:2003

CE

All certificates and standards are available on: https://webstore.iec.ch/

ComAp
The heart of smart control

Manufacturer:
ComAp a.s.
Czech Republic
Phone: +420 246 012 111
E-mail: info@comap-control.com
Web: www.comap-control.com

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Appendix 09 - ComAp HMI Datasheet

InteliVision 8

CONTROLLER COLOUR DISPLAY UNIT

Description

InteliVision 8 is a colour display unit designed as a simple, easy-to-use Plug and Play solution and delivers high visibility of all engine data, monitoring information and trend history in a bright, colorful and forward looking design. It can be used for either InteliGen^{NT}, InteliSys^{NT}, InteliMains^{NT}, InteliDrive DCU and InteliDrive Mobile.

InteliVision 8 comes with the large high-resolution colour TFT display, which helps visibility and definition of onscreen information. The control interface has user-friendly, intuitive active buttons – giving users access to more information in less time. InteliVision 8 boasts the unique TRENDS monitoring as a standard feature, helping you evaluate past events easily on one screen. It offers a site data storage using a USB stick and permits adding external pictures for customization of screens.

InteliVision 8 includes ComAp's standard communication interface using RS232/485 and CAN bus communication. Designed to be mounted in both monitoring and engine room, InteliVision 8 gives complete access to all control functions when connected to control unit.

- Galvanically separated CAN and RS-485 interface
- Screen editor
- Tier 4
- Trends
- USB import & export
- Front IP65
- Plug and play interface
- Large history
- Insert images
- Configurable buttons

ComAp is a member of AMPS (The Association of Manufacturers of Power generating Systems).

ComAp products meet the highest standards, with every stage of production undertaken in accordance with the ISO certification obtained in 1998.

The product has the UL Certification.

USB as data storage

InteliVision 8 makes working with your data even easier. You can export data to a USB flash drive, in order to work with data later at your computer with ease.

Data export capability:

- History
- Controller archive
- InteliVision firmware
- Trend – single export & continuous logging

The history and trend data is saved in a format that is supported by third party software. It is also possible to import trend data from a USB flash drive to InteliVision 8 and analyse them in the Trend screen.

USB as Login key

If quick, convenient access to InteliVision 8 is what you need, you can use a USB flash drive as a login key. When a user's password is saved onto a USB flash drive, simply plug it into InteliVision 8 and you are automatically logged in – no need to enter a password manually! A great idea for high security operations, as only staff with the correct USB flash drive are able to access the unit.

Configurable functional buttons

If you need quick access to frequently used functions on InteliVision 8, there are a number of user customisable buttons to which you can assign commands.

Offers fast access to frequently used functions:

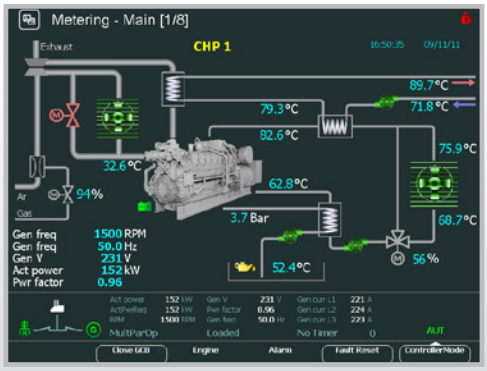
- Binary signal activation
- Associate the buttons with generator or engine commands
- Fast jump to any measurement or Setpoints screen

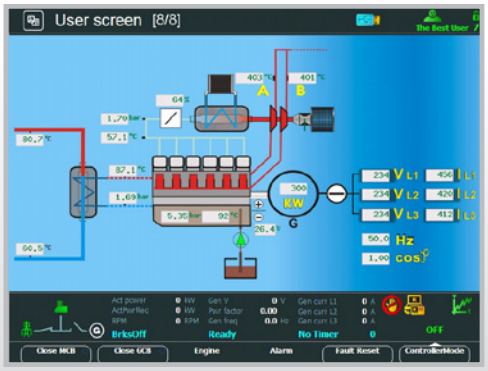
Configuration of these buttons is easy in ScreenEditor, which is part of GenConfig software application.

Import pictures and ScreenEditor

If you need to see a particular engine reading, a certain graph, or other frequently accessed information it is possible with ScreenEditor to customise InteliVision 8 to your preference. You can even add your company logo, or any other photo to further make InteliVision 8 unique to your application.

Screen examples





Trends improvement

Working with trends is now much easier. We have added new features such as:

- Faster movement through Trends
- The ability to evaluate change in trends across several screen
- Indication of remaining time for saving of trends

A major new feature is the ability to display only data from the binary signal that the user wants to see. This is a big change from the previous method of having to see all data, and find the section you need.

Benefits

- Large, colour screen with high-resolution
- PLUG and PLAY operation (auto configuration based on controller application)
- Simpler, faster and more intuitive control
- More information in less time
- TRENDS monitoring screen
- USB flash disk as file STORAGE (export trends, history and archive to USB flash disk)
- Quick AUTO login with USB stick
- User's PICTURES import to measurement screen
- Easy Drag & Drop screen CONFIGURATION by customer in new GRAPHICAL Editor
- CONFIGURABLE soft keys buttons
  - Fast jump to any Measurement or Setpoints screens
  - Binary signal activation – toggle button/pulse generator
  - Associating of genset commands
- ADAPTIVE and COLOR alarm list displaying
- Support of Tier 4 icons
- Direct connection to the controller (converters are not needed)

Features

- 8" colour TFT display with resolution 800×600 pixels
- Customized initial screen logo and the content of a controller help
- Same language support as InteliGen^{NT}, InteliSys^{NT}, InteliMains^{NT}, InteliDrive DCU and InteliDrive Mobile
- Allows full monitoring of ONE controller (in case of more controllers on CAN it is possible to switch over among controllers monitoring by change of CAN address)
- The same dimensions as IS-Display (possible as a replacement for IG-Display LT GC, IS-Display or I-RD-CAN)
- Connection via of RS232/485 and CAN bus
- Possibility to mount InteliGen^{NT} BaseBox, InteliGen^{NTC} BaseBox, InteliSys^{NTC} BaseBox or InteliSys^{NT} BaseBox to the rear side of InteliVision 8
- Windows CE operating system
- Operating temperature: –20 to + 70°C
- Face is sealed to IP65
- EMC, climatic and mechanical tests
- CE, UL certification

Connection Possibilities

The table shows the number of InteliVision 8 that can be connected to each port controller.

	RS232	RS485	Display port (RS485)	CAN2
InteliGen^{NT}	1	0	1	4
InteliGen^{NT} BaseBox	1	0	2	4
InteliGen^{NTC} BaseBox	1	1	2	4
InteliSys^{NT} BaseBox	1–2*	0*–1	3	4
InteliSys^{NTC} BaseBox	1	1	3	4
InteliMains^{NT}	1	0	1	4
InteliMains^{NT} BaseBox	1	1	2	4
InteliMains^{NTC} BaseBox	1	0	2	4
InteliDrive DCU Industrial	1	0	0	3
InteliDrive DCU Marine	1	0	0	4
InteliDrive Mobile	0	1	0	2

* Port is shared (can be set either as 485(2) or as RS232(2)

Order code

Controller	Order code
InteliVision 8	INTELIVISION 8

Appendix 10 - HVO Confirmation Letter

Rolls-Royce Solutions GmbH
Maybachplatz 1
88045 Friedrichshafen
Germany
T +49 7541 90-0

Ben Pritchard
Sales Director
AVK – SEG (UK) Ltd
77 Bastwick St.
London, United Kingdom

Contact:
e-Mail: @ps.rolls-royce.com
Tel. No.:
Fax No.:
Date: XX.XX.XX
Ref.: IPAS XXXXX

Confirmation of Generating Set performance when utilising EN15940 compliant HVO and GtL fuels: LON1X2 build C

Draft

Dear Mr. Pritchard,

Following your recent enquiry regarding the performance of our Generating Sets that are pro-posed for your LON1X2 build C project, I am pleased to confirm that using any HVO/ GtL fuel compliant to EN15940 will cause no negative influence on Genset power.

Equally, there will be no negative impact on emissions or additional wear and tear over and above what would be expected running on conventional EN590 Diesel.

Additional Fuel consumption of approximately 3% can occur because EN15940 fuels have a lower density / caloric heat value. This lower density is compensated by our fuel system by extending the duration of the injection and hence increasing consumption slightly.

For reference, please see below the confirmed Generating Set specification for LON1X2 build C:

Product:	***mtu*** 20V4000 DS3300
Engine:	20V4000G34F
Alternator:	LSA 52.3 L14 / 4p
Voltage:	400 V
Application:	3F – Data Center Continuous
Optimisation:	NOx Emissions Optimised

Please note that all data provided is valid in conjunction with the Genset datasheets and engine 'TEN' technical data for the configuration above. Of course, site conditions above those agreed at tender (40ºC ambient and 100M above sea level) can cause power derates with any fuel.

Sincerely,

i.V
Director of PG Engineering
Rolls Royce Solutions GmbH

i.A.
Senior Manager of PG Engineering
Rolls Royce Solutions GmbH

Board of Management: Andreas Schell (President and CEO), Louise Öfverström, Dr. Otto Preiss.
Chairwoman of the Supervisory Board: Jasmin Staiblin. Domicile: Friedrichshafen. Register Court: Ulm, Nr. I No. HRB 630 227.
Bank Details: Deutsche Bank AG Stuttgart: (all currencies) SWIFT/BIC DEUTDESSXXX, IBAN DE35 6007 0070 0162 9039 00.
Commerzbank AG Friedrichshafen: (EUR) SWIFT/BIC COBADEFF651, IBAN DE68 6514 0072 0170 0038 00.
V.A.T. No. DE 811121844

Appendix E – Air Quality Assessment

AtkinsRéalis

Air Quality Assessment

EHS International Ltd for Yondr

October 2025

100122494

LON1X2 DATA CENTRE, SLOUGH

AtkinsRéalis - Sensitive / Sensible [FR]

Notice

This document and its contents have been prepared and are intended solely as information for EHS International Ltd for Yondr and use in relation to the LON1X2 data centre at the Former Akzonobel Decorative Paints, Wexham Road, Slough, SL2 5DS.

AtkinsRéalis Ireland Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 57 pages including the cover.

Document history

Document title: Air Quality Assessment

Document reference: 100122494

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Draft for client comment	OR	DF	ME	SH	30/10/25

Client signoff

Client	EHS International Ltd for Yondr
Project	LON1X2 DATA CENTRE, SLOUGH
Job number	100122494
Client signature/date	

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1. Overview

1.1 Introduction

EHS International Ltd, on behalf of Yondr Group, commissioned AtkinsRéalis Ireland Limited (AtkinsRéalis) to undertake an air quality assessment for the LON1X2 data centre facility, referred to as 'Building C'. The LON1X2 facility represents the second phase (Phase 2) of the wider mixed-use development located at the former AkzoNobel site in Slough.

This report describes an atmospheric dispersion modelling study of combustion emissions undertaken to evaluate the impact on human health and ecological receptors, of the operation of the standby diesel generator engines during testing and in an emergency power outage.

1.2 Background

Outline planning permission for the development area (reference P/00072/096) was granted on 19th November 2020 for a mixed-use development on land at the former AkzoNobel Decorative Paints facility, Wexham Road, Slough SL2 5DB. This permission was granted by Slough Borough Council (SBC) subject to multiple conditions, including Condition 17, which requires an air quality assessment associated with the data centre end use:

Condition 17 stated:

> *"Should a Reserved Matters application be made for data centre use on all or any part of the commercial land, an Air Quality Assessment demonstrating that ambient concentrations of applicable pollutants during the operation of the proposed facility(ies) would not result in significant impact at relevant sensitive receptors shall be submitted and approved by the Local Authority alongside the first Reserved Matters application.*
>
> *Reason: To protect sensitive receptors from pollution in accordance with Policy 8 of the adopted Core Strategy 2006–2026 and the National Planning Policy Framework (2019)."*

To discharge Condition 17, a Reserved Matters application (reference P/00072/137) was submitted for Phase 1 (LON1X0, Buildings A and B), including an air quality assessment hereafter referred to as the 'Phase 1 report'[1].. This was approved by SBC in October 2021. Notably, the air quality assessment also considered emissions associated with Phase 2 (LON1X2, Building C) based on outline design information. Subsequent consultation between the Applicant and SBC Environmental Services division in 2024 provided the following confirmation that Condition 17 could be discharged:

> *"Air quality – Following the receipt of additional information, the conclusions of the Air Quality Assessment submitted pursuant to Condition 17 are acceptable and the condition can be discharged. The EA will also be reviewing this assessment and will not grant a permit if they find any issues with the Assessment. The proposed development will not significantly or adversely impact local amenity. A compliance condition is recommended, however, in relation to generator testing to ensure that only one generator is tested at any one time across the campus. This has been included as Condition 2 in the recommendation."*

[1] SWECO (2021) Air Quality Assessment: 66202273-SWE-ZZ-XX-YA-RP-0003

Condition 2 states:

> *"Air quality – Generator testing for the normal operation of the proposed scheme, only one generator shall be tested on-load at any one time. This shall be coordinated across all three data centres (Building A, Building B and Building C) to ensure that only one generator is tested at any one time across the site.*
>
> *REASON: To protect sensitive receptors from pollution in accordance with Policy 8 of the adopted Core Strategy 2006 - 2026 and the National Planning Policy Framework (2023)."*

The LON1X0 facility comprises 52 standby generator sets (26 per building) to provide backup power. The proposed LON1X2 facility, which is the subject of this air quality assessment, is a new and separate data centre. It will require the installation of an additional 32 standby generators (Rolls Royce DS3300 units), arranged consecutively in two sets of 16. As with the LON1X0 facility, these generators provide emergency backup power to ensure critical systems remain operational during a power outage. The generators will require periodic testing to ensure performance and availability in the event of an unplanned or emergency power loss. There are two routine test regimes for the standby generators:

- Monthly testing at no load for approximately 15 minutes per generator; and
- Biannual on-load testing for a maximum of 6 hours per event (total 12 hours per year).

1.3 Approach

In line with consultation comments provided by SBC Environmental Services, an air quality assessment will be required to support the Environmental Permit application for the LON1X2 facility and will be submitted to the Environment Agency (EA) for review. The air quality assessment for the LON1X2 facility has therefore been undertaken with reference to Environment Agency online guidance, 'Air Emissions Risk Assessment for your Environmental Permit'[2] and 'Environmental Permitting: Air Dispersion Modelling Reports'[3], in accordance with accepted good practice. Cumulative impacts from the adjacent permitted LON1X0 facility are considered.

The approach reflects the methodology and model inputs from the Phase 1 report, which was accepted for planning, and has been updated to reflect:
the latest design parameters for the proposed LON1X2 facility and existing facilities;

- the latest measured and modelled air quality concentrations in the study area;
- local constraints, such as any new sensitive developments;
- worst-case human health and ecological receptor locations and elevations;
- the latest dispersion modelling software version (AERMOD v24142); and
- five recent years of hourly meteorological data from Heathrow Airport meteorological station.

The assessment of construction-phase dust and operational-phase traffic was accepted at the outline planning stage (reference: P/00072/096). Construction dust mitigation measures suitable for the site activities were recommended in the Phase 1 report, which also confirmed that road-based contributions from development traffic are insignificant (modelled concentrations were less than 1% of the relevant air quality criteria for all receptors and all pollutants of concern in this assessment).

There are no design aspects which would materially affect either the likely volume of construction dust or increase the level of operational-phase traffic therefore the Phase 1 report remains a robust representation of the potential

[2] Defra (2025) 'Air emissions risk assessment for your environmental permit'. Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[3] Defra (2024) 'Environmental permitting: air dispersion modelling reports'. Available at: https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports

impacts from these sources. As such, both traffic emissions and construction dust are considered not to be a material concern and have been scoped out of this Phase 2 assessment.

This report for Phase 1 provides:

- a description of existing conditions and sensitive receptors;
- a summary of model input data including the flow rates and emission rates;
- a dispersion modelling study using meteorological data for a five-year period;
- an assessment of pollutant concentrations at human health and ecological receptors;
- a comparison of pollutant concentrations against air quality criteria;
- consideration of cumulative impacts during routine and emergency testing; and
- conclusions regarding the acceptability of the findings.

2. Assessment methodology

2.1 Baseline conditions

Information on existing baseline air quality conditions was obtained from the following sources:

- Information on local air quality including Air Quality Management Areas (AQMAs) and monitoring data from the latest SBC air quality annual status report[4] and Department for Environment, Food and Rural Affairs (Defra) AQMA mapping[5];
- background pollutant concentrations model data from Defra's Air Quality Information Resource (UK-AIR)[6];
- residential properties have been identified from OpenStreetMap[7];
- designated nature conservation sites have been identified from Multi-Agency Geographic Information for the Countryside (MAGIC) website[8]; and
- air pollution information for designated sites from the UK Air Pollution Information System (APIS)[9] website.

2.2 Study area

The study area for this air quality assessment lies within SBC and was defined in accordance with the Environment Agency's online guidance for air emissions risk assessment[2]. This includes ecological screening distances of 10 kilometres for internationally or European-designated sites, 2 kilometres for nationally designated sites, and 1 kilometre for non-statutory local sites. The 1-kilometre screening distance was also applied to identify the worst-case human health receptors and SBC air quality monitoring locations and was covered by an isopleth (contour) plot to illustrate the pattern of dispersion across the study area.

The study area is illustrated in Figure 2-1.

[4] SBC Air Quality Annual Status Report (2024). Available at: https://www.slough.gov.uk/downloads/file/4398/2024-air-quality-annual-status-report-asr-

[5] Defra AQMA interactive map. Available at: http://uk-air.DEFRA.gov.uk/aqma/maps

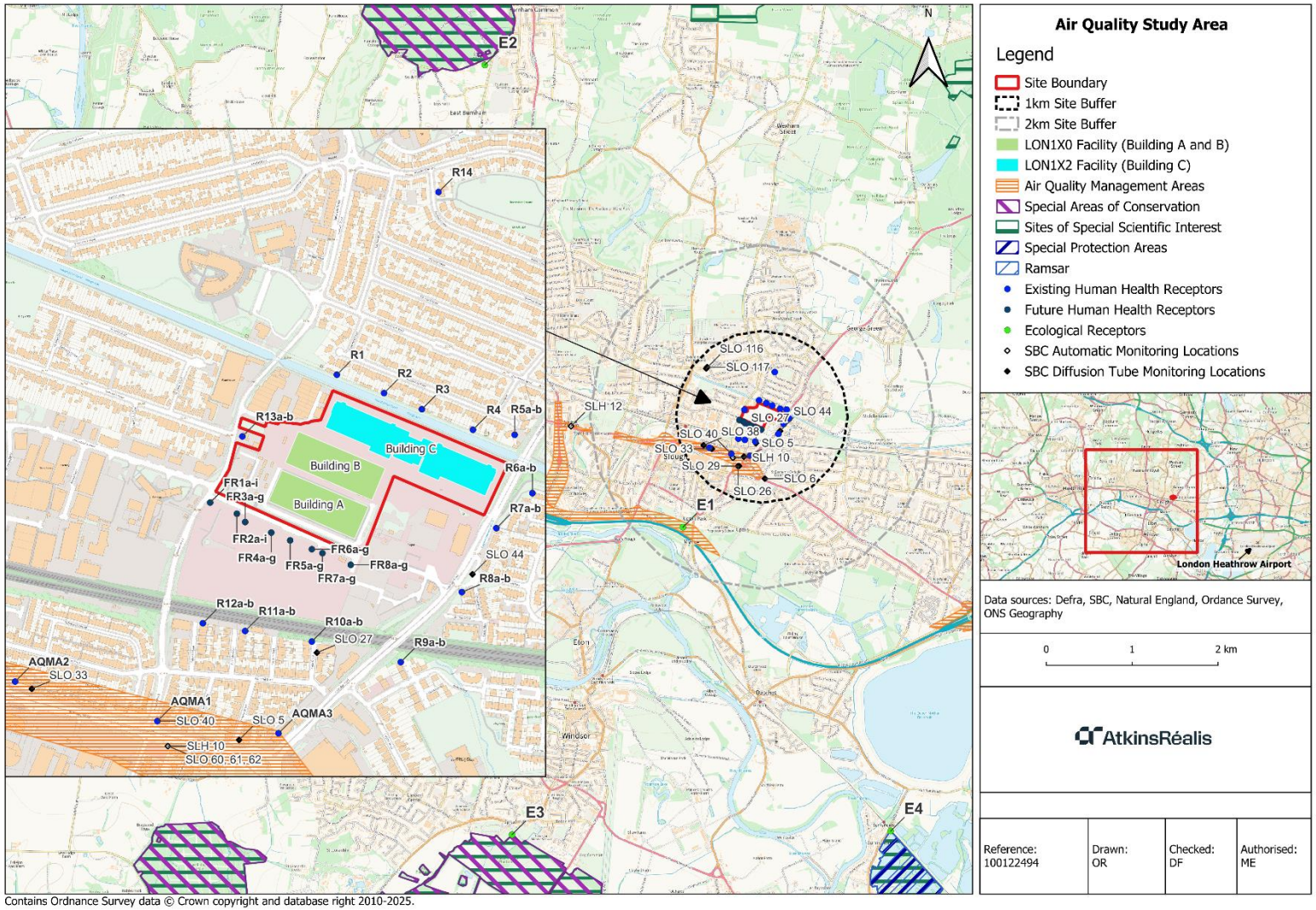
[6] Defra UK-AIR 'Modelled background pollution data'. Available at: https://uk-air.Defra.gov.uk/data/modelling-data

[7] OpenStreetMap. Available at: https://www.openstreetmap.org

[8] Defra Magic. Available at: https://magic.defra.gov.uk/

[9] UK Air Pollution Information System. Available at: https://www.apis.ac.uk/

Figure 2-1 - Air quality study area



Contains Ordnance Survey data © Crown copyright and database right 2010-2025.

2.3 Sensitive receptors

2.3.1 Human health

For the purposes of air quality assessment, sensitive human health receptors are those where members of the public will be frequently present and where more vulnerable receptors (e.g. residential/schools/care home etc).

For consistency, the discrete modelled human health receptors considered in this assessment were aligned with those assessed in the accepted Phase 1 report. Additional human health receptors were included in the model to represent a range of locations that are likely to be most affected by emissions from Phase 2. This included extended receptor coverage to the north, where short term generator impacts from Building C operation are likely to be highest due to prevailing winds and building influences. Discrete receptors within the Slough AQMA No.4 to the south have also been included.

Details of the selected representative sensitive human health receptors considered within this assessment are set out in Table 2-1.

Table 2-1 - Selected local human health receptors

ID	Location	Eastings, m	Northings, m	Height, m
R1	Hazlemere Road	498717	180472	1.5
R2	Hazlemere Road	498802	180439	1.5
R3	Hazlemere Road	498870	180410	1.5
R4	Hazlemere Road	498962	180373	1.5
R5a*-b	Hazlemere Road	499037	180364	1.5 and 4.5
R6a-b	Goodman Park	499069	180259	1.5 and 4.5
R7a-b	Goodman Park	499004	180196	1.5 and 4.5
R8a-b	Victoria Road	498942	180081	1.5 and 4.5
R9a-b	Denton Way	498832	179955	1.5 and 4.5
R10a-b	India Road	498672	179992	1.5 and 4.5
R11a-b	Australia Road	498552	180011	1.5 and 4.5
R12a-b	Colonial Road	498476	180025	1.5 and 4.5
R13a^-b	Wrexham Road	498547	180361	1.5 and 4.5
R14	Maple Crescent	498900	180800	1.5
AQMA1#	Wexham Road	498394	179849	1.5
AQMA2#	Apsley House	498138	179920	1.5
AQMA3#	Uxbridge Road	498612	179827	1.5

*Assessed as discrete receptor R2 in the Phase 1 report.

^Assessed as discrete receptor R19 in the Phase 1 report.

#Located in the Slough AQMA No. 4 and assessed as discrete receptors R4, R5 and R24 in the Phase 1 report.

The Phase 2 site forms part of a wider development area, which includes additional residential properties to the south of the LON1X0 and LON1X2 facilities. These properties have not yet been constructed and, in line with the

Phase 1 report methodology, have been considered within the assessment as future sensitive human health receptors.

The locations of the future sensitive human health receptors have been updated following the Phase 1 report and now consider multiple elevations, starting from 1.5 metres above local ground level to represent the breathing zone, and extending vertically at 3 metre increments to cover the full height of the proposed future residential buildings.

Details of the future sensitive human health receptors considered within this assessment are set out in Table 2-2.

Table 2-2 – Future local human health receptors

ID	Location	Eastings, m	Northings, m	Height, m
FR1a-i	Future Residential Block A	498489	180242	1.5, 4.5, 7.5, 10.5, 13.5, 16.5, 19.5, 22.5 and 25.5
FR2a-i		498537	180222	
FR3a-g	Future Residential Block B	498552	180207	1.5, 4.5, 7.5, 10.5, 13.5, 16.5 and 19.5
FR4a-g		498599	180188	
FR5a-g		498633	180174	
FR6a-g		498672	180158	
FR7a-g	Future Residential Block C	498691	180151	1.5, 4.5, 7.5, 10.5, 13.5, 16.5 and 19.5
FR8a-g		498742	180130	

2.3.2 Ecological receptors in designated habitats

Designated nature conservation sites may contain features that are sensitive to increased concentrations and deposition of airborne pollutants. Evaluation of the significance of the effect on designated habitats has been undertaken with consideration of the ecological receptors identified in the Phase 1 report, in addition to the following screening distances set out in the Environment Agency's online guidance for air emissions risk assessment2:

- Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar sites within 10 kilometres of the development area;
- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs), within 2 kilometres of the development area; and
- Local Wildlife Sites (LWSs) and areas of Ancient Woodland (AW) within 1 kilometre of the development area.

Details of the ecological receptors considered within this air quality assessment are set out in full in Table 2-3. All ecological receptors were modelled at a height of 0 metres.

Table 2-3 – Ecological receptor locations

ID	Name	Designation	Eastings, m	Northings, m	Distance, km
E1	Herschel Park^	LNR	497830	178995	1.4
E2	Burnham Beeches^	SAC	495524	184373	4.9
E3	Windsor Forest & Great Park^	SAC	495842	175418	5.5
E4	Southwest London Waterbodies*	SPA/Ramsar	500249	175460	4.9

*Considered to be 'Grassland'.
^Considered to be 'Forest'.

2.4 Dispersion modelling

The atmospheric dispersion modelling was undertaken using the latest available version of the US EPA model AERMOD (24142), as incorporated by Trinity Consultants Inc. in the software BREEZE AERMOD. This model is the result of many years development by the US EPA and the American Meteorological Society. It has been developed as a regulatory model that incorporates the current understanding of atmospheric physical processes. This model is used by regulatory agencies, consultants and industry worldwide to assess the impact of air emissions from point, area, line, flare and volume sources.

AERMOD simulates essential atmospheric physical processes and provides refined concentration estimates over a wide range of meteorological conditions and modelling scenarios. The dispersion modelling system includes:

- an advanced meteorological pre-processor to compute site-specific planetary boundary layer parameters;
- highly developed dispersion formulations that incorporate current planetary boundary layer understanding and variables for both convective and stable boundary inversions;
- enhanced treatment of plume rise and plume penetration for elevated inversions, allowing for effects of strong updrafts and downdrafts that occur in unstable conditions; and
- improved computation of vertical profiles of wind, turbulence and temperature.

AERMOD includes two data pre-processors for streamlining data input: AERMET, a meteorological pre-processor, and AERMAP, a terrain pre-processor. The model can address both local topography and building downwash effects concurrently, where relevant to the study. The model provides reasonable estimates over a wide range of meteorological conditions and modelling scenarios. The building downwash algorithms in AERMOD PRIME, using parameters calculated by the Building Parameter Input Program (BPIP), distinguish this model from earlier versions of AERMOD, which used a simpler procedure to address downwash.

2.4.1 Source parameters

The stack emission parameters for the 32 diesel generators (Rolls Royce DS3300) associated with LON1X2 (Building C), and the sources of information, are set out in Table 2-4. The stack emission parameters for the LON1X0 facility (Buildings A and B) generators are set out in Table 2-5.

Due to permanent electrical infrastructure limitations, as confirmed by the operator, the LON1X2 generators will be de-rated to a power output of 2,200 kW. Where information was unavailable (e.g. actual flow rate, exit temperature and NO_x emission rate) for the derated generators, stack emission parameters were sourced from the Phase 1 report. The PM_{10} emission rate was taken from measurements provided in the generator datasheet for the 20V4000G34F 6ETC (DS3300) engine model.

All stack emission parameters for the LON1X0 generators were sourced from the Phase 1 report, except for the PM_{10} emission rate. The PM_{10} emission rate was again sourced from the generator datasheet for the 20V4000G34F 6ETC engine model.

Table 2-4 – Stack emission parameters for the LON1X2 facility (Building C) generators

Parameter	Unit	Value	Source
Number of units	-	32	Layout plans (document ID: LON1X2-RKD-CZ-ZZ-DR-A-00002.pdf)
Stack diameter (internal)	m	0.55	Layout plans (document ID: LON1X2-AVK-CZ-XX-DR-E-3002 - Exhaust Flue APM.pdf)
Stack height (above ground level)	m	15.95	Provided by client
Generator power (Derated)	KWe	2,200	Derated from 2,400 kWe. Phase 1 report and engineering limitation discussions
Actual flow rate	Am^3/s	8.07	Phase 1 report
Exit velocity	m/s	33.97	Phase 1 report and layout plans (document ID: LON1X2-AVK-CZ-XX-DR-E-3002 - Exhaust Flue APM.pdf)
Exit temperature	K	750.80	Phase 1 report
NO_x emission rate	g/s	2.25	
PM_{10} emission rate	g/s	0.043	Calculated from generator specification sheet (document ID: Rolls Royce Generators LON1X2.pdf)

Table 2-5 – Stack emission parameters for the LON1X0 facility (Buildings A and B) generators

Parameter	Unit	Value	Source
Number of units per building	-	26	Phase 1 report
Stack diameter (internal)	m	0.55	
Stack height (above ground level)	m	21.95	
Generator power (100% load)	KWe	2,400	
Actual flow rate	Am^3/s	10.30	
Exit velocity	m/s	44.00	
Exit temperature	K	789.15	
NO_x emission rate	g/s	2.22	
PM_{10} emission rate	g/s	0.047	Calculated from generator specification sheet (document ID: Rolls Royce Generators LON1X2.pdf and Extracted LON1X0 Generator Datasheet.pdf)

2.4.2 Model scenarios

Two core model scenarios have been assessed, which each consider the emissions from the 32 generators associated with Building C (LON1X2) in combination with emissions from the 26 generators associated with Buildings A and B (LON1X0). The modelled scenarios are:

1. '**Most-likely' testing scenario**: monthly testing at no load for approximately 15 minutes per generator, and biannual on-load testing for a maximum of 6 hours per event (a total runtime of 12 hours per generator per year). The emissions were conservatively modelled, assuming that:
   a. testing of any individual engine could last up to an hour, at any time of the year giving a total runtime of 24 hours per generator per year, nearly twice the anticipated usage.

   The 'Most-likely' testing scenario was set up to run every generator in all hours of the year, both individually and in combination. The results were factored to represent 24 hours of operation of each generator per year (6 x 2 hours load testing, 12 x 1-hour monthly testing).

   The approach to modelling the maximum short-term impact for the 'Most-likely' testing scenario reflects Planning Condition 2 (see section 1.2) wherein no engine may be tested concurrently.
2. **'Worst case' emergency scenario**: an emergency power outage event, which is inherently unpredictable in terms of the timing, magnitude and duration of the occurrence. The emissions were conservatively modelled, assuming that:
   a. generators from Buildings A, B and C would run on-load with emissions at the maximum permitted limit;
   b. there could be 4-hour, 12-hour, or 72-hour outages, all involving continuous operation of all generators at maximum power output.
   c. To estimate the maximum annual mean contribution, the results from the emergency scenario were combined with those for the 'most-likely' testing scenario

   Of these worst-case scenarios, the 4-hour event is considered a 'reasonable worst case', based on regional estimates[10] suggesting such power outage events may occur approximately once every 23 years and not for longer than 4 hours.

For each scenario, estimates were made of the short- and long-term process contributions (i.e. the hourly/daily and annual average ground level concentrations at receptors) and where appropriate, the total concentration including baseline. More information on post-processing of model outputs is provided in section 2.6.

2.4.3 Receptors

Pollutant concentrations were modelled at discrete receptors (see section 2.3) and using nested Cartesian receptor grids covering the local area. A 50 metre resolution grid over an area 2 by 2 kilometres wide centred on the development area was used in combination with a smaller, localised 750 metre wide grid set at 25 metre resolution. The higher resolution grid improves the spatial resolution of the model results in those areas subject to the highest concentration gradients close to the site boundary.

All gridded and discrete receptors were specified at a height of 1.5 metres above local ground elevation to represent the average human breathing zone height. Some discrete receptors were additionally modelled at 3 metre increments above local ground elevation to represent multi-storey residential properties.

[10]The Office of Gas and Electricity Markets (Ofgem). *Frequency Risk and Control Report 2025 Consultation.*

2.4.4 Terrain

Terrain elevations were not included in the dispersion model, either for receptors or structures. This is appropriate due to the limited variation in elevation across the air quality study area. This approach aligns with the Phase 1 methodology.

2.4.5 Meteorological data

The most appropriate meteorological station with adequate records in the format required for the dispersion modelling study is the Heathrow Airport meteorological station. This station is located approximately 7.3 kilometres to the east of the LON1X2 facility. Hourly sequential meteorological data for the five-year period 2020 to 2024 (covering the most recent five years of available data) were used in the dispersion model. The general topography of the area is such that records from Heathrow Airport are suitably representative of conditions in Slough in the vicinity of the LON1X2 facility. Furthermore, the meteorological station and the facility are at comparable elevations above sea level.

Each meteorological data file contains over 43,000 hourly records and, in accordance with best practice, is considered adequate to characterise local meteorology in terms of both extreme events and long-term average conditions.

In accordance with the US EPA guidance, the near-field land use within a one kilometre radius of the site was evaluated to determine the surface roughness length[11]. Land uses were specified by directional sector. A determination of the percentages of each type of land use was made based on inspection of Ordnance Survey mapping and aerial photography. The Bowen ratio[12] and albedo[13] were determined by the land use categories within the far-field, represented by a 10 x 10 km square centred on the site. A determination of the percentages of each type of land use was made based on inspection of Ordnance Survey mapping and aerial photography. The land use proportions are simply averaged over the area and are independent of distance or direction from the site: water (fresh and sea) 3%, deciduous forest 9%, urban 41% and cultivated land 47%.

Land use categories and sectors were entered in the AERMET software programme to generate site surface characteristics for use in the model. The model parameters (AERMOD recommended values) used to represent the area around the site are shown in Table 2-6.

Table 2-6 - Site surface characteristics

Sector	Degrees	Albedo	Bowen Ratio	Surface Roughness, m
Urban	0 - 360	0.240	1.111	1.0

The processed meteorological data were used to generate five individual annual meteorological data files for use in this assessment. Frequency distribution of wind speed and direction for each year is presented in Figure 2-2. It is evident from the figures that there is a primary prevailing wind from the south to west and adjoining sectors; there is a secondary prevailing wind from the north east.

[11] Surface roughness length is a measure of the height of obstacles to wind flow. It is not equal to the physical dimensions of obstacles but is generally proportional to them.

[12] The Bowen ratio is a measure of the amount of moisture at the earth's surface. This influences other parameters which in turn affect atmospheric turbulence.

[13] Noon-time albedo is the fraction of incoming solar radiation reflected from the ground when the sun is directly overhead. Adjustments are made in AERMET to incorporate the variation in the albedo with solar elevation angle.

Figure 2-2 - Heathrow Airport wind roses, 2020-2024

2.4.6 Building downwash

Buildings close to point source plume discharges that are more than 40% of the stack height may potentially cause downwash effects. The BPIP programme within AERMOD was used to calculate for each wind sector the direction specific building downwash parameters for each stack. The BPIP programme determines which structures are significant for each of the 360-degree wind directions and modifies the AERMOD input files with the appropriate parameters. For each stack on all buildings, there is an acoustic barrier which has been modelled as a single ancillary structure on each building which sits atop the roofline of the main buildings in the model.

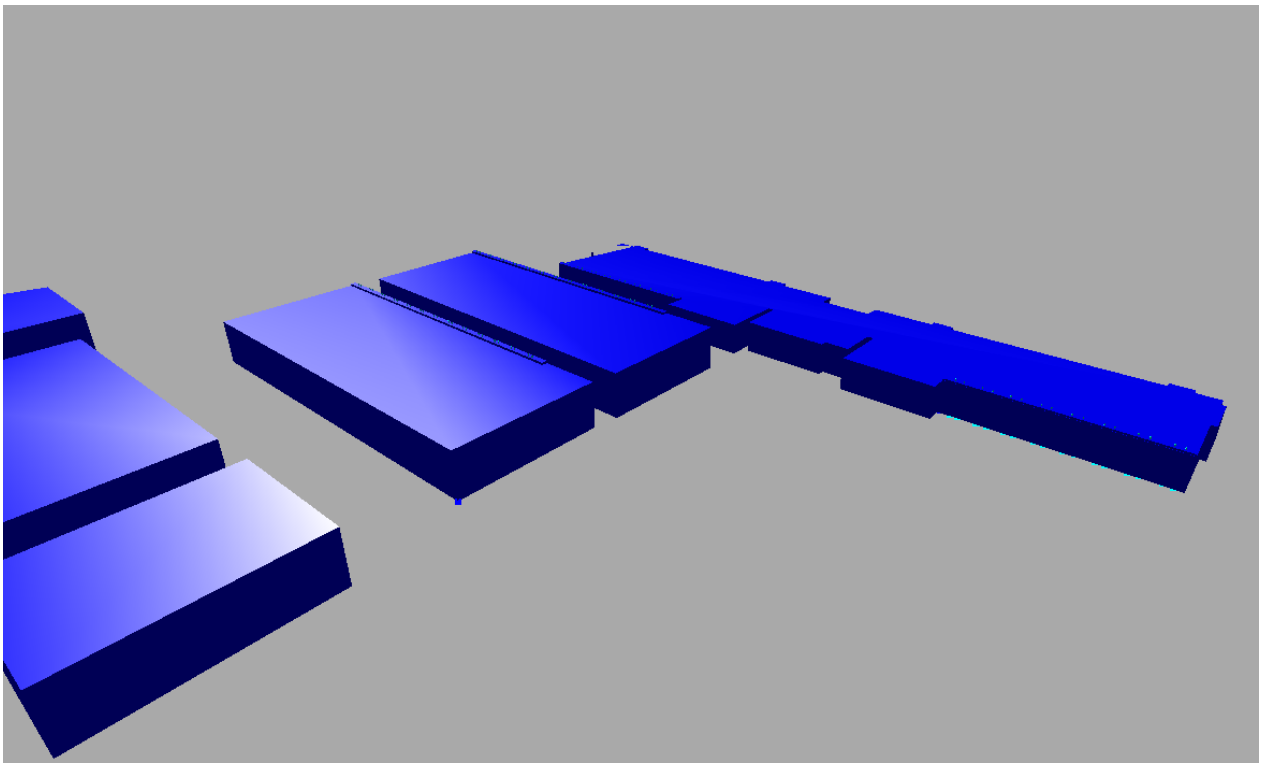
The detailed dimensions for the modelled buildings are provided in Table 2-7. The main structure included in the dispersion model is shown as a schematic in

Figure 2-3 , viewed from the south, with future residential structures to the left of the image.

Table 2-7 -Building input data

Name	Height, m	X Length, m	Y Length, m	Source
Building A	19.95	61.0	170.0	Phase 1 report
Building A ancillary structure	20.95	2.5	144.0	Layout plans (document ID: LON1X0-AVK-AZ-XX-DR-E-3002[Exhaust Flue Layout] Bld A Flue Stack.pdf)
Building B	19.95	65.0	170.0	Phase 1 report
Building B ancillary structure	20.95	2.5	144.0	Layout plans (document ID: LON1X1-AVK-BZ-XX-DR-E-3002 Bld B Gen Stack.pdf)
Building C	14.50	62.8	317.2	Layout plans (document IDs: LON1X2-AVK-CZ-XX-DR-E-3002 - Exhaust Flue APM.pdf and LON1X2-RKD-CZ-ZZ-DR-A-00002.pdf)
Building C ancillary structure	15.25	2.5	88.0	Layout plans (document ID: LON1X2-AVK-XX-XX-TS-E-0011 Rev P01.pdf)
Future Residential Block A	25.50	130.3	60.0	Phase 1 report, updated to reflect latest layout plans (planning document ID: P72-96.pdf, P/00072/096)
Future Residential Block B	21.00	68.9	130.3	
Future Residential Block C	21.00	73.7	54.9	
Future Residential Block D	21.00	26.5	92.8	
Future Residential Block E	21.00	26.5	57.5	
Future Residential Block F	21.00	26.0	57.5	
Future Residential Block G	28.50	26.5	22.5	

Figure 2-3 Schematic view of LON1X0 and LON1X2 with future residential buildings



2.4.7 Model uncertainty

Any atmospheric dispersion modelling exercise has inherent areas of uncertainty, including:

- input data (e.g. daily and seasonable variability in process emissions, source dimensions and stack parameters);
- simplifications in model algorithms and empirical relationships that are used to simulate complex physical and chemical processes in the atmosphere and the influence of structures on dispersion; and
- meteorological data, as no one year will be the same.

Uncertainty associated with the atmospheric dispersion modelling of emissions from the LON1X0 and LON1X2 facilities have been minimised by using:

- algorithms and relationships within a recognised dispersion model (AERMOD) that has been independently validated and judged as fit for purpose;
- a recent version of AERMOD (v12, Executable 24142) and AERMET (v10, Executable 24142) incorporating the latest bug fixes and algorithms;
- hourly sequential meteorological data provided by an approved supplier and which has been subject to robust quality checks; and
- conservative assumptions regarding the operational emissions e.g. assume a full hour of testing not 15 minutes; assuming testing could occur at any time of the year to coincide with the worst meteorological conditions; testing and emergency running at load with higher emissions that are likely at reduced or no load.

The approach taken for this assessment is considered sufficiently robust and in line with good practice.

2.5 Comparison with air quality criteria

In line with the Environment Agency's online guidance for air emissions risk assessment[2], to assess the potential impact on air quality, the modelled process contribution (PC) is compared to the relevant environmental standards (air quality criteria).

The results of the dispersion modelling have been presented as:

- tabulated PCs at selected discrete receptor locations to facilitate the discussion of maximum results; and
- concentration isopleths (contour plots) to illustrate the distribution of PCs across the wider study area.

In accordance with the Environment Agency's online guidance for air dispersion modelling reports[3], a PC is considered *insignificant* where it is less than:

- 10% of a short-term environmental standard; or
- 1% of a long-term environmental standard.

The guidance states that "*at the detailed modelling stage there are no criteria to decide whether PCs are significant*". For PCs that are not considered insignificant, the Predicted Environmental Concentration (PEC = PC + existing pollutant concentration) has been calculated to allow comparison to the relevant air quality criterion (standards and objectives) for both short-term and long-term exposure.

To estimate the long-term PEC, the PC is combined with the long-term baseline concentration; for the short-term PEC the PC is combined with twice the long-term baseline concentration. Air quality monitoring data from the latest SBC 2024 Annual Status Report were used to identify appropriate baseline concentrations for different receptor locations. These are shown in the results tables.

2.5.1.1 Human health

The Air Quality Strategy (AQS)[14] objectives/standards, for the pollutants of concern in this assessment (NO_2, PM_{10} and $PM_{2.5}$) are shown in Table 2-8.

Table 2-8 – NO_2, PM_{10} and $PM_{2.5}$ AQS objectives/standards (µg/m^3)

Pollutant	Short-term	Long-term
NO_2	200* (1h)	40 (1y)
PM_{10}	50^ (24h)	40 (1y)
$PM_{2.5}$	-	20 (1y)

*Not to be exceeded more than 18 times a year.
^Not to be exceeded more than 35 days a year.

Non statutory criteria, such as the Defra Daily Air Quality Index (DAQI) and the United States Environmental Protection Agency (US EPA) Acute Exposure Guideline Levels (AEGLs), are useful in evaluating short-term elevated concentrations such as those which may arise during a full emergency power outage.

[14] Defra (2023), The Air Quality Strategy for England: Framework for Local Authority Delivery. Available at: https://www.gov.uk/government/publications/the-air-quality-strategy-for-england

The DAQI[15] for nitrogen dioxide is based on the hourly mean concentrations shown in Table 2-9. Note that the primary purpose is to generate a daily, regional index for multiple pollutant exposure to ambient air, rather than occasional, very localised areas of impact from individual combustion sources.

Table 2-9- DAQI categories for hourly nitrogen dioxide concentrations

Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Mod-erate	Mod-erate	Mod-erate	High	High	High	Very High
µg/m³	0-67	68-134	135-200	201-267	268-334	335-400	401-467	468-534	535-600	>600

For nitrogen dioxide, the US EPA acute exposure guideline level[16] AEGL-1 threshold of 0.5 ppm (approximately 940 µg/m^3) is the concentration above which the general population, including susceptible individuals, could experience discomfort, irritation, or certain asymptomatic non-sensory effects over short exposures up to eight hours. These are considered transient effects and reversible upon cessation of exposure (non-disabling). The AEGL-2 level of 12 ppm (23,000 µg/m^3) over one hour or 8 ppm (13,000 µg/m^3) over four hours, is a concentration that could lead to irreversible or other serious, long-lasting adverse (disabling) effects.

2.5.1.2 Ecological sites

The EU (Withdrawal Agreement) Act 2020 implements the air quality limit values that are included in the EU Directive and sets a critical level for annual mean concentrations of nitrogen oxides (NO_x) to protect sensitive vegetation. This objective does not apply in those areas where assessment of compliance with the limit value is not required. UK statutory nature conservation agencies' (Natural England) policy is to apply the criteria set out in Table 2-10, on a precautionary basis as a benchmark only, in all designated conservation sites.

Table 2-10 - NO_x air quality criteria (µg/m^3)

Pollutant	Short-term	Long-term
NO_x	75 (24h)*	30 (1y)

*A conservative choice, compared to using the higher value of 200 µg/m^3 for low pollution areas.

Oxides of nitrogen can contribute to nitrogen and acid deposition which can affect certain sensitive species and habitats within ecological sites. Dry nitrogen and acid deposition rates were calculated from NO_x (assuming 100% conversion to NO_2) using IAQM guidance[17] deposition velocities for woodland and grassland vegetation. These are used for assessment against the relevant critical loads for sensitive habitats identified within designated ecological sites, where available on APIS. Ranges for critical loads rather than fixed values are provided to allow for natural variation, uncertainties about deposition values and temporal variability of available data. Typically, the lower value in the range is used for a conservative assessment.

[15] Defra. 'What is the Daily Air Quality Index?' Available at: https://uk-air.defra.gov.uk/air-pollution/daqi?view=more-info&pollutant=no2#pollutant

[16] https://www.epa.gov/aegl/nitrogen-dioxide-aegl-program,

[17] IAQM (2020) 'A guide to the assessment of air quality impacts on designated nature conservation sites' v.1.1 Available at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

2.6 Post processing

2.6.1 Long-term average concentrations

2.6.1.1 'Most-likely' testing scenario

To estimate the annual mean contribution from engine testing, all engines were modelled to run concurrently at full load in every hour in the meteorological dataset. The results were then processed to extract the maximum NO_2 and PM_{10} (as well as $PM_{2.5}$) annual mean process contributions (PCs) from each of the five years at each receptor.

In line with EA guidance for permitting, a factor representing the expected number of operating hours per engine as a proportion of all hours in a year i.e. (24/8760) was applied to the maximum annual mean PCs for the testing scenario. The total of 24 operational hours is based on monthly no-load testing assuming one full hour per test, and biannual on-load testing of up to 6 hours per test.

For comparison with the long-term AQS objective for NO_2, the modelled oxides of nitrogen (NO_x) concentrations were multiplied by a factor of 0.7, in line with the Environment Agency's online guidance for air emissions risk assessment[2] recommendation for estimating long-term NO_2 PCs.

Although not modelled explicitly, $PM_{2.5}$ can be conservatively assumed to be the same as PM_{10}.

2.6.1.2 'Emergency' scenario

To estimate the annual mean contribution from emergency running, all engines were modelled to run concurrently at full load in every hour in the meteorological dataset. The results were then processed to extract the maximum NO_2 and PM_{10} (as well as $PM_{2.5}$) annual mean PCs from each of the five years at each receptor.

In line with EA guidance for permitting, a factor representing the total number of operating hours per engine as a proportion of all hours in a year i.e. (28/8760) was applied to the maximum annual mean PCs for the testing scenario. The total of 28 operational hours is based on monthly no-load testing assuming one full hour per test, and biannual on-load testing of up to 6 hours per test plus four hours of emergency outage. Additional factors were applied for a 12 hour and 72 hour outage.

For comparison with the long-term AQS objective for NO_2, the modelled NO_x concentrations were multiplied by a factor of 0.7, in line with the Environment Agency's online guidance for air emissions risk assessment[2] recommendation for estimating long-term NO_2 PCs.

2.6.2 Short-term average concentrations

2.6.2.1 'Most-likely' testing scenario

To determine the highest 1-hour average NO_2 PC at each receptor in the 'most likely' testing scenario, a source group apportionment model run was carried out. This provided individual results for each of the 84 generators for each year that was modelled. As AERMOD was run with a five-year data file, over 43,000 hours were processed. For each source group, the highest (100^{th} percentile) concentration at each receptor was identified. This is a deliberately conservative approach as it assumes that, for each receptor, the specific generator (out of the 84) that causes the greatest impact is running at full capacity for one hour during the worst possible weather conditions for pollutant dispersion, chosen from more than 43,000 hours of data in five years. In reality, any single engine is likely to operate for just 12 hours per year, making this scenario an extremely conservative result that combines testing with the worst of the 8,760 hours in a year.

To identify the maximum 24-hour mean PC for both NO_x and PM_{10} at each of the receptors, again a source group apportionment run was undertaken. This is considered a conservative approach, as it assumes the unlikely event of the individual generator, which gives the highest result at a receptor, aligning with the least favourable conditions for dispersion over a 24 hour period. A factor was applied to the maximum modelled 24-hour mean PC to represent the six hours of biannual on-load testing of engines in one 24 hour period for the 'most-likely' testing scenario.

For comparison with the short-term AQS objective for NO_2, the modelled oxides of nitrogen concentrations were multiplied by a factor of 0.35, in line with the Environment Agency's online guidance for air emissions risk assessment[2] recommendation for short-term process contributions.

2.6.2.2 'Emergency' scenario

To determine the highest 1-hour average NO_2 PC at each receptor in an emergency scenario, all 84 generators were modelled to operate concurrently in all hours throughout the year. As AERMOD was run with a five-year data file, over 43,000 hours were processed to identify the highest (100th percentile) concentration at each receptor.

The BREEZE post processing software 3DAnalyst was used to derive counts of exceedances of specified hourly average NO_2 concentrations thresholds, i.e. the short-term AQS standard of 200 µg/m^3 and the AEGL-1 threshold of 940 µg/m^3 for individual years. These were used in the hypergeometric mean calculation[18] which calculates the probability for likelihood of the short-term AQS objective or AEGL-1 threshold being exceeded.

To identify the maximum 24-hour mean PC at each of the receptors, a source group apportionment run was undertaken. Similar to the NO_2 hourly mean scenario described above, this is considered a conservative, risk-based approach, as it assumes the unlikely event of the generator which gives the highest result at a receptor aligning with the least favourable conditions for dispersion over a 24 hour period.

3. Baseline conditions

3.1 Local air quality management

All local authorities are required by Part IV of the Environment Act 1995 to review air quality and to assess both present and likely future air quality against objectives set out in the UK government's AQS. Where a local authority finds, that one or more of the AQS objectives is likely to be breached it must designate an Air Quality Management Area (AQMA) and develop an Action Plan to alleviate pollution levels.

It is noted that the Slough AQMAs[5] (No.1, No.3 extension and No.4) as well as the South Bucks District Council AQMA No. 2, all declared due to exceedances of the annual mean NO_2 AQS objective, are located within the modelled study area. The closest of which is the Slough AQMA No.4, situated within 345 metres of the development area.

3.2 Air quality monitoring

Air quality monitoring is undertaken by national and local authorities and is a key component of local air quality management. Measurements of pollutant concentrations are made by analytical instruments that measure

[18] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

continuously, or simpler passive sampling devices such as diffusion tubes. The most recent monitoring data for Slough is from 2023, as reported in the SBC 2024 Annual Status Report[4].

The locations of the air quality monitoring sites located within the air quality study area is shown on Figure 2-1.

3.2.1 Continuous monitoring data (CMS)

SBC undertook automatic monitoring at 12 sites during 2023. The closest of these is the Slough Town Centre, Wellington Street (SLH 10), a roadside site located 455 metres to the south of the development area which monitored NO_x and NO_2 concentrations. The results in Table 3-1 indicate that annual mean NO_2 concentrations between 2019 and 2023 were consistently below the long-term AQS objective for NO_2 at both the SLH 10 and SLH12 CMS.

Table 3-1 – Monitored CMS annual mean NO_2 concentrations (µg/m^3)

Site ID	Site type	X	Y	2019	2020	2021	2022	2023
SLH 10	Roadside	498413	179804	34.7	24.6	27.3	28.3	25.1
SLH 12	Roadside	496528	180171	39.2	26.9	28.9	28.7	25.5

The closest SBC automatic monitoring site which monitors PM_{10} is the Slough Windmill, Bath Road roadside site (SLH 12), located 1.9 km to the west of the site, in the Slough AQMA No. 3 Extension. The results in Table 3-2 indicate that annual mean PM_{10} concentrations between 2019 and 2023 were consistently well below the long-term AQS objective for PM_{10} at SLH 12.

Table 3-2 – Monitored CMS annual mean PM_{10} concentrations (µg/m^3)

Site ID	Site type	X	Y	2019	2020	2021	2022	2023
SLH 12	Roadside	496528	180171	23.4	18.9	18.7	19.8	17.0

3.2.2 Passive monitoring data

SBC undertook non-automatic (i.e. passive) monitoring of NO_2 at 74 sites during 2023, 12 of which are within 1 kilometre of the development area. All sites are roadside monitoring locations, except for SLO 27, which is classified as 'other', and SLO 29, 60, 61, and 62, which are kerbside.

The location of the monitoring sites is shown on Figure 2-1. The monitoring results in Table 3-3 indicate that annual mean NO_2 concentrations were consistently below the long-term AQS objective for NO_2 at all 12 sites within the study area between 2019 and 2023, except for SLO 29 in 2019 and 2022.

Table 3-3 – Monitored SBC diffusion tube annual mean NO_2 concentrations (µg/m^3)

Site ID	Site type	X	Y	Distance to site (m)	2019	2020	2021	2022	2023
SLO 5*	Roadside	498541	179815	390	33.6	27.6	25.2	28.3	23.2
SLO 6	Roadside	498784	179560	585	27.8	21.2	21.2	23.8	-
SLO 26*	Roadside	498473	179706	515	31.8	20.3	19.0	19.6	19.6
SLO 27	Other	498681	179972	190	35.2	26.7	29.3	29.7	26.1

Site ID	Site type	X	Y	Distance to site (m)	2019	2020	2021	2022	2023
SLO 29*	Kerbside	498483	179707	515	**48.5**	33.8	39.0	44.2	34.6
SLO 33*	Roadside	498168	179907	485	30.1	23.1	20.0	24.2	-
SLO 38*	Roadside	498071	179949	530	33.0	25.0	22.4	22.4	18.1
SLO 40*	Roadside	498394	179849	415	37.9	29.7	29.6	32.6	29.1
SLO 44	Roadside	498961	180113	110	29.8	24.7	23.6	23.6	20.8
SLO 60, 61, 62*	Kerbside	498413	179804	455	33.6	24.9	26.8	29.5	25.8
SLO 116	Roadside	498103	180842	630	-	-	24.5	23.8	22.8
SLO 117	Roadside	498112	180857	635	-	-	21.5	24.5	20.1

Bold text denotes an exceedance of the NO_2 annual mean limit value.

*Located within the Slough AQMA No. 4.

3.2.3 Mapped background concentrations

Estimates of current and future year background pollutant concentrations in the UK are available on the Defra UK-AIR website[6]. These background estimates, which are a combination of measured and modelled data, are available for each one km grid square throughout the UK for a reference year of 2021, which is the basis for future year estimates up to 2050. These background estimates include contributions from all source sectors, e.g. road transport, industry and domestic and commercial heating systems.

Estimated annual mean background concentrations for the 1 km grid squares that include the LON1X2 facility and the study area for the operational phase for 2026 are presented below in Table 3-4 for the pollutants NO_x, NO_2, PM_{10} and $PM_{2.5}$. These data indicate that background concentrations of key pollutants are predicted to be well below relevant AQS objectives in 2026.

Table 3-4 – Defra background concentrations in 2026 (µg/m^3) across the study area

Grid square (x, y) *	2026 background concentration (µg/m^3)			
	NO_x	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Site boundary^	17.1	12.8	14.2	8.5
Minimum	11.5	8.9	11.3	7.0
Maximum	18.5	13.7	14.7	8.5

^Grid square where the LON1X2 site boundary is located (498500,180500).

*The following grid squares across the air quality study area have been considered: 495500, 178500; 495500, 184500; 495500, 187500; 496500, 179500; 496500, 180500; 497500, 178500; 497500, 179500; 497500, 180500; 497500, 181500; 498500, 178500; 498500, 179500; 498500, 180500; 498500, 184500; 499500, 180500; 500500, 183500; 501500, 180500.

For SAC designated sites, habitat types, key features, critical loads, and background nitrogen deposition rates were obtained from site-specific information available on the APIS website. For all other sites, parameters were derived

from the average values for the relevant grid square on the APIS website. Critical loads were based on the habitat type suggested by the Magic Living Habitat Map[19] for that grid square.

The habitat types, key features, critical loads, and background nitrogen deposition rates are set out in Table 3-5.

Table 3-5 – Critical loads and background nitrogen deposition rates for nitrogen sensitive designated sites

Site name	Designation	Minimum nitrogen critical load (kg N/ha/yr)	Background nitrogen deposition rate (kg N/ha/yr)	Acidity critical load (keq/ha/yr)	Acid background (keq/ha/yr)
Herschel Park	LNR^	5	12.0	4.4	0.9
Burnham Beeches	SAC#	10	24.2	2.1	1.0
Windsor Forest & Great Park	SAC**	10	22.2	1.0	1.7
Southwest London Waterbodies	SPA/Ramsar^^	5	12.3	1.8	1.0

^Herschel Park suggested designated feature(s): Acid, Calcareous and Neutral Grassland.

#Burnham Beeches designated feature(s): Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion), Fagus Sylvatica - Deschampsia Flexuosa Woodland, Fagus Sylvatica - Rubus Fruticosus Woodland, Quercus Robur – Pteridium Aquilinum - Rubus Fruticosus Woodland, Invertebrate assemblage.

**Windsor Forest & Great Park designated feature(s): Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion), Old acidophilous oak woods with Quercus robur on sandy plains and Limoniscus violaceus and Lucanus cervus.

^^Southwest London Waterbodies suggested designated feature(s): Improved grasslands, Broadleaved, Mixed and Yew Woodland, Rivers and streams, Standing open water and canals, Eutrophic Standing Waters and Rivers.

3.3 Summary of background data

3.3.1 Human health

Monitoring data from SBC for 2023 was used to represent baseline pollutant concentrations providing a more conservative representation of baseline conditions than the mapped Defra background concentrations projected for 2026.

The maximum measured NO_2 concentration within Slough, AQMA No. 4, 34.6 µg/m^3 at kerbside site SLO29, and the closest measured NO_2 concentration to the site boundary, 20.8 µg/m^3 at roadside site SLO44, were used as conservative representations of 2026 background concentrations at receptors located within and outside the AQMA, respectively (see Table 3-3).

[19] Natural England. (2024). Living England Habitat Map - Phase 4. Natural England. https://naturalengland-defra.opendata.arcgis.com/maps/19aa7b1604434fd7a3b35f2fbfb9c519/about

The closest measured PM_{10} concentration to the site boundary (17.0 µg/m^3 at roadside site SLH12, see Table 3-2), measured in the Slough AQMA No. 3 Extension was used as conservative representations of 2026 background concentrations at receptors located within and outside the AQMA.

The general trend across the 2019 to 2023 datasets in Slough (see section 3.2), as seen in many areas of the UK unaffected by external influences, is a gradual reduction in pollutant concentrations over time. This trend is expected to continue into the opening year (2026) and beyond, as indicated by Defra's 2026 mapped background concentrations across the air quality study area.

The Defra background concentrations set out in Table 3-4 indicated a maximum annual mean concentration of 13.5 µg/m^3 for NO_2 and 14.7 µg/m^3 for PM_{10} across the study area.

A summary of the short-term and long-term background concentrations used in the assessment for human health are set out below in Table 3-6.

Table 3-6 – Summary of background concentrations used in the assessment

Pollutant	Time period	2026 background concentrations, µg/m^3	Source
NO_2	Long-term (Annual)	20.8	Roadside site SLO44 – adjacent to site.
		34.6	Kerbside site SLO29 – Within AQMA.
	Short-term (1h)	41.6	Twice the long-term concentrations above*
		69.2	
PM_{10}	Long-term (Annual)	17.0	Roadside CMS SLH12 – within AQMA.
	Short-term (24h)	34.0	Twice the long-term concentration above*
$PM_{2.5}$	Long-term (Annual)	8.5	Defra mapped value

*In line with the Environment Agency's online guidance for air emissions risk assessment[2], which states: *'When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration'.*

3.3.2 Ecological receptors

The relevant data from APIS for ecological receptors (background nitrogen deposition rates) were set out in Table 3-5.

4. Results

4.1 'Most likely' testing scenario

4.1.1 Long-term NO_2 impacts on human health

The maximum modelled annual mean PCs for NO_2 at human health receptors (factored to represent a conservative 24 hours of operation of each of the 84 generators per year), are presented in Table 4-1.

Many of the modelled PCs for the selected existing and future human health receptors were below 1% of the long-term NO_2 AQS objective.

The maximum annual mean NO_2 PC at any modelled human health receptor is 1.1 µg/m^3 at R2. This is a residential property on Hazlemere Road, approximately 45 metres north of Building C. The maximum calculated annual mean NO_2 PEC (using a measured roadside concentration of 20.8 µg/m^3) at this receptor is 21.9 µg/m^3. This is well below the long-term NO_2 AQS objective of 40 µg/m^3.

The maximum annual mean NO_2 PC at any modelled human health receptor within the Slough AQMA No.4 is 0.3 µg/m^3 at AQMA3. This is a residential property on Uxbridge Road, approximately 350 metres south of Building A. The maximum calculated annual mean NO_2 PEC (using a measured kerbside concentration of 34.6 µg/m^3) at this receptor is 34.9 µg/m^3. This is below the long-term NO_2 AQS objective of 40 µg/m^3.

The maximum modelled (factored) annual mean NO_2 PCs are presented as concentration isopleths overlaid on a base map in Figure 4-1. These are interpolated from the maximum individual year results from the five modelled years of data at each point in the Cartesian receptor grid.

On evaluation of the modelled concentrations across the study area (isopleths) and estimated PECs at discrete receptors, the 'most-likely' testing scenario is not considered have a significant effect on existing annual mean NO_2 concentrations either at receptors adjacent to the facility, or further afield within declared AQMAs. The achievement of the long-term NO_2 AQS objective is therefore unaffected by the operation of the testing regime, despite the conservative assumptions within the modelling.

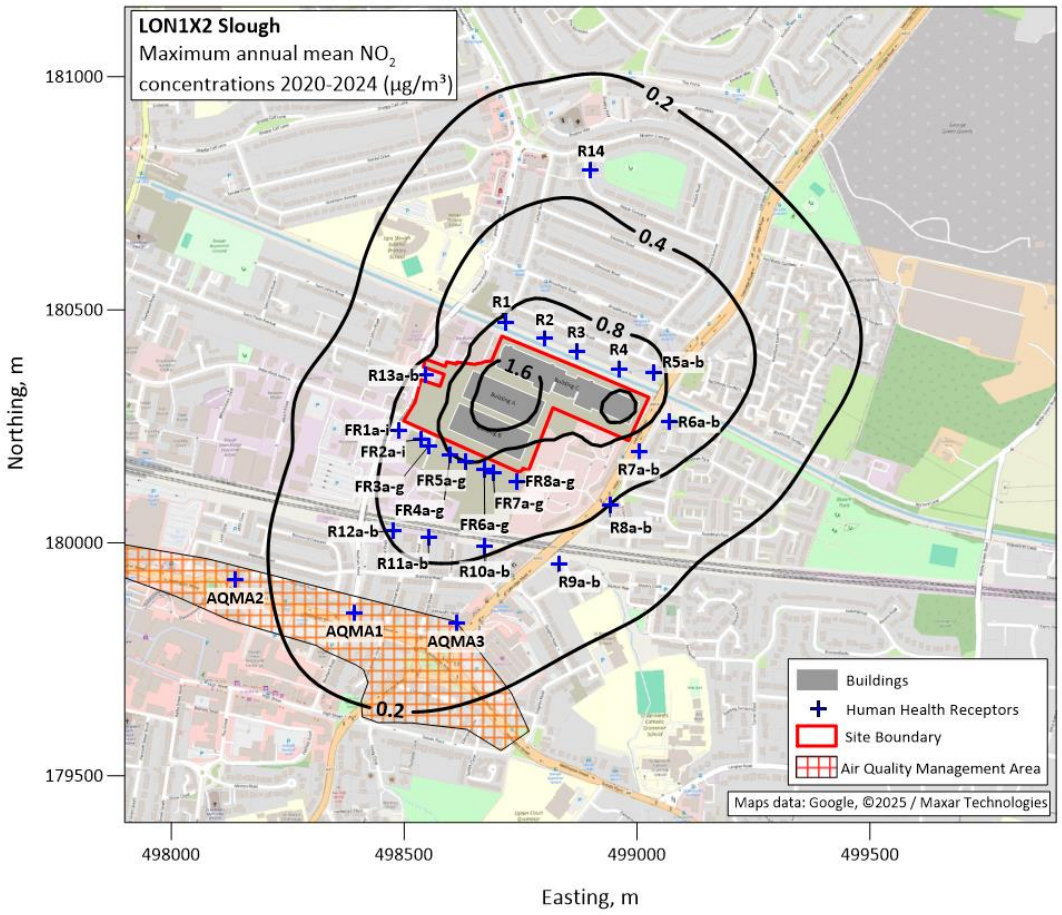
Table 4-1 – Maximum annual average NO_2 concentrations at human health receptors

ID	Description	Baseline, µg/m³	PC*, µg/m³	PC/AQS objective^, %	PEC, µg/m³	PEC/AQS objective^, %
Existing human health receptors						
R1	Hazlemere Road	20.8	0.9	2.2	21.7	54.2
R2	Hazlemere Road	20.8	1.1	2.6	21.9	54.6
R3	Hazlemere Road	20.8	1.0	2.4	21.8	54.4
R4	Hazlemere Road	20.8	1.0	2.4	21.8	54.4
R5(a)	Hazlemere Road	20.8	0.8	2.1	21.6	54.1
R6(a)	Goodman Park	20.8	0.6	1.5	21.4	53.5
R7(a)	Goodman Park	20.8	0.5	1.4	21.3	53.4
R8(a)	Victoria Road	20.8	0.4	1.0	21.2	53.0
R9(a)	Denton Way	20.8	0.3	0.8	21.1	52.8
R10(a)	India Road	20.8	0.4	1.0	21.2	53.0
R11(a)	Australia Road	20.8	0.5	1.1	21.3	53.1
R12(a)	Colonial Road	20.8	0.4	1.0	21.2	53.0
R13(a)	Wrexham Road	20.8	0.5	1.2	21.3	53.2
R14	Maple Crescent	20.8	0.3	0.8	21.1	52.8
AQMA1	Wexham Road	34.6	0.3	0.7	34.9	87.2
AQMA2	Apsley House	34.6	0.2	0.4	34.8	86.9
AQMA3	Uxbridge Road	34.6	0.3	0.7	34.9	87.2
Future human health receptors						
FR1(i)	Residential Block A	20.8	0.4	1.1	21.2	53.1
FR2(i)	Residential Block A	20.8	0.6	1.6	21.4	53.6
FR3(g)	Residential Block B	20.8	0.7	1.7	21.5	53.7
FR4(g)	Residential Block B	20.8	0.8	2.1	21.6	54.1
FR5(g)	Residential Block B	20.8	0.9	2.2	21.7	54.2
FR6(g)	Residential Block B	20.8	0.8	2.0	21.6	54.0
FR7(g)	Residential Block C	20.8	0.7	1.8	21.5	53.8
FR8(g)	Residential Block C	20.8	0.6	1.5	21.4	53.5

*Maximum modelled annual mean PCs, factored to represent 24 hours of operation of all 84 generators per year.

^Long-term NO_2 AQS objective of 40 µg/m³

Figure 4-1 - Maximum modelled (factored) annual mean NO_2 process contributions (µg/m^3)



4.1.2 Long-term PM_{10} impacts on human health

The maximum modelled annual mean PCs for PM_{10} at all human health receptors (factored to represent 24 hours of operation of each of the 84 generators per year) are less than 0.1 µg/m^3 and thus less than 1% of the long-term PM_{10} AQS objective. The modelled concentrations can therefore be assessed as making an insignificant contribution to existing PM_{10} concentrations within the study area.

The same conclusion may be drawn for $PM_{2.5}$, which is assumed to be the same as PM_{10}. On that basis, the maximum annual mean PC would be less than 1% of the 2040 target value of 10 µg/m^3.

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4.1.3 Short-term NO_2 impacts on human health

The maximum modelled 1-hour mean PCs for NO_2 at human health receptors are presented in Table 4-2. These results from the source group apportionment run represent the least favourably placed generator from either the LON1X0 or LON1X2 facilities operating in the vicinity of a receptor, in combination with the least favourable hour of meteorological data from a five year dataset.

The maximum modelled PCs (100th percentile) at human health receptors were above 10% of the short-term NO_2 AQS standard of 200 µg/m^3 for NO_2 (not to be exceeded more than 18 times a year).

The maximum 1-hour mean NO_2 PC at any human health receptor is 89.7 µg/m^3 at FR2. This is a future residential property, approximately 60 metres south of Building A. The calculated PEC at this receptor (using twice the measured roadside concentration, 41.6 µg/m^3), is 131.3 µg/m^3. This is below the short-term NO_2 AQS standard of 200 µg/m^3.

The maximum 1-hour mean NO_2 PC at any existing human health receptor within the Slough AQMA No.4, based on a single generator operating throughout five modelled years, is 47.9 µg/m^3 at AQMA3. The calculated PEC at this receptor (using twice the measured kerbside concentration, 69.2 µg/m^3), is 117.1 µg/m^3. This is below the short-term NO_2 AQS standard of 200 µg/m^3.

Therefore, the modelled concentrations for the 'most-likely' testing scenario are not considered to have a significant effect on hourly NO_2 concentrations either at receptors adjacent to the facility, or further afield within declared AQMAs. The achievement of the short-term NO_2 AQS standard is unaffected, despite the conservative assumptions within the modelling.

An assessment of acute exposure is not required for this scenario, as all maximum concentrations are well below AEGL-1.

The maximum nitrogen monoxide (NO) PC (assuming all NOx is NO) is 256 µg/m^3 an order of magnitude below the Environment Agency's short term criterion of 4,400 µg/m^3.

Table 4-2 – Maximum 1-hour average NO_2 concentrations from any generator, at human health receptors

ID	Description	Baseline, µg/m³	PC*, µg/m³	PC/AQS standard^, %	PEC, µg/m³	PEC/ AQS standard^, %
Existing human health receptors						
R1	Hazlemere Road	41.6	68.3	34.1	109.9	54.9
R2	Hazlemere Road	41.6	39.9	19.9	81.5	40.7
R3	Hazlemere Road	41.6	34.4	17.2	76.0	38.0
R4	Hazlemere Road	41.6	49.9	25.0	91.5	45.8
R5(a)	Hazlemere Road	41.6	40.3	20.1	81.9	40.9
R6(a)	Goodman Park	41.6	46.5	23.3	88.1	44.1
R7(a)	Goodman Park	41.6	73.6	36.8	115.2	57.6
R8(b)	Victoria Road	41.6	52.3	26.1	93.9	46.9
R9(b)	Denton Way	41.6	54.3	27.1	95.9	47.9
R10(b)	India Road	41.6	48.7	24.3	90.3	45.1
R11(b)	Australia Road	41.6	48.4	24.2	90.0	45.0
R12(b)	Colonial Road	41.6	47.8	23.9	89.4	44.7
R13(a)	Wrexham Road	41.6	45.4	22.7	87.0	43.5
R14	Maple Crescent	41.6	50.2	25.1	91.8	45.9
AQMA1	Wexham Road	69.2	44.9	22.5	114.1	57.1
AQMA2	Apsley House	69.2	39.6	19.8	108.8	54.4
AQMA3	Uxbridge Road	69.2	47.9	24.0	117.1	58.6
Future human health receptors						
FR1(i)	Residential Block A	41.6	77.7	38.9	119.3	59.7
FR2(i)	Residential Block A	41.6	89.7	44.8	131.3	65.6
FR3(g)	Residential Block B	41.6	69.6	34.8	111.2	55.6
FR4(g)	Residential Block B	41.6	50.2	25.1	91.8	45.9
FR5(a)	Residential Block B	41.6	55.7	27.8	97.3	48.6
FR6(a)	Residential Block B	41.6	58.1	29.0	99.7	49.8
FR7(g)	Residential Block C	41.6	50.6	25.3	92.2	46.1
FR8(g)	Residential Block C	41.6	74.5	37.2	116.1	58.0

*Maximum modelled 1-hour mean PCs based on a single generator operating throughout five modelled years.

^Short-term NO_2 AQS standard of 200 µg/m³ for NO_2 (not to be exceeded more than 18 times a year).

4.1.4 Short-term PM_{10} impacts on human health

The maximum modelled 24-hour mean PCs for PM_{10} at human health receptors are presented in Table 4-3. These results from the source group apportionment run represent the least favourably placed generator from either the LON1X0 or LON1X2 facilities operating in the vicinity of a receptor, in combination with the least favourable hour of meteorological data from a five year dataset..

The modelled PCs (factored to represent 6 hours of operation of a single generator, throughout five modelled years) at human health receptors were all below 10% of the short-term PM_{10} AQS standard of 50 µg/m^3 (not to be exceeded more than 35 days a year).

The maximum 24-hour mean PM_{10} PC at an existing human health receptor, is 0.6 µg/m^3 at FR5. This is a future residential property, approximately 45 metres south of Building A. The calculated PEC at this receptor (using twice the measured roadside concentration, 34.0 µg/m^3), is 34.6 µg/m^3.

Therefore, the modelled concentrations for the ‘most-likely’ testing scenario are not considered to have a significant effect on existing 24-hour PM_{10} concentrations. The achievement of the short-term PM_{10} AQS standard is unaffected, despite the conservative assumptions within the modelling.

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Table 4-3 – Maximum 24-hour average PM_{10} concentrations from a generator, at human health receptors

ID	Description	Baseline, µg/m³	PC*, µg/m³	PC/AQS standard^, %	PEC, µg/m³	PEC/AQS standard^, %
Existing human health receptors						
R1	Hazlemere Road	34.0	0.3	0.6	34.3	68.6
R2	Hazlemere Road	34.0	0.3	0.6	34.3	68.6
R3	Hazlemere Road	34.0	0.3	0.5	34.3	68.5
R4	Hazlemere Road	34.0	0.5	0.9	34.5	68.9
R5(a)	Hazlemere Road	34.0	0.3	0.7	34.3	68.7
R6(a)	Goodman Park	34.0	0.3	0.6	34.3	68.6
R7(a)	Goodman Park	34.0	0.5	0.9	34.5	68.9
R8(a)	Victoria Road	34.0	0.2	0.5	34.2	68.5
R9(a)	Denton Way	34.0	0.1	0.3	34.1	68.3
R10(b)	India Road	34.0	0.2	0.4	34.2	68.4
R11(a)	Australia Road	34.0	0.1	0.3	34.1	68.3
R12(a)	Colonial Road	34.0	0.1	0.3	34.1	68.3
R13(a)	Wrexham Road	34.0	0.3	0.6	34.3	68.6
R14	Maple Crescent	34.0	0.1	0.1	34.1	68.1
AQMA1	Wexham Road	34.0	0.1	0.2	34.1	68.2
AQMA2	Apsley House	34.0	0.1	0.1	34.1	68.1
AQMA3	Uxbridge Road	34.0	0.1	0.2	34.1	68.2
Future human health receptors						
FR1(i)	Residential Block A	34.0	0.2	0.4	34.2	68.4
FR2(i)	Residential Block A	34.0	0.3	0.6	34.3	68.6
FR3(g)	Residential Block B	34.0	0.3	0.6	34.3	68.6
FR4(a)	Residential Block B	34.0	0.4	0.8	34.4	68.8
FR5(a)	Residential Block B	34.0	0.6	1.1	34.6	69.1
FR6(a)	Residential Block B	34.0	0.5	0.9	34.5	68.9
FR7(g)	Residential Block C	34.0	0.3	0.6	34.3	68.6
FR8(g)	Residential Block C	34.0	0.3	0.5	34.3	68.5

*Maximum modelled 24-hour (based on 6 hour) mean PCs based on a single generator operating throughout five modelled years.

^Short-term PM_{10} AQS standard of 50 µg/m³ (not to be exceeded more than 35 days a year).

4.1.5 NO_x impacts on ecological receptors

The maximum modelled annual mean PCs for NO_x at ecological receptors (factored based on 24 hours of operation of all 84 generators annually) are presented in Table 4-4.

The maximum annual mean NO_x PC at an ecological receptor, 0.2 µg/m^3 occurred at E1, Herschel Park LNR, approximately 1.4 kilometres south of Building A. The modelled annual mean NO_x PCs at all the modelled ecological receptors were all equal to or below 1% of the critical level (CL) of 30 µg/m^3.

Table 4-4 – Maximum annual and hourly average NO_x concentrations at ecological receptors

ID	Description	Long-term		Short-term	
		PC*, µg/m^3	PC/CL^, %	PC**, µg/m^3	PC/CL#, %
E1	Herschel Park	0.1	0.2	0.7	1.0
E2	Burnham Beeches	<0.1	<0.1	0.1	0.1
E3	Windsor Forest & Great Park	<0.1	<0.1	0.1	0.1
E4	Southwest London Waterbodies	<0.1	<0.1	0.2	0.2

*Maximum modelled annual mean PCs, factored to represent 24 hours of operation of all 84 generators per year.

^Long term critical level of 30 µg/m^3.

** Maximum modelled 24-hour (based on 6 hour) mean PCs based on a single generator operating throughout five modelled years.

#Short-term critical level of 75 µg/m^3.

The maximum 24-hour mean NO_x PC (factored to represent 6 hours of operation of a single generator, throughout five modelled years) at an ecological receptor, is 0.7 µg/m^3, which also occurred at E1. This conservative approach considers the least favourably placed generator from the LON1X0 and LON1X2 facilities (Generator 53, Building C) operating in the vicinity of the receptor, in combination with the least favourable hour of meteorological data, which occurred in 2023.

The PCs at all modelled ecological receptors were below 10% of the non-statutory critical level of 75 µg/m^3 (a conservative choice, compared to using the higher value of 200 µg/m^3 for low pollution areas) and as such can be considered insignificant.

4.1.6 Nitrogen deposition impacts on ecological receptors

The total nitrogen deposition PCs at ecological receptors (factored for 24 hours of operation of all 84 generators annually) are presented in Table 4-5.

The maximum annual mean nitrogen deposition PC at an ecological receptor, is 0.013 kgN/ha/yr at E1.

The modelled annual mean nitrogen deposition PCs at all the modelled ecological receptors were all below 1% of the minimum critical load for nitrogen deposition. As such, the modelled concentrations make an insignificant contribution to existing rates of nitrogen deposition at ecological receptors within the study area.

Table 4-5 – Maximum total nitrogen deposition at ecological receptors

ID	Description	Minimum Critical Load, kgN/ha/yr	Total N Deposition PC*, kgN/ha/yr	PC/Critical Load, %
E1	Herschel Park	5	0.013	0.3
E2	Burnham Beeches	10	0.001	<0.1
E3	Windsor Forest & Great Park	10	0.002	<0.1
E4	Southwest London Waterbodies	5	0.001	<0.1

*Maximum modelled annual mean PCs, factored to represent 24 hours of operation of all 84 generators per year.

4.1.7 Acid deposition impacts on ecological receptors

The total N-acid deposition PCs at ecological receptors (factored based on 24 hours of operation of all 84 generators annually) are presented in Table 4-6.

The maximum annual mean N-acid deposition PC at an ecological receptor is 0.001 keq/ha/yr at E1.

The modelled PCs at all the ecological receptors were below 0.1% of the N-acid deposition critical load. As such, the PCs make an insignificant contribution to existing rates of N-acid deposition at ecological receptors within the study area.

Table 4-6 – Maximum total N-acid deposition at ecological receptors

ID	Description	MinCLMaxN, keq/ha/yr	N-Acid Deposition PC*, keq/ha/yr	PC/Critical Load, %
E1	Herschel Park	4.363	0.001	<0.1
E2	Burnham Beeches	2.056	<0.001	<0.1
E3	Windsor Forest & Great Park	1.044	<0.001	<0.1
E4	Southwest London Waterbodies	1.761	<0.001	<0.1

*Maximum modelled annual mean PCs, factored to represent 24 hours of operation of all 84 generators per year.

4.2 'Emergency' Scenario

4.2.1 Long-term NO_2 impacts on human health

As it is possible that both the 'most-likely' and 'emergency' scenarios could occur within the same year, their combined impact is presented in this section.

The maximum modelled annual mean PCs for NO_2 at human health receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent totals of 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-1 in Appendix B.

4.2.1.1 4-hour emergency event (reasonable worst case)

For a 4-hour emergency event combined with routine testing, the maximum annual mean NO_2 PC at any modelled human health receptor is 1.2 µg/m^3 at receptor R2; within an AQMA it is 0.3 µg/m^3 at receptor AQMA3 within the Slough AQMA No.4. The corresponding annual mean NO_2 PECs, based on the baseline concentrations set out in Table 3-6, are 22.0 µg/m^3 and 34.9 µg/m^3, respectively.

Therefore, the modelled concentrations at all receptors remain below the long-term NO_2 AQS objective of 40 µg/m^3.

4.2.1.2 12-hour emergency event

For a 12-hour emergency event combined with routine testing, the maximum annual mean NO_2 PC at any modelled human health receptor is 1.6 µg/m^3 at receptor R2; within an AQMA it is 0.4 µg/m^3 at receptor AQMA3 within the Slough AQMA No.4. The corresponding annual mean NO_2 PECs, based on the baseline concentrations set out in Table 3-6, are 22.4 µg/m^3 and 35.0 µg/m^3, respectively.

Therefore, the modelled concentrations at all receptors remain below the long-term NO_2 AQS objective of 40 µg/m^3, even with the conservative assumption of three times the reasonable worst-case emergency event.

4.2.1.3 72-hour emergency event

For a 72-hour emergency event combined with routine testing, the maximum annual mean NO_2 PC at any modelled human health receptor is 4.2 µg/m^3 at receptor R2; within an AQMA it is 1.2 µg/m^3 at receptor AQMA3 within the Slough AQMA No.4. The corresponding annual mean NO_2 PECs, based on the baseline concentrations set out in Table 3-6, are 31.3 µg/m^3 and 37.6 µg/m^3, respectively.

Therefore, the modelled concentrations at all receptors remain below the long-term NO_2 AQS objective of 40 µg/m^3, even with the extremely conservative assumption of a 72-hour emergency event.

4.2.2 Long-term PM_{10} impacts on human health

The maximum modelled annual mean PCs for PM_{10} at human health receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-2 in Appendix B.

4.2.2.1 4-hour emergency event (reasonable worst case)

For a 4-hour emergency event combined with routine testing, the maximum annual mean PM_{10} PC at any modelled human health receptor is 0.04 µg/m^3 at receptor R2. The corresponding annual mean PEC, based on the baseline concentration set out in Table 3-6, is 17.04 µg/m^3.

Therefore, the modelled concentrations at all receptors remain well below the long-term PM_{10} AQS objective of 40 µg/m^3.

The same conclusion may be drawn for $PM_{2.5}$, which can be conservatively assumed to be the same as PM_{10}. On that basis, the maximum annual mean PC would be less than 1% of the 2040 target value of 10 µg/m^3.

4.2.2.2 12-hour emergency event

For a 12-hour emergency event combined with routine testing, the maximum annual mean PM_{10} PC at any modelled human health receptor is 0.05 µg/m^3 at receptor R2. The corresponding annual mean PEC, based on the baseline concentration set out in Table 3-6, is 17.05 µg/m^3.

Therefore, the modelled concentrations at all receptors remain well below the long-term PM_{10} AQS objective of 40 µg/m^3, even with the conservative assumption of three times the reasonable worst-case emergency event.

The same conclusion may be drawn for $PM_{2.5}$, which can be conservatively assumed to be the same as PM_{10}. On that basis, the maximum annual mean PC would be less than 1% of the 2040 target value of 10 µg/m^3.

4.2.2.3 72-hour emergency event

For a 72-hour emergency event combined with routine testing, the maximum annual mean PM_{10} PC at any modelled human health receptor is 0.1 µg/m^3 at receptor R2. The corresponding annual mean PEC, based on the baseline concentration set out in Table 3-6, is 17.1 µg/m^3.

Therefore, the modelled concentrations at all receptors remain well below the long-term PM_{10} AQS objective of 40 µg/m^3, even with the extremely conservative assumption of a 72-hour emergency event.

The same conclusion may be drawn for $PM_{2.5}$, which can be conservatively assumed to be the same as PM_{10}. On that basis, the maximum annual mean PC would be equal to 1% of the 2040 target value of 10 µg/m^3 and less than 1% of the interim target of 12 µg/m^3 by 2028.

4.2.3 Short-term NO_2 impacts on human health

The maximum modelled hourly NO_2 PC for the concurrent operation of all generators (100th percentile) is 2,008 µg/m^3. This is the absolute highest concentration at any modelled receptor in a five-year run and assumes operation of all 84 engines at maximum load during the least favourable hour of meteorological data in over 43,000 modelled hours. The modelling assumed no derating or load-shedding.

The number of exceedances of the short-term NO_2 AQS standard and the AEGL-1 threshold at human health receptors in each year modelled, assuming a hypothetical continuous outage throughout the year, is presented in Table 4-7. These results inform the statistical analysis of the probability of an exceedance occurring for a range of durations of a power outage presented later in this section.

Table 4-7 – No. of NO_2 hourly exceedances in a year at a receptor (all modelled hours in a year, all generators concurrently operating)

Year	No. of NO_2 hourly exceedances in a year			
	>200 µg/m^3 (AQS standard)		>940 µg/m^3 (AEGL-1 threshold)	
	Min	Max	Min	Max
2020	539	3936	0	186
2021	599	3223	0	197
2022	482	3722	0	215
2023	457	4172	0	213
2024	381	3862	0	271

The results at individual receptors show that, based on all engines operating throughout the year, between 381 and 4,172 hours were identified to exceed the short-term NO_2 AQS standard and between 0 and 271 hours were identified to exceed the AEGL-1 of 0.5 ppm (approximately 940 µg/m^3), the threshold for non-disabling effects, in any modelled year. No exceedances of the AEGL-2 of 12 ppm (23,000 µg/m^3) the threshold for disabling effects, were modelled.

The maximum modelled hourly mean NO_2 PCs are presented as concentration isopleths overlaid on a base map in Figure B-1 in Appendix B. These are the maximum modelled results from the five modelled years of data at each receptor.

4.2.3.1 4-hour (reasonable worst case)

For the 4-hour emergency event, which is considered a reasonable worst case emergency scenario, while an exceedance of the short-term NO_2 AQS standard of 200 µg/m^3 under least favourable conditions may occur, it is not expected to affect the achievement of the short-term NO_2 AQS objective (which allows for 18 hours above the standard each year). The probability of the AEGL-1 being exceeded even once is under 30%, and the probability it being exceeded twice within the 4 hour period is less than 1.5%.

4.2.3.2 12-hour emergency event

For the 12-hour emergency event, as per the 4-hour emergency event, even if an exceedance of the short-term NO_2 AQS standard of 200 µg/m^3 were to occur under least favourable conditions, this would be of limited duration and thus not expected to affect the achievement of the short-term NO_2 AQS objective (no more than 18 hours above the

standard each year). The probability that the AEGL-1 would be exceeded for one hour during this event is 31%, and for three hours is less than 1.5%

4.2.3.3 72-hour emergency event and acute exposure

During a highly improbable 72-hour emergency event, the short-term NO_2 AQS objective (200 µg/m^3 not to be exceeded more than 18 times a year) is likely to be exceeded, as is the AEGL-1. This is based on the hypergeometric mean calculation for a full emergency outage lasting 72 hours per year as set out in detail in Appendix B, Table B-3. The calculation shows the probability of exceeding:

- the short-term NO_2 AQS standard more than 18 times at a residential receptor is 99.99% (249.98% with a factor of 2.5 applied for consecutive hours of outage); and
- the AEGL-1 threshold once at a residential receptor is 89.69% (224.22% with a factor of 2.5 applied);
- the AEGL-1 threshold four times at a residential receptor is 18.29% (45.74% with a factor of 2.5 applied);
- the AEGL-1 threshold eight times at a residential receptor is 0.16% (0.41% with a factor of 2.5 applied).

Therefore, there is a theoretical potential for concentrations of NO_2 resulting from the simultaneous operation of all 84 generators for 72 hours to exceed both the short-term NO_2 AQS objective and the AEGL-1 threshold under least favourable dispersion conditions, however, the probability of an outage lasting 72 hours is infinitesimally low. An emergency power outage of a few hours' duration is only estimated to occur once every 23 years[10]. The probability of an emergency power outage of a longer duration coinciding with the worst individual hours of meteorological conditions from a five-year dataset is thus far lower.

A slightly less conservative, yet still unlikely, outage of 24 hours has been considered and the results are presented in Appendix B, Table B-3. For 24 hours the calculation shows the probability of exceeding:

- the short-term NO_2 AQS standard more than 18 times at a residential receptor is 0.16% (0.40% with a factor of 2.5 applied); and
- the AEGL-1 threshold once at a residential receptor is 53.01% (132.52% with a factor of 2.5 applied);
- the AEGL-1 threshold four times at a residential receptor is 0.58% (1.46% with a factor of 2.5 applied).

The hypergeometric mean calculations indicate that while there is a risk of exceeding the AEGL-1 threshold at a residential receptor in the unlikely event there is 24 hours of outages in a year, the probability of exceeding it more than four times is extremely remote (less than 1%), as is the probability of the short-term NO_2 AQS objective at a residential receptor (the indicative threshold for likely exceedances given in Environment Agency guidance[20] for specified generators is 5%).

It is important to note that, while all engines would initially be fired up to maintain data supply, it is anticipated that load shedding would occur after a short period. This would reduce the number of operational generators and/or the associated NO_x emissions. The modelling undertaken to generate the above statistics assumes continuous full load operation of all 84 generators, a very conservative approach. In practice, load shedding is likely to occur, meaning actual concentrations would be lower than those modelled.

[20]Environment Agency (2023). Specified generators: dispersion modelling assessment. Available at: https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

4.2.4 Short-term PM_{10} impacts on human health

4.2.4.1 4-hour (reasonable worst case), 12-hour and 72-hour emergency events

The maximum modelled 24-hour PM_{10} PC for the concurrent operation of all generators (100th percentile) is 51.8 µg/m^3. This finding represents the absolute highest concentration at a receptor in a five-year model run and assumes continuous operation thus representing the least favourable year of meteorological data in over 44,000 modelled hours. This is not a realistic scenario and represents a theoretical maximum. Nevertheless, it only marginally exceeds the short-term PM_{10} AQS standard of 50 µg/m^3.

While the 'most-likely' and 'emergency' scenarios are considered separate scenarios, it is possible that both could occur within the same year. However, as set out in section 4.1.4, no exceedances of the short-term PM_{10} AQS standard of 50 µg/m^3 were identified. Therefore, the cumulative contribution of the 'most-likely' testing scenario to the short-term PM_{10} AQS objective of 35 days above the standard does not need to be considered.

For the 4-hour, 12-hour and 72-hour emergency events, even were an exceedance of the short-term PM_{10} AQS standard of 50 µg/m^3 to occur under least favourable meteorological conditions, it will be limited in duration and is not expected to affect the achievement of the short-term NO_2 AQS objective which allows for 35 days above the standard each year.

4.2.5 NO_x impacts on ecological receptors

The maximum modelled annual mean PCs for NO_x at ecological receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-4 in Appendix B.

For the emergency events, the highest annual mean NO_x PC at any modelled ecological receptor occurred at Herschel Park.

4.2.5.1 4-hour emergency event (reasonable worst case)

When factored for a theoretical 4-hour full emergency outage within a year, the PC at Herschel Park LNR is 0.08 µg/m^3 or 0.3% of the critical level (long-term NO_x: 30 µg/m^3). Therefore, under a 4-hour emergency event, the annual mean NO_x PCs at all modelled ecological receptor is below 1% of the NO_x critical level.

This scenario is based on regional estimates suggesting that such events may occur approximately once every 23 years and, along with the conservative parameters used within the model, is considered a reasonable worst-case. The theoretical 12-hour and 72-hour emergency events are considered extremely unlikely and are reported below completeness.

4.2.5.2 12-hour emergency event

When factored for a theoretical 12-hour full emergency outage within a year, the PC at Herschel Park LNR is 0.10 µg/m^3 or 0.3% of the NO_x critical level. Therefore, under a 12-hour emergency event, the annual mean NO_x PCs at all modelled ecological receptor is below 1% of the NO_x critical level.

4.2.5.3 72-hour emergency event

When factored for a theoretical 72-hour full emergency outage within a year, the PC at Herschel Park LNR is 0.26 µg/m^3 or 0.9% of the NO_x critical level. Therefore, under a 72-hour emergency event, the annual mean NO_x PCs at all modelled ecological receptor is below 1% of the NO_x critical level.

4.2.6 Nitrogen deposition impacts on ecological receptors

The maximum modelled total nitrogen deposition PCs at ecological receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-5 in Appendix B.

For the emergency events, the highest total nitrogen deposition PC at any modelled ecological receptor occurred at Herschel Park.

4.2.6.1 4-hour emergency event (reasonable worst case)

When adjusted for a theoretical 4-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.015 µg/m^3 or 0.3% of the lowest minimum critical load (5 kgN/ha/yr). Therefore, under a 4-hour emergency event, the total nitrogen deposition PCs at all modelled ecological receptors were all well below 1% of the relevant minimum critical loads for nitrogen deposition.

This scenario is based on regional estimates suggesting that such events may occur approximately once every 23 years and, along with the conservative parameters used within the model, is considered a reasonable worst-case. The theoretical 12-hour and 72-hour emergency events are considered extremely unlikely and are reported below completeness.

4.2.6.2 12-hour emergency event

When adjusted for a theoretical 12-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.020 µg/m^3 or 0.4% of the lowest minimum critical load. Therefore, under a 12-hour emergency event, the total nitrogen deposition PCs at all modelled ecological receptors were all well below 1% of the relevant minimum critical loads for nitrogen deposition.

4.2.6.3 72-hour emergency event

When adjusted for a theoretical 72-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.052 µg/m^3 or 1.0% of the lowest minimum critical load. Therefore, under a 72-hour emergency event, the total nitrogen deposition PCs at all modelled ecological receptors were all below or equal to 1% of the relevant minimum critical loads for nitrogen deposition.

AtkinsRéalis - Sensitive / Sensible [FR]

4.2.7 Acid deposition impacts on ecological receptors

The maximum modelled total N-acid deposition PCs at ecological receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-6 in Appendix B.

For the emergency events, the highest total N-acid deposition PCs at any modelled ecological receptor occurred at Herschel Park.

4.2.7.1 4-hour emergency event (reasonable worst case)

When adjusted for a theoretical 4-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.001 keq/ha/yr, equivalent to 0.03% of the minimum critical load (4.363 MinCLMaxN). Under a 4-hour emergency event, the total N-acid deposition PCs at all ecological receptors were all well below 1% of the relevant minimum N-acid deposition critical loads.

This scenario is based on regional estimates suggesting that such events may occur approximately once every 23 years and, along with the conservative parameters used within the model, is considered a reasonable worst-case. The theoretical 12-hour and 72-hour emergency events are considered extremely unlikely and are reported below completeness.

4.2.7.2 12-hour emergency event

When adjusted for a theoretical 12-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.001 keq/ha/yr, equivalent to 0.03% of the minimum critical load. Under a 12-hour emergency event, the total N-acid deposition PCs at all ecological receptors were all well below 1% of the relevant minimum N-acid deposition critical loads.

4.2.7.3 72-hour emergency event

When adjusted for a theoretical 72-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.004 keq/ha/yr, equivalent to 0.09% of the minimum critical load. Under a 72-hour emergency event, the total N-acid deposition PCs at all ecological receptors were all well below 1% of the relevant minimum N-acid deposition critical loads.

5. Conclusions

This air quality assessment included an atmospheric dispersion modelling study of emissions from the 32 standby emergency generators associated with the LON1X2 facility (Building C) in addition to the 52 standby emergency generators associated with the adjacent LON1X0 facility (Building A and B). The detailed assessment of the emissions has been undertaken using an internationally accepted model (AERMOD) to evaluate the impacts on human health and ecology during scheduled routine testing ('most-likely' testing scenario) and during a power outage ('worst case' emergency scenario).

For the 'most-likely' testing scenario, no exceedances of the short-term and long-term assessment criteria for NO_2, PM_{10} or $PM_{2.5}$ were identified at any human health receptors, either in proximity to the facility or beyond, including the Slough AQMA No.4. Furthermore, the contributions at ecological receptors were less than 1% of the long-term critical levels and loads and less than 10% of the short-term critical level.

For the 'worst case emergency' scenario, hypothetical outages of 4, 12 and 72 hour duration were considered. The modelling shows that for a full outage, exceedances of both the hourly NO_2 AQS standard and the AEGL-1 could occur, but the AEGL-2 will not be exceeded. This assumes a full outage requiring all engines to operate at load coincides with the very least favourable hours of meteorological data for dispersion. The probability of this happening is extremely low as such an outage is a 1 in 23 years event. Further calculations using the hypergeometric mean approach have shown that, for 24 hours of power outage in a year, the probability of an exceedance of the AQS objective for a cumulative outage across all sites is below 1%, while the probability of the AEGL-1 being exceeded on more than 4 occasions is less than 2%.

In summary, the operation of individual generators at the expanded facility for routine testing is concluded not to present a significant adverse effect on the nearest sensitive human health and ecological receptors. During a worst case emergency outage, the hourly standard for NO_2 and the AEGL-1 level for non-disabling health effects may be exceeded; however, the probability of such an event coinciding with the least favourable hours of meteorological data for dispersion is extremely low.

It is anticipated that an air quality management plan will be required under the environmental permit, to set out the actions that will be taken and those responsible, in the unlikely event of an emergency power outage in order to prevent adverse effects on public health.

APPENDICES

Appendix A. Additional information

Table A-1 – Building A stack locations and height – LON1X0 facility

Stack ID	X, m	Y, m	Stack height, m
Building A Stack 1	498623	180299	21.95
Building A Stack 2	498625	180298	
Building A Stack 3	498632	180295	
Building A Stack 4	498634	180294	
Building A Stack 5	498642	180291	
Building A Stack 6	498644	180290	
Building A Stack 7	498652	180286	
Building A Stack 8	498654	180285	
Building A Stack 9	498662	180282	
Building A Stack 10	498664	180281	
Building A Stack 11	498672	180278	
Building A Stack 12	498674	180277	
Building A Stack 13	498682	180274	
Building A Stack 14	498684	180273	
Building A Stack 15	498692	180269	
Building A Stack 16	498694	180268	
Building A Stack 17	498702	180265	
Building A Stack 18	498704	180264	
Building A Stack 19	498712	180261	
Building A Stack 20	498714	180260	
Building A Stack 21	498722	180257	
Building A Stack 22	498724	180256	
Building A Stack 23	498732	180252	
Building A Stack 24	498734	180251	
Building A Stack 25	498742	180248	
Building A Stack 26	498744	180247	

Table A-2 – Building B stack locations and height – LON1X0 facility

Stack ID	X, m	Y, m	Stack height, m
Building B Stack 27	498652	180366	21.95
Building B Stack 28	498654	180365	
Building B Stack 29	498661	180362	
Building B Stack 30	498663	180361	
Building B Stack 31	498671	180357	
Building B Stack 32	498673	180356	
Building B Stack 33	498681	180353	
Building B Stack 34	498683	180352	
Building B Stack 35	498691	180349	
Building B Stack 36	498693	180348	
Building B Stack 37	498701	180345	
Building B Stack 38	498703	180344	
Building B Stack 39	498711	180340	
Building B Stack 40	498713	180339	
Building B Stack 41	498721	180336	
Building B Stack 42	498723	180335	
Building B Stack 43	498731	180332	
Building B Stack 44	498733	180331	
Building B Stack 45	498741	180328	
Building B Stack 46	498743	180327	
Building B Stack 47	498751	180323	
Building B Stack 48	498753	180322	
Building B Stack 49	498760	180319	
Building B Stack 50	498763	180318	
Building B Stack 51	498770	180315	
Building B Stack 52	498773	180314	

Table A-3 – Building C stack locations and height – LON1X2 facility

Stack ID	X, m	Y, m	Stack height, m
Building C Stack 53	498699	180378	15.95
Building C Stack 54	498703	180376	
Building C Stack 55	498710	180373	
Building C Stack 56	498713	180372	
Building C Stack 57	498720	180369	
Building C Stack 58	498723	180368	
Building C Stack 59	498729	180365	
Building C Stack 60	498733	180363	
Building C Stack 61	498739	180361	
Building C Stack 62	498743	180359	
Building C Stack 63	498749	180356	
Building C Stack 64	498753	180355	
Building C Stack 65	498759	180352	
Building C Stack 66	498763	180350	
Building C Stack 67	498769	180348	
Building C Stack 68	498773	180346	
Building C Stack 69	498908	180288	
Building C Stack 70	498911	180287	
Building C Stack 71	498918	180284	
Building C Stack 72	498922	180282	
Building C Stack 73	498928	180280	
Building C Stack 74	498931	180278	
Building C Stack 75	498938	180275	
Building C Stack 76	498941	180274	
Building C Stack 77	498948	180271	
Building C Stack 78	498951	180270	
Building C Stack 79	498958	180267	
Building C Stack 80	498961	180265	
Building C Stack 81	498968	180262	
Building C Stack 82	498971	180261	
Building C Stack 83	498978	180258	
Building C Stack 84	498981	180257	

Appendix B. ‘Emergency’ scenario results

Figure B-1 - Maximum modelled 1-hour mean NO_2 process contributions (µg/m³)

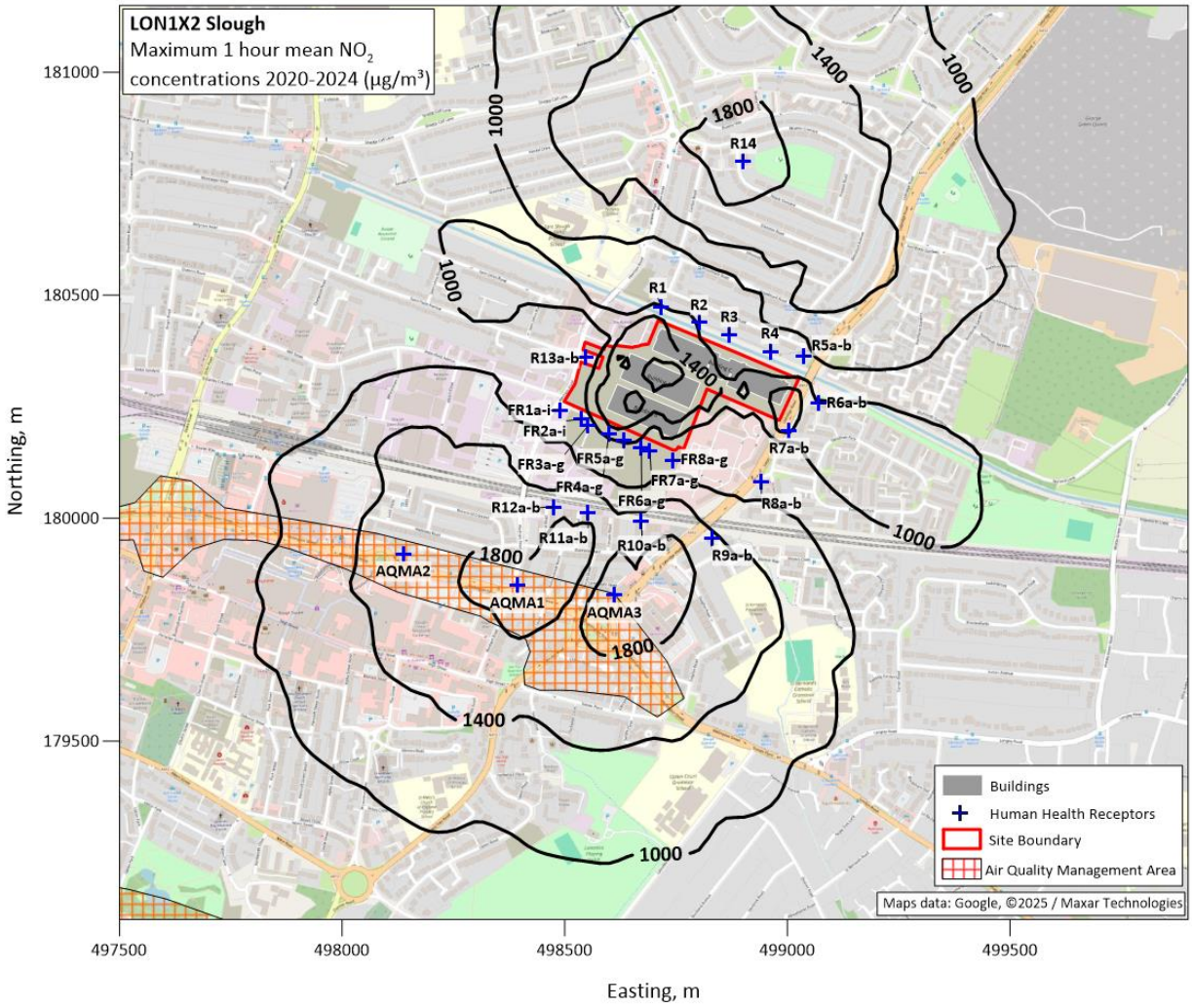

Table B-1 - Maximum annual average NO_2 concentrations at human health receptors for the emergency events

ID	Description	Baseline, µg/m³	Emergency event*		
			4-hour PC, µg/m³	12-hour PC, µg/m³	72-hour PC, µg/m³
R1	Hazlemere Road	20.8	1.0	1.3	3.5
R2	Hazlemere Road	20.8	1.2	1.6	4.2
R3	Hazlemere Road	20.8	1.1	1.5	3.9
R4	Hazlemere Road	20.8	1.1	1.4	3.9
R5a-b	Hazlemere Road	20.8	1.0	1.3	3.3
R6a-b	Goodman Park	20.8	0.7	0.9	2.5
R7a-b	Goodman Park	20.8	0.6	0.8	2.2
R8a-b	Victoria Road	20.8	0.5	0.6	1.6
R9a-b	Denton Way	20.8	0.4	0.5	1.3
R10a-b	India Road	20.8	0.5	0.6	1.7
R11a-b	Australia Road	20.8	0.5	0.7	1.8
R12a-b	Colonial Road	20.8	0.5	0.6	1.7
R13a-b	Wrexham Road	20.8	0.5	0.7	1.9
R14	Maple Crescent	20.8	0.4	0.4	1.3
AQMA1	Wexham Road	34.6	0.3	0.4	1.1
AQMA2	Apsley House	34.6	0.2	0.2	0.7
AQMA3	Uxbridge Road	34.6	0.3	0.4	1.2
FR1a-i	Residential Block A	20.8	0.5	0.7	1.7
FR2a-i	Residential Block A	20.8	0.7	1.0	2.6
FR3a-g	Residential Block B	20.8	0.8	1.0	2.6
FR4a-g	Residential Block B	20.8	1.0	1.2	3.3
FR5a-g	Residential Block B	20.8	1.0	1.3	3.5
FR6a-g	Residential Block B	20.8	0.9	1.2	3.2
FR7a-g	Residential Block C	20.8	0.8	1.1	2.9
FR8a-g	Residential Block C	20.8	0.7	0.9	2.3

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

Table B-2 - Maximum annual average PM_{10} concentrations at human health receptors for the emergency events

ID	Description	Baseline, µg/m³	Emergency event*		
			4-hour PC, µg/m³	12-hour PC, µg/m³	72-hour PC, µg/m³
R1	Hazlemere Road	17.0	<0.1	<0.1	0.1
R2	Hazlemere Road		<0.1	<0.1	0.1
R3	Hazlemere Road		<0.1	<0.1	0.1
R4	Hazlemere Road		<0.1	<0.1	0.1
R5a-b	Hazlemere Road		<0.1	<0.1	0.1
R6a-b	Goodman Park		<0.1	<0.1	<0.1
R7a-b	Goodman Park		<0.1	<0.1	<0.1
R8a-b	Victoria Road		<0.1	<0.1	<0.1
R9a-b	Denton Way		<0.1	<0.1	<0.1
R10a-b	India Road		<0.1	<0.1	<0.1
R11a-b	Australia Road		<0.1	<0.1	<0.1
R12a-b	Colonial Road		<0.1	<0.1	<0.1
R13a-b	Wrexham Road		<0.1	<0.1	<0.1
R14	Maple Crescent		<0.1	<0.1	<0.1
AQMA1	Wexham Road		<0.1	<0.1	<0.1
AQMA2	Apsley House		<0.1	<0.1	<0.1
AQMA3	Uxbridge Road		<0.1	<0.1	<0.1
FR1a-i	Residential Block A		<0.1	<0.1	<0.1
FR2a-i	Residential Block A		<0.1	<0.1	<0.1
FR3a-g	Residential Block B		<0.1	<0.1	<0.1
FR4a-g	Residential Block B		<0.1	<0.1	0.1
FR5a-g	Residential Block B		<0.1	<0.1	0.1
FR6a-g	Residential Block B		<0.1	<0.1	<0.1
FR7a-g	Residential Block C		<0.1	<0.1	<0.1
FR8a-g	Residential Block C		<0.1	<0.1	<0.1

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

Table B-3 – Hypergeometric mean calculation for theoretical 24h and 72h outages

ID	Description	AQS standard >18 times		AEGL-1 1 or 4 times		Comment
		24h	**72h**	**24h**	**72h**	
x	No. successes in the sample	5	53	23	71	Operational hours minus number of “allowed” exceedances
n	Sample size	24	72	24	72	No. emergency operational hours
M	No. successes in the population	4588	4588	8552	8552	Non-exceedance hours per year
N	Population size	8760	8760	8760	8760	Potential operating envelope per year
-	-	4172	4172	271	271	No. hours modelled to exceed per year
-	-	19	19	1 / 4	1 / 4	No. exceedances allowed by the objective or threshold
Result	Hypergeometric distribution	0.16%	99.99%	53.01% / 0.58%	89.69% / 18.29%	Probability of < 5% indicates exceedances are unlikely as long as the generator plant operational lifetime is no more than 20 years
		0.40%	249.98%	132.52% / 1.46%	224.22% / 45.74%	Factor of 2.5 applied for consecutive hours of emergency operation

Table B-4 - Maximum annual average NOx concentrations (µg/m^3) at ecological receptors for the emergency events

ID	Description	Critical level, µg/m^3	Emergency event*		
			4-hour PC	12-hour PC	72-hour PC
E1	Herschel Park	30	0.08	0.10	0.26
E2	Burnham Beeches		0.01	0.01	0.02
E3	Windsor Forest & Great Park		0.01	0.02	0.04
E4	Southwest London Waterbodies		0.01	0.01	0.03

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

Table B-5 - Maximum total nitrogen deposition (kgN/ha/yr) at ecological receptors for the emergency events

ID	Description	Minimum Critical Load, kgN/ha/yr	Emergency event*		
			4-hour PC	12-hour PC	72-hour PC
E1	Herschel Park	5	0.015	0.020	0.052
E2	Burnham Beeches	10	0.001	0.002	0.004
E3	Windsor Forest & Great Park	10	0.002	0.003	0.008
E4	Southwest London Waterbodies	5	0.001	0.001	0.003

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

Table B-6 - Maximum total N-acid deposition (keq/ha/yr) at ecological receptors for the emergency events

ID	Description	MinCLMaxN, keq/ha/yr	Emergency event*		
			4-hour PC	12-hour PC	72-hour PC
E1	Herschel Park	4.363	0.001	0.001	0.004
E2	Burnham Beeches	2.056	<0.001	<0.001	<0.001
E3	Windsor Forest & Great Park	1.044	<0.001	<0.001	0.001
E4	Southwest London Waterbodies	1.761	<0.001	<0.001	<0.001

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

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Appendix F – Site Condition Report

LON1X0 Data Centre, Slough: Environmental Permit Application.

APPENDIX F – REVISED SITE CONDITION REPORT TO INCLUDE BUILDING C, LON1X2

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1. Introduction

Yondr Group intend to install an addition to their current Data Centre campus, LON1X0, for which a bespoke Environmental Permit is required for an installation undertaking combustion activity, including "burning any fuel in an appliance with a rated thermal input of 50 or more megawatts". The installation, Building C, will consist of 32 emergency backup generators, specifically Rolls-Royce MTU DS3300 diesel generating set with MTU 20V4000G34F NOx turbocharged diesel engine and Leroy Somer LSA53.2 L14 /4p brushless synchronous alternator, as well as 2 Clarke JU4H-LP24 diesel-driven emergency fire pumps.

EHS International were appointed to provide environmental permit support services for Yondr Group in connection with the proposed installation. As part of this appointment, EHS International were tasked with the preparation of the application for a variation to the bespoke Environmental Permit (EPR/NP3829SP with Variation Reference Number /P002 CRM:0640985) for the development taking place at Wexham Rd, Slough SL2 5DS, National Grid Reference SU 98700 80300 (the Site).

1.1 Background

This Site Condition Report draws on information provided for the Site and the surrounding area as part of the planning application to turn the former AkzoNobel Decorative Coatings, Slough Manufacturing Unit, over to a mixed-use commercial and residential development, following the acquisition of the Akzo site by Panattoni UK Developments Ltd.

As a Condition of the grant of planning permission in November 2020, the provision of a contaminated land verification report was required. A grant of partial discharge was made in June 2022, following submission of the required information.

The objective of the reports and data presented to help secure planning permission was to determine the nature, degree and extent of contamination associated with historical manufacturing activities at the Site, develop a remediation strategy to clean up the legacy of contamination proven and leave the Site in a condition suitable to allow new development to proceed.

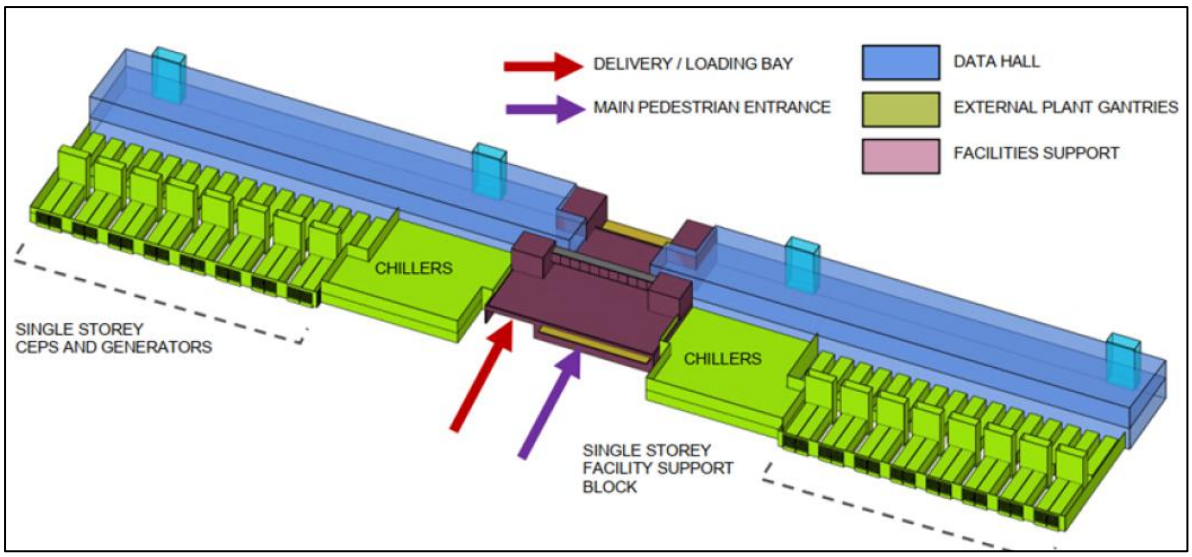
1.2 The Scheme

The project (LON1x2) comprises the installation of Building C on the purpose-built Data Centre campus site, located in Slough, London, UK. The proposed development shall include the following key features:

A data centre building comprising data halls and associated support plant, storage, office and welfare accommodation, logistics area and loading bay, external plant gantry accommodating 32 Rolls-Royce MTU 20V4000 DS3300 gas oil-fuelled standby generators, electrical plant rooms and heat rejection plant, ancillary support functions, external compounds, and associated infrastructure.

The diagram (Figure 1) below illustrates how these elements go to make up Building C as proposed.

Figure 1 Building C Layout



1.3 Site Details

Name of the Applicant	Yondr Group Limited
Activity Address	Wexham Rd, Slough SL2 5DS
National Grid Reference	498684, 180207

1.4 Site Condition Report

A site condition report (SCR) is required for any facility which is subject to regulation under the Environmental Permitting Regulations where there may be a significant risk to land or groundwater, including where one is necessary to satisfy the requirements of the Industrial Emissions Directive (IED). A SCR describes and records the condition of the land and groundwater at a site at particular points in time. The objective is to allow the operator to demonstrate that land and groundwater has been protected during the lifetime of the site and that the land is in a satisfactory state for the purposes of permit surrender.

A full demonstration that the permitted operation has ensured the protection of groundwater against pollution and environmental deterioration requires:

- Development of the relevant sections (1 to 3) of the SCR at the time of application for Permit. For installations subject to the IED, this will satisfy the requirements to provide a "baseline report".
- Updating the SCR during the lifetime of the permit as appropriate (sections 4 to 7), and;
- Completing the surrender parts (Sections 8 to 10) and submitting the fully completed SCR on application to surrender the environmental permit.

The following sections of this SCR set out the technical basis for satisfying the requirements of a "baseline report".

2. Condition of the Land at Permit Issuance

2.1 Site Description & Location

The following sections provide a summary of current and historical land use, geological and environmental setting of the Site. This section is primarily based on information presented within the report prepared by Buckingham Group Contracting Limited entitled Former AkzoNobel Site - Slough Remediation Completion and MMP Verification Report, dated November 2021, and the BWB Consulting report, Panattoni UK Developments Ltd, Akzo Nobel Site, Slough, Land Condition Report, October 2019. Where other sources have been used, these have been documented below.

2.1.1 Site Location

The data centre is located in the central part of the former AkzoNobel Decorative Coatings, Slough Manufacturing Unit, located at Wexham Rd, Slough SL2 5DS, National Grid Reference SU 98700 80300.

Figure 2 Site location

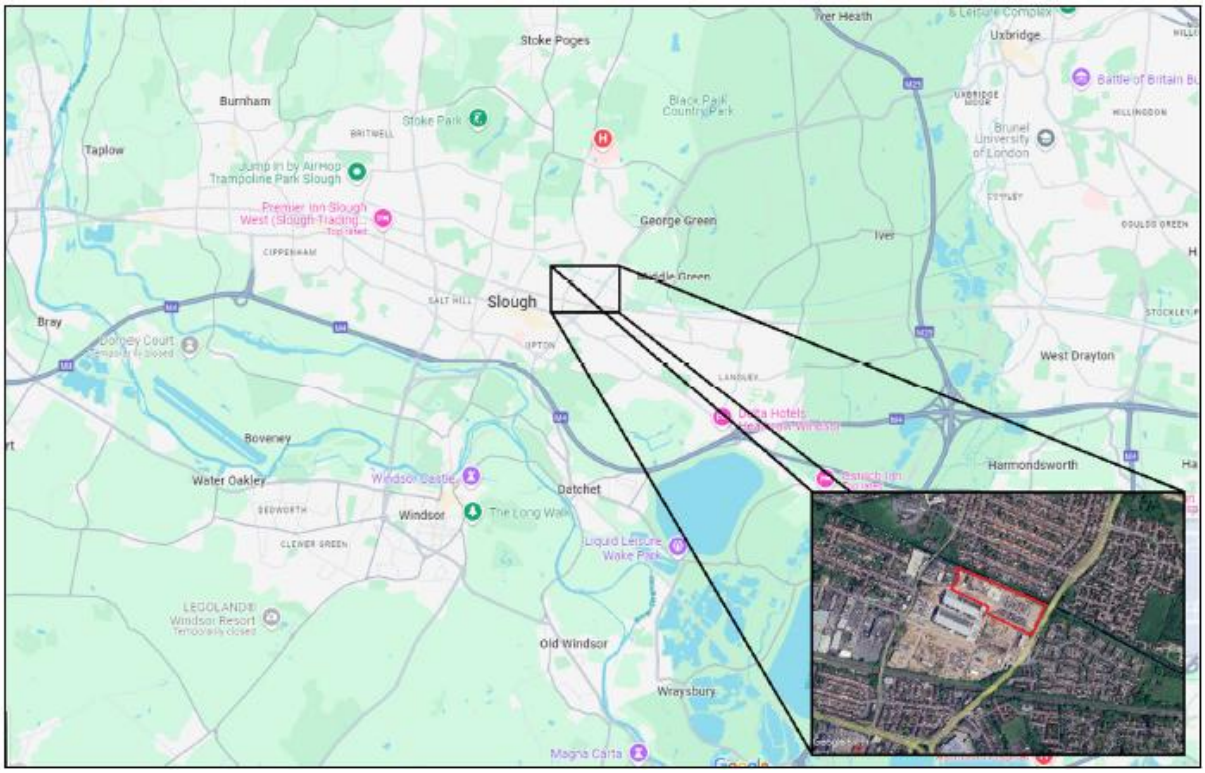


Figure 3 Phase 2, Marked with red border

2.1.2 Current Land Use

At present, the site consists of Buildings A and B, which operate independently, and the proposed modification, referred to as LON1X2, involves the addition of a third structure, Building C, to the existing data centre complex. The site was redeveloped under Slough Borough Planning permission P/00072/096 and is located in the central part of the former AkzoNobel Decorative Coatings, Slough Manufacturing Unit located at Wexham Rd, Slough SL2 5DS, National Grid Reference SU 98700 80300.

The site redevelopment is for mixed use comprising part B2/B8 sui generis (a portion of the development will be for heavy-duty industrial and/or massive storage/distribution purposes) and/or data centre use (and associated infrastructure) divided into 3 Phases. This Site Condition Report has been written in support of a Permit application for the operation of a data centre constructed during Phase 1 and Phase 2 of the redevelopment. This data centre will be the first to be constructed within the proposed new 'Data Centre Campus'.

Phase 2 of the redevelopment, which is what this variation (EPR/NP3829SP/P002 CRM:0640985) to the bespoke permit is being applied for, will also occur within the boundaries of the site as delineated in Figure 2.1 and will comprise the construction of a second data centre within the Data Centre Campus for which a separate planning application P/00072/139 has been made.

Phase 3 of the redevelopment (to be confirmed) will be the construction of multi-storey residential apartments with associated access and car parking and limited soft landscaping. This will be undertaken in the wider former AkzoNobel Decorative Coatings, Slough Manufacturing Unit, adjacent to the south of the current Permit application site.

2.1.3 Historical Land Use

Historically, the site has been used for paint and coating manufacture from 1919 until operation ceased in 2018. Prior to this the site was utilised for brick-earth excavation and brick making in the late 1800s as well as for a US/Canadian Army Storage Base between 1914-1918.

Planning permission was sought in November 2020 for the mixed-use development of the site (Ref P/00072/116). As part of the permission, the site underwent remediation in accordance with Buckingham Group Contracting Ltd.'s (BCGL) "First Panattoni, Former AkzoNobel Site-Slough, Remediation Scheme for Contamination" (reference BGCL-C19019/001/v5, dated 31 March 2020). The remediation was approved by the regulatory bodies, including the local contaminated land officer and the Environment Agency, and Condition 34 (Contaminated Land Verification Report) of the planning permission was discharged in June 2022.

Planning Permission for the development of Building C (Ref P/00072/139) was registered 15th March 2024. This application seeks Reserved Matters approval for the appearance, layout (inc. internal site arrangements), scale, and landscaping associated with the final phase (Phase 2 – Building C) of the approved commercial floorspace pursuant to the Outline Planning Permission granted in November 2020. It also follows the approval of Reserved Matters for Phase 1 (Buildings A and B data centres) in October 2021.

2.2 Geology

2.2.1 Published Geology

The geology is shown on the British Geological Survey (BGS) map 269 1:50,000 Series and on the BGS website. The site is underlain by between 5m and 9m of the Taplow Gravel Member, underlain by up to 39m thickness of the Lambeth Group. The underlying bedrock is the Seaford and Newhaven Chalk Formation.

Made ground overlies the natural soils in much of the site as a result of previous development and has a thickness of between 1.0 – 1.5mbgl.

2.3 Hydrogeology

2.3.1 Published Hydrogeology

British Geological Survey provides a Hydrogeology 625K digital hydrogeological map of the UK, from which the following information was obtained. The Rock unit is Lambeth Group, and the Character of the site is described as a low-productivity aquifer. The summary provided is a variable sequence of clays, shell beds, fine sands, silts and pebble beds giving low yields, sometimes, in hydraulic continuity with the underlying Chalk aquifer.

The Taplow Gravel Member is currently designated by the Environment Agency as a "Secondary A Aquifer", and the Lambeth Group remains classified as a "Secondary A Aquifer". The Seaford and Newhaven Chalk is classified as a "Principal Aquifer". It is considered that the more cohesive and lower-permeability strata of the Lambeth Group are acting as an aquiclude between the Taplow Gravel Member and the deeper Chalk aquifer.

The site resides within Groundwater Source Protection Zone III (Total Catchment). Updated mapping indicates that SPZ 2 (Outer Protection) lies approximately 540 m from the site, and SPZ 1 (Inner

Protection) is around 1.85 km from the site. This was determined using the buffer zone feature in the Environment Agency's Magic Map service (Defra, 2025).

The site has been subject to environmental monitoring as part of site investigations undertaken between 2015 and 2018.

A Piling Risk Assessment and subsequent groundwater monitoring activities, Groundwater Monitoring and Decommissioning Report K0681-AYE-ENV-R-0003 is available as Appendix J to the Permit Application Supporting Information Document, were carried out in response to the Environment Agency (EA) comments in regard to the discharge of planning condition 27:

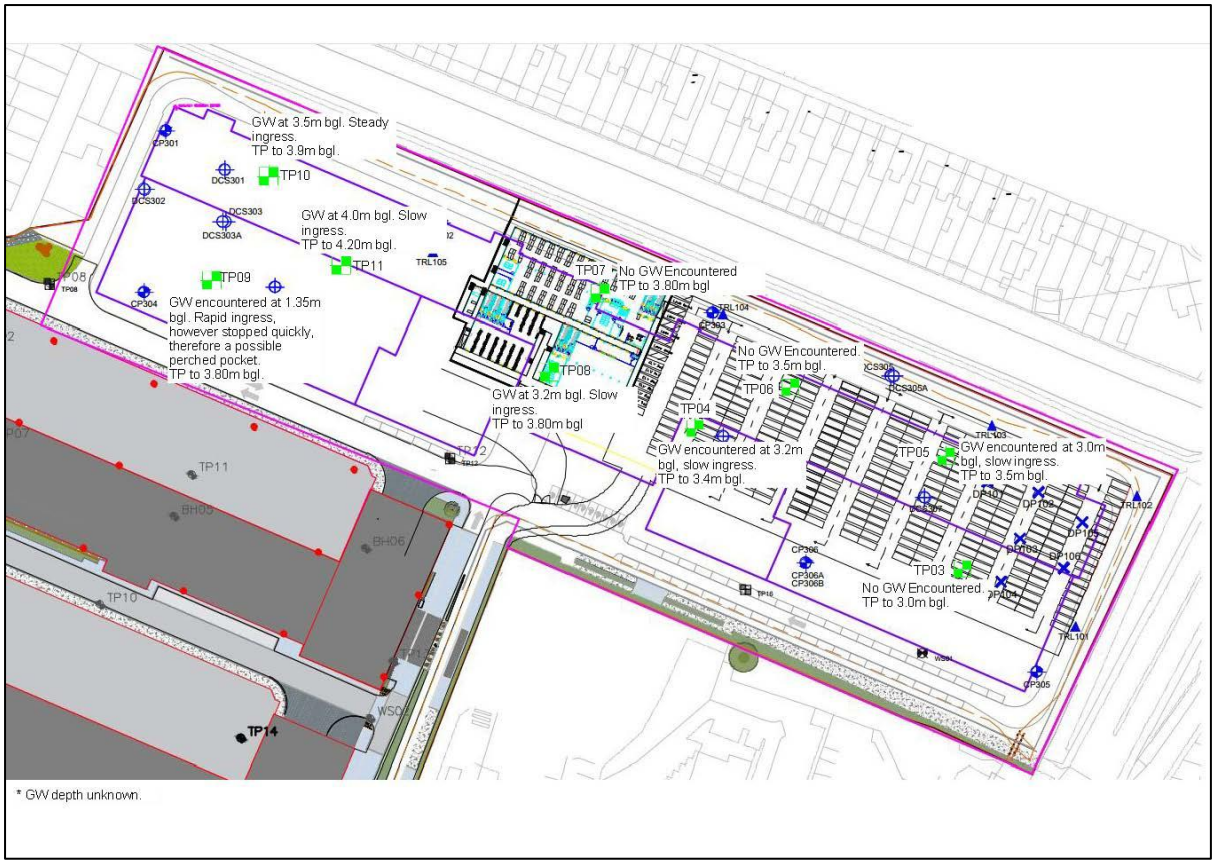
> *'Given the site's history and the environmental setting, we would endorse that control measures to reduce risks to groundwater units are taken, including the measures listed above (sleeving made ground, and below the groundwater level and any other suitable techniques), and that a scheme of groundwater monitoring from all available nearby boreholes (which the applicant mentions are available) is submitted to provide assurances that any residual contamination is not disturbed, and not impacting groundwater as a result of the piling activities.'*

Table 1 Groundwater levels were found at the following trial pits (TP):

Trial Pit (TP)	Groundwater Level (bgl)	Ingress Levels
TP03	No GW encountered	Relatively dry
TP04	3.2 m bgl	Slow ingress
TP05	3.0 m bgl	Slow ingress
TP06	No GW encountered	Relatively dry
TP07	No GW encountered	Dry
TP08	3.2m bgl	Slow ingress
TP09	GW encountered at 1.35m bgl.	Rapid ingress, however stopped quickly, therefore a possible perched pocket.
TP10	3.5 m bgl	Steady ingress
TP11	4.0 m bgl	Slow ingress

* *Previous trial pits labelled TP01 and TP02 were undertaken by LF Solutions without Ayesa's attendance. The logs for these trial pits were not available.*

Figure 4 Groundwater Level Location Plan



2.4 Hydrology

The nearest surface waters to the site are the Grand Union Canal along the northern site boundary and the culverted course of the Dachett Brook, which is understood to be present beneath Uxbridge Road immediately east of the site. The Canal is not considered to be a likely receptor due to its elevated position in relation to the site, coupled with its upgradient location. Similarly, the Dachett Brook is not considered to be a receptor due to its location up-hydraulic gradient from the site.

2.5 Pollution History

2.5.1 Historical land uses and associated contaminants

As described in Section 2.1.3, there has been a history of paint and coatings manufacture on the site since circa 1919.

2.6 Evidence of historic contamination

2.6.1 Historical site investigation

Numerous intrusive investigations have been undertaken at the site from 2015. BGCL provide a summary of the previous intrusive investigations undertaken within their Remediation Scheme for Contamination Report (ref BGCL-C19019/001/v3) provided in support of planning application P/00072/096. This includes a summary of visual and olfactory evidence of contamination and previous Detailed Quantitative Risk Assessments (controlled waters and human health).

Historical land use left a legacy of contamination on the site, including from past uncontrolled waste disposal, resulting in soil and groundwater contamination:

- Tank Farm/Plume 1 – groundwater contamination including dissolved phase BTEX, TPH, and alcohols, as well a free phase hydrocarbon and elevated TPH concentrations in unsaturated soils. Buried drums, tins and gross paint contamination were also encountered during historical ground investigations
- Plume 2- localised plume of dissolved phase BTEX and TPH with occasional elevated concentrations in the unsaturated soils
- Plume 3- Historic solvent and oil storage and industrial use since the 1930s. Dissolved phase BTEX, TPH, chlorinated solvents and localised asbestos in the unsaturated soils. Buried drums, tins, oily rags, waste wood and gross hydrocarbon contamination in two burial pits.
- Plume 4- Groundwater plume with elevated dissolved phase BTEX, TPH and naphthalene.

2.6.2 Remediation and Verification of the Site

The site has been subject to a programme of remediation works undertaken by BCGL between 2019 and 2021. A multi-phased remediation of the site was undertaken, which comprised the following:

- Targeted delineation and further site-wide ground investigation
- Targeted abstraction and off-site disposal of floating free-phase hydrocarbons on the groundwater
- Provision of a downgradient permeable reactive barrier to intersect and treat residual dissolved phase contamination.
- Excavation and segregation of historical disposed waste and associated contaminated soils.
- Direct injection treatment of the dissolved phase groundwater plumes with Oxygen Release Compound
- Ex-situ bioremediation of excavated soils and off-site disposal of segregated extraneous materials
- Ongoing regular groundwater quality monitoring.

The remediation works were completed in 2021, and the Verification Report produced by BGCL was reviewed and approved by the Regulatory Authorities.

In addition, a Groundwater Monitoring and Decommissioning Report (Report No. K0681-AYE-ENV-R-0003 - Rev 02 - July 2025) was carried out in July 2025 by Ayesa. This report concluded that the monitoring and subsequent decommissioning works were completed, with no evidence of significant contamination linked to the piling activities. The observed results during decommissioning are considered to reflect localised borehole conditions and are not anticipated to compromise the overall environmental integrity of the site.

2.7 Baseline soil and groundwater reference data

Based on the remediation works undertaken on the site, legacy contamination risks associated with the historical activity undertaken at the location are considered to have been removed.
The BUGCL Remediation Completion and MMP Verification Report (and associated appendices) dated November 2021 (Ref BGCL-C19019/007/v3) establishes the current soil and groundwater baseline conditions at the site.

2.7.1 Supporting Information

- BGCL Former Akzonobel Site – Slough. Remediation Scheme for Contamination. December 2019
- BGCL Former Akzonobel Site- Slough. Remediation Completion and MMP Verification Report. February 2021.
- Slough Borough Council Application for Approval of Details Reserved by Condition. Amended Decision Notice 1st July 2022. Planning Application P/00072/116
- Groundwater Monitoring and Decommissioning Report, Yondr Slough, Report No. K0681-AYE-ENV-R-0003, July 2025

2.8 Air Quality

An air quality assessment has been carried out as part of the EPR Permit variation application. The full analysis and report is document "*100122494 LON1X2 Slough AQA_Report_v1.0.docx 100122494 1.0, October 2025"* and is available as Appendix E to the Permit Application Supporting Information Document.

This assessment included air dispersion modelling using the using the latest available version of the US EPA model AERMOD (24142) with the software being the BREEZE AERMOD. This model is the result of many years development by the US EPA and the American Meteorological Society. It has been developed as a regulatory model that incorporates the current understanding of atmospheric physical processes. This model is used by regulatory agencies, consultants and industry worldwide to assess the impact of air emissions from point, area, line, flare and volume sources.

AERMOD simulates essential atmospheric physical processes and provides refined concentration estimates over a wide range of meteorological conditions and modelling scenarios. The dispersion modelling system includes:

- an advanced meteorological pre-processor to compute site-specific planetary boundary layer parameters;
- highly developed dispersion formulations that incorporate current planetary boundary layer understanding and variables for both convective and stable boundary inversions;
- enhanced treatment of plume rise and plume penetration for elevated inversions, allowing for effects of strong updrafts and downdrafts that occur in unstable conditions; and
- improved computation of vertical profiles of wind, turbulence and temperature.

Two core model scenarios have been assessed, which each consider the emissions from the 32 generators associated with Building C (LON1X2) in combination with emissions from the 26 generators associated with Buildings A and B (LON1X0). The modelled scenarios are:

'**Most-likely' testing scenario**: monthly testing at no load for approximately 15 minutes per generator, and biannual on-load testing for a maximum of 6 hours per event (a total runtime of 12 hours per generator per year). The emissions were conservatively modelled, assuming that: testing of any individual engine could last up to an hour, at any time of the year giving a total runtime of 24 hours per generator per year, nearly twice the anticipated usage.

The ‘Most-likely’ testing scenario was set up to run every generator in all hours of the year, both individually and in combination. The results were factored to represent 24 hours of operation of each generator per year (6 x 2 hours load testing, 12 x 1-hour monthly testing).

The approach to modelling the maximum short-term impact for the ‘Most-likely’ testing scenario reflects Planning Condition 2 (see section 1.2) wherein no engine may be tested concurrently.

‘Worst case’ emergency scenario: an emergency power outage event, which is inherently unpredictable in terms of the timing, magnitude and duration of the occurrence. The emissions were conservatively modelled, assuming that: generators from Buildings A, B and C would run on-load with emissions at the maximum permitted limit; there could be 4-hour, 12-hour, or 72-hour outages, all involving continuous operation of all generators at maximum power output.

To estimate the maximum annual mean contribution, the results from the emergency scenario were combined with those for the ‘most-likely’ testing scenario.

Of these worst-case scenarios, the 4-hour event is considered a ‘reasonable worst case’, based on regional estimates10 suggesting such power outage events may occur approximately once every 23 years and not for longer than 4 hours.

For each scenario, estimates were made of the short- and long-term process contributions (i.e. the hourly/daily and annual average ground level concentrations at receptors) and where appropriate, the total concentration including baseline.

The key understanding or learning from this air quality modelling and assessment is that the modelled concentrations across the study area (isopleths) and estimated PECs at discrete receptors, the ‘most-likely’ testing scenario is not considered have a significant effect on existing annual mean NO2 concentrations either at receptors adjacent to the facility, or further afield within declared AQMAs. The achievement of the long-term NO2 AQS objective is therefore unaffected by the operation of the testing regime, despite the conservative assumptions within the modelling.

2.9 Noise Impact Assessment

ES Acoustics Ltd (ESA) were appointed by Yondr Group to undertake a noise impact assessment in support of the reserved matters submission for Building C of the proposed data centre development located at Wexham Road, Slough SL2 5DB. This assessment has been carried out to address the requirements of Planning Condition 12 associated with outline planning permission reference: P/00072/096.

Baseline sound conditions in the surrounding area were previously characterised by WYG as part of the noise assessment submitted with the outline planning application (Report Reference A114100, dated December 2019). ESA has used these established baseline parameters to inform the current assessment and ensure alignment with the planning condition.

This report presents the predicted noise emissions from the plant associated with Building C and evaluates the cumulative noise impact of the entire development. The total site emissions have been calculated by combining ESA’s assessment for Building C with Sweco’s assessments for Buildings A and B, the Substation, and the Mechanical Yard. The combined results demonstrate that the cumulative noise levels are within the limits specified by Planning Condition 12, thereby supporting its discharge and confirming that the site will operate in accordance with relevant environmental noise standards.

Refer to Appendix E of the Permit Application Supporting Information Document for the full report.

3. Permitted Activities

3.1 Permitted activities

This SCR has been developed in support of an application for an Environmental Permit under Schedule 1, Section 1.1 Part A(1)(a) 'Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.

See the Environmental Permit Supporting Information, for a full description of the site, including permitted activities and wider ancillary activities undertaken across the site. The remediation was approved by the regulatory bodies, including the local contaminated land officer and the Environment Agency, and Condition 34 (Contaminated Land Verification Report) of the planning permission was discharged in June 2022.

3.1.1 Non-permitted activities

Activities associated with the operation of a data centre, excluding the operation of diesel-fired generators and diesel storage.

3.1.2 Document references

See the Environmental Permit supporting information document for the site plan showing activity layout (Appendix A) and the Environmental Risk Assessment (Appendix B).

3.2 Operating Techniques

Technical standards and EA guidance used to ensure appropriate measures are followed as part of the data centre operation are listed as:

- Environment Agency - Risk assessments for your environmental permit https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit
- Environment Agency - Develop a management system: environmental permits https://www.gov.uk/guidance/develop-a-management-system-environmental-permits
- Department for Environment, Food & Rural Affairs (DEFRA)- Environmental permitting: Core Guidance for the Environmental Permitting (England and Wales) Regulations 2016 https://www.gov.uk/government/publications/environmental-permitting-guidance-core-guidance--2
- Department for Environment, Food & Rural Affairs (DEFRA) - Control and monitor emissions for your environmental permit https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit

The total rated thermal input of the 84 no. Generator sets is 517.097 MWth. The location of the generators, fuel tanks, emissions points (flues/stacks) and surface water connections are shown in the site plan found in Appendix A to the Permit Application Supporting Information Document. The installation boundary encompasses the listed activities only.

4. Operational Phase

The operation of the installation - subject to permit - does not include any point source emissions to land or groundwater. The principal risk to land and groundwater is associated with the accidental release of diesel to the ground. The design and installation of fuel storage facilities have been developed in accordance with best available techniques, whilst the site EMS, operating procedures and preventative maintenance regime will be developed to minimise the potential for accidental loss of fuel. These approaches set out how the operator will ensure that land and controlled waters are protected during the operational lifetime of the permit and how the site will be left in a satisfactory condition.

The sole risk to soil and groundwater is regarded to be the use of liquid fuels such as Diesel / HVO. The installation of boreholes to facilitate ongoing soil and groundwater monitoring is going to increase the risk to the environment as it will present a potential pathway to ground for pollutants e.g. in the unlikely event of a spillage. To mitigate the risks of spillages and fuel entering the environment, the site has primary, secondary and tertiary containment systems, with leak detection in place along with comprehensive spill control Site Operating Procedures (SOPs) and Emergency Operating Procedures (EOPs) in place, to prevent and contain pollution at source before it enters the environment. Given the above we are proposing that there is no requirement to complete ongoing soil and groundwater monitoring unless there is a pollution incident that warrants further investigation e.g. significant spillage which has led to pollution of the environment.

4.1 Changes to the Activity

4.1.1 Have there been any changes to the activity boundary?

Yes, Phase of the installation, Building C, has increased the site boundary. Please see the updated site boundary Appendix A to the Permit Application Supporting Information Document. To be further assessed if there are any future changes to the activity on decommissioning.

4.1.2 Have there been any changes to the permitted activities?

No, there has not been any change to the permitted activities. To be re-assessed if there are any future changes to the activity / on decommissioning.

4.1.3 Have any 'dangerous substances' not identified in the Application Site Condition Report been used or produced as a result of the permitted activities?

No. To be re-assessed if there are any future if there are changes to the activity / on decommissioning.

4.2 Measures taken to protect land

Use records that you collected during the life of the permit to summarise whether pollution prevention measures worked. If you can't, you need to collect land and/or groundwater data to assess whether the land has deteriorated.
Checklist of supporting information

- Inspection records and summary of findings of inspections for all pollution prevention measures
- Records of maintenance, repair and replacement of pollution prevention measures

To be completed on decommissioning and permit surrender.

4.3 Pollution incidents that may have had an impact on land, and their remediation.

Summarise any pollution incidents that may have damaged the land. Describe how you investigated and remedied each one. If you can't, you need to collect land and /or groundwater reference data to assess whether the land has deteriorated while you've been there.
Checklist of supporting information

- Records of pollution incidents that may have impacted on land
- Records of their investigation and remediation

To be completed on decommissioning and permit surrender. It has been reported to EHS International by Yondr Group Limited, no pollution incidents have occurred since the permit EPR/NP3829SP was granted.

4.4 Soil gas and water quality monitoring (where undertaken)

Provide details of any soil gas and/or water monitoring you did. Include a summary of the findings. Say whether it shows that the land deteriorated as a result of the permitted activities. If it did, outline how you investigated and remedied this.
Checklist of supporting information:

- Description of soil gas and/or water monitoring undertaken
- Monitoring results (including graphs).
-

Groundwater Monitoring and Decommissioning Report

A groundwater monitoring and decommissioning report was carried out in July 2025 to assess potential impacts on groundwater quality associated with piling activities at the former AkzoNobel site. The works involved groundwater sampling and analysis, followed by the subsequent borehole decommissioning of the boreholes located across the site. The works were split into three phases: pre-piling, during piling and post-piling, to provide assurances that any residual contamination within the shallower Taplow Gravel strata is not disturbed and subsequently impacts groundwater as a result of the piling activities.

Groundwater monitoring and sampling commenced on 4th November 2024, and occurred weekly prior to and during the piling, and fortnightly for a period of three months thereafter. This approach provided a robust dataset to evaluate any changes in groundwater quality.

Following the completion of the sampling works, the wells were decommissioned as per the Piling Risk Assessment. The decommissioning works consisted of infilling the redundant boreholes with a bentonite/cement grout via the existing monitoring well screens installed within the boreholes. Although it was provisioned to decommission all six wells, an anomaly in groundwater results observed in borehole pair 403 (located to the east of the site) led to a decision to defer decommissioning of the remaining two boreholes pending further investigation. During our site visit of 16 October 2025, we were informed by Collen staff that all BH's have now been decommissioned.

The monitoring results indicated that the majority of determinants remained stable and well below their respective guideline values throughout the monitoring period, indicating minimal and localised impact from the piling activities. While localised exceedances of benzene and xylenes were noted, particularly during and shortly after piling, there is no clear evidence of widespread or sustained deterioration in groundwater quality. Observed exceedances were generally consistent with historical patterns, with no emergent trends indicative of significant contamination attributable to piling activities. Refer to Appendix J of the Permit Application Supporting Information Document for the full report.

5. Site Closure & Surrender

The surrender part of the SCR is intended to describe the condition of the land and groundwater at the point at which an application to surrender the environmental permit is made. It must provide the evidence necessary to convince the Environment Agency (EA) that the site does not pose a pollution risk and is in a satisfactory state.

This section of the SCR is intentionally left blank in order to allow changes to be made as and when they occur.

5.1 Decommissioning and removal of pollution risk

Describe how the site was decommissioned. Demonstrate that all sources of pollution risk have been removed. Describe whether the decommissioning had any impact on the land. Outline how you investigated and remedied this.

Checklist of supporting information:

- Site closure plan
- List of potential sources of pollution risk
- Investigation and remediation reports (where relevant)

5.2 Reference data and remediation (where relevant)

Say whether you had to collect land and/or groundwater data. Or say that you didn't need to because the information from sections 3, 4, 5 and 6 of the Surrender Site Condition Report shows that the land has not deteriorated.
If you did collect land and/or groundwater reference data, summarise what this entailed, and what your data found. Say whether the data shows that the condition of the land has deteriorated, or whether the land at the site is in a "satisfactory state". If it isn't, summarise what you did to remedy this. Confirm that the land is now in a "satisfactory state" at surrender.
Checklist of supporting information

- Land and/or groundwater data collected at application (if collected)
- Land and/or groundwater data collected at surrender (where needed)
- Assessment of satisfactory state
- Remediation and verification reports (where undertaken)

5.3 Statement of site condition

Using the information from sections 3 to 7, give a statement about the condition of the land at the site. This should confirm that:

- the permitted activities have stopped
- decommissioning is complete, and the pollution risk has been removed
- the land is in a satisfactory condition.

Appendix G – Noise Impact Assessment

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Noise Impact Assessment Report for Discharge of Condition 12 Pertaining to Building C

Former Akzonobel Decorative Paints Facility, Wexham Road, Slough, SL2 5DB

Report Reference 20309.NIA-RPT.01

ES Acoustics Limited Registered in England Company No. 14373293
ES Acoustics is part of Environmental Sensors (Registered in England Company No. 12699902)

Project Address	Former Akzonobel Decorative Paints Facility, Wexham Road, Slough, SL2 5DB
Report Title	Noise Impact Assessment Report for Discharge of Condition 12 Pertaining to Building C
Prepared For	Yondr Group
Report Reference Number	20309.NIA-RPT.01
Principal Author	Daniel J. Green MIOA, Principal Acoustic Consultant
Report Checked By	Duncan Arkley MIOA, Principal Acoustic Consultant

Document Revision History		
Revision Reference	**Issue Date**	**Purpose and/or Description of Revision**
Draft Issue	8th February 2024	Noise impact assessment report for reserved matters application pertaining to the discharge of Condition 12 for Building C
Formal Issue	28th February 2024	
Rev A	19th June 2024	Report updated to include additional scenarios to reflect the generator testing schedules and relevant supporting information

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EXECUTIVE SUMMARY

ES Acoustics Ltd (ESA) have been commissioned by Yondr Group to prepare a noise impact assessment in support of a reserved matters submission for Building C of the proposed data centre development at Wexham Road, Slough SL2 5DB, as required by Planning Condition 12 of outline planning permission reference: P/00072/096. The prevailing sound conditions in the area have been determined by WYG as part of the noise impact assessment for the outline planning application (Report Reference A114100, dated December 2019), from which ESA have established the parameters set by the Planning Condition.

The full commercial aspect of the scheme to which Planning Condition 12 relates comprises 3 no. data centre buildings (Buildings A, B and C) with an associated substation and mechanical yard. A previous noise impact assessment was prepared for Buildings A and B, the Substation, and Mechanical Yard of the development by Sweco (report reference 66202273-SWE-ZZ-XX-YA-RP-0002, Rev.: P02, dated 19/03/2021). Based on the outcome of this report, it is understood that Planning Condition 12 has been discharged in relation to Buildings A and B.

This report details the resultant noise emissions from the plant associated with Building C, allowing the full noise emissions from the site to be understood to such that Planning Condition 12 can be discharged in relation to Building C.

The overall noise emissions from the full scheme have been established by adding the calculated noise emissions from Building C (undertaken by ES Acoustics) with the calculated noise emissions from Buildings A and B, the Substation, and Mechanical Yard (undertaken by Sweco).

The resultant noise emissions from the full site at the closest noise sensitive receptors are compliant with the requirements of Planning Condition 12.

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LIST OF ATTACHMENTS

Appendix A	Acoustic Terminology
Appendix B	Policy Standards and Guidance Review
Appendix C	Noise Maps for Various Assessment Scenarios

1 INTRODUCTION

ES Acoustics Ltd (ESA) have been commissioned by Yondr Group to prepare a noise impact assessment in support of a reserved matters submission for Building C of the proposed data centre development at Wexham Road, Slough SL2 5DB, as required by Planning Condition 12 of outline planning permission reference: P/00072/096. The prevailing sound conditions in the area have been determined by WYG as part of the noise impact assessment for the outline planning application (Report Reference A114100, dated December 2019), from which ESA have established the parameters set by the Planning Condition.

The full commercial aspect of the scheme comprises 3 no. data centre buildings (Buildings A, B and C) with an associated substation and mechanical yard. A previous noise impact assessment was prepared for Buildings A and B, the substation, and mechanical yard of the development by Sweco (report reference 66202273-SWE-ZZ-XX-YA-RP-0002, Rev.: P02, dated 19/03/2021). Based on the outcome of this report, it is understood that Planning Condition 12 has been discharged in relation to Buildings A and B.

Planning Condition 12 relates to the whole commercial scheme including the aspects assessed by Sweco as noted above, and Building C, which is assessed within this report. Therefore, the overall noise emissions from the full scheme would be established by calculating the noise emissions associated with Building C, and adding this to the noise emissions levels calculated by Sweco for the remainder of the commercial scheme, to establish the overall noise impact (as required by the Planning Condition). Full details of the Condition are presented in Section 2.2.

The Client and Design Team have engaged ESA at an early stage to ensure that the development proposals for Building C have been reviewed in context of the full scheme and the requirements of Planning Condition 12. Building C has therefore been designed from the outset to ensure the requirements of the Planning Condition are met, and suitable mitigation measures incorporated into the design accordingly.

The preparation of this report has benefitted from initial correspondence and meetings held between Sweco and Slough Borough Council (SBC), detailed within the Sweco report, whereby the scope and methodology of the assessment were agreed. Confirmation was also provided that the use of the outline planning noise survey data is appropriate, and it assumed that this is still the case given that this report relates to the same Planning Condition.

2 POLICY, STANDARDS AND GUIDANCE

2.1 Policy, Standards and Guidance Review

A full review of relevant National Policy, Local Policy, British Standards and Good Practice Guidance has been undertaken, as outlined in Appendix B. A summary of the documentation reviewed is as follows:

- *National Planning Policy Framework (NPPF)*
- *Noise Policy Statement for England (NPSE)*
- *National Planning Practice Guidance (NPPG)*
- *The Local Plan for Slough including The Core Strategy Development Plan Document, Site Allocations Development Plan Document and Local Plan Saved Policies*
- *BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'*
- *BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'*

2.2 Noise Assessment Criteria

2.2.1 Normally Operating Plant and Operational Noise

This noise impact assessment is based on the requirements of Planning Condition 12 of the outline planning consent (P/00072/096), which states:

Planning Condition 12 - Noise assessment for commercial area

Alongside each first reserved matters application for each individual part within the commercial area a detailed noise assessment and mitigation scheme shall be submitted to and approved by the Council in writing.

a) The scheme will demonstrate:

i. how the overall sound rating level from normally operating plant will not exceed 2 dB(A) above the background noise levels at existing noise sensitive receptors; and

ii. how noise levels from normal external operations will not exceed 55 dB $L_{Aeq(1\ hr)}$ during the daytime (07:00 – 23:00); or 45 dB $L_{Aeq(1\ hr)}$ during the night-time (23:00 – 07:00); or 60 dB $L_{Amax(15\ mins)}$ during the night-time (23:00 – 07:00) as determined by measurement or calculation at free field locations representing facades of dwellings at existing noise sensitive receptors.

b) Cumulative noise from the operational use of the commercial development will not exceed 2 dB(A) above background noise levels at noise sensitive receptors. Noise levels from external operations will not exceed 55 dB $L_{Aeq(1\ hr)}$ during the daytime (07:00 – 23:00); or 45 dB $L_{Aeq(1\ hr)}$ during the night-time (23:00 – 07:00); or 60 dB $L_{Amax(15\ mins)}$ during the night-time (23:00 – 07:00) as determined by measurement or calculation at free field locations representing facades of existing noise sensitive receptors.

The noise impact assessment will be undertaken in accordance with BS 4142:2014+A1:2019. Further calculations would also be undertaken to consider the indoor ambient noise levels for residential properties as suggested in BS 8233:2014.

The approved noise mitigation scheme will be fully implemented in the construction and operation of the development and thereafter retained indefinitely.

2.2.2 Emergency Plant

It is understood that further to a pre-application meeting held by Sweco and Slough Borough Council (SBC) for the previous elements of the commercial scheme, SBC requested that specific criteria for emergency plant were not used for the scheme, and that the emergency operating condition noise levels should be calculated and stated at each receptor with windows open and windows closed so that a judgement of suitability could be made.

Section 5.4.3 of the Sweco report notes the following (with context changed accordingly):

- *There are no noise criteria for noise emissions during emergency operating conditions. To assist in the understanding the noise levels that will occur during the emergency condition, predictions would be made of the worst-case ambient plant noise levels at the receptor façades (façade incident levels), inside the residential receptors when windows are closed, and inside the residential receptors when windows are open. This has been requested by SBC.*
- *Exact predictions of noise break-in to the residential receptors would require detailed knowledge on the receptor's building envelope specifications, and internal room dimensions/finishes. This level of detail is not available, and therefore assumptions are made with regards to the reductions achieved in both scenarios.*
- *Standard double glazing is known to achieve a sound reduction index of approximately 30 – 34 dB R_w. The external walls would typically achieve a higher sound reduction performance than the windows. As a typical worst-case, a reduction of 30 dB would be applied where windows are closed.*
- *A typical reduction of 15 dB would be applied where the receptor's windows are open. This value is applicable to partially open windows and is taken from a range stated in the 1999 version of BS 8233. This value was confirmed as suitable by SBC in the pre-applicable meeting.*

ESA would follow the same methodology, calculating the worst-case ambient plant noise levels at the receptor façades, inside the residential receptors when windows are closed, and inside the residential receptors when windows are open.

The predicted internal noise levels (with windows open and closed) would be compared against the recommended internal noise levels for residential dwellings presented in BS 8233:2014 for informative purposes only. The levels are reproduced in Table 1.

Room	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Living Room	≤ 35 dB $L_{Aeq,16hr}$	N/A
Dining Room	≤ 40 dB $L_{Aeq,16hr}$	N/A
Bedroom	≤ 35 dB $L_{Aeq,16hr}$	≤ 30 dB $L_{Aeq,8hr}$

Table 1 BS 8233:2014 indoor ambient noise levels for dwellings

Indicative noise targets at the façade of the closest nearby receptors, and within the property of the closest noise sensitive property, for emergency plant would therefore be as follows:

Time	Worst-case Internal Noise Target	Receptor Window Open / Closed	Sound Reduction from Outside to Inside	Suggested Maximum Permissible Level at the Façade
Daytime 07:00-23:00	≤ 35 dB $L_{Aeq,16hr}$	Closed	30 dB	65 dB(A)
		Open	15 dB	50 dB(A)
Night-time 23:00-07:00	≤ 30 dB $L_{Aeq,8hr}$	Closed	30 dB	60 dB(A)
		Open	15 dB	45 dB(A)

Table 2 Internal noise targets and maximum permissible emergency plant noise level at the façade

3 SITE CONTEXT AND BACKGROUND INFORMATION

3.1 Site Description

The site is located to the east of Wexham Road and falls within the jurisdiction of Slough Borough Council. The surrounding area is a mixture of commercial and residential uses.

Building C forms part of a wider development which includes the Substation and Buildings A and B of the commercial scheme, as well as an area with outline permission for residential development to the south.

Figure 1 presents the red line boundary for the previous part of the scheme (Building A, Building B and the Substation) and a green boundary line for the area where Building C will be constructed.

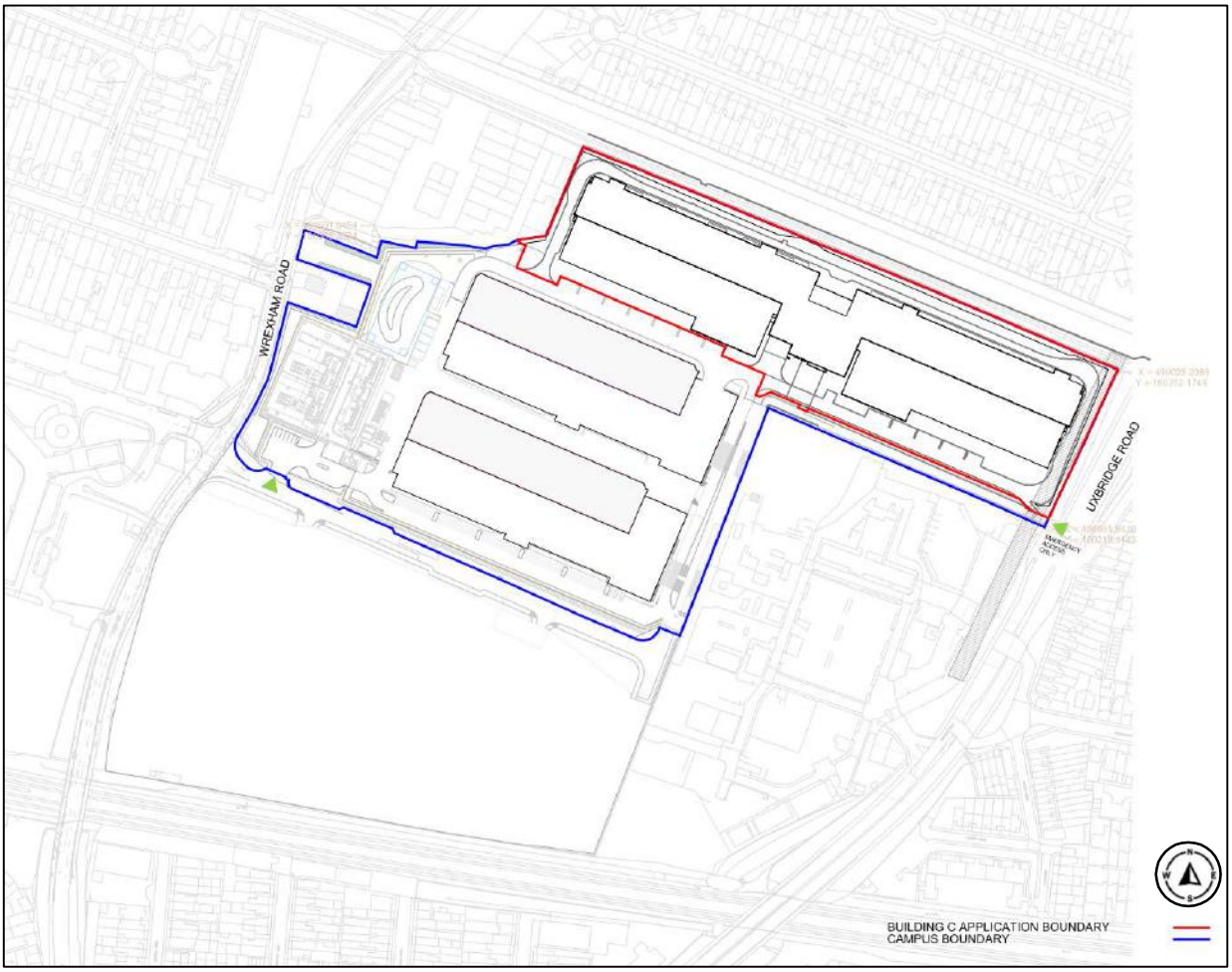


Figure 1 Site location plan

3.2 Closest Receptor Properties

The closest noise sensitive receptors to Building C are the residential properties on Hazlemere Road to the north (R1), the residential properties on Uxbridge Road to the east (R2), the area to the south of Buildings A, B and C with outline planning consent for future residential development (R3), and the residential properties on Wexham Road to the west (R4).

The receptor references are kept in line with those used within the previous noise impact assessment reports for the scheme for consistency.

In order to ensure that appropriate mitigation is specified, all receptor locations would be assessed to provide a clear picture of noise emissions from Building C.

The receptor locations are identified in Figure 2.

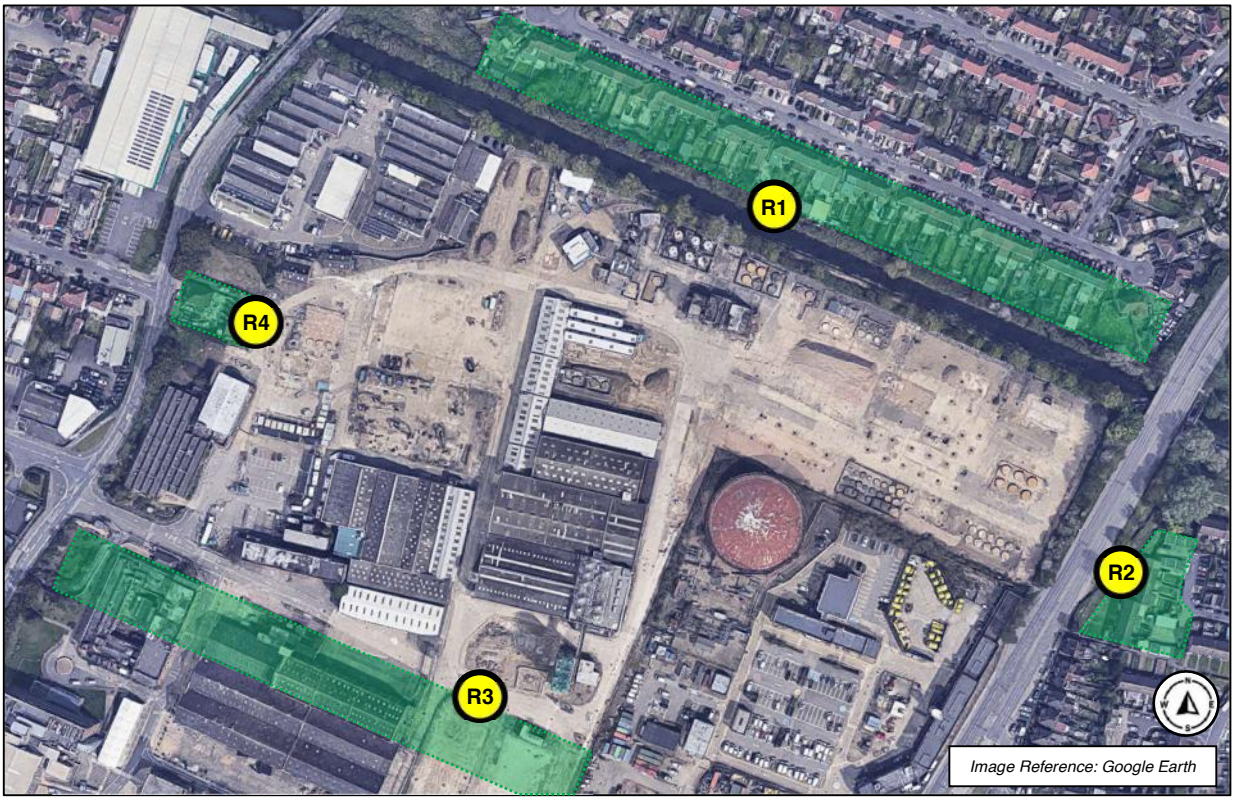


Figure 2 Closest receptor locations

3.3 Proposed Development

Building C would deliver a 40MW data centre comprised of data halls at ground and first floors and facilities support/office spaces at first floor level.

The data halls would be cooled by Chillers which are located on a raised gantries to either side of the central facilities support and office core.

Generators are proposed to provide backup power in the event of emergencies, externally at ground floor level to the south side of the data halls. Generators will be tested regularly under normal operating conditions and all generators will run in the event of a power outage.

Containerised Electrical Plantrooms (CEPs) are proposed externally at equivalent first floor level, positioned above the Generators and adjacent to the Chillers. Each CEP would be served by two external condenser units positioned at a central position on top of the unit, and two extract fans positioned at high levels on the sides of the units.

It is understood that there will also be a selection of Facilities Support Plant which will be located at ground floor level underneath the Chiller gantries.

Ground and first floor layouts are shown in the proposed plans below:

Figure 3 Ground (top), first-floor (middle) and roof (bottom) plans

4 BASELINE NOISE LEVELS

4.1 Measurement Location and Procedure

The prevailing sound conditions in the area have been determined by WYG as part of the noise impact assessment for the outline planning application (Report Reference A114100, dated December 2019).

The WYG report presents and uses two data types for background noise, including numerous long-term and short-term monitoring locations to determine the noise climate across the development. It is understood that for the long-term monitoring positions, the typical background noise level is presented as the modal average of 5-minute sample periods which were measured continuously throughout the day and night-time periods. For short-term measurements, 15-minute sample periods were used, and measurements were undertaken at each location during the daytime, evening and night-time periods.

The typical background noise levels presented by WYG in the outline application are considered representative and robust. Note that the noise levels measured by WYG were subsequently used by Sweco as part of their noise assessment for the Substation and Buildings A and B, as agreed by SBC.

Full details of the survey, including survey methodology, equipment used, survey results and time history graphs are presented in the WYG noise assessment. A summary of the typical background noise levels and ambient noise levels captured are presented in the figures below. Note that the redline boundary indicated is from the outline permission and not indicative of the current application for Building C only.

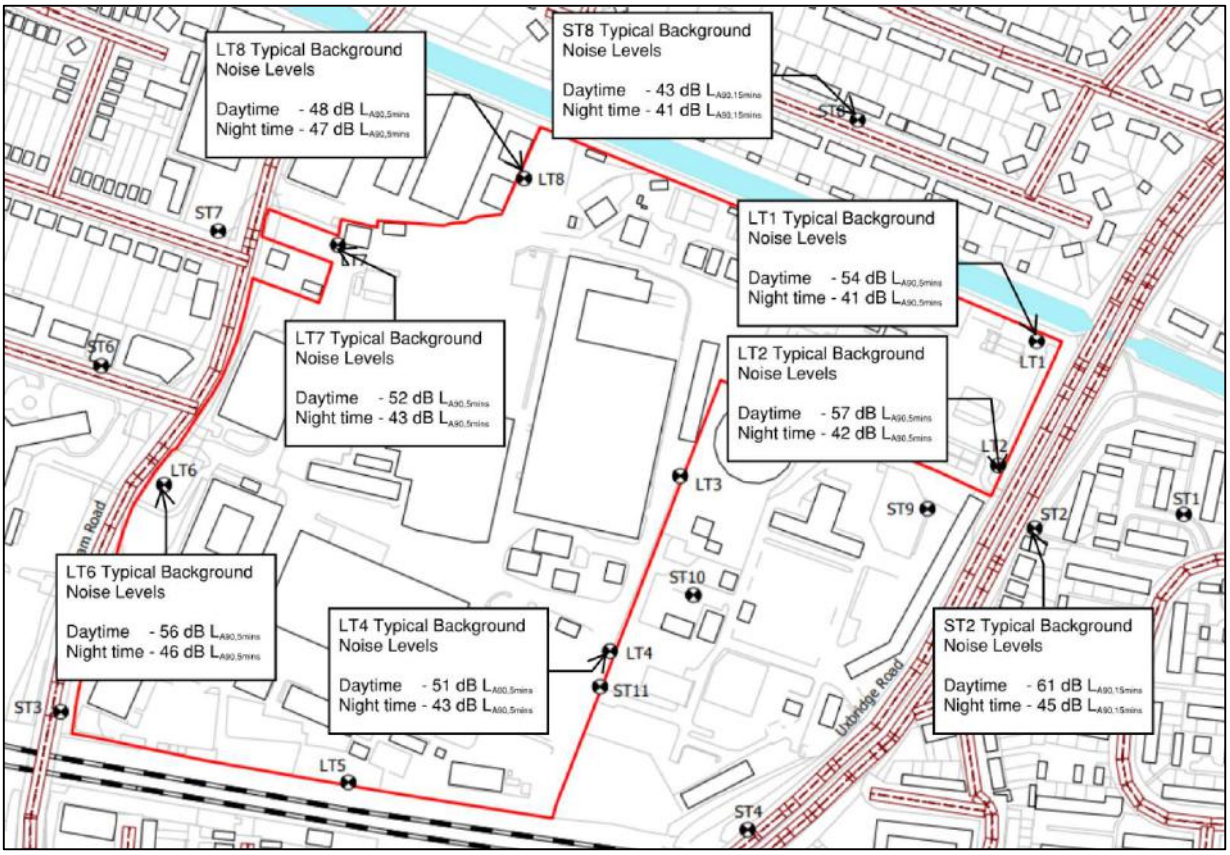


Figure 4 Background noise levels (L_{A90})

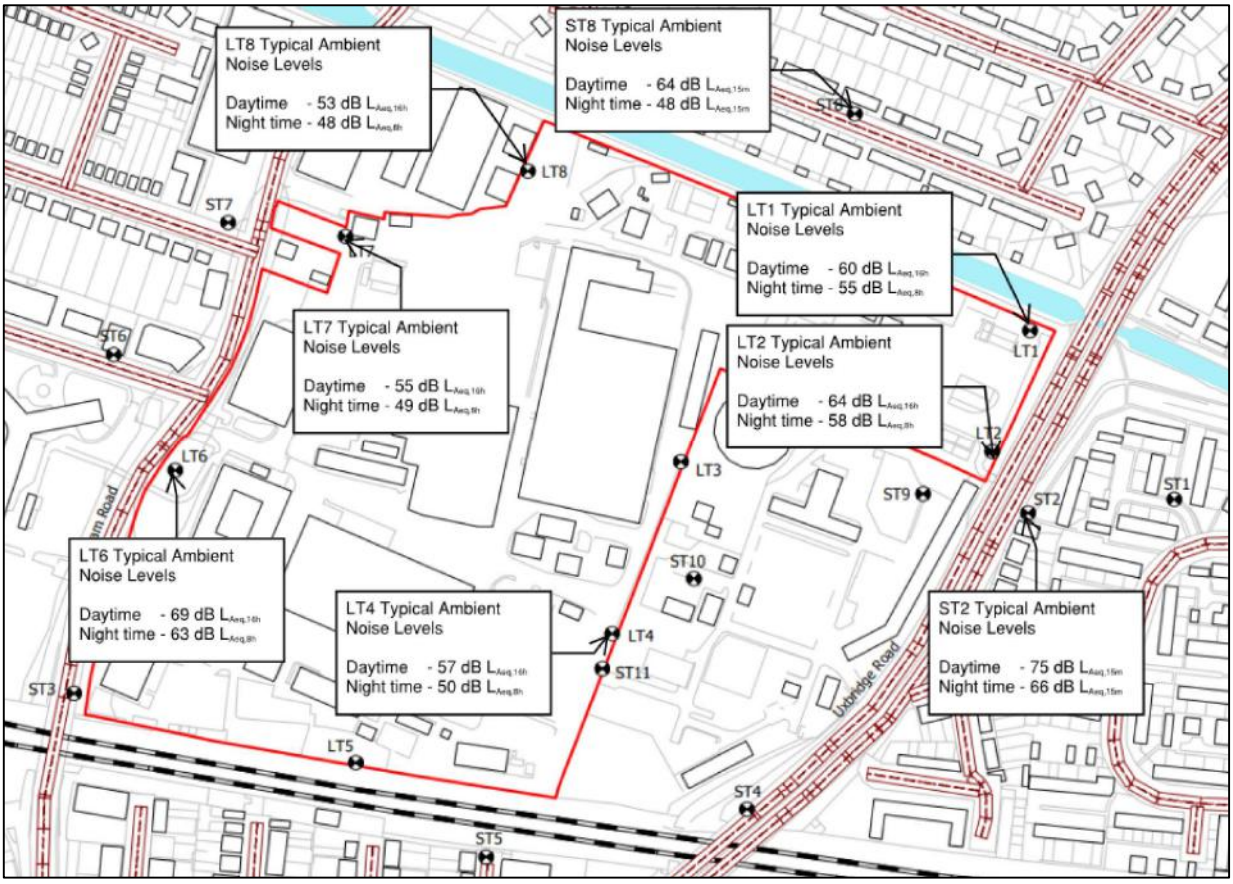


Figure 5 Ambient noise levels (L_{Aeq})

5 NOISE IMPACT ASSESSMENT

5.1 Assessment Criteria

5.1.1 Planning Condition 12 Criteria for the Full Scheme

The assessment criterion for each noise sensitive receptor for non-emergency plant have been set to ensure compliance with Planning Condition 12, which states:

"The overall sound rating level from normally operating plant will not exceed 2dB(A) above the background noise levels at existing noise sensitive receptors."

In order to maintain consistency with the Sweco report prepared for Buildings A, B, the Substation and Mechanical Yard, the same background noise levels and limiting noise criteria are shown in the table below. This would ensure that the additive aspect of the noise assessment, to assess the combined noise emissions from all Buildings, remains consistent.

The only exception to this is the background sound level used during night-time hours at R2 (properties on Uxbridge Road to the east), where Sweco used a background sound level of 42 dB(A) based on the noise levels measured at LT2 (see Figure 4). ESA would instead propose to use the background sound level of 45 dB(A) measured at ST2 which is directly reflective of the receptor location in question.

Receptor No.	Location	Time	Background Level L_{A90} (dB)	Limiting Criteria for Normally Operating Plant $L_{Aeq,\,T}$ dB
R1	Hazlemere Road (north)	07:00-23:00	43	45
		23:00-07:00	41	43
R2	Uxbridge Road (east)	07:00-23:00	54	55*
		23:00-07:00	45	47
R3	Future Residential (south)	07:00-23:00	50	52
		23:00-07:00	43	45
R4	Wexham Road (west)	07:00-23:00	52	54
		23:00-07:00	43	45

Table 3 Summary of background noise levels and limiting noise emissions criteria at each receptor location
The criterion for this location and period is set against the ambient planning condition requirement (55 dB $L_{Aeq,T}$ during the day) as this is more onerous than the background noise level criterion.

The above limits apply to the total noise emission levels from all static plant and processes within the full commercial development i.e. the Substation and Buildings A, B and C. Therefore, noise from individual Buildings, or on a more granular level, individual plant items, will need to be designed to a lower limit such that the overall total level achieves the stated criteria above.

The final plant noise predictions would need to include the calculated noise emissions from Building C, which would need to be added to the calculated noise emissions from Building A, Building B, the Substation, and Mechanical Yard (as calculated by Sweco), to ensure the cumulative level achieves the criteria as required by Planning Condition 12.

5.1.2 Noise Emissions Calculated for Building A, Building B, the Substation and Mechanical Yard Including Generator Testing Schedule

The final noise emissions calculated by Sweco for Building A, Building B, the Substation, and Mechanical Yard, including an allowance for the generator testing schedule, are presented in Figure 6 and Table 4 below. Note that 3 no. receptor positions have been assessed for the properties on Hazlemere Road to the north (R1) and 2 no. receptor positions have been assessed for the Future Residential block to the south (R3). The individual receptor positions are described by their corresponding position in Figure 6.

Figure 6 Noise emission predictions for Building A, Building B, Substation and Mechanical Yard Including Generator Testing Schedule (provided by Sweco)

Receptor No.	Location	Time	Limiting Criteria for Normally Operating Plant $L_{Aeq,\,T}$ dB	Predicted Noise Level for Building A + B, SS & MY* $L_{Aeq,\,T}$ dB
R1 (west)	Hazlemere Road (north)	07:00-23:00	45	45
		23:00-07:00	43	40
R1 (central)	Hazlemere Road (north)	07:00-23:00	45	43
		23:00-07:00	43	41
R1 (east)	Hazlemere Road (north)	07:00-23:00	45	41
		23:00-07:00	43	39
R2	Uxbridge Road (east)	07:00-23:00	55	43
		23:00-07:00	47	38
R3 (west)	Future Resi (south)	07:00-23:00	52	47
		23:00-07:00	45	40
R3 (east)	Future Resi (south)	07:00-23:00	52	45
		23:00-07:00	45	41
R4	Wexham Road (west)	07:00-23:00	54	54
		23:00-07:00	45	45

Table 4 Summary of predicted noise levels from Buildings A and B, the Substation and Mechanical Yard (including generator testing) vs the limiting noise emissions criteria to ensure planning compliance
SS: Substation, MY: Mechanical Yard

5.1.3 Noise Emissions Calculated for Building A, Building B, the Substation and Mechanical Yard Excluding Generator Testing Schedule

The final noise emissions calculated by Sweco for Building A, Building B, the Substation, and Mechanical Yard, excluding an allowance for the generator testing schedule, are presented in Figure 7 and Table 5 below. It must be noted that the purpose of providing this information is that it is understood that the Environmental Agency restricts the number of generators under test at any one time to 1 no. generator. Therefore, in cases where the generators for Building C are being tested, no generators would be under test for Buildings A or B.

As above, 3 no. receptor positions have been assessed for the properties on Hazlemere Road to the north (R1) and 2 no. receptor positions have been assessed for the Future Residential block to the south (R3). The individual receptor positions are described by their corresponding position in Figure 7.

Figure 7 Noise emission predictions for Building A, Building B, Substation and Mechanical Yard with no Generator Testing (provided by Sweco)

Receptor No.	Location	Time	Limiting Criteria for Normally Operating Plant $L_{Aeq,\,T}$ dB	Predicted Noise Level for Building A + B, SS & MY* $L_{Aeq,\,T}$ dB
R1 (west)	Hazlemere Road (north)	07:00-23:00	45	42
		23:00-07:00	43	41
R1 (central)	Hazlemere Road (north)	07:00-23:00	45	42
		23:00-07:00	43	41
R1 (east)	Hazlemere Road (north)	07:00-23:00	45	41
		23:00-07:00	43	39
R2	Uxbridge Road (east)	07:00-23:00	55	41
		23:00-07:00	47	38
R3 (west)	Future Resi (south)	07:00-23:00	52	44
		23:00-07:00	45	40

Receptor No.	Location	Time	Limiting Criteria for Normally Operating Plant $L_{Aeq, T}$ dB	Predicted Noise Level for Building A + B, SS & MY* $L_{Aeq, T}$ dB
R3 (east)	Future Resi (south)	07:00-23:00	52	44
		23:00-07:00	45	41
R4	Wexham Road (west)	07:00-23:00	54	51
		23:00-07:00	45	45

Table 5 Summary of predicted noise levels from Buildings A and B, the Substation and Mechanical Yard (with no generator testing) vs the limiting noise emissions criteria to ensure planning compliance
SS: Substation, MY: Mechanical Yard

5.1.4 Noise Emissions Criteria for Building C (Excluding Generator Testing for Building C)

The noise emission calculations for the initial part of the scheme has allowed specific noise emissions criteria for Building C to be established, to ensure that once noise emissions from all aspects of the scheme are added together, the requirements of the Planning Condition are met.

Table 6 shows the limiting criteria for the full scheme, the predicted noise emissions from Building A, Building B, the Substation and Mechanical Yard (including the generator testing schedule for Buildings A and B) by Sweco, and the resultant maximum noise emissions allowable for Building C (excluding generator testing for Building C) to ensure the Planning Condition is met.

Receptor No.	Time	Limiting Criteria for Normally Operating Plant $L_{Aeq, T}$ dB	Predicted Noise Level for Building A, Building B, SS & MY* $L_{Aeq, T}$ dB	Maximum Noise Emissions from Building C Excluding Generator Testing $L_{Aeq, T}$ dB
R1 (west)	07:00-23:00	45	45	35
	23:00-07:00	43	40	40
R1 (central)	07:00-23:00	45	43	41
	23:00-07:00	43	41	39
R1 (east)	07:00-23:00	45	41	43
	23:00-07:00	43	39	41
R2	07:00-23:00	55*	43	55
	23:00-07:00	47	38	46
R3 (west)	07:00-23:00	52	47	50
	23:00-07:00	45	40	43
R3 (east)	07:00-23:00	52	45	51
	23:00-07:00	45	41	43
R4	07:00-23:00	54	54	44
	23:00-07:00	45	45	35

Table 6 Summary of the allowable noise emissions from Building C based on the predicted noise levels from Buildings A and B, the Substation and Mechanical Yard and the limiting noise emissions criteria to ensure planning compliance
SS: Substation, MY: Mechanical Yard

5.1.5 Noise Emissions Criteria for Building C (Including Generator Testing for Building C)

The noise emission calculations for the initial part of the scheme has allowed specific noise emissions criteria for Building C to be established, to ensure that once noise emissions from all aspects of the scheme are added together, the requirements of the Planning Condition are met.

Table 7 shows the limiting criteria for the full scheme, the predicted noise emissions from Building A, Building B, the Substation and Mechanical Yard (without generator testing for Building A and B) by Sweco, and the resultant maximum noise emissions allowable for Building C (including generator testing for Building C) to ensure the Planning Condition is met.

Receptor No.	Time	Limiting Criteria for Normally Operating Plant $L_{Aeq,T}$ dB	Predicted Noise Level for Building A, Building B, SS & MY* $L_{Aeq,T}$ dB	Maximum Noise Emissions from Building C Including Generator Testing $L_{Aeq,T}$ dB
R1 (west)	07:00-23:00	45	42	41
	23:00-07:00	43	41	39
R1 (central)	07:00-23:00	45	42	41
	23:00-07:00	43	41	39
R1 (east)	07:00-23:00	45	41	43
	23:00-07:00	43	39	41
R2	07:00-23:00	55*	41	55
	23:00-07:00	47	38	46
R3 (west)	07:00-23:00	52	44	51
	23:00-07:00	45	40	43
R3 (east)	07:00-23:00	52	44	51
	23:00-07:00	45	41	43
R4	07:00-23:00	54	51	54
	23:00-07:00	45	45	45

Table 7 Summary of the allowable noise emissions from Building C based on the predicted noise levels from Buildings A and B, the Substation and Mechanical Yard and the limiting noise emissions criteria to ensure planning compliance
SS: Substation, MY: Mechanical Yard

5.2 Proposed Building Services Plant for Building C

5.2.1 Chillers

The Chillers would be provided by Airedale (model DeltaChill R32) with a scheme of noise attenuation measures implemented by Allaway Acoustics. It is understood that the design targets provided to Airedale and Allaway Acoustics were as follows:

Chiller Measurement Location	Daytime Sound Pressure Level at 10m	Night-time Sound Pressure Level at 10m
Horizontally	43 dB(A)	37 dB(A)
Above	56 dB(A)	50 dB(A)
Below	58 dB(A)	52 dB(A)

Table 8 Design target noise levels for chillers

The mitigation for the chillers is comprised of an upflow acoustic enclosure, as shown in the figure below:

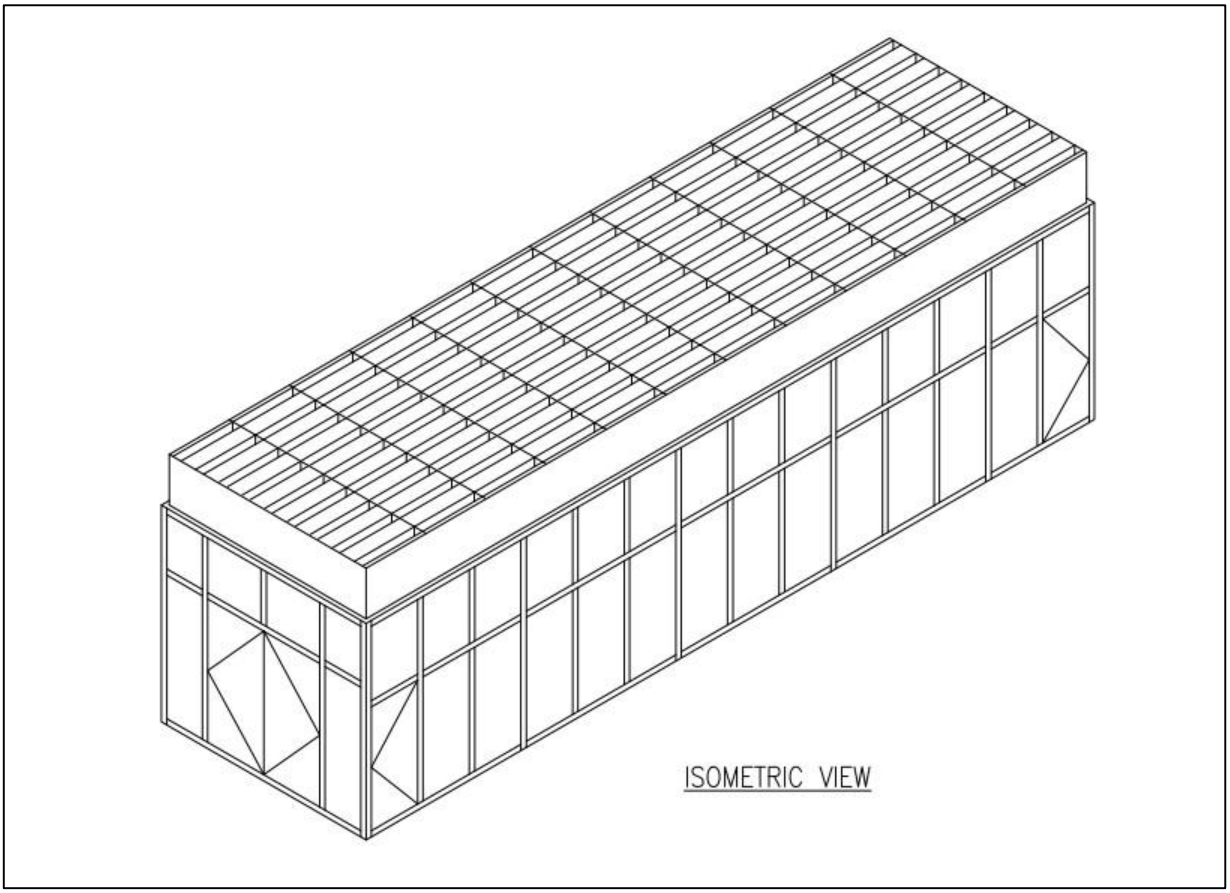


Figure 8 Isometric view of chiller enclosures

The resultant noise emissions from the Chillers once mitigated are as reported in Table 9.

Mitigated Airedale Chiller Noise Emissions	Sound Pressure Level at 10m (dB) at Octave Band Centre Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
40C 10m horizontal	53.6	55.6	43.8	32.8	20.9	14.5	17.0	21.4	41.5
40C 10m above	53.5	55.5	41.8	31.2	24.1	23.3	25.7	33.3	41.6
40C 10m below	54.5	56.5	43.8	33.2	24.1	25.3	28.7	33.3	42.8

Table 9 Noise emissions data for Chiller plant (with mitigation applied)

In order to ensure the noise calculations and noise model presents a complete worst-case scenario, the higher design target noise levels would be used within the assessment.

5.2.2 CEPs

Each CEP unit will be served by and 2 no. condensers and 2 no. extraction fans.

The 2 no. condenser units will be MCL110-1 Mcx EC Fan units positioned on top of the CEP containers at a centralised position. The 2 no. extraction fans are yet to be selected but will not exceed a sound power level of 75 dB(A).

Table 12 presents a summary of the plant noise levels used for this assessment.

Plant Type	Manufacturer's Noise Emissions
CEP: Switchroom Container – Impulse/Extract Fans Make / Model to be selected	Sound Power Level: 75 dB(A)
CEP: Battery Module (Container) – Condensers MCL110-1 Mcx EC Fan units	Sound Pressure Level at 5m: 57 dB(A)

Table 10 Noise emissions data for CEP plant

5.2.3 Generators

Generator noise emission levels are presented in the table below. Each Generator will be located within an attenuating container and will have attenuation to the exhaust and flue. The generator enclosures have been selected to not exceed a sound pressure level of 60 dB(A) at 7m.

Description	Sound Pressure Level at 1m (dB) at Octave Band Centre Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Outside container wall	70	76	71	64	60	60	57	65	70
Before air inlet attenuator	90	83	73	59	54	51	48	60	71
Outside air outlet attenuator	91	83	73	61	57	53	50	66	72
Outside flue gas silencer	94	82	70	63	62	58	50	-	72

Table 11 Noise emissions data for Generator plant

Under normal conditions, the generators will be subject to regular testing. The proposed test regime for each generator is currently as follows:

- *Monthly testing for a duration of 15 minutes at no load; and*
- *6 monthly testing for a duration of 6 hours – totalling 12 hours per year.*

Onload testing is to be undertaken on one generator at a time, with the maximum number of generators being tested at any one time being 2 (one offload and one onload). In order to reduce the potential noise impact to the surrounding noise sensitive receptors, it is recommended that testing only occurs during daytime hours (07:00-23:00).

The emergency condition includes for all generators running at full capacity. This will only occur if there is a power outage is therefore not considered under normal operating conditions. As part of the previous reserved matters report for Buildings A and B, additional detail was sought regarding the average amount of time that power outages are likely to occur, and therefore the likely periods for which the emergency operating condition (all generators active) will occur. The site is to be connected to a reliable DNO network

supplied by SSE. Based on the latest published data from Ofgem in March 2021, the actual average minutes lost per customer per year for the network is 51.4 minutes.

5.2.4 Other Plant Items

A number of other small condensers and VRF condensers are proposed for the scheme to serve the internal office and ancillary spaces. The condensers will be situated under the chiller gantries, and split between the two core areas as follows:

West Plant Block

- 2 no. Airedale CR65-0 chillers (serving BSFE rooms)
- 4 no. Mitsubishi PUZ-Z100YKA units
- 1 no. Mitsubishi PURY-EP1100YSNW-A2 unit

East Plant Block

- 2 no. Airedale CR65-0 chillers (serving BSFE rooms)
- 6 no. Mitsubishi PUZ-Z100YKA units
- 1 no. Mitsubishi PURY-EP1100YSNW-A2 unit

Table 12 presents a summary of the manufacturers plant noise levels used for this assessment:

Plant Type	Manufacturer's Sound Power Levels
Airedale CR65-0 chillers	81 dB(A)
Mitsubishi PUZ-Z100YKA condenser	92 dB(A) at 100% capacity
Mitsubishi PURY-EP1100YSNW-A2 condenser	69 dB(A)

Table 12 Noise emissions data for 'other plant' items

5.2.5 Internal Noise Breakout from Data Halls

Calculations have been undertaken to predict the internal levels in the proposed Data Halls and Mechanical Corridors. The main sound sources dictating the reverberant noise levels in these spaces are fan walls. 24 no. fan walls are proposed per mechanical corridor and per data hall for a total of 48 no. fan walls.

At this stage it is assumed that the proposed fan walls proposed for Building C would be the same as those for Buildings A and B. Noise levels are shown in Table 13.

Description	Sound Pressure Level at 1m (dB) at Octave Band Centre Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Case breakout	96	101	95	91	87	84	84	76	97
Discharge air	96	101	95	91	87	84	84	76	97
Return air	96	101	95	91	87	84	84	76	97

Table 13 Noise emissions data for fan wall

Reverberant noise levels as per Building B are currently assumed, as follows:

- *Data Hall: 80 dB(A)*
- *Mechanical Corridor: 97 dB(A)*
- *Intermediate Distribution Frame Rooms: 90 dB(A)*
- *MEP for IDF rooms: 90 dB(A)*

Panelled façades with internal linings and lightweight roof systems are proposed. The sound reduction index specifications listed below have been assumed:

- *External Wall – Data Hall: 28 dB $R_w + C_{tr}$*
- *Roof – Data Hall: 38 dB $R_w + C_{tr}$*
- *Roof – Mechanical Corridor: 31 dB $R_w + C_{tr}$*

5.3 Noise Modelling Exercise

Proprietary modelling software SoundPlan 8.2 has been used to provide a visual representation of the noise emissions associated with Building C based on the proposed plant outlined above.

6 no. key operational scenarios have been assessed, which are as follows:

1. Daytime 07:00-23:00 – all plant operational to determine the worst-case scenario during daytime hours. This includes the emergency operating condition with all generators running simultaneously.
2. Daytime 07:00-23:00 – normal site operating conditions, including all plant (but not the generators or any generator testing)
3. Daytime 07:00-23:00 – normal site operating conditions, including all plant in addition to the generators at the outer edges of the compound as per Section 5.2.3)
4. Daytime 07:00-23:00 – normal site operating conditions, including all plant in addition to the generators at the inner edges of the compound as per Section 5.2.3)
5. Night-time 23:00-07:00 – all plant operational to determine the worst-case scenario during night-time. This includes the emergency operating condition with all generators running. Note that this would be a highly unlikely scenario, as generators would be tested during daytime hours and only operational during night-time hours in the emergency condition. Even in the emergency condition, it is highly unlikely that all generators would be operational at once.
6. Night-time 23:00-07:00 – normal site operating conditions, including all plant (but not the generators)

The resultant noise maps for each assessment scenario are presented below. Full sized maps are presented in Appendix C.

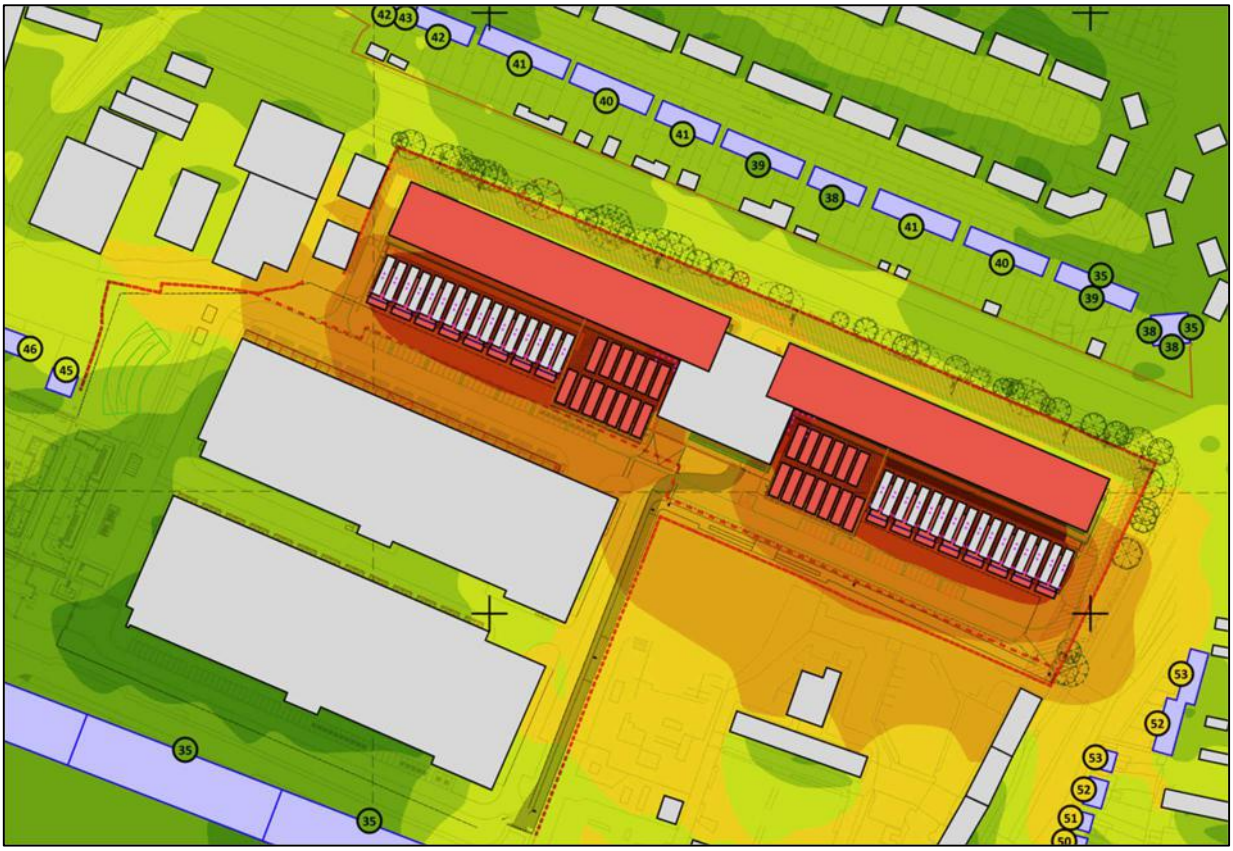


Figure 9 Noise Map 1: Daytime hours, all plant operational

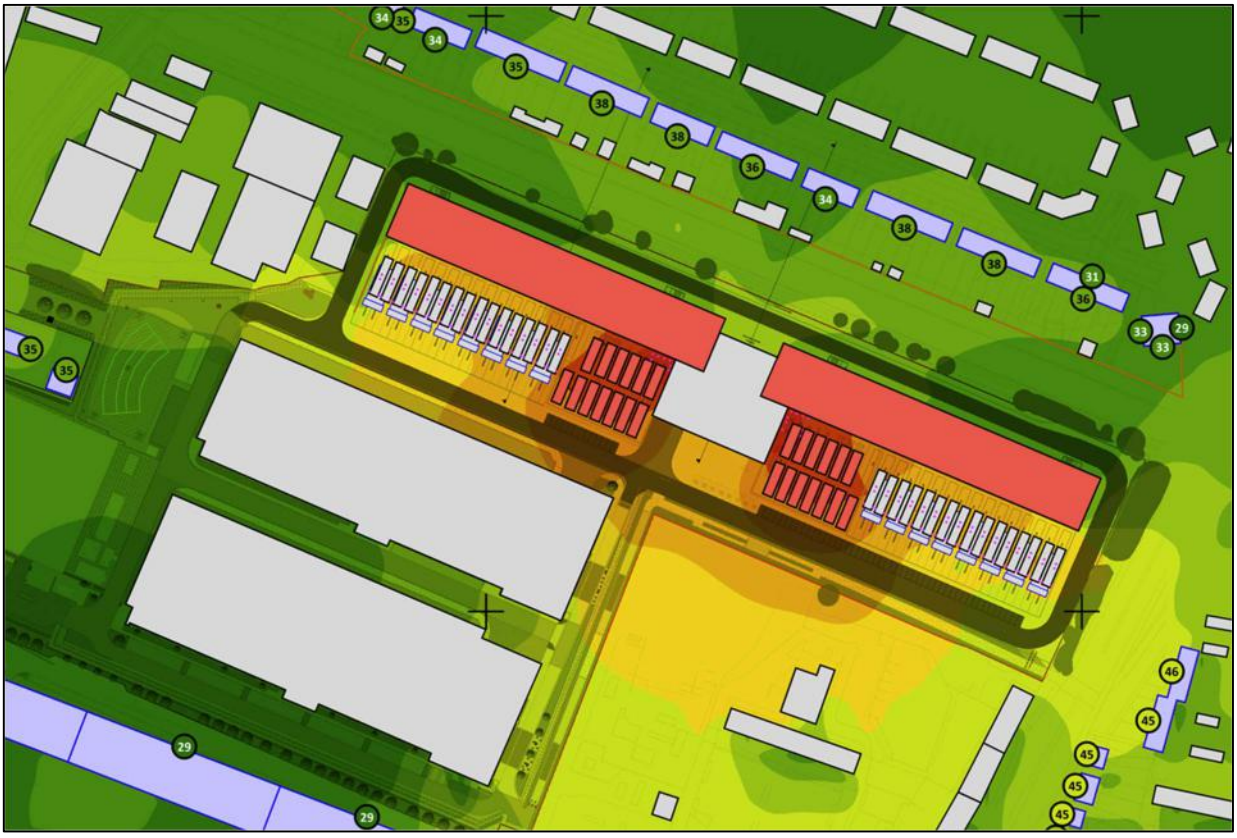


Figure 10 Noise Map 2: Daytime hours, all 'normally operating plant' on, generators off

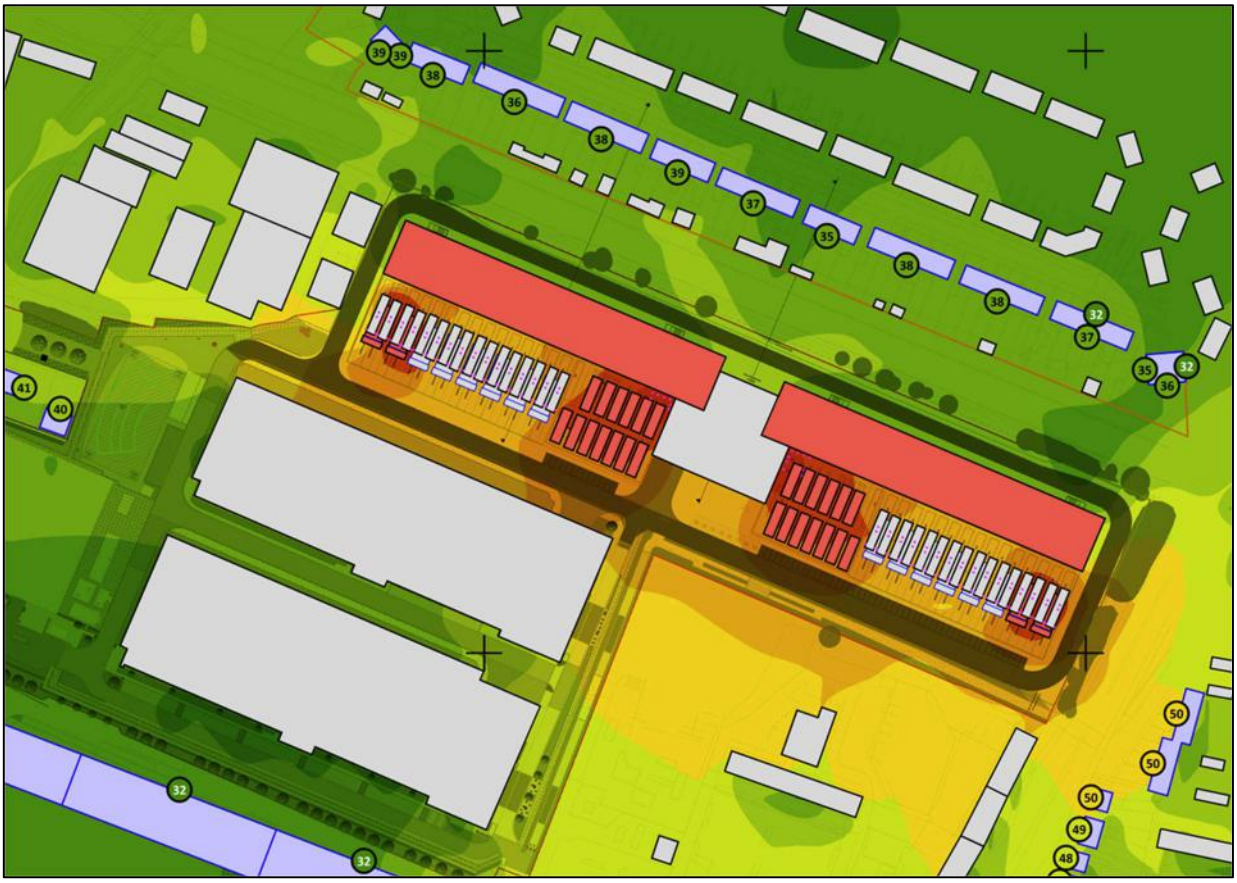


Figure 11 Noise Map 3: Daytime hours, all 'normally operating plant' on, generators testing at outer edges

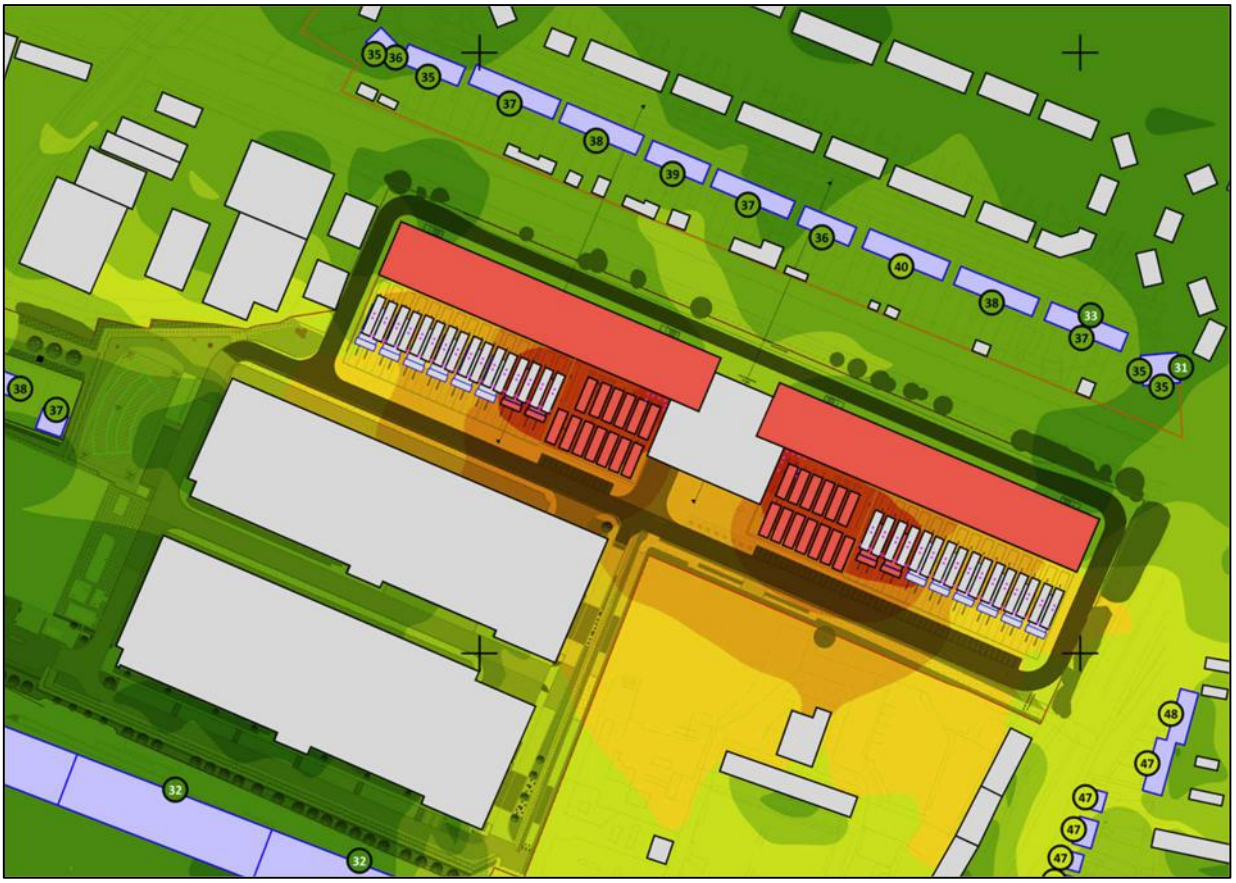


Figure 12 Noise Map 4: Daytime hours, all 'normally operating plant' on, generators testing at inner edges

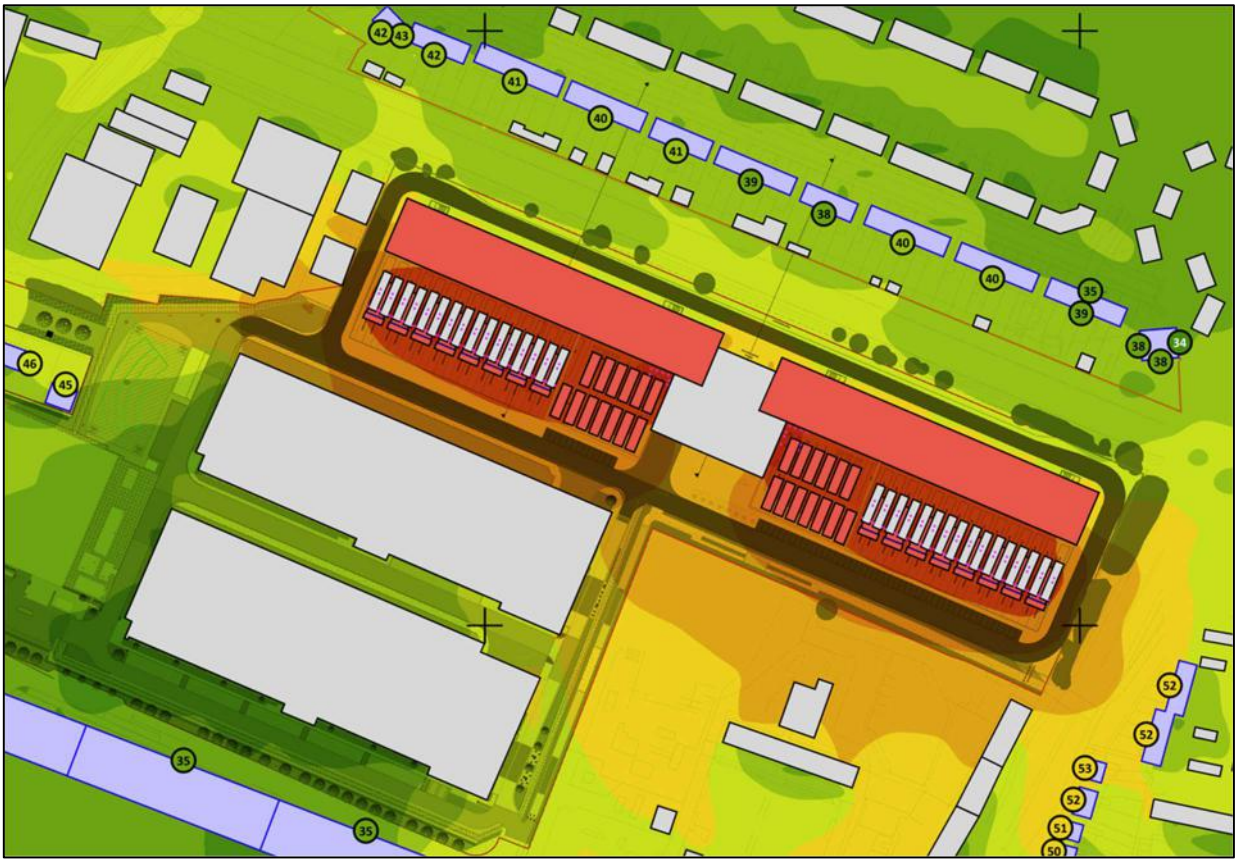


Figure 13 Noise Map 5: Night-time hours, all plant operational

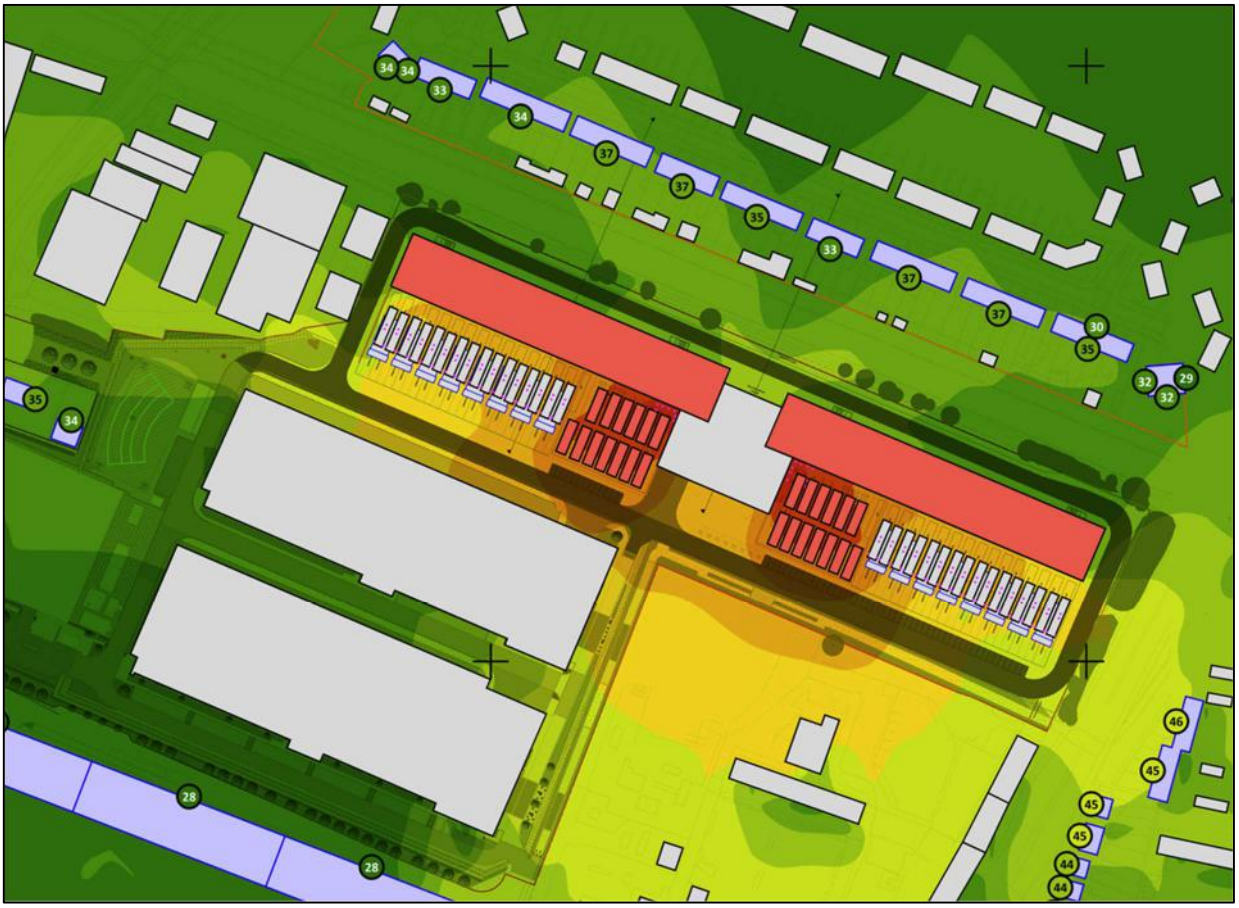


Figure 14 Noise Map 6: Night-time hours, all 'normally operating plant' on, generators off

5.4 Plant Noise Impact Assessment

BS 4142:2014 requires consideration of rating penalties for features in the noise, including tonality, impulsivity, and intermittency.

Noise from all plant under consideration would not be considered tonal, and therefore no correction for tonality has been applied to the modelling noise levels.

Generators will be tested as per the details in Section 5.2.3. As the generators will not operate continuously, there is potential for the on-off conditions for this noise source to be noticeable at the receptors. Therefore, the BS 4142 intermittency correction of +3 dB has been applied to the generator noise emissions within the noise modelling exercise.

Rating noise levels are presented in Sections 5.4.1 and 5.4.2, which include the following situations:

1. Normally operating noise from Building A, B and C plus emergency generator testing for Building A or B, but not Building C; and
2. Normally operating noise from Building A, B and C plus emergency generator testing for Building C only, but not Buildings A or B.

5.4.1 Total Noise Emissions Associated with Non-Emergency Plant from the Full Site (Buildings A & B plus Emergency Generator Testing, Building C with no Emergency Generator Testing)

The table below shows the predicted noise emissions from Building A, B (including emergency generator testing), the Substation and Mechanical Yard, the predicted noise emissions from Building C (excluding emergency generator testing), the total noise emissions from the site vs the planning condition criteria, and the degree to which the planning condition is met or exceeded.

Receptor No.	Time	Predicted Noise Emissions from Building A + B, SS, MY $L_{Aeq, T}$ dB	Predicted Noise Emissions from Building C $L_{Aeq, T}$ dB	Total Noise Emissions from the Site $L_{Aeq, T}$ dB	Planning Condition 12 Criteria $L_{A90, T}$ dB	+ / -
R1 (west)	07:00-23:00	45	38	46	45	0
	23:00-07:00	40	38	42	43	-2
R1 (central)	07:00-23:00	43	41	45	45	-1
	23:00-07:00	41	40	44	43	-1
R1 (east)	07:00-23:00	41	39	43	45	-3
	23:00-07:00	39	38	42	43	-3
R2	07:00-23:00	43	46	48	55*	-7
	23:00-07:00	38	46	47	47	0
R3 (west)	07:00-23:00	47	31	47	52	-5
	23:00-07:00	40	30	40	45	-5
R3 (east)	07:00-23:00	45	30	45	52	-7
	23:00-07:00	41	30	41	45	-4
R4	07:00-23:00	54	39	54	54	0
	23:00-07:00	45	38	46	45	0

Table 14 Predicted noise emissions of non-emergency plant from full site (including generator testing for Buildings A and B, and excluding generator testing for Building C)
SS: Substation, MY: Mechanical Yard

5.4.2 Total Noise Emissions Associated with Non-Emergency Plant from the Full Site (Buildings A & B with no Emergency Generator Testing, Building C with Emergency Generator Testing)

The table below shows the predicted noise emissions from Building A, B (excluding emergency generator testing), the Substation and Mechanical Yard, the predicted noise emissions from Building C (including emergency generator testing), the total noise emissions from the site vs the planning condition criteria, and the degree to which the planning condition is met or exceeded.

Receptor No.	Time	Predicted Noise Emissions from Building A + B, SS, MY $L_{Aeq, T}$ dB	Predicted Worst-Case Noise Emissions from Building C $L_{Aeq, T}$ dB	Total Noise Emissions from the Site $L_{Aeq, T}$ dB	Planning Condition 12 Criteria $L_{A90, T}$ dB	+ / -
R1 (west)	07:00-23:00	42	39	44	45	-1
R1 (central)	07:00-23:00	42	39	44	45	-1
R1 (east)	07:00-23:00	41	37	43	45	-3
R2	07:00-23:00	41	50	51	55*	-5
R3 (west)	07:00-23:00	44	34	44	52	-8
R3 (east)	07:00-23:00	44	32	44	52	-8
R4	07:00-23:00	51	41	51	54	-3

Table 15 Predicted noise emissions of non-emergency plant from full site (Excluding generator testing for Buildings A and B, and including generator testing for Building C)
SS: Substation, MY: Mechanical Yard

Note that night-time noise levels would be as shown in Table 14, as no emergency generator testing would take place for Building C during night-time hours.

5.5 Discussion of Results for Non-Emergency Plant

As shown in Table 14, the resultant noise emissions from the full site at the closest noise sensitive receptors are compliant with the requirements of Planning Condition 12 in all cases. Adverse impacts on health and quality of life would be avoided.

5.6 Total Noise Emissions Associated with Emergency and Non-Emergency Plant from the Full Site (Buildings A, B, C, the Substation and Mechanical Yard)

The table below shows the predicted noise emissions associated with both emergency and non-emergency plant from Building A, B, the Substation and Mechanical Yard, the predicted noise emissions associated with both emergency and non-emergency plant from Building C, and the total noise emissions associated with both emergency and non-emergency plant from the site.

As noted in Section 2.2.2, the noise emissions are predicted internally within the properties of the closest receptors with the windows both open and closed for the Local Authority to make a judgement on acceptability.

Receptor No.	Time	Emergency Plant Noise Emissions from Building A + B, SS & MY $L_{Aeq, T}$ dB	Emergency Plant Noise Emissions from Building C $L_{Aeq, T}$ dB	Total Noise Emissions from Full Site $L_{Aeq, T}$ dB	Receptor Window Condition (Open or Closed)	Receptor Window Attenuation dB	Resultant Internal Noise Level $L_{Aeq, T}$ dB
R1 (west)	07:00-23:00	52	43	53	Open	-15	38
		52	43	53	Closed	-30	23
	23:00-07:00	52	43	53	Open	-15	38
		52	43	53	Closed	-30	23
R1 (central)	07:00-23:00	49	43	50	Open	-15	35
		49	43	50	Closed	-30	20
	23:00-07:00	49	43	50	Open	-15	35
		49	43	50	Closed	-30	20
R1 (east)	07:00-23:00	48	41	49	Open	-15	34
		48	41	49	Closed	-30	19
	23:00-07:00	48	41	49	Open	-15	34
		48	41	49	Closed	-30	19
R2	07:00-23:00	57	52	58	Open	-15	43
		57	52	58	Closed	-30	28
	23:00-07:00	57	52	58	Open	-15	43
		57	52	58	Closed	-30	28
R3 (west)	07:00-23:00	51	37	51	Open	-15	36
		51	37	51	Closed	-30	21
	23:00-07:00	51	37	51	Open	-15	36
		51	37	51	Closed	-30	21
R3 (east)	07:00-23:00	51	36	51	Open	-15	36
		51	36	51	Closed	-30	21
	23:00-07:00	51	35	51	Open	-15	36
		51	35	51	Closed	-30	21
R4	07:00-23:00	60	46	60	Open	-15	45
		60	46	60	Closed	-30	30
	23:00-07:00	60	46	60	Open	-15	45
		60	46	60	Closed	-30	30

Table 16 Predicted noise emissions of emergency and non-emergency plant from full site
SS: Substation, MY: Mechanical Yard

6 CONCLUSION

ES Acoustics Ltd (ESA) have been commissioned by Yondr Group to prepare a noise impact assessment in support of a reserved matters submission for Building C of the proposed data centre development at Wexham Road, Slough SL2 5DB, as required by Planning Condition 12 of outline planning permission reference: P/00072/096. The prevailing sound conditions in the area have been determined by WYG as part of the noise impact assessment for the outline planning application (Report Reference A114100, dated December 2019), from which ESA have established the parameters set by the Planning Condition.

The full commercial aspect of the scheme to which Planning Condition 12 relates comprises 3 no. data centre buildings (Buildings A, B and C) with an associated substation and mechanical yard. A previous noise impact assessment was prepared for Buildings A and B, the Substation, and Mechanical Yard of the development by Sweco (report reference 66202273-SWE-ZZ-XX-YA-RP-0002, Rev.: P02, dated 19/03/2021). Based on the outcome of this report, it is understood that Planning Condition 12 has been discharge in relation to Buildings A and B.

This report details the resultant noise emissions from the plant associated with Building C, allowing the full noise emissions from the site to be understood to such that Planning Condition 12 can be discharged.

The overall noise emissions from the full scheme have been established by adding the calculated noise emissions from Building C (undertaken by ES Acoustics) with the calculated noise emissions from Buildings A and B, the Substation, and Mechanical Yard (undertaken by Sweco).

Calculations show that the requirements of Condition 12 are met.

APPENDIX A

ACOUSTIC TERMINOLOGY

Decibel scale - dB

The decibel (dB) is a relative unit of measurement used in acoustics. The dB is a logarithmic ratio between a measured level and a reference level of 0 dB (i.e the threshold of human hearing). Simply put, the decibel compresses the wide range of sounds we hear into more manageable numbers.

Addition of noise from several sources

Sound produced by multiple sound sources are added logarithmically e.g. power ratio of 2 = 3dB, power ratio of 10 = 10dB. Therefore, two equally intense sound sources operating simultaneously produce a sound level which is 3dB higher than a single source e.g. 60dB + 60dB = 63dB.

Subjective impression of noise

Human response to sound is highly individualized and often based on psychological factors such as emotion and expectation. Sensitivity to sound typically depends on the loudness, pitch, duration of the occurrence, and time of occurrence (e.g. a sound source could cause annoyance during the night where it would not during the day). The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level	Change in perceived loudness
1 dB	Imperceptible
3 dB	Just barely perceptible
6 dB	Clearly noticeable
10 dB	About twice as loud

'A' Weighted Frequency Filter - dB(A)

The human ear is not equally sensitive in all frequencies. The A-weighting filter was devised to take this into account when undertaking noise measurements and allows a sound level meter to replicate the human ears response to sound.

$L_{Aeq, T}$

Sound can fluctuate widely over a given period. L_{Aeq} is the A-weighted equivalent continuous sound level, with T denoting the time period over which the fluctuating sound levels were averaged e.g. $L_{Aeq,16h}$ is the equivalent continuous noise level over an 16 hour period.

L_{A90}

A-weighted sound level exceeded for 90% of the measurement period, calculated via statistical analysis. The L_{A90} descriptor is typically used to establish background sound levels for noise impact assessments

L_{A10}

A-weighted sound level exceeded for 10% of the measurement period, calculated via statistical analysis.

L_{AFmax}

A-weighted sound level maximum sound pressure level that has been measured over a given time period

APPENDIX A

ACOUSTIC TERMINOLOGY

Octave Bands

The audio or frequency spectrum of the human ear is in the range of 20Hz to 20 kHz. The spectrum tells how the energy of the sound signal is distributed in frequency. Octave bands divides the audio spectrum into 10 equal parts. The International Standards Organisation defines the centre frequency of these bands as 31.5Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz.

Noise Rating (NR) Curves

A method of rating noise using a set of curves relating octave band sound pressure levels. Typically used for building services systems within offices

Airborne sound

Sound radiated from a source into the surrounding air e.g. musical instruments, tv/radio, machinery/equipment. Airborne sound insulation refers to the reduction or attenuation of airborne sound, usually via a solid partition between a source and receiver.

Impact sound

Sound resulting from the impact between colliding objects, e.g. footfall impact upon a floor. Impact sound insulation refers to the resistance of a floor to the transmission of impact sound, typically via the installation of a ‘resilient layer’

Flanking sound

The transmission of airborne sound between two adjacent rooms by paths other than via the separating partition between the rooms, e.g. the abutment point of a wall and floor.

Structure-borne noise

Noise caused by the vibration of elements of a structure. This can result in reradiated noise, whereby the vibrating element transmits airborne sound into a space e.g. vibration caused by mechanical plant installed within a plant room which is not adequately isolated from the structure, or construction/demolition work in an adjacent building.

Reverberant sound

Sound in an enclosed space (usually a room), which results from repeated reflections at the boundaries. Reverberation time is the time taken for a steady sound level in an enclosed space to decay by 60dB, measured from the moment the sound source is switched off. A example of a typically reverberant space would be a classic church. Absorptive materials can be used to reduce reflections and reverberation times.

APPENDIX B

POLICY, STANDARDS AND GUIDANCE REVIEW

NATIONAL POLICY

National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) superseded and replaced Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in England.

The paragraphs relating to noise state:

180. Planning policies and decisions should contribute to and enhance the natural and local environment by;

> e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans

191. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

> a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
>
> b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are *prized for their recreational and amenity value for this reason; […]*

193. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of *use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation* before the development has been completed.

Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010. The long-term vision of the Government noise policy is to 'Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development.'

The NPSE vision noted above is supported by the following aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.

The NPSE outlines observed effect levels relating to the above, as follows:

- No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected;
- Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected;
- Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur;

Noise effect levels are not set at absolute noise level targets, but instead vary depending on the context and character of the noise and site specific factors which may impact on the severity of the effect. The NPSE states:

'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further *evidence and suitable guidance is available.'*

National Planning Practice Guidance (NPPG)

The NPPG provides practical guidance on how the NPPF should be applied as well as and guidance on the factors influencing whether noise may be a concern at the planning stage and how adverse effects can be mitigated. The table below summarises the effect levels presented within the NPSE, as follows:

Response	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific Measures required
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate & reduce to a minimum

APPENDIX B

POLICY, STANDARDS AND GUIDANCE REVIEW

Response	Examples of Outcomes	Increasing Effect Level	Action
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening, and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 Noise exposure hierachy

LOCAL POLICY

Slough Borough Council Planning Policy

The Local Development Plan for Slough sets out the long-term overall vision for how the area should develop, and a strategy for how this should take place. The plan must comply with the legal requirements set by national government, and also meet the needs of local residents and businesses.

This policy sets the framework for making decisions on individual planning applications. All planning applications – whether for a small extension to a building, or for a large development of multiple houses – must be approved or rejected in line with the policies in the development plan, unless any other strong planning reasons emerge.

The Local Development Plan for Slough is broadly comprised of:

- The Core Strategy Development Plan Document - Slough Local Development Framework Core Strategy 2006 - 2026
- Site Allocations Development Plan Document
- Local Plan Saved Policies

Relevant policies in relation to noise are as follows:

<u>Core Policy 8 – Sustainability and the Environment</u>

All development in the Borough shall be sustainable, of a high quality design, improve the quality of the environment and address the impact of climate change.

1. Sustainable Design and Construction Principles:

   All development should, where feasible, include measures to:

   a) Minimise the consumption and unnecessary use of energy, particularly from non renewable sources;

   b) Recycle waste;

c) Generate energy from renewable resources;

d) Reduce water consumption; and

e) Incorporate sustainable design and construction techniques, including the use of recycled and energy efficient building materials.

2. High Quality Design:

   All development will:

   a) Be of a high quality design that is practical, attractive, safe, accessible and adaptable;

   b) Respect its location and surroundings;

   c) Provide appropriate public space, amenity space and landscaping as an integral part of the design; and

   d) Be in accordance with the Spatial Strategy in terms of its height, scale, massing and architectural style.

   The design of all development within the existing residential areas should respect the amenities of adjoining occupiers and reflect the street scene and the local distinctiveness of the area.

3. Pollution

   Development shall not:

   a) Give rise to unacceptable levels of pollution including air pollution, dust, odour, artificial lighting or **noise**;

   b) Cause contamination or a deterioration in land, soil or water quality; and

   c) Be located on polluted land, areas affected by air pollution or in noisy environments unless the development incorporates appropriate mitigation measures to limit the adverse effects on occupiers and other appropriate receptors.

4. Flooding

   a) Development will only be permitted where it is safe and it can be demonstrated that there is minimal risk of flooding to the property and it will not impede the flow of floodwaters, increase the risk of flooding elsewhere or reduce the capacity of a floodplain; and

   b) Development must manage surface water arising from the site in a sustainable manner which will also reduce the risk of flooding and improve water quality.

APPENDIX B

POLICY, STANDARDS AND GUIDANCE REVIEW

GOOD PRACTICE GUIDANCE

BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

BS 4142:2014+A1:2019 provides a methodology for rating and assessing the impacts of industrial and commercial sound at noise sensitive receptors.

The methodology involves comparing the Rating Noise Level due to the sound source/s under assessment with the existing background sound level (L_{A90}) when the noise source is not operating to estimate the initial impact, as follows (Typically, the greater this difference, the greater the magnitude of the impact):

a) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context

b) A difference of around +5 dB could be an indication of an adverse impact, depending on the context

c) The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context

The standard notes that a noise source under assessment will have a 'low impact' when the 'rating level' of a noise source is less than the existing background sound. It is also important to note that any quantitative assessment results are assessed considering the context in which the sound occurs.

The standard notes three types of context within Clause 11, which are:

1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

   Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

   Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect

the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

    i. facade insulation treatment;

    ii. ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

    iii. acoustic screening.

The definitions noted above are described below:

- **Specific sound** – sound source being assessed ($L_s = L_{Aeq, Tr}$)
- **Residual sound** – Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound ($L_r = L_{Aeq, T}$)
- **Ambient sound** – totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far ($L_a = L_{Aeq, T}$)
- **Background level** – sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval ($L_{A90, T}$)
- **Rating level** – specific sound level plus any adjustment for the characteristic features of the sound ($L_{Ar,Tr}$)

With regards to background sound levels, BS 4142:2014+A1:2019 notes:

"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background *sound level, but rather to quantify what is typical during particular time periods."*

With regards to the 'rating level', the adjustments for the characteristic features of the sound are outlined below:

- Tonality – *+2 dB for a tone which is 'just perceptible' at the noise receptor, +4 dB where it is 'clearly perceptible', and +6 dB where it is 'highly perceptible'*
- Impulsivity – *+3 dB for a tone which is 'just perceptible' at the noise receptor, +6 dB where it is 'clearly perceptible', and +9 dB where it is 'highly perceptible'*
- Intermittency – +3 dB if the intermittency is readily distinctive against the residual acoustic environment

- Other sound characteristics – where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.

It must be noted that as the rating level is determined at the closest noise sensitive receptor, the acoustic feature corrections should be applied based on the level at receptor location, not at source. This is particularly relevant when noise propagation characteristics cause differences in sound reduction at various frequency bands.

Note that the assessment reference periods that should be considered for daytime and night-time, as defined within the standard, are:

- One hour period for a sound source operating during daytime hours (07:00-23:00 hours)
- Fifteen-minute period for a sound source operating during the night-time (23:00-07:00 hours)

ES Acoustics Notes regarding Context:

The notes presented below are informed by the BS 4142:2014+A1:2019 Technical Note prepared by the Association of Noise Consultant Good Practice Working Group. Assessment context is often misunderstood or applied incorrectly, and the notes are therefore presented to provide a clear picture on what aspects of context should be considered when assessing the overall impact of a particular scenario:

Subclause 11(1)

The second paragraph notes that absolute levels may be as, or more, important than relative outcomes where background and rating levels are low. It is important to note that both background and rating levels would need to be low for this particular caveat to apply.

BS 4142 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low, only that the absolute levels may be more important than the difference between the two values. It is likely that where the background and rating levels are low, the absolute levels might suggest a more acceptable outcome than would otherwise be suggested by the difference between the values. For example, a situation might be considered acceptable where a rating level of 30dB is 10dB above a background sound level of 20dB, i.e. an initial estimate of a significant adverse impact is modified by the low rating and background sound levels. However, there may be situations where the opposite is true, and it is for the assessor to justify any modifications to the initial estimate of impact.

BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB L_{A90}, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$. We would consider that similar values would not be unreasonable in the context of the current edition of BS 4142.

The third paragraph states that "where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts".

APPENDIX B

POLICY, STANDARDS AND GUIDANCE REVIEW

In the ordinary application of BS 4142 the residual sound level is not compared with the background sound level to determine the level of impact. The third paragraph is therefore taken to mean that the level of impact caused by the residual level has been determined by professional judgement or with reference to another document, such as the Noise Insulation Regulations 1975 (as amended 1988). Where professional judgement is used, it should be appropriately justified.

Where the residual sound levels are very high, a significant adverse impact might be declared in a situation where the rating level exceeds the background sound level by, say, 4dB, i.e. since the residual sound levels are already considered to cause a significant impact, any worsening of the situation would be considered a significant adverse impact, even if the difference between the rating level and background sound level would not suggest this to be the case.

Subclause 11(2)

The second aspect of context described in BS 4142 relates to the character and level of the specific sound. In essence, whether or not the character of the sound is distinguishable from the character of the ambient or residual acoustic environment or is incongruous.

BS 4142 does not provide instruction as to how to treat the assessment outcomes in these circumstances, nor does it explain how to distinguish between this contextual consideration and the process for applying rating penalties. The latter is itself informed by the distinctive characteristics of the specific sound in the context of the residual sound environment.

Where character-based contextual matters are taken into account, the assessor should make it clear how these matters are distinct from those that informed the rating level corrections, and what the implications of these further character assessments should be. For example; new deliveries on an estate entailing rating penalties for reversing alarms and impulsive noise but these types of noise are already present at other existing premises, so contextually the impact is reduced. Conversely, where the residual level is largely comprised of natural sounds, such as the sea or birdsong, so the impact from the specific source might be increased.

Subclause 11(3)

The third contextual matter described in Clause 11 relates to the receptor itself. It is important to note that the *reference at the start of this section of BS 4142 to 'the sensitivity of the receptor' refers to a generic receptor* type, i.e. a dwelling, and not to the particular attitudes or responses of a particular person (although if the residential receptor type is specific it may have a bearing e.g. student accommodation).

The ANC working group notes that this part of BS 4142 allows the internal noise environment to be considered, despite BS 4142 excluding such matters from its Scope (Subclauses 1.1, 1.2 and 1.3). The working group considers that the consideration of the internal noise environment is only valid in a BS 4142 assessment where it relates to the contextual elements of the assessment.

APPENDIX B

POLICY, STANDARDS AND GUIDANCE REVIEW

BS 8233: 2014 'Guidance on sound insulation and noise reduction for buildings'

Table 4 of BS 8233:2014 (reproduced below) provides guidance on recommended internal ambient noise levels in residential spaces based on World Health Organisation (WHO) research.

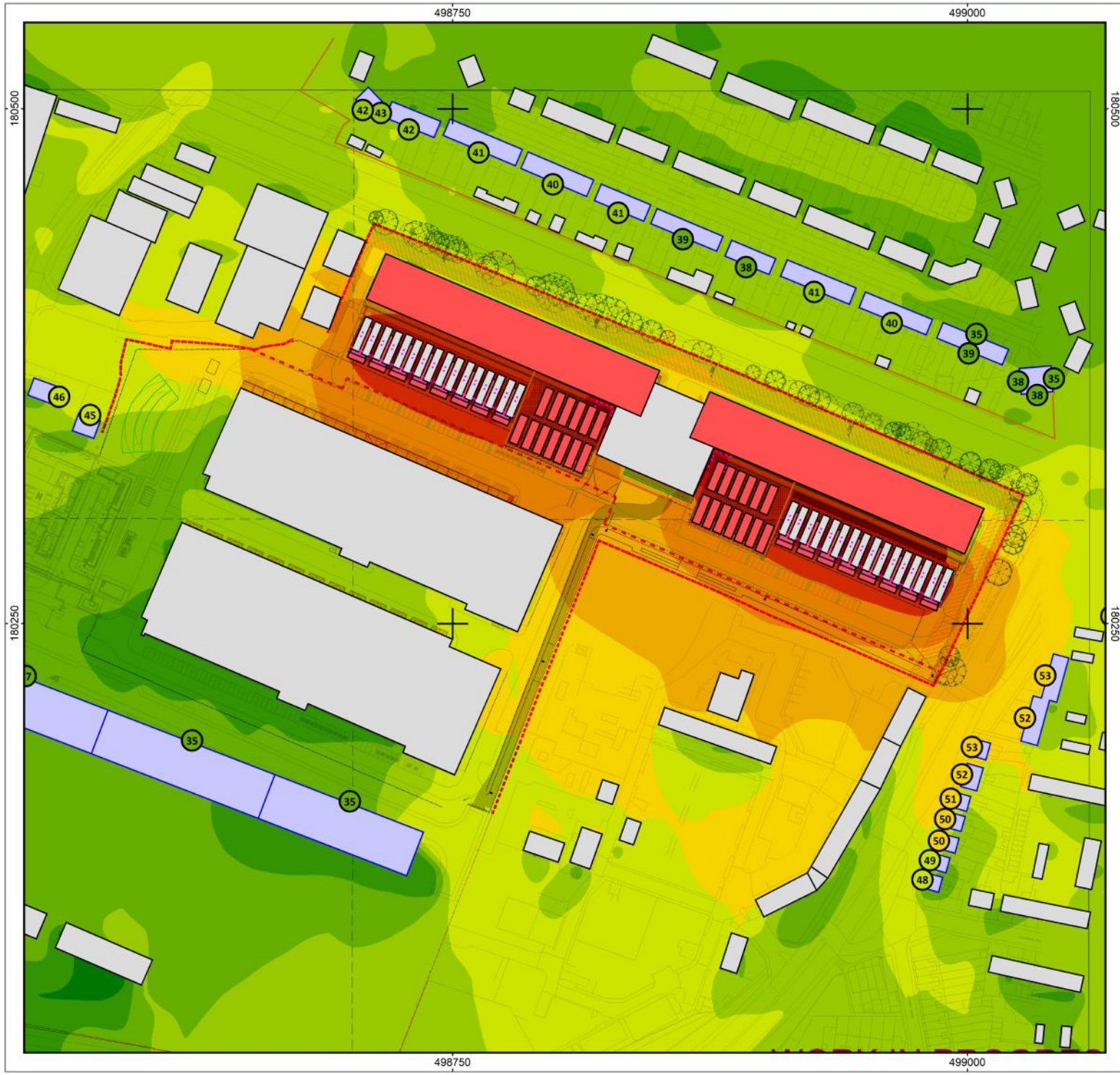
Room	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Living Room	≤ 35 dB $L_{Aeq,16hr}$	N/A
Dining Room	≤ 40 dB $L_{Aeq,16hr}$	N/A
Bedroom	≤ 35 dB $L_{Aeq,16hr}$	≤ 30 dB $L_{Aeq,8hr}$

Table 2 BS 8233:2014 indoor ambient noise levels for dwellings

Whilst it is accepted that the levels presented above are for steady external noise sources without a specific character, the guidance provides useful context as to what acceptable internal noise levels are in an ideal situation.

The standard suggests that lower noise limits might be appropriate in cases where noise sources contain a specific character, however it doesn't not specify how such limits should be applied.

APPENDIX C
NOISE MAPS



Customer: Yondr Group
Project: Lon1 - Building C
Project-No. 20309

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Map 1

Daytime Noise Map (07:00-23:00) (All plant ON)

Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
Created: 28/02/2024
Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lday
in dB(A)

< 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80

Legend

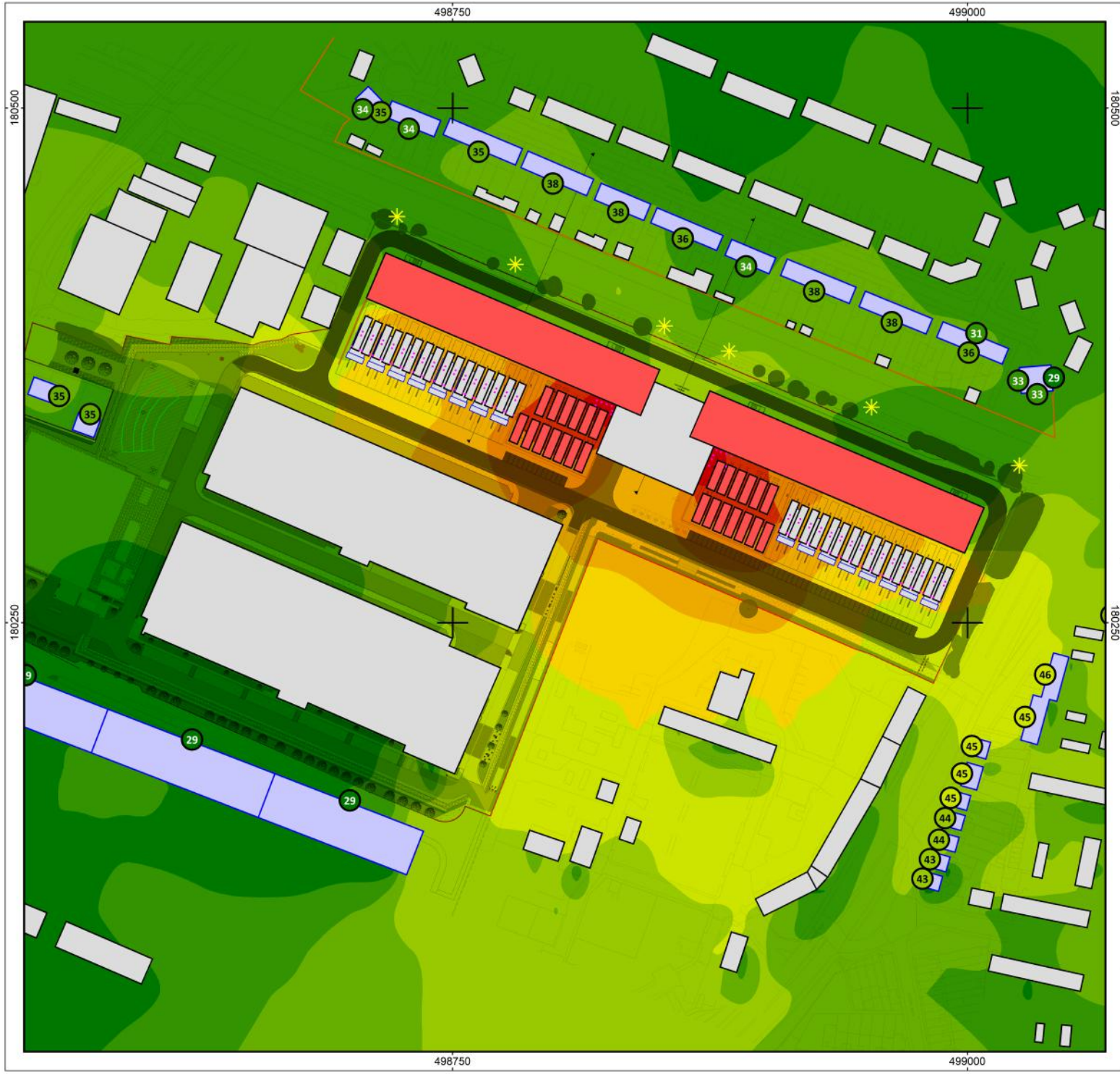
- Residential Receptor
- Building
- Noise Source Type 1
- (generators, chillers, datacentre, etc)
- Noise Source Type 2
- (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

N

Length scale 1:1874

0 15 30 60 90 120 m

Noise Modelling & Map Prepared By: es acoustics



Customer: Yondr Group
Project: Lon1 - Building C
Project-No. 20309

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Map 2

Daytime Noise Map (07:00-23:00)
(All 'normally operating plant' ON, generators OFF
Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
Created: 28/02/2024
Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lday
in dB(A)

<	30
30 -	35
35 -	40
40 -	45
45 -	50
50 -	55
55 -	60
60 -	65
65 -	70
70 -	75
75 -	80
>=	80

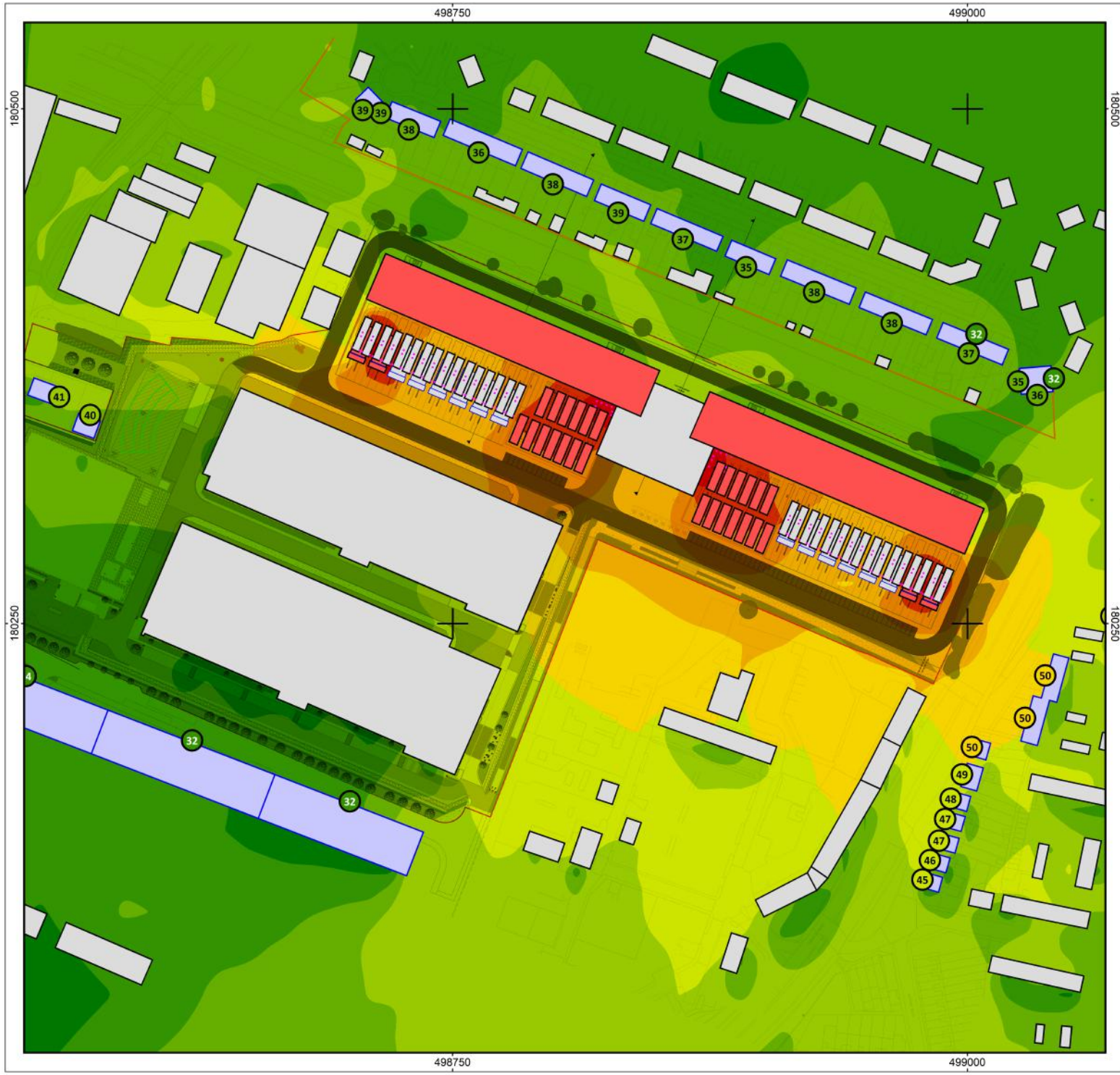
Legend

- Residential Receptor
- Building
- Noise Source Type 1
- (generators, chillers, datacentre, etc)
- Noise Source Type 2
- (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

N

Length scale 1:1874
0 15 30 60 90 120 m

Noise Modelling & Map Prepared By: es acoustics



Customer: Yondr Group
Project: Lon1 - Building C
Project-No. 20309

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Map 3

Daytime Noise Map (07:00-23:00)
(All 'normally operating plant' ON, generator testing at outer edges)

Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
Created: 19/06/2024
Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lday
in dB(A)

<	30
30 -	35
35 -	40
40 -	45
45 -	50
50 -	55
55 -	60
60 -	65
65 -	70
70 -	75
75 -	80
>=	80

Legend

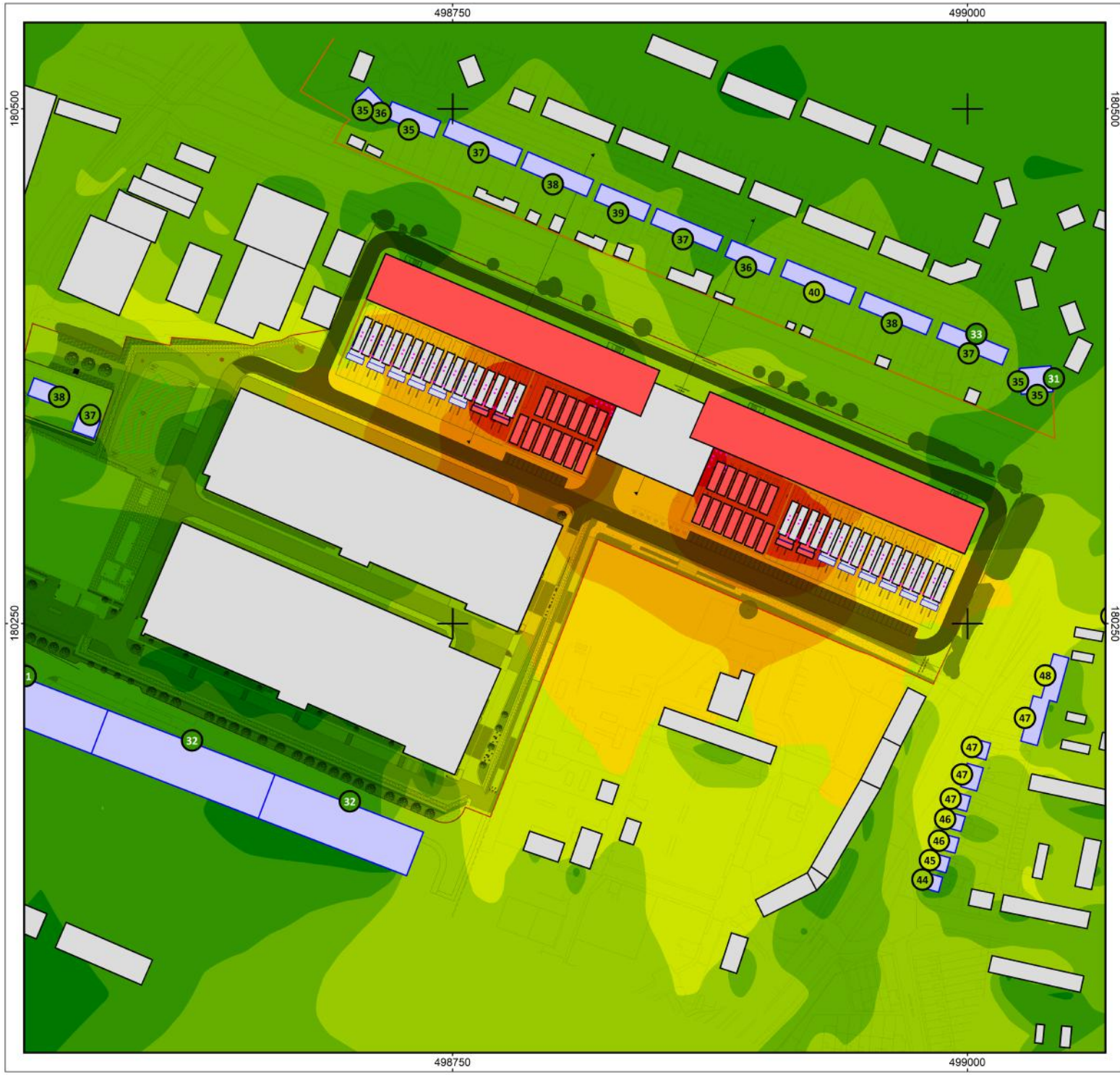
- Residential Receptor
- Building
- Noise Source Type 1
- (generators, chillers, datacentre, etc)
- Noise Source Type 2
- (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

N

Length scale 1:1874

0 15 30 60 90 120 m

Noise Modelling & Map Prepared By: es acoustics



Customer: Yondr Group
Project: Lon1 - Building C
Project-No. 20309

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Map 4

Daytime Noise Map (07:00-23:00)
(All 'normally operating plant' ON, generator testing at inner edges)
Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
Created: 19/06/2024
Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lday
in dB(A)

< 30	
30 - 35	
35 - 40	
40 - 45	
45 - 50	
50 - 55	
55 - 60	
60 - 65	
65 - 70	
70 - 75	
75 - 80	
>= 80	

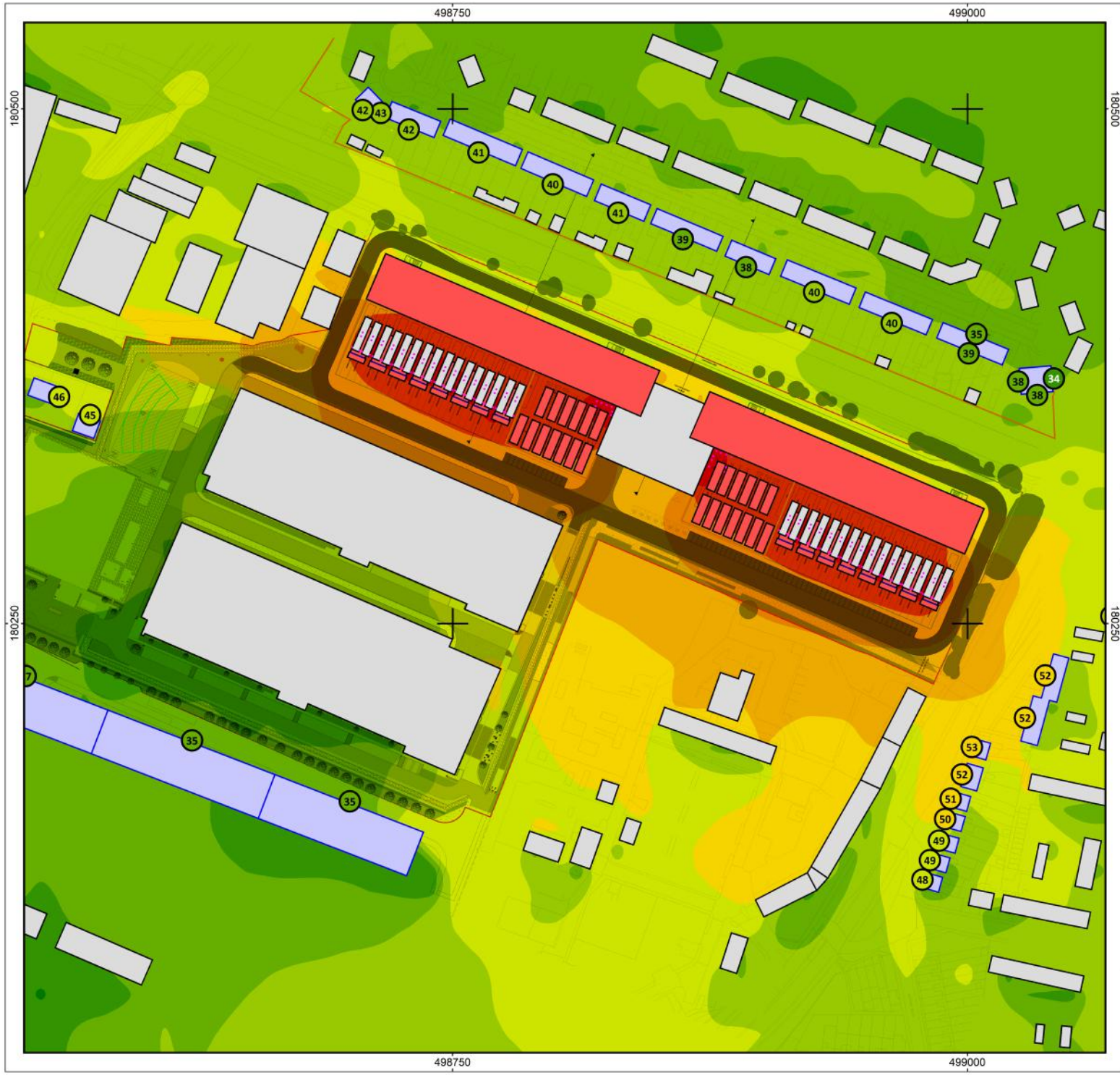
Legend

- Residential Receptor
- Building
- Noise Source Type 1
- (generators, chillers, datacentre, etc)
- Noise Source Type 2
- (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

N

Length scale 1:1874
0 15 30 60 90 120 m

Noise Modelling & Map Prepared By: es acoustics



Customer: Yondr Group
Project: Lon1 - Building C
Project-No. 20309

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www.yondrgroup.com

Map 5

Night-time Noise Map (23:00-07:00)
(All plant ON, chillers in night set-back mode)

Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
Created: 28/02/2024
Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lnight
in dB(A)

< 30	
30 - 35	
35 - 40	
40 - 45	
45 - 50	
50 - 55	
55 - 60	
60 - 65	
65 - 70	
70 - 75	
75 - 80	
>= 80	

Legend

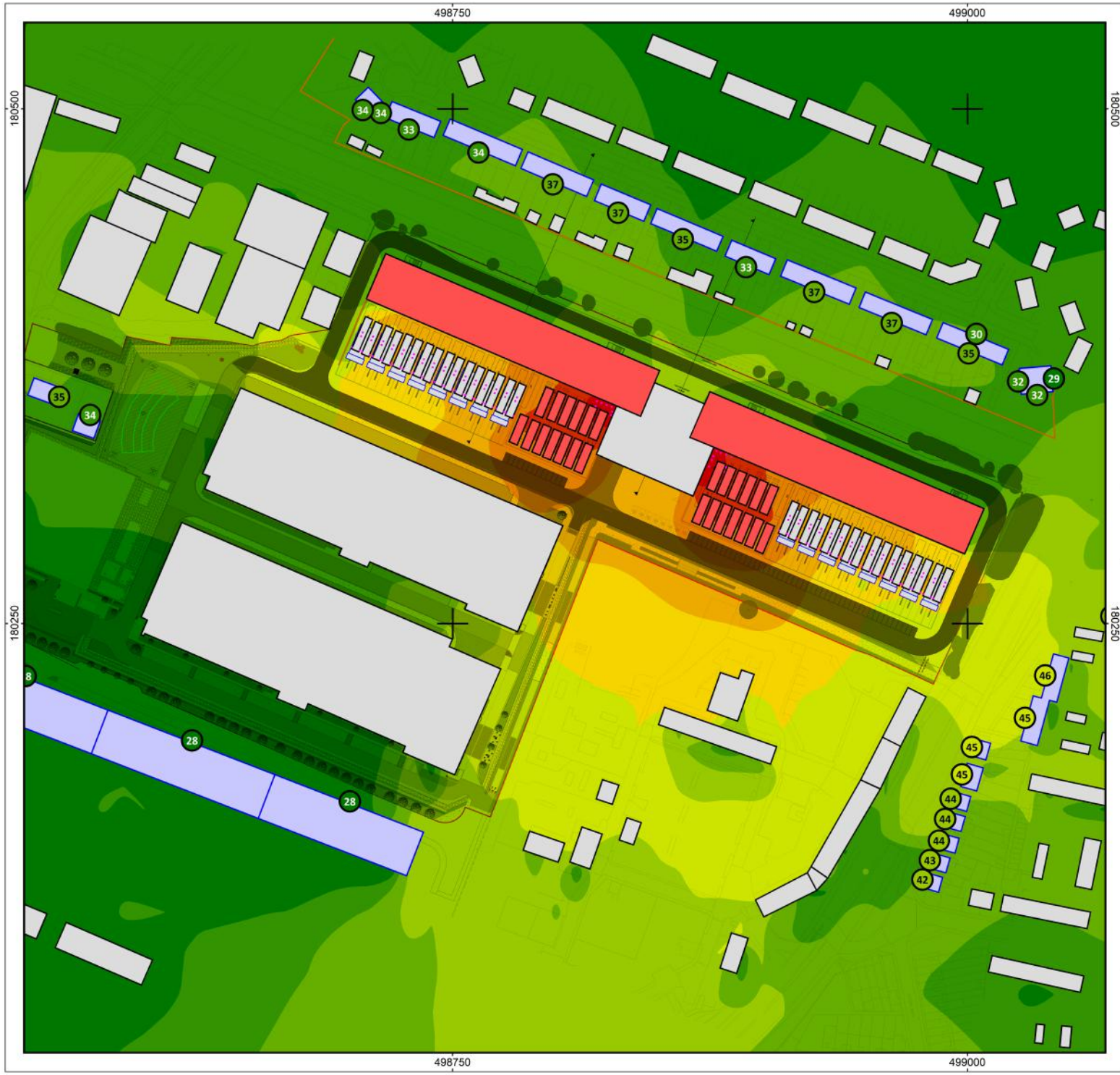
- Residential Receptor
- Building
- Noise Source Type 1
- (generators, chillers, datacentre, etc)
- Noise Source Type 2
- (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

N

Length scale 1:1874

0 15 30 60 90 120 m

Noise Modelling & Map Prepared By: es acoustics



Customer: Yondr Group
Project: Lon1 - Building C
Project-No. 20309

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Map 6

Night-time Noise Map (23:00-07:00)
(All 'normally operating plant' ON, chillers in night set-back mode, generators OFF)
Calculation in 1.5 m above ground

Project engineers: Daniel Green MIOA & Duncan Arkley MIOA
Created: 28/02/2024
Processed with SoundPLAN 8.2, Update 09/11/2022

Levels Lnight
in dB(A)

< 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80

Legend

- Residential Receptor
- Building
- Noise Source Type 1
- (generators, chillers, datacentre, etc)
- Noise Source Type 2
- (point sources such as condensers, etc)
- Wall / Fence
- Facade Point

N

Length scale 1:1874
0 15 30 60 90 120 m

Noise Modelling & Map Prepared By: es acoustics

Appendix H – Fire Pump Engine Specification

CLARKE®

FIRE PUMP ENGINES

MODELS

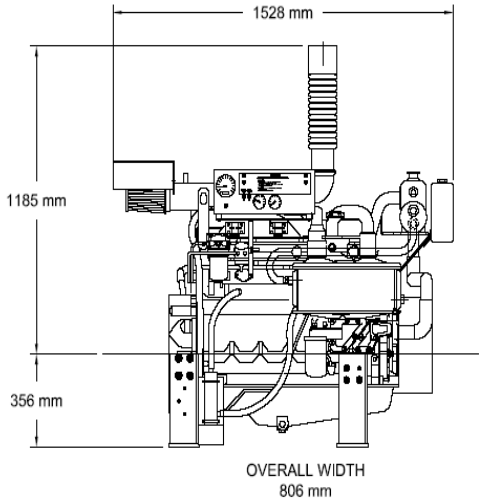
JU4H-LP20 JU4H-LP24 JU4H-LP50 JU4H-LPL4 JU4H-LP54 JU6H-LP50 JU6H-LP54 JU6H-LP60 JU6H-LP84

UK Purchased

LPCB APPROVED RATINGS KW/*BHP*

JU4/6H MODEL	RATED SPEED 1760		2100		2350		2600		2800		2960	
JU4H-LP20	45	*60*	50	*67*	54	*72*						
JU4H-LP24					54	*72*	56	*75*	60	*80*	62	*83*
JU4H-LP50	82	*110*	97	*130*	95	*127*						
JU4H-LPL4							92	*123*	97	*130*	101	*135*
JU4H-LP54					91	*122*	104	*139*	108	*145*	108	*145*
JU6H-LP50	137	*183*	157	*210*	157	*210*						
JU6H-LP54**					157	*210*	161	*216*	161	*216*	161	*216*
JU6H-LP60	149	*200*	179	*240*	179	*240*						
JU6H-LP84**					181	*243*	185	*247*	193	*259*	205	*275*

**Note: JU6H-LP54 and JU6H-LP84 engines cannot be applied between 2600 and 2800 RPM.



SPECIFICATIONS

ITEM	JU4/6H MODELS JU4H-LP20/24	JU4H-LP50/54/L4	JU6H-LP50/54	JU6H-LP60/84
Number of Cylinders	4		6	
Aspiration	NA	T		TRWA
Rotation*	CW			
Weight – kg (lb)	413 (910)	424 (935)	750 (1657)	766 (1693)
Compression Ratio	17.6:1	17.0:1		
Displacement – l (cu. in.)	4.5 (275)		6.8 (414)	
Engine Type	4 Stroke Cycle – Inline Construction			
Bore & Stroke – mm (in.)	106 x 127 (4.19 x 5.00)			
Installation Drawing	UD124		UD125	UD207
Wiring Diagram AC	C07591			
Wiring Diagram DC	U071056			
Engine Series	John Deere 4045 Series		John Deere 6068 Series	

Abbreviations: CW – Clockwise NA – Naturally Aspirated T – Turbocharged TRWA – Turbocharged with Raw Water Aftercooling
*Rotation viewed from Heat Exchanger / Front of Engine

CERTIFIED POWER RATING

- Each engine is factory tested to verify power and performance.
- Although power ratings are shown at specific speeds, Clarke engines can be applied at any intermediate speed. To determine the intermediate speed power; make a linear interpolation from the Clarke power curve. Contact Clarke or your Pump OEM Representative to obtain details.

LPCB

Meets
LPS 1239
Requirements

ENGINE RATINGS BASELINES

- Engines are not to be used for continuous duty. Engines are to be used only for stationary emergency standby fire pump service.
- Engines are rated at standard SAE conditions of 29.61 in. (752.1 mm) Hg barometer and 77°F (25°C) inlet air temperature [approximates 300 ft. (91.4 m) above sea level] by the testing laboratory (see SAE Standard J 1349).
- A deduction of 3 percent from engine horsepower rating at standard SAE conditions shall be made for diesel engines for each 1000 ft. (305 m) altitude above 300 ft. (91.4 m)
- A deduction of 1 percent from engine horsepower rating as corrected to standard SAE conditions shall be made for diesel engines for every 10°F (5.6°C) above 77°F (25°C) ambient temperature.

CLARKE®

FIRE PUMP ENGINES

MODELS

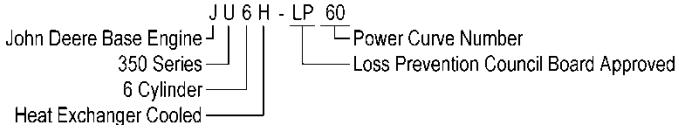
JU4H-LP20 JU4H-LP24 JU4H-LP50 JU4H-LPL4 JU4H-LP54 JU6H-LP50 JU6H-LP54 JU6H-LP60 JU6H-LP84

ENGINE EQUIPMENT

EQUIPMENT	STANDARD	OPTIONAL
Air Cleaner	Direct Mounted, Washable, Indoor Service with Drip Shield	Disposable, Drip Proof, Indoor Service Outdoor Type
Alternator	12V-DC, 42 Amps with Poly-Vee Belt and Guard	24V-DC, 40 Amps with Belt and Guard
Coupling	Bare Flywheel	Centaflex, Model CFA50
Exhaust Protection	Blankets on JU4H-LP20/24; Metal Guards on Manifolds and Turbocharger on JU4H-LP50/54/L4, JU6H-LP50/54/60/84	
Engine Speed Control	Mechanical Type, governing within 5% of rated speed at any load condition	
Exhaust System		Industrial Silencer with two meters straight pipe and one meter straight pipe with 90° elbow and four clamps for connections
Exhaust Flex Connection	Stainless Steel Flexible Bellows; JU4H-LP20/24 – Clamped 3"; JU4H-LP50/54/L4–Clamped 4"; JU6H-LP50/54/60/84 – Clamped 5"	
Flywheel Housing	SAE #3	
Flywheel Power Take Off	11.5" SAE Industrial Flywheel Connection	
Fuel Connections	Fire Resistant, Flexible, USA Coast Guard Approved, Supply and Return Lines	
Fuel Filter	Primary Filter with Priming Pump	
Fuel Injection System	Stanadyne Direct Injection	
Fuel Lift Pump	Mechanical	
Fuel Solenoid	12V-DC Energized to Stop	24V-DC Energized to Stop
Engine Heater	JU4H - 230V-AC, 1000 Watt JU6H - 230V-AC, 1360 Watt	
Governor, Speed	Constant Speed, Mechanical	
Heat Exchanger	Tube and Shell Type; 10 BAR (145 PSI), BSP(F) Connections on JU4H-LP20/24/50/54/L4 and JU6H-LP50/54; 5 BAR (72.5 PSI), BSP(F) Connections on JU6H-LP60/84	
Instrument Panel	English and Metric, Tachometer, Hourmeter, Water Temperature, Oil Pressure	
Junction Box	Integral with Instrument Panel; For DC Wiring Interconnection to Fire Pump Controller	
Lube Oil Cooler	Engine Water Cooled, Plate Type	
Lube Oil Filter	Full Flow with By-Pass Valve	
Lube Oil Pump	Gear Driven, Gear Type	
Manual Start Control	On Instrument Panel	
Raw Water Solenoid Operation	Automatic from Fire Pump Controller	
Run – Stop Control	Energized to Stop (ETS) with Manual Stop Lever	
Spares	Hoses and Clamps for Heat Exchanger, Two (2) Oil Filters, Two (2) Fuel Filters, One (1) Drive Belt, One (1) Head Gasket,One (1) Sump Gasket, Two (2) Injector Nozzles	
Starter Controls	Dual Solenoids	
Starters	One (1) 12V-DC	One (1) 24V-DC
Switches	Low Oil Pressure, Low and High Water Temperature	
Throttle Control	Adjustable Speed Control, Tamper Proof	
Turbo Lubrication Unit	Fitted on JU4H-LP50/54/L4, JU6H-LP50/54/60/84	
Water Pump	Centrifugal Type, Poly-Vee Belt Drive with Guard	

Abbreviations: DC –Direct Current, AC – Alternating Current, SAE – Society of Automotive Engineers, BSP(F) – British Standard Pipe Thread (Female)

MODEL NOMENCLATURE (8 Digit Models)



CLARKE®

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C131317 revH

24JAN18

Specifications and information contained in this brochure subject to change without notice.

Appendix I - The Health, Safety, Quality and Environmental Management System

Health Safety, Environmental & Quality Management System

Owner	Liz Raven (Senior Manager Continuous Improvement)	**Approval Date**	10-09-2024
Approval Authority	Gareth Evans (VP HSE)	**Effective Date:**	10-10-2024
Version	2.0	**Next Review Date:**	10-09-2025
Classification	Restricted (Internal)	**Reviewed By:**	Athina Koligkioni, Denise Vogelaar, Ron Gantt, Juliane Blohme, Gareth Evans, James Richards
Document No.	HSE0021		

Revision	Date	Description of change
1.0	09-08-2024	First publication
2.0	27-09-2024	Addition to considerations and exclusions, link to design management change

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Introduction

General

The aim of this document is to highlight the systems and processes necessary to maintain and continually improve Health Safety, Quality & Environment (HSQE) performance, including HSQE efficiency. The aim of the system is to support HSQE performance improvement at all levels of the organisation.

The implementation of this management system (MS from here on) includes the Health & Safety policy, Quality Policy & Sustainability & Environmental Policy, objectives, and action plans while meeting applicable legal requirements and other requirements. This MS enables Yondr to set and achieve objectives and targets, to take actions as needed to improve its systems, and to demonstrate the conformity of its system to the requirements of the ISO 45001, 14001 & 9001 standards.

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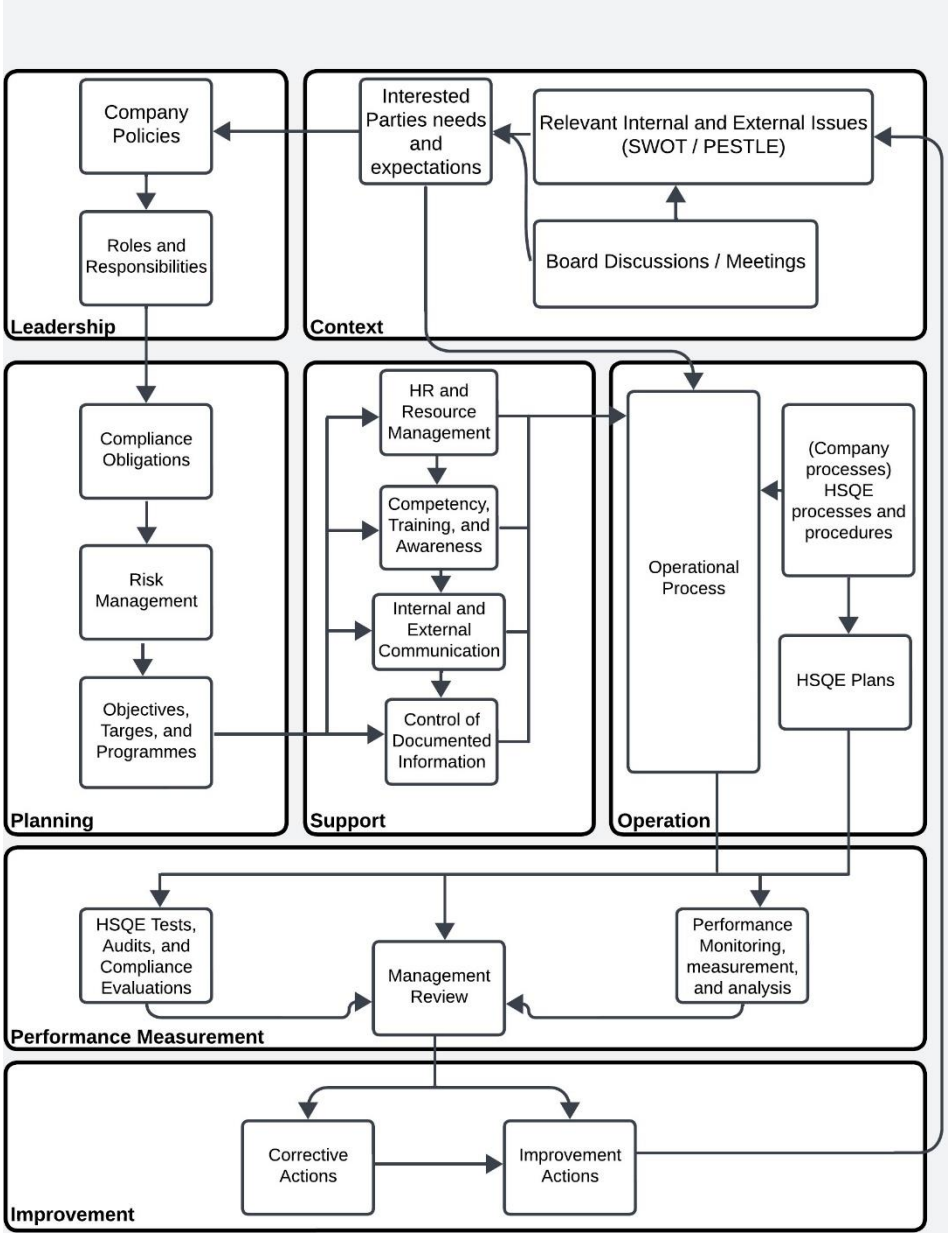
The following diagram shows the process flow of the HSQE management system.



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Context of the organisation

Interested Parties

The interested parties that are relevant to HSQE performance and the MS are determined, as are the relevant requirements of these parties and if and the way in which they will be addressed through this MS.

The following link below identifies stakeholders across the business rather than HSQE specific. This document linked below is reviewed twice a year with the relevant HSQE Management team.

Interested parties
PESTLE

Both internal and external issues that are in relation to the HSQE Management System are regularly reviewed and updated and can be found within the management reviews for ELT/SLT reporting.

Determining the scope of the management system

This document is the main document for the Yondr ISO 45001, 14001 & 9001 HSQE management system. The Yondr MS is set up as a digital system and stored on the Yondr SharePoint.

The purpose of the Management System is to establish a governance structure which will enable Yondr to continually improve performance. Yondr will also aim to continually improve the Management System itself.

The scope of the HSQE Management System covers the Development, Design, project management and development of scalable technology real estate. Research and development for implementation into scalable technology real estate. Asset management including operational and maintenance support to scalable technology real estate.

Link to Entity overview

Considerations

- Future data centres shall be managed based on the HSQE Management system.
- Future data centres shall be managed based on the global Yondr Operations Framework of processes and procedures.
- Not all entities have the full management system scope. I.e operational datacentres follow the scope “Asset management including operational and maintenance support to scalable technology real estate.”
- Organisation structure for future sites shall be based on identical models – however local laws and regulations shall be considered and implemented.
- Technical structure for future sites will be based on identical models.

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Exclusions to the system

- Joint ventures where Yondr are not the primary authority for decision making onsite are not included in this system.
- Yondr Operations UK limited are not included in this system.

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Leadership

Yondr Values

Yondr values are at the heart of everything we do. They guide how we approach our work, how we act each day to create a strong, differentiated brand, and how we behave towards clients and our fellow Yondr-ites.

Value:	Traits:	Do:	Don't:
Focused Explorer	/ Drive efficiency in projects and processes / Conserve time and resources / Simplify complexity / Make decisions quickly and confidently	/ Hit deadlines / Say no to things you can't do / Turn up to meetings on time / Follow company processes	/ Waste time / Complicate matters / Attend pointless meetings
Everyday Inventor	/ Challenge convention / Spread great ideas / Make things happen / Champion the big picture	/ Communicate own ideas / Listen to other people's ideas / Escalate good ideas / Make ideas scalable	/ Say 'we've always done it this way' / Belittle bad ideas
Quiet Hero	/ Listen more / Learn from and teach others / Do what's right for all / Offer your time and skills	/ Listen to understand, not to respond / Share your experiences to help others / Be humble / Lift up others	/ Bulldoze over others' opinions or ideas / Be arrogant, ego-centric, glory-seeking or selfish / Disregard health and safety / Ignore issues
Candid Friend	/ Show everyone the same level of respect / Admit wrong doing and /or ignorance / Have the difficult conversations / Support others' successes	/ Respectful candour / Say 'I don't know' / Admit mistakes / Help each other	/ Bullshit / Do politics / Avoid tough conversations

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HSQE Principles

At Yondr we believe that health, safety, environmental (HSE) excellence is our goal not only because it is the right thing to do, but it creates strategic value for the organization. To that end, we want to embed an approach to HSE excellence that brings out the best in people, fosters resilience in our operations, and that creates the conditions for human flourishing for our stakeholders.
The following are our guiding principles we will use to create this HSE excellence. We strive to embed these ideas in everything we do. They inform our decision making and guide us in those moments where the path forward is not clear.

HSE performance is defined by its presence.

Typically, HSE performance is defined, and therefore measured by the absence of negatives (number of accidents, illnesses, spills, errors, etc.). However, this leads to reactivity and confusion about what actually leads to successes and failures in our operations. We can't define HSE by what does or does not happen. We have to define HSE by the presence of those things we are doing to enable the creation of human thriving for our stakeholders.

We improve HSE performance by improving work.

The normal approach to HSE is to focus on these as issues separate from the work, as if these are issues that must be dealt with to allow people to do the real work. But the only place where HSE sits separate from how people do work in our organization is on our org chart. Where the work happens people must find a way to effectively perform while balancing these goals and other goals (e.g., productivity, efficiency, quality, and personal goals) at the same time with constrained resources. We achieve HSE excellence by helping people manage this complexity reliably.

People are the solution.

Typically, in HSE people are seen as the problem to be managed by adding more controls or constraints to their work, or by trying to eliminate them altogether through technology, because the variability of people is inherently hazardous. However, this approach ignores the fact that we rely on that same variability to manage the complexity of work, to avoid failure, and to create success. We believe that by creating systems in processes that release and support people using their creative potential at work not only creates a better place to work, but also creates excellent HSE performance.

Policies

All HSQE policies shall be displayed in the relevant office and site locations via a QR code (where possible). This allows for ease of access to both external and internal stakeholders. All policies across the business will be reviewed on an annual basis to ensure relevancy.

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Other Yondr policies in relation to People (human resources), IT, Risk, Security can be found Sharepoint. These shall undergo a yearly review.

Yondr Global Policies

Organisational Roles, Responsibilities, and Authorities

Central HSQE & Top Management Team

The central HSQE management team consists of people from the Operations pilar of the organisation, which is led by the Chief Operations Officer - Global Data Center Operations (COO) as representative for the top management. For each individual and future data center, a decentral team will be added to this central team for the HSQE management of that specific activity. For more detailed roles and responsibilities please refer to the HSE PEP.

Chief Operations Officer - Global Data Center Operations

The COO is the top management representative for the HSQEMS. From that role they shall assign the responsibility and authority to the central HSQE management team for:

- Ensuring that the HSQEMS scope and boundaries are established.
- Ensuring that the policies are relevant to the HSQEMS, objectives and targets are established and compatible with the direction of the business.
- ensuring that the HSQEMS is established, implemented, maintained and continually improved.
- ensuring that the HSQEMS conforms to the requirements of this document.
- Ensuring action plans are approved and implemented to continually improve HSQE performance.
- Ensuring the formation of an HSQE management team and that resources needed are available for the HSQEMS.
- Communicating the importance of conforming and an effective management system
- reporting on the performance of the HSQEMS and improvement of HSQE performance to top management at determined intervals.
- establishing criteria and methods needed to ensure that the operation and control of the HSQEMS are effective.
- Ensuring processes are established and implemented to identify and address changes to the HSQEMS.
- Promoting continual improvement

Yondr and individual department organisational charts can be located on HiBob under People. (note, HiBob is only available to Yondr staff)

Top management ensures that the responsibilities and authorities for relevant roles are assigned and communicated through job descriptions, banding allocation and the below.

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The members of the central HSQE management team are:

VP HSE

- Accountable globally for legal compliance and obligations in regard to health, safety, quality and environmental management, and ensure control measures are in place.
- Accountable for the effectiveness of Yondr's HSQE management systems
- Responsible for the deployment of HSQE policies across the organisation and that they are compatible with the strategic direction of Yondr
- Supporting other relevant management roles to demonstrate leadership

Continuous Improvement

- Manage and lead the Group Audit Programme
- Lead and prepare multi-disciplinary teams for company audits, assessments and inspections from all accreditation bodies.
- Ensure the company remains compliant with ISO 9001, 14001, 45001, 27001, 23201 & 50001.
- Budget setting and control of external auditing and consultancy
- Lead and develop the Continuous Improvement Programme delivery.
- Create, assign and manage Continuous Improvement plans following external and internal reviews.

Environmental Manager

- Conduct Continuous Improvement Reviews based on ISO 14001
- Provide subject matter expertise advice to projects and support the HSE Directors
- Provide input into the development of appropriate local objectives, plans and actions.
- Support the delivery of the Yondr ISO 14001 Environmental Management Systems on projects.
- Work with the Directors of HSE to ensure environmental and sustainability is embedded into contractor management and evaluation.
- Support with the development of the reporting, evaluation and analysis of environmental performance data including environmental KPIs.

HSE Regional Directors

- Responsible for legal compliance for HSE in respective region
- Implementation of Yondr's Management system across, projects, facilities, and corporate offices
- Manage local HSQE team members.
- Lead regional HSE Steer Groups and be a part of the regional senior leadership teams.
- Contribute and share best practices with the global HSQE team.

HSEQ coordinator

- HSQE administration
- Data collection, consolidation, and analytics
- Team communications and internal Yondr communications
- Team coordination

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- Management of Safety Culture
- Legal and regulatory reviews and forecasting.
- Supplier reviews and early-stage onboarding.
- Ownership of HSQE internal intranet page.

Continuous Improvement Coordinator

- Administration of the Group Audit Programme.
- Facilitation of internal audits and improvement events.
- Development of reports and dashboards on CI.
- Improving and implementing CI tools.
- Management of CI communications.
- Management of ISO corrective actions.
- Assist with new and existing accreditation readiness to ensure compliance

Apart from the above-mentioned roles, both COO and VP HSE can request support from other roles within the Yondr organisation when needed to contribute to their tasks.

Decentral HSQE management

The following roles and responsibilities listed below are localised to the design & construction and operations. The roles below support the project and site teams as well as the central HSQE management team members listed above.

Data Center Operations Manager

- Ensure operations are Healthy & safety compliant - including all environmental aspects
- Deliver Yondr data center service as contracted by our customers.
- Maintain and operate the data center to establish optimal availability of the infrastructure against minimum costs.
- Site organisation including third party service provider.
- Customer relation and satisfaction
- Reporting to all stakeholders: customer, management
- Drive and share continuous improvement of design, delivery and all operations aspects: reduce costs, improve revenue.
- Site operations and project budgets (P&L)
- Provide continual support to the team and audit these procedures to ensure continual improvement and enhanced customer experience.
- Develop / build / support Yondr operations activities globally.

Regional Operations HSE Manager

- Represent Yondr in its capacity as a client / owner.
- Monitor, observe and support the operational facility to deliver and maintain HSE excellence in line with its Global HSE Performance Expectations for DC Operations
- Complete timely inspections and audits in line with project/facility schedules
- Support Yondrs' Campus Operations Managers and operational team in subject matter expert advice regarding HSE.

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- Support Vendors and General Contractors in reviewing of adverse events.
- Maintain Client / Customer relationships in regard to their respective areas.

Site and Senior HSE Manager (D&C)

- Represent Yondr in its capacity as a client / owner specific to Design and Construction
- Daily Monitoring, observe and support the project / facility to deliver and maintain HSE excellence through the General Contractor in line with Yondr's Global HSE Performance Expectations DC Construction
- Complete timely inspections and audits in line with project/facility schedules
- Support Yondr's' Project Directors and site teams in subject matter expert advice regarding HSE.
- Support Vendors and General Contractors in reviewing of adverse events.
- Maintain Client / Customer relationships in regard to their respective areas.

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Planning

Actions to address risks and opportunities

In this section the actions to address risks, issues, and opportunities (RIO) that apply to the whole scope are described. There is now a single register of all RIOs developed using Smartsheet, providing filtered views, reports and dashboards for each function, department, and project. All RIO owners, project and leadership teams have access to the register. You can request access using this form.

For the individual project sites and data centers, the access to separate documents are held by the site teams, however access shall be made available to the HSQE management team upon request.

The following links are the risk policy and framework, the framework includes the risk conformance rating which is used as a standard across the business.

Risk Management Policy
Risk Management Framework

Environmental Aspects & Impacts

Yondr has established, implemented, and maintains an aspects and impacts register for each location that is included under the management system. The register is updated based on changes in the operations and offices environment, and items are immediately controlled and implemented.

Aspects and impacts for the operational sites are maintained by the FM provider/GC and local HSE manager and the Aspects and impacts for office locations are reviewed by the environmental manager and office managers. The registers are stored locally and access to these are given by the central HSQE management team.

The register at a minimum reviewed every year by the FM Provider and local HSE manager/Environmental Manager.

Aspects and impacts Guidance

Compliance Obligations

Yondr uses a system called Enhesa to monitor compliance obligations. Enhesa is used in each region and country Yondr operates in unless it is a hot desk shared facility with less than 5 people.

The central HSQE management team is accountable for ensuring Enhesa is kept up to date, however the responsibility for reviewing and providing evidence of compliance to local regulations sits with the local HSE managers.

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Enhesa compliance rates are reviewed every month by the central HSQE management team, the system automatically calculates the compliance against applicability. This then forms part of the monthly reporting to ELT and SLT.

Enhesa goes through a review every 3 months to ensure applicability and compliance. This is conducted manually via an excel spreadsheet and is owned by the Central HSQE management team.

Link to Enhesa manual
Link to Enhesa

Objectives and Targets

Objectives and targets are set at the end of Q4 for the following year by each department, these are then reviewed live on Culture Amp throughout the year and formally every 6 months for progress updates. The progress on the objectives contribute towards yearly performance. Objectives and targets shall be set by all functions, departments, and sites within the system CultureAmp. Objectives should feed into ELT objectives that are set each year. Functional, departmental and site owned objectives are sat with the team owners.

Link company wide objectives & Guidance

Change Management

Change management is managed differently dependant on what the change is, listed below are different variations of change management used throughout Yondr.

Governance Committees

Governance is established for key processes ensuring key commercial controls are in place and effective for achieving business growth and regulatory compliance. Governance committees provide a forum for collaborative, collective and strategic decision making, while ensuring appropriate documentation is maintained for financial, audit and administrative purposes. The corporate governance framework at Yondr provides enhanced Yondr decision making, improved financial performance, mitigation of risks and ensures alignment of resources and activities to deliver business plans.

There are 8 committees within Yondr as detailed below;

- Audit Committee – Is Chaired by the CFO. The objective of this committee is to monitor and ensure the integrity of financial reporting and its processes. Approve the selection of an external auditor.
- Capital Committee – Is chaired by the CFO. The objective of this committee is approval of all capital expenditure relating to development and construction projects.

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- Deal Pricing Committee – Is chaired by the CFO. The objective of this committee is approval of pricing requests at each decision gate leading up to the disclosure of a price to a customer.
- Finance Committee – Is chaired by the CFO. The objective of this committee is to set financial goals, objectives, and annual budget. Track audit and tax compliance.
- Risk Committee – Is chaired by the CFO. The objective of this committee is to review company risks and approve mitigation measures.
- Remuneration committee – Is chaired by the CPO. The objective of this committee is to review and approve any changes to financial impact as it pertains to compensation.
- Sustainability Committee – Is chaired by the CDO. The objective of this committee is to deliver the Yondr sustainability strategy with board level accountability on driving progress and strategic decision making.
- Technology and Business change committee – Is chaired by the CFO. The objective of this committee is for approval of all technology and business change requests.

To access meeting minutes, process flow diagrams and to submit a change request through a governance committee the follow link should be used.

Yondr Corporate Governance Landing Page

Design Management Change

Details of the design management change process.

Quality Assurance and Commissioning

Yondr is committed to a Safe Quality Right the First-Time project through a predictable quality culture from initial design through commissioning to promote an environment for all workers to speak up, take pride in their work and their contribution to the delivery of the facility.

The linked document below outlines the Yondr expectations for Quality Assurance in Design & Construction projects. The essence of quality is at the heart of performing work safely, most cost effectively and on schedule. Reducing cost of rework, applying lessons learned for Improvement, and planning one's work are key tenets to Good Manufacturing Practices.

Yondr, the Owner is defining the Quality Assurance expectations for building construction through the Division. The GC/CM will then provide Quality Control in response to verify our expectations are met.

Link to Quality Plan

HSE Global D&C Expectations

The central HSQE management team owns and maintains a set of HSE performance expectations for the design and construction team supply chain. Performance expectations in each region shall be reviewed by a local SME to ensure that all local regulations are also included. The expectations are included in the supplier contract to highlight what is required in terms of HSE before they arrive on site.

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During the project kick off the Yondr team shall run through the expectations to ensure contractors fully understand what is required of them.

Once the expectations have been included into the contract they cannot be changed unless it is a major change. Any other changes shall be included into the contract which is issued at a new project stage. The performance expectations shall at a minimum be reviewed annually by the central HSQE management team.

Yondr HSE Global Ops Performance Standards

The HSE performance standards are owned by the central HSQE management team, they outline what Yondr expects from the FM provider and how the data center should be run from an HSE perspective. The Performance standards are issued to the FM provider at contract stage and are explained through the kick off meetings.

Once the expectations have been included into the contract they cannot be changed unless it is a major change. Any other changes shall be included into the contract which is issued at a new project stage. The performance expectations shall at a minimum be reviewed annually by the central HSQE management team.

Mobilization Plan

The Global Mobilization Program develops and maintains processes, procedures, and supporting tools to facilitate a complete and timely transition of a data center construction project into an operational campus in collaboration with all Yondr business pillars and functional areas using a global approach that is consistent, efficient, and scalable.

Key Stakeholders:

- Executive Sponsor: VP DC Operations – Americas
- Program Leads: Mobilization Manager
- Primary Internal Customers: D&C, People, and DC Ops Teams
- Primary External Customers: Facilities Management Service Providers

The Mobilization program activities ensure that Ops is ready to operate and maintain each data center to safely meet contractual obligations (including but not limited to Early Access and Ready for Service milestones). The mobilization program toolkit ensures that each site builds operational readiness in a consistent manner, with the ability to adapt to local conditions when required. This consistency aligns with Yondr's vision and is highly valued by our clients. The program activities include key hand-off points with our XFN partners (e.g., delivery of as-built drawings, planned hiring dates). With schedules integrated with the main construction schedule, the mobilization program ensures a coordinated approach across Yondr functional pillars to ensure Operational Readiness.

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The plans are held locally for each project and contained within Smartsheets.

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Resources

Resources

Procore
Is a construction management software tool that Yondr use to manage construction projects (it is used alongside SharePoint & or other tools used by either the GC or Yondr). Procore is used as the reporting platform for all activities, not just HSE. From a HSE perspective, Observations, Incident notifications, inspections progress meetings/minutes are stored on this platform (if SharePoint or Safety Culture is not used)

Aconex
Can also be used alongside Procore within the D&C environment (not all) and stores all the documents during the different stages of the project, it is managed by all the stakeholders involved in the project and controlled by the GC. It has a repository of all documents and its different versions across the lifecycle of the project, Aconex will provide the appropriate tools to create the workflows for the revision and approval of the documents, it also incorporates comments and markups.

YondrONE
Automates Yondr's Operations maintain and operate model and is the platform. Yondr's very own CAFM system.

SafetyCulture
A mobile and web-based application that is used to carry out inspections, audits and action management that are stand-alone outside of Construction Projects and live data centers.

ENHESA
A web based regulatory forecasting tool that we use to check the legal requirements for all entities, facilities and construction projects that are under control by Yondr.

Smartsheet
A web based collaborative work management tool. It can be used to assign tasks, track projects, management shared document and other works using a tabular interface. Smartsheet is used to manage various items across the business for example (not limited to) – Audit programme, continuous improvement plans and the mobilisation plan.

CxAlloy
Aa highly effective and intuitive cloud-based commissioning software. This is the tool used by the QA Cx program to execute required checklists and manage the resolution of identified deficiencies.

People
To run the HSQEMs, human capacity is needed for the execution of the various tasks. The roles identified are listed and described in the Organisational roles and responsibilities section of the MS.

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Competence

Job descriptions given at Yondr which are owned by individuals and/or the People team identify the necessary competence of persons doing work under its control that affects its HSQE performance and HSQEMs.

Competences within locations under the management system are reviewed through the internal audit.

Individual competences are reviewed formally every 6 months through performance reviews, these reviews take place against meeting objectives, banding requirements (linked below), Yondr values and peer reviews.

Yondr Employee Banding

Awareness & Training

All Yondr staff shall undergo mandatory training within the Yondrversity platform. The mandatory training must be conducted by all Yondr staff, and a refresher shall be undertaken each year.

Yondrversity Onboarding Must Haves

All new Yondr Ops staff shall undergo ISO and Environmental awareness training which shall be given by the Environmental Manager and Continuous Improvement function before handover to ensure the team is fully aware of all requirements.

All staff working on a project, site or office shall undergo an induction – all inductions are given and held locally. For induction requirements please refer to the HSE Performance requirements for construction and operational sites.

Each construction and operational data centre shall keep and maintain their own training matrix of what is required for high risk works and shall be held by the local teams.

Communication

The HSQE team shall manage a community's page on the company intranet – Yondrverse – this shall allow employees to make comments, suggest improvements or to highlight any HSQE issues or best practices. The communities page shall also house the HSQE policies and HSE expectations. (note. Yondrverse is only available to Yondr employees)

The comms plan is owned by the communications manager and determine the internal and external communications relevant to the HSQEMs
HSQE Yondrverse
Comms plan & process

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Documented information

ISO 45001, 14001 & 9001 mentions two types of documented information to be available:

- information required by the standard itself;
- documented information determined by the organisation as being necessary for the effectiveness of the HSQEMS and to demonstrate HSQE performance improvement.

All documentation listed in the below tables are issued and managed through the document control procedure (linked below).

All documents shall be created in the English language unless specified otherwise (in the description).

Procedure	**Policies**
Description / action(s)	All policies shall be reviewed each year by the policy owner and by ELT for sign off. Policies are housed within SharePoint and are available within Yondrverse. Policies applicable to the MS are also shown within locations via QR codes (where possible).
Link to separate document	Link to Policy Central Link to Policy Register
When	Every year
Accountable	Policy owners

Procedure	**Objectives, targets and planning to achieve them.**
Description / action(s)	Objectives and targets shall be created at the beginning of each calendar year and progress shall be reviewed quarterly by each department.
Link to separate document	Link to ELT objectives Link to HSQE Objectives
When	Every year, with quarterly reviews
Accountable	Everyone working with the system

Procedure	**Monthly reporting and evaluation**

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Description / action(s)	Each month, for each site and operational data center an evaluation shall be conducted to monitor progress on the execution of the plans and HSQE performance. On a central level, these evaluations shall be aggregated to one document, which shall be given to ELT for presentation in the monthly company wide meetings. The reports shall be kept as documented information on a data center and central level.
Link to separate document	Link to ELT regional business updates
When	Once every month
Accountable	● Data center level: Site Manager ● D&C: Project directors ● Central level: VP HSE

Procedure	**Yearly review – Business Planning**
Description / action(s)	Each year reviews shall be conducted for each business unit. This shall be done using given document for this purpose. Each review shall be handed to the ELT as input for the company wide business review. The reviews shall include but not limited to; Objectives – past and future Resource planning Risks & Opportunities Budget setting
Link to separate document	Held locally
When	Q3 each year
Accountable	∉ SLT & relevant teams

Procedure	**Aspects & Impacts**

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Description / action(s)	Aspects and impacts register for each location that is included under the management system. / The register is updated based on changes in the environment. / Items are immediately controlled and implemented. / Operational sites are maintained by the local HSE manager. / Office locations are reviewed by the environmental manager and office managers.
Link to separate document	Sits locally within each location
When	Continuously with an annual review
Accountable	Local HSE Managers Environmental Manager

Procedure	**Permit Consent Licence (PCL)**
Description / action(s)	The PCL register shows all permits and compliance regulations. D&C – Managed by consultant mentioned within D&C HSE expectations. Ops – PCL register is reviewed once per year and is audited once by year by the Environmental Manager. PCL is through smartsheets. To ensure no changes to actions required.
Link to separate document	HSE Permit Consents & Licence Process
When	Continuously
Accountable	D&C – Consultants Ops – Local Ops team Environmental Manager

Procedure	**Suggestions for improvement of the MS and performance**
Description / action(s)	● Every person doing work under the organisation's control can comment or suggest improvements to the MS and HSQE performance if they identify them.

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	• There is an email address on which all personnel can make suggestions on how to improve the MS on the HSQE YondrVerse page and on how to improve HSQE performance in general.
Link to separate document	-
When	On occurrence, continuously.
Accountable	∉ Doing suggestions: Every person doing work under the organisation's control. ∉ Receiving and evaluation of comments / suggestions: HSQE team

Procedure	**Complaints and Satisfaction - Internal**
Description / action(s)	Speak Up Policy – for colleagues and third parties to raise genuine concerns. A review and investigation shall take place and Yondr shall decide on the outcome. Yondr Talks survey allows Yondr to get employee feedback on how they are doing and how they can further improve. Results are communicated across the business and goals are set based on results of the survey.
Link to separate document	Speak Up Policy Yondrtalks Info
When	Speak Up – Continuously YondrTalks – every 6 months
Accountable	∉ Yondrtalks – all Yondr employees ∉ Speak Up – all Yondr employees, third parties & People team for follow up

Procedure	**Complaints & Satisfaction - External**
Description / action(s)	Managed on an ad-hoc basis. Where Yondr has specific customers, we have ongoing cadence with customers during each phase of the project. Meeting minutes are kept and tracked by the project lead of the specific project. Any problems/issues are raised in these meetings. Category of problems/risks are based on yondr risk category.

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	Client solutions is responsible for the tool Hubspot this tracks all customer engagements and circulating meetings. There is a QBR section for critical items which is circulated to the client. Surveys are given to the client yearly this owned and responsible by client solutions team. Marketing will issue the surveys to the client. Client solutions to manage the responses and create action plan.
Link to separate document	-
When	Continuously
Accountable	∉ Project Leads ∉ Client Solutions Team

Procedure	**Evaluation of compliance with requirements**
Description / action(s)	Yondr shall evaluate the compliance with legal requirements and other requirements within Enhesa.
Link to separate document	Link to Enhesa
When	Continuously
Accountable	HSQE Coordinator Local Operations teams

Procedure	**Internal Audit (Internal Review)**
Description / action(s)	Internal Reviews (Audits) are conducted on each location, site and operational data centre as per scope of the business. Internal reviews are set via the review schedule which is planned 2 years in advance.
Link to separate document	Link to audit procedure Link to audit schedule
When	As per audit schedule
Accountable	Continuous Improvement

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Procedure	Corrective action on non-conformities
Description / action(s)	On non-conformities that are identified during the internal and external audits, corrective action shall be taken. Continuous Improvement Plans shall we used to track corrective actions raised from root cause analysis workshops after internal and external audits. Non-conformities raised on a D&C location shall be raised, tracked and monitored via Procore (or the tool of choice on the project)
Link to separate document	Link to CIP Register
When	On occurrence, when nonconformities are identified.
Accountable	Continuous Improvement

Control of documented information

Documented information required by the HSQEMS and by this document shall be controlled to ensure:

- it is available and suitable for use, where and when it is needed.
- it is adequately protected (e.g., from loss of confidentiality, improper use, loss of integrity).

The documented information is available in various locations depending on the type of document and dependant on the function. Most documents are stored on the organisation's SharePoint storage, with links to them provided in this document.
The HSQE monitoring data is kept within the YondrOne system for Operational datacentres and Procore and or Sharepoint/Safety Culture for construction projects. Access to documents can be assigned on an individual basis on all systems listed.

Documented information of external origin determined by the organisation to be necessary for the planning and operation of the HSQEMs shall be identified, as appropriate, and controlled.

Link to Procore User Guide
Link to HSE Document Control Procedure

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Operations

Operational planning and control

Yondr has established, implemented, and maintains operation control procedures to manage HSQE. The following procedures are relevant to the operational facilities only. For construction projects, refer to the planning section.

Yondr ensures that all operations and its activities carried out by both employees and/or contractors are properly controlled and all procedures are communicated.

Asset Management

An asset is an item, thing or entity that has potential or actual value to an organization. The value will vary between different organizations and their stakeholders, and can be tangible or intangible, financial, or non-financial. Furthermore, assets consist of systems and components with capital value that are needed to ensure SLA (Service Level Agreement) uptime to the facility, to sustain/maintain statutory. compliance, or identified to be exceptional enough to be managed. For tracking purposes, assets are managed within an asset register.

Yondr Ops Asset Register Requirement

Yondr Ops HSE Framework Plan

Yondr has created and maintains an Ops Framework plan which identifies all expectations, deliverables, and actions for the Yondr Operations team in terms of health, safety and environmental requirements. This document is given to the Yondr operations team and to the FM provider via a kick off meeting where the central HSQE management team run through all expectations, this is done within a minimum of 4 months before RFS.

The document contains various categories that need to be met such as; Audit and assurance, Communication and consultation, Contractor Management, Environmental and Waste Management, Health and Wellbeing Management, Incident and Emergency Management, Legislative and Statutory Requirement, Performance Management and Reporting, Risk Management, Training and Competency Management. The framework plan shall be split into regions to ensure all regional/local requirements are met and highlighted.

The deliverable dates are set, monitored and tracked by the central HSQE management team, however it is the local Yondr operations and FM providers responsibility to ensure evidence is uploaded within the set time frames.

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Reviews are conducted annually by the central HSQE management team to ensure dates and evidence of each requirement has been met/in place. The items are then marked as complete as they are compliant. co

Link to Yondr HSE Framework Plan

Maintain and Operate Model

Maintain and operate model is a holistic strategy that combines proactive maintenance practices with effective operational procedures. This integrated approach aims to minimize downtime, enhance reliability, and ensure the continuous availability of critical systems. Each piece of the model has a unique meaning and purpose of the overall strategy.

Maintain: This aspect involves activities related to the ongoing care, upkeep, and preservation of the critical facility.

Maintenance tasks include routine inspections, preventive maintenance, repairs, and upgrades to ensure that all systems and equipment are in optimal condition over the entire life cycle of the asset. The goal is to identify and address potential issues before they cause disruptions to the critical operations.

Operate: This involves the day-to-day operational activities necessary for the smooth functioning of the critical environment.

Operational tasks include monitoring critical systems, responding to alarms and alerts, managing resources such as power and cooling, and ensuring overall security. The focus is on maintaining optimal conditions for the equipment and systems to operate efficiently.

CEM Maintain and Operate Model

Emergency Preparedness and Response

Yondr has established, implemented and maintains emergency preparedness and response procedures which identify potential emergency situations and responses to those situations in order to prevent and/or mitigate any HSQE impacts and/or issues that are associated.

Each Yondr office and data centre holds its own Emergency Preparedness and Response procedure.

Link to Incident Management

The D&C function utilises the main general contractor procedure as they are the main contractor on the sites, however the requirement for implementing this is contained within the Yondr D&C HSE Expectations.

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Incident and Escalation

The purpose of the incident escalation and management process is to facilitate efficient and effective responses to incidents by creating a consistent language and sets of responses to incidents. As defined by the Yondr Business Continuity Plan (BCP), an incident may be any situation which might or could lead to a disruption, loss, emergency, or crisis affecting the normal operations of Yondr.

This process applies to all unplanned events / incidents that occur within Yondr offices / data centers and/or involve Yondr employees.

Note that in some instances, specific Yondr teams (e.g., operational and/or construction sites) will generate tailored incident / event management processes to provide additional detailed guidance and ensure consistent responses across various locations.

Link to Yondr Business Continuity Plan and Policy

Design

Design & development of products and services

Yondr has an established Design Process for the delivery of Data Centres on a Global Scale as well as established Products (Blueprint Designs) for use within this design process. The Design Process is a 'continuous improvement' process which takes account of HSQE lessons learned on each Yondr Project.
The 'Hyperbloc' Product is utilised globally to ensure a repeatable, predictable, dependable (RPD) design and outcome for each Yondr Project. Using this product, the Yondr Design Delivery team manage our supply chain to ensure the delivery of Design in line with the RPD strategy.

Requirements of products and services

Yondr has implemented the Design & Development Procedure which defines the activities that are required to provide effective products and services.

The organisation considers HSQE performance improvement opportunities and operational control in the design of new, modified and renovated facilities and equipment that can have a significant impact on its HSQE performance over the planned or expected operating lifetime.

Where applicable, the results of the HSQE performance consideration shall be incorporated into specification, design and procurement activities and captured in updated 'Hyperbloc' design standards for incorporation in new projects moving forward.

Control of externally provided processes, products and services

During the Design Process – the external supply chain is managed/tracked by several standard Design Management Documents;

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Design Management Tracker (Lessons Learned, Permit Tracking, Project Risk Tracking)
Design Deviations Tracker
Global Standards
Change Management

The above ensure consistency in delivery of design through Yondr's Design & Development process and ensure consistency in internal reporting across the business.

Release of products and services

Yondr utilises Procore and or SharePoint for all projects – this enables a consistent, centralised platform for information release with the correct responsibilities assigned for workflow review. The design supply chain generate and release design information to the Procore platform (or another that is used) while adhering to the Yondr Global Standards which include, but are not limited to, Design, Reporting, Deliverable Naming, Asset Naming, Risk allocation.

Yondr's Global Standards are updated and released periodically – based on the lessons learned, continuous improvement and emerging sustainability target updates from the Yondr Sustainability team/regional sustainability legislation.

Control of non-conforming outputs

The Design Delivery team lead the conformance of the project to design, permitting, sustainability and quality utilising the tools mentioned above. Non-conformances should be reduced upon delivery of the service/product as a result of Design Team leadership, however the Design Deviations Tracker and Technical Quality Review forms are in utilised to record non-conforming deliverables.

These non-conformances are registered on Procore (or another platform that is used) for action/closeout by the supply chain and are reviewed by the design team on an iterative basis to ensure products/services adhere to the Yondr Global Standards.

Procurement

Yondr uses a system called Canopy to manage contractor onboarding. Canopy conducts credit and legal requirement checks before a contractor is uploaded onto the system. Yondr currently does not have a preferred supplier list. Each supplier once they go through the question set will automatically set which questions are relevant to them I.e. a smaller business with lower risk will answer different questions to a main contractor – it will be based on risk.

The central HSQE management team reviews all contractor's compliance against the HSE set questions. These reviews are done per new release of contractor. Information that expires will automatically get released back to the contractor so there is no manual review process. Evaluation checks will be conducted throughout the relationship to highlight risks, performance on and ongoing basis.

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Performance evaluation

Monitoring, measurement, analysis, and evaluation of HSQE performance and the MS

Yondr has an established reporting process which consists of the following;

- Monthly HSE project report
- Monthly HSE board report

Aside from the following the central and decentral HSQE team also feed into the following reports on an adhoc basis.

- Client specific reports
- Yearly ESG report (owned by the Sustainability team)

The HSE managers are responsible for issuing all information for the reports. The HSQE central management team are responsible for gathering all information and creating the report. The data that is input into the Monthly HSE project reports is consolidated for the monthly board report.

The monthly project reports are issued to the project director and team on the project. It consists of the following (but is not limited to);

- Capacities
- Global HSE Performance
- Inspection scores & breakdown
- Critical control effectiveness
- Planned vs Action HRA & Leadership tours
- Observations and closeout rate
- HRA Observations
- Events – Details & Learnings
- Reactive and Proactive Learning
- PLC (Proactive Learning Capacity) & RLC (Reactive Learning Capacity)
- Monthly HSE Inspection – Environmental breakdown
- Recycling rates

The monthly board report is issued to the executive leadership team and consists of the following (but not limited to);

- Events
- Client project breakdown
- Event Categories
- Workhours
- Events - details & learnings
- HRA Event Matrix

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- Inspection Scores
- ISO / Audit Status

ESG – Environmental, Social and Governance

Environmental, Social and Governance (ESG) is led by our ESG Manager but delivered by the business. It involves ensuring we have the policies, processes, controls, and data collection methods to ensure we are acting ethically, responsibly and sustainability. This touches on all parts of the business and issues can include our carbon footprint, labour standards, responsible procurement, and several other areas. We are in scope of ESG regulation, including the Corporate Sustainability Reporting Directive (CSRD) and the EU Taxonomy, which will require us to report publicly on ESG issues that are material to Yondr.

Internal Reviews

Internal audits shall be referred to as internal reviews.

The internal review is owned and led by the Continuous Improvement function. The internal review schedule is based on needs/requirements from the business, risk and results found from previous reviews. At a minimum each project shall be reviewed once every year.

All continuous improvement plans shall also undergo an evaluation after closure to ensure it's effectiveness, details of this are contained within the review procedure.

Review procedure
Review schedule

All internal review findings shall undergo a root cause analysis workshop, this ensures that findings are being effectively closed and ensures the outcome is resolved across the business and not only locally.

All continuous improvement plans shall also undergo an evaluation after closure to ensure it's effectiveness, details of this are contained within the review procedure.

HSQE reviews

HSQE reviews shall also be conducted monthly and 6 monthly on both D&C sites and operational sites by the HSQE and leadership teams.

These reviews shall be contained and tracked within the system Safety Culture. The purpose of these reviews is to ensure compliance to HSE requirements/expectations, ELT/SLT and HSQE leadership and to act as an impartial party for the site teams. The following reviews currently take place;

- Yondr leadership site safety walk – This is conducted by the ELT/SLT/Senior site management
- Monthly Construction audits – This is conducted by the HSE site managers
- Monthly Ops audits – This is conducted by the HSE site managers

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- 6 monthly HSE Performance audits – This is conducted by the HSE Directors of region, this is a comparison on how site is doing against performance requirements.
- Spot checks – This is conducted by the HSE Managers on site or by GC

Link Safety Culture

Management review

Top management shall review the organisation's HSQEMS once a year to ensure its continuing suitability, adequacy, effectiveness and alignment with the strategic direction of the organisation. This is done alongside the reporting requirements and business planning.

Outputs of the management review

All actions raised within the HSQE management review shall be documented and tracked within Safety Culture.

Link to Management review guidelines

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Improvement

Nonconformity and corrective action

External audit non conformities raised are logged on the linked NCR Log and are controlled via continuous improvement plans (linked register). This is managed and maintained by the continuous improvement function. These are checked twice upon closure, the time frame for the effectiveness check is dependent on type of finding and whether it was internally or externally raised. The time frames can be found within the audit procedure.

NCR Log
CIP Register

A NC raised on an operational site shall be controlled via YondrOne. There is engagement with the facilities provider (CBRE) to undertake a RCA and raise a ticket via YondrOne to ensure closure of any actions.

Continual improvement

Yondr strives to continually improve its HSQE performance by using the following tools;

Internal reviews and root cause analysis

Learning teams

A Learning Team is an ad hoc team of subject matter experts who are brought together to discuss a particular task or process with the goal of understanding how it is working in practice (not just how it is supposed to work) and opportunities to improve the task or process.

Actions that arise from a learning teams session are tracked and monitored on Smartsheet's or applicable tool used on location (i.e. YondrOne, Procore).

Link to Learning teams procedure

Rapid Insights

Rapid Insights is a process where a group of people with unique experience or insight on a given problem, challenge, or opportunity are engaged to identify how effectively existing processes are working and what opportunities there may be for improvement. The process is designed to be flexible, quick, and actionable.

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After the Rapid Insights session, the facilitators should meet with the responsible person to discuss the outcomes of the session and develop an action plan. At a minimum the action plan must include:

- Follow-up activities with due dates on those critical factors discussed in the session that require improvement.
- A plan to communicate outcomes of the follow-up activities to attendees of the session within a reasonable time frame, but not more than one week after the session.

It is not expected that the responsible person will know the fixes to all the problems or challenges identified during the session.

All actions are tracked and monitored on the preferred system that is used at that location/site/project.

Link to Rapid Insights procedure

Project Management Office (PMO)

The PMO partners with teams across Yondr to deliver change and improvements to processes, policies, tools, controls, and organisation.

The PMO portfolio of projects will vary depending on business needs. Typically, the projects are cross-functional in nature, and drive business change that impacts people, process and technology. The comprises mainly of contractors, who are brought in to lead or support specific projects which require skills and experience that does not exist in Yondr.

PMO Toolkit

Anyone can submit a project initiation through the PMO by using the PMO Project Initiation Document (PID) template.

PMO PID template

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Acronym & Glossary

CIP	Continuous Improvement Plan
CX	Commissioning
D&C	Design and Construction
ELT	Executive Leadership Team
FM Provider	Facilities Management Provider
GC	General Contractor
HSE	Health Safety & Enviromental
HSQE	Health Safety, Quality & Environmental
HSQEMS	Health Safety, Quality & Environmental Management System
HRA	High risk activity
KPI	Key Performance Indicators
MS	Management System
NCR	Non Conformance report
PCL	Permit Consent Licences
PLC & RLC	Proactive learning Capacity & Reactive learning capacity
Ops	Yondr Operations team
RIO	Risk Issues Opportunities
SLT	Senior Leadership Team
VP	Vice President

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Appendix J- Groundwater Monitoring and Decommissioning Report