ARUP

Amazon Data Services UK Ltd

Hemel Hempstead Data Centre – Emergency Back-up Generation Facility

Non-Technical Summary - Environmental Permit Application

Reference: 284474-EP-NTS

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1. Introduction

Ove Arup & Partners Ltd (Arup) has been commissioned by Amazon Data Services UK Ltd (henceforth referred to as 'the Operator') to prepare a bespoke application for an Environmental Permit for the Hemel Hempstead Data Centre – Emergency Back-up Generation Facility only (not including the whole Data Centre).

The application is made by Amazon Data Services UK Limited, which is the legal entity that will be responsible for operating the generating installation. The data centre is located at 3A Blossom Way, Hemel Hempstead in the Borough of Dacorum, Hertfordshire.

The site is situated in the Prologis Industrial Park, located in a light industrial and commercial area in Hemel Hempstead, shown in the Site Location Plan[1].

The northern boundary of the site consists of a Costa Coffee 'drive thru' and a fitness centre with its adjoining multi-deck car park. There are warehouses to the east; to the west there is a self-storage facility; and to the southwest there is a Travelodge Hotel, a car park and open space. Residential properties are located further to the west and south, approximately 100m from the site boundary. Several major roads are located in proximity to the site, including the A414 (Breakspear Way) to the south, the A4147 (Maylands Avenue) to the west. The M1 motorway is located 1.2km to the east.

The site was historically occupied by TRW Lucas Aerospace Ltd (1955-2002) and used for the manufacture of power systems for aircraft and military vehicles. It contained a metal plating shop, a spray-painting shop, a solvent degreasing works, heat treatment furnaces and above and below ground fuel and chemical storage tanks. The factory was demolished around the year 2002 and the land remained vacant until 2018 when works were initiated to prepare the land for future development.

In December 2019, Prologis UK Ltd received consent in December 2019 for the following (Dacorum Borough Council reference 4/01922/19/MFA):

"Comprehensive redevelopment of the site to provide 21,726 sqm of flexible floorspace within use classes B1c/B2/B8 & ancillary offices, with car & cycling parking, access & landscaping"

Construction of the consented scheme commenced in January 2021, with site development works and the building on the site substantially complete.

A minor material amendment planning application under Section 73 of the Town and Country Planning Act, 1990, was submitted in March 2022, for proposed alterations to be progressed to enable the site to be occupied as a data centre.

The data centre will be manned on a 24-hour basis and will have around 50 operational staff. The majority of staff will be present during normal office hours. A team of key engineering staff and security will also be onsite 24 hours a day, involving approximately 7 personnel on a shift basis.

Once operational, up to 50 staff will be on site at the data storage facility at any given time (a maximum of 50 day time staff). It is estimated that up to 35 no. full time data storage facility staff will be on site on a daily basis during standard operation, including security staff with a further 7 no. night shift staff and 15 no. external staff/maintenance contractors/visitors.

This non-technical summary (NTS) provides a summary of the activities that will be undertaken at the data centre, an explanation of what is being applied for, and a summary of the key technical standards and control measures that will be implemented at the site.

[1] Site Location Plan (Document reference 284474-EP-DR001)

2. Environmental Permit Application

2.1 Environmental Permit Type

2.1.1 Scheduled Activity

The site comprises 33 containerised generators for emergency back-up purposes with a combined thermal input capacity of 222 MWth. 30 of the main back-up generators are double stacked, with two being included as secondary back-ups (redundancy). There is also a smaller ('house') generator to cover non-critical loads (e.g., office lights, office fire system) during an emergency.

The data centre will be served by a direct power connection to the National Grid. In case of a break in power supply, back-up power will be supplied by operating the emergency diesel generators.

Each generator has an individual flue terminating at 25m above ground, the locations of which are provided in the Site Layout and Emissions Point Plan[2]. The 30 double stacked generator flues are located close to each other but are separate flues.

Combustion activities are regulated under The Environmental Permitting (England and Wales) Regulations 2016 (EPR). The regulations enact both the Industrial Emission Directive (IED) and the Medium Combustion Plant Directive (MCPD) in England. Operators undertaking any of the activities identified under these regulations require an environmental permit to carry out these activities.

The "activities" that are proposed are defined in the EPR:

Section 1.1 Part A(1)(a) burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.

In accordance with the EPR:

"…where two or more appliances with an aggregate rated thermal input of 50 or more megawatts are operated on the same site by the same operator, those appliances must be treated as a single appliance with a rated thermal input of 50 or more megawatts."

The total aggregated capacity of the generators is above 50 MWth and will therefore be permitted under the IED. However, because the individual combustion is below 15 MWth the installation will be permitted as an IED Chapter II installation but not a Chapter III (Large Combustion Plant) installation. This means the installation will not be required to meet the Best Available Technique (BAT) Conclusions for the Large Combustion plant. The permit will therefore follow the guidelines set out under the MCPD.

The generators will not be used to provide a balancing service or for demand side response operations such as triad avoidance or fast frequency response. No electricity generated from the site will be exported off-site or fed back into the National Grid.

2.1.2 Directly Associated Activity

Schedule 1, Part 1 Regulation 2(1) of the EP Regulations provides that a Directly Associated Activity (DAA) is an operation that, in relation to any other activity:

- Has a technical connection with the activity;
- Is carried out on the same site as the activity; and
- Could have an effect on pollution.

[2] Site Layout and Emissions Point Plan (Document reference 284474-EP-DR002).

Diesel fuel will also be stored in a top-up diesel tank on-site with a volume of 40,000 litres / 40 m^3. This will be used to fill the 'belly tanks' of the generators, each of 16,000 litres / 16m^3 in volume. As the purpose of this fuel storage is to serve the generators and the 'combustion' Scheduled Activity, this storage of fuel therefore constitutes a directly associated activity to be covered in this Permit Application.

All tanks will be above ground and double skinned. The main top-up tank will be contained within a bund with a capacity of 110% of the storage capacity of the tank.

Each belly tank is containerised and self-bunded to contain 110% of the storage capacity of the tank. All tanks will comply with the Oil Storage Regulations (SI 2001/2954. The Control of Pollution (Oil Storage) (England) Regulations 2001).

2.2 Application Contents

The application comprises the following elements:

- Environmental Permit Application forms (Parts A, B2, B3 and F1);
- Non-technical Summary[3];
- Summary Technical Report with supporting Appendices[4];
- Site Condition Report with supporting Appendices[5];
- Environmental Risk Assessment with supporting Appendices [6];
- Air Quality Assessment[7];
- Drawing 1 Site Location[1];
- Drawing 2 Site Layout and Emission Points[2];
- Drawing 3 Environmental Site Setting[8]; and
- Drawing 4 Cultural and Natural Heritage[9].

[3] Non-technical Summary – Environmental Permit Application (2022) (Document ref 28447-EP-NTS).

[4] Summary Technical Report– Environmental Permit Application (2022) (Document ref 28447-EP-STR).

[5] Site Condition Report – Environmental Permit Application (2022) (Document ref 28447-EP-SCR).

[6] Environmental Risk Assessment – Environmental Permit Application (2022) (Document ref 28447-EP-ERA).

[7] Air Quality Assessment - Environmental Permit Application (2022) (Document ref 28447-EP-AQ).

[8] Environmental Site Settings Drawing (Document reference 284474-EP-DR003).

[9] Cultural and Natural Heritage (Document reference 284474-EP-DR004).

3. Site Condition Report

A Site Condition Report[5] (SCR) has been prepared in accordance with the Environment Agency's H5 Guidance Note on SCR.

The SCR describes and presents detailed information on the condition of the land and groundwater at the site at the time of permit application. It also serves as a baseline so that it can be demonstrated to the EA that the land and groundwater have been protected during the lifetime of the site and that the land is in a satisfactory state on permit surrender.

Sections 1 to 3 of the EA's SCR template have been completed in the preparation of this document, which comprises the following:

- Site details;
- Condition of the land at permit issue:
    - Geology;
    - Hydrogeology;
    - Hydrology;
- Pollution history;
- Evidence of historic contamination; and
- Permitted activities.

Appendices are also provided to evidence the previous ground investigation and remediation at the site.

Section 4 to 7 of the SCR template will be maintained during the life of the permit and Sections 8 to 10 will be completed and submitted in support of the application to surrender the permit.

4. Environmental Risk Assessment

An Environmental Risk Assessment (ERA)[6] has been undertaken in accordance with the EA Risk assessments for your environmental permit[10] and is included with the EP application.

The ERA is a simple effective tool for identifying potentially hazardous or polluting consequences of activities and providing mitigation systems that reduce the risk of those activities causing pollution.

The primary risks to the environment as a result of the Installation are considered to be from emissions to air as a result of the diesel-fuelled generator use, together with the potential for leaks from the associated fuel tanks and delivery systems affected water and land. Other potential environmental risks also covered including Noise and Vibration, Odour, Accidental and Fugitive Emissions and Global Warming Impact.

Overall, with the design and operational measures in place to manage potential risks, no significant environmental risks have been identified at the site.

[10] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit Accessed March 2022

5. Air Quality Assessment

As the primary risk to the environment as a result of the Installation is considered to be from emissions to air as a result of the diesel-fuelled generator use, a detailed stand-alone Air Quality Assessment[7] has been undertaken as part of the EP application.

The assessment has been undertaken to consider the potential impact of the use of the back-up diesel generators during routine testing and maintenance (19 hours per year per generator), as well as commissioning and in the unlikely event of an emergency power outage for 68 hours.

The modelling considered and assessed emissions of oxides of nitrogen (NOx), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2) and carbon monoxide (CO).

An extensive flue stack height determination study was undertaken during the design process for the data centre, seeking to minimise the potential impact to local air quality, and identify a stack height which would ensure that no significant impacts were likely. This assessment concluded on a height of 25m above ground level for all generator stacks.

The summary of this is that significant impacts are considered unlikely from any of the modelled routine or unplanned events at sensitive human or ecological receptors.

6. Key Design & Operational Information

A review of the key design and operational information is provided as part of the Summary Technical Report[4] is included with the EP application. The STR been undertaken in accordance with the following regulations and guidance pertinent to the 'combustion' Scheduled Activity and Directly Associated Activity for the on-site diesel fuel storage:

1. The Environmental Permitting (England and Wales) Regulations 2016, SI2016/1154.

2. EU, 2010 Directive 2010/75/EU of the European Parliament and the Council on industrial emissions.

3. EU, 2015. Directive (EU) 2015/2193 on the limitation of emissions of certain pollutants into the air from medium combustion plant.

4. The Control of Pollution (Oil Storage) (England) Regulations 2001

5. Best available techniques (BAT): environmental permits[11]

6. Risk assessments for specific activities: environmental permits[12].

7. Environment Agency Data Centre FAQ Headline Approach[13]

8. Reference Document - Best Available Techniques on Emissions from Storage 2016[14]

9. CIRIA, 2014. Containment systems for the prevention of pollution (C736F)[15].

6.1 Generator Type

The EA's Data Centre FAQ[13] acknowledges that diesel generators are presently the default technology for standby generators in data centres.

The STR[4] details the justification for the choice of engine with a review of potential alternatives and sets out the need for the installed configuration and sizing of engines.

Diesel engines are considered to be BAT for this data centre on the basis of:

- Diesel engines (and on-site diesel storage) give the operator local control to ensure power continuation at the site that is independent of any third-party interruption;

[11] https://www.gov.uk/guidance/best-available-techniques-environmental-permits Accessed March 2022

[12] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit Accessed March 2022

[13] EA, 2018. Data Centre FAQ Headline Approach – Release to Industry version 10.0 01/06/18. Available <https://consult.environment-agency.gov.uk/psc/cr0-4td-digital-realty-uk-limited/supporting_documents/Data%20Centre%20FAQ.pdf> Accessed March 2022

[14] EC, 2016. Reference Document - Best Available Techniques on Emissions from Storage. Available at <https://eippcb.jrc.ec.europa.eu/sites/default/files/2022-03/efs_bref_0706_0.pdf> Accessed March 2022

[15] CIRIA, 2014. Containment systems for the prevention of pollution. Secondary, tertiary and other measures for industrial and commercial premises. Available at < https://www.ciria.org/ItemDetail?iProductCode=C736F&Category=FREEPUBS> Accessed March 2022.

- Diesel fuelled engines have been chosen due to the ability to store the required volumes of diesel on site and therefore maximise energy security in the system;
- The size of the engines has been selected in order to ensure fast start up and shut down can be achieved as this is a fundamental requirement of the emergency back-up nature of the generators;
- Instantaneous supply of electricity is required in the event of power loss to the site, which diesel engines provide.
- The technology is well established, replacement parts are readily available and the maintenance costs are low.

6.2 Emissions to air

The emergency back-up diesel generators >1 MWth are exempted from MCPD ELVs because they operate for less than 500 hours per year.

The planned testing and maintenance regime is for a total of 19 hours per year per generator. This is significantly less than the 50 hours per year expectation set out in the EA Data Centre FAQ[13] to minimise the potential for adverse air quality impacts and minimised diesel usage.

Whilst the back-up generators have no ELVs, the guidance specifies the BAT as *"2g TA-Luft or US EPA Tier II (or equivalent standard) with NOx emission levels in the range of 2000 mg/m3 at 5% oxygen and reference conditions*". The main back-up generators to be installed state NOx emission concentrations of 2091 mg/m^3 at 5% oxygen and reference conditions

During the design stage, 25m stacks were decided to be BAT as they resulted in no significant adverse impacts during either routine or unplanned scenarios.

Monitoring ports which comply the EA's MCERTS (monitoring certification scheme) will be included on the flue stacks to allow the sampling of NOx and CO.

6.3 Emissions to water/land

There are no point source emissions to and from the generators or associated fuel storage.

Surface water and foul water drainage plans have however been provided in the EP application and in the Site Layout and Emissions Point Plan[2]. A Drainage and Flood Risk Assessment (FRA) Report[16] for the site has also been provided for further information within Appendix 03-03 of the EP application.

No process waters will be generated by operation of the installation, hence there will be no associated process water discharge to ground or groundwater.

6.4 Noise and Vibration

A Noise and Vibration Assessment[17] has been completed and provided as part of the EP application within Appendix 03-06. The generators are located within noise attenuating container units and associated exhausts 25m above ground level.

Modelling carried out predicts that during both routine and unplanned scenarios, adverse effects at the nearest sensitive receptors are considered to be unlikely.

[16] Arup, 2022. Flood Risk Assessment and Drainage Strategy Report (document reference ARP-005).

[17] Arup, 2022. Acoustic Noise Impact Assessment (document reference ARP-008).

6.5 Fugitive emissions / leaks

The standby generation diesel fuel storage, fuel delivery and engine lubrication oil systems have been designed to consider the potential impact of leaks / spillages on the site.

Management systems will be in place at the facility to ensure that the risk from fugitive emissions to air is minimised, for example through regular inspection and maintenance of plant. Protection systems will include automatically triggered safe plant emergency shutdown in the event of major

faults in equipment. Scheduled maintenance of diesel tanks will be incorporated into the EMS, to minimise the risk of fugitive emissions of fumes to air.

The principal guidance for the design of the oil storage and associated infrastructure is the Control of Pollution (Oil Storage) (England) Regulations 2001. Additionally, the requirement for the safe environmental storage of fuel on-site (including transport of fuel) is covered within the EPR. BAT Reference (BREF) document 'Emissions from storage' for sites regulated under the IED has also been considered as part of the design.

The top-up tank is located above ground within a bunded area capable of retaining 110% of the 40,000 litre tank volume in the event of spillage of diesel. The tank has integral level alarms remotely monitored allowing instant accurate assessment of the filling level.

A road tanker will fill up the diesel top-up tank at the fill point. The tanker will be parked on an area of slab that slopes towards a central drain which is connected to an oil separator, and in turn is connected to the surface water drain network (see Document reference Appendix 03-03).

The top-up fuel tank bund has a sump-pump located within it to remove any surface water, which connects to an oil interceptor before discharging non-oily rainwater to the foul sewer network.

This top-up diesel tank is connected via a short underground twin walled pipe (pipe-in-pipe) which is connected to the main bunded generator enclosure area (110% capacity of the total volume). The fuel is distributed to the individual generator belly tanks via a single pipe network. Any leaks from the single pipe network would collect through local surface drains within the oil interceptor.

The underground pipe between the top-up tank and main generator bunded area is essential to remove the potential for risk of collision and rupture of an above ground fuel pipe during fuel delivery.

The underground pipe contains a leak detection system along the length, which uses a vacuum between the inner and outer pipe linked to an additional alarm panel.

The diesel will be automatically pumped from the receiver tanks directly to the belly tanks. See the Fuel Distribution (Document reference Appendix 03-05) provided for further details.

All tanks, pipes and valves are designed to appropriate industry standards and flanged connections between pipes are kept to a minimum by the proximity of the tanker fill point.

Fuel integrity is maintained with each generator housing a fuel polishing unit to constantly circulate and filter the fuel.

The belly tanks will also monitor pressure loss and fill (high/low) levels.

The operator will also carry out daily checks for signs of smaller leakage not notified by the alarm system. There are multiple alarm systems including: high, low, block and leak alarms.

Fuel tank filing will be carried out by trained fuel tanker drivers. This reduces any significant risk of spillages and leaks. Spill kits will also be available to deal with any leaks.

Relevant spill response equipment will be situated at various locations around the site, designed for the particular hazard characteristics of the materials (fuel) present.

All spillages will be logged, investigated and corrective action will be taken.

It is anticipated that fugitive emissions of odour will not be significant for the facility. Diesel will be contained within vented tanks and therefore would only be a potential source of odour if a spill were to occur. Procedures will be incorporated within the EMS to ensure the potential for spills is minimised and they are dealt with swiftly should they occur.

No powders or other dry materials will be used or stored at the installation and therefore fugitive emissions of dust are unlikely to occur.

6.6 Energy Efficiency

The data centre is exempt from the EED requirements as the total installed planned maintenance and testing schedule falls below the 1,500 hour threshold (33 generators x 19 hours each = 627 hours).

Operation of the back-up generators will be for emergency back-up only. The efficiencies of the main emergency generators and the smaller 'house' generators at the data centre are 35% each, with a total installed thermal input of 222 MW and a rated electrical output rating of 77.7 MWe.

Energy recovery is not reasonably practicable for engines of this emergency nature with such small anticipated operational hours and the provision of combined heat and power is not considered to be feasible. However, improving energy efficiency will form part of the Operator's Environmental Management System, with an objective to monitor energy use and evaluate opportunities to influence energy efficiency, and achieve as low a Power Usage Effectiveness (PUE) ratio as possible.

6.7 Network Reliability

National Grid's National Electricity Transmission System Performance Report 2020-21 states that the overall reliability of supply during 2020–21 was: 99.999966%.

None of the supply incidents reported in 2020-21 were in the vicinity of the data centre site.

6.8 Environmental Management Systems

The Operator will establish an Environmental Management System (EMS) on site and will cover those elements required for environmental permitting. The EMS will follow certain aspects of the EMS standard ISO 14001:2015.

The EMS will be underpinned by an environmental policy. All staff and external contractors will be made aware of the environmental policy as part of the induction training and a copy will be made available on site.

The Operator will also implement a record keeping system on site as part of its management system.

The operator has a corporate ISO 14001:2015 certification (Document reference App 03-07) specific to its colocation sites, which does not include this own built Hemel Hempstead data centre site. It is the operators long term ambition however to have the ISO 14001 certification across different types of sites, including this Hemel Hempstead data centre site.

7. Conclusion

The overall conclusion from the studies undertaken as part of the EP application is that there is unlikely to be a significant environmental impact as a result of the operation of back-up generators at the data centre.

The data centre operator is fully committed to ensuring the highest standards are met and will undertake its activities in a manner consistent with best industry practices.