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Cody Park, ARK Datacentres: Permit Variation EPR/ VP3235DJ

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Date of issue:	14 February 2022

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Non-Technical Summary

The Cody Park Data Centre Campus, owned by Ark Data Centres Ltd (Ark) operates in accordance with Environmental Permit EPR/VP3235DJ first issued 27/01/20. Electricity for operation of the data centres is provided by four individual connections to the National Grid. Due to the need to always ensure availability of uninterrupted power supply, the site incorporates diesel/Hydrotreated Vegetable Oil (HVO) fired standby generators. To account for this and the future expansion of the facility Ark is proposing to install additional standby generators that will be phased in over time, providing a total of 84. These will serve the existing buildings, as well as a proposed new A105 unit once operational.

Ark Data Centres Ltd is an experienced data centre operator and has established specification and management arrangements for the safe and efficient operation of data centres within the UK that are certified to ISO14001:2015 & ISO 50001:2018. Ark has a rigorous design process to ensure that its data centres remain innovative, progressive, environmentally focussed, secure and energy efficient. The company recognises the importance of the design and development function in ensuring its activities are as energy efficient as possible. This includes the utilisation of free cooling and the specification of energy efficient plant and equipment.

The company employs specialist contractors for the supply of equipment, management and maintenance of the facility to ensure compliance with Best Available Techniques (BAT). The installation is therefore specified and will operate in a manner that is consistent with EU guidance for Large Combustion Plants BREF note. In addition, the operator has been instrumental in consulting with the Environment Agency in advance of permitting regulations being extended to data centre operations and complies with the requirements highlighted within the EA published FAQ Headline Approach V10 agreed with operators and TechUK. Ark remains actively engaged with the data centre sector working group on environmental permitting.

Each of the existing and new emergency standby generators associated with the data centre is new and are emissions optimised and are therefore designed to operate within strict emission control standards. In addition, the operator has trialled the use of HVO and has rolled out the use of this alternative fuel type across its facilities. The generators are tested periodically to ensure they are ready for use in the event of a mains failure and the impact of their operation during normal, test and emergency operation condition has been assessed from a noise and air quality perspective. Fuel specification, handling and containment arrangements are in place and the facility is served by high integrity hard standing with petrochemical interceptors on surface water drains. All personnel on site are inducted and trained in operational control procedures including responding to environmental incidents.

Both the noise and air quality assessments conclude that the impact of routine maintenance operations on air emissions is “insignificant” and with the mitigation and management measures in place, the risk of air quality exceedance arising from emergency operations is low.

1. What operations are you applying to vary?

Table 1 Types of Activities

Schedule 1 listed activities						
Installation Name	**Schedule 1 References**	**Description of the activity**	**Activity daily capacity**	**Annex IIA or IIB (disposal and recovery) codes**	**Hazardous waste treatment capacity**	**Non-hazardous waste treatment capacity**
Cody Park Data Centre	S1.1 A1(a): Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts	Operation of 84 emergency standby generators with a total thermal input of approximately 372.61MWth. The generators will burn diesel/Hydrotreated vegetable oi (HVO) solely for the purpose of providing electricity to the installation in the event of a failure of supply from the National Grid. Building A101: 12 x 2.71MWth. Building A102: 24 x 2.71MWth. Building A103: 24 x 5.38MWth. Building A104: 6 x 7.35 MWth. Building 105: 18 x 5.65 MWth.	372.61 MW(th)	-	-	-

Directly associated activities		
Name of DAA	**Description of the DAA (please identify the schedule 1 activity it serves)**	
Storage of fuel materials	From receipt of fuel to use within the facility.	
Storage of raw materials	From receipt of raw materials to use within the facility.	
Surface water drainage	Input to site drainage system until discharge to surface water drain via interceptors.	
Discharge to sewer	Collection of process effluent from concrete refuelling bays to discharge to sewer connection.	
For installations that take waste	**Total storage capacity**	N/A
	Annual throughput (tonnes each year)	N/A

1.1 Proposed Changes

Cody Park Data Centre operates in accordance with Environmental Permit EPR/ VP3235DJ first issued 27/1/20. This permit currently covers operation of 69 diesel fuelled standby generators that serve separate data centre buildings (A101, A102, A103 and A104). 36 of the generators have a thermal input of 2.71MWth, 24 generators at 5.38MWth and 9 generators at 3.66MWth. The aggregated total combustion capacity on site is approximately 260MWth.

In order to meet customer expectations and to provide security of services the operator is required to have resilient, concurrently maintainable standby generator systems on site. Each building is therefore required to be supported by at least "N+1" generators, which means there is one generator more than would be required to provide the total power for that building in the event of an external power failure.

To account for this and the future expansion of the facility Ark is proposing to install additional facilities with standby generators in a phased deployment, providing a total of 84 at some time in the future. These will serve the existing buildings, as well as a proposed new building (A105) that is expected to become operational in 2022.

Alongside the installation of the additional emissions optimised 18 standby generators this variation will account for the removal of 3 standby generators (associated with A104) from the current Environmental Permit to allow operation of a total of 84. These will serve the existing buildings, as well as the proposed A105 building once operational. The generators will be configured in five banks as follows:

- A101: 12 standby generators (all 12 included in existing Environmental Permit);
- A102: 24 standby generators (all 24 already included in existing Environmental Permit);
- A103: 24 standby generators (all 24 already included in existing Environmental Permit);
- A104: 6 standby generators (9 included in existing Environmental Permit, reduced to 6 by Variation Application); and,
- A105: 18 standby generators (all 18 covered by Variation Application).

This variation permit therefore seeks to update and confirm the information referenced within the existing permit regarding the layout and configuration of the generators within A104 already agreed with the local inspector.

1.2 Standby Generator Capacity

The Cody Park Site Plan (1001 - Campus IED Generator Site Plan v0) shows:

- The land ownership boundary of the campus (blue line). This is also the existing installation boundary of the permit.
- The location of each of the emergency standby generators associated with the data centres are indicated by the exhaust stack locations using the references within Table 4. The Generator Data Sheets are presented in Appendix C with details of air emissions from the supplier's datasheet used within the Air Quality Assessment Report (Appendix D) and noise performance data used within the noise assessment (Appendix E).

The provision on site for an ultimate deployment of a total of a maximum of 84 emergency standby generators has been assessed in the attached technical assessments for noise and air quality. It should be noted that the Air Quality Assessment has been carried out assuming diesel as the fuel supply of choice. In reality Ark is in the process of replacing all diesel on site with HVO by April 2022. Extensive testing by Ark has shown that the use of HVO will reduce NOx emissions by some 17% and particulates by some 29%, when compared to diesel operation. These benefits have NOT been included in the Air Quality Assessments carried out to date.

All generating units to be installed within the existing installation boundary will be configured in five banks as outlined Table 2 and illustrated on Drawing 1 (Ref 1001 - Campus IED Generator Site Plan v0) which shows the location of each of these units. The total generating capacity and thermal input at the site will increase from the current 69 permitted standby generators with approximately 260MWth in total to 84 units comprising approximately 372.6 MWth input.

Table 2 – Summary of overall standby generating capacity

Campus	Facility	Generator Capacities			Final Capacity		
		Generator No	Rating (e) (kW)	Rating (th) (kW)	Generator No	Rating (e) (kW)	Rating (th) (kW)
Cody Park	A101	1	1,000	2,717	12	12,000	32,604
	A102	1	1,000	2,717	24	24,000	65,208
	A103	1	2,000	5,375	24	48,000	129,000
	A104	1	2,368	7,350	6	14,208	44,100
	A105	1	2,024	5,650	18	36,432	101,700
Cody Park		**Total Campus**			*84*	*134,640*	*372,612*

The table above confirms that no individual plant is larger than 15 MWth, the activity falls under Chapter II of the IED. The plant are classed as medium combustion plant as part of a Chapter II installation. Medium Combustion Plant Directive (MCPD) requirements are fulfilled through compliance with Chapter II of Directive 2010/75/EU. The engines are classed at emergency/standby plant.

1.3 Combustion Technology Selection & BAT

At Cody Park, the emergency back-up generators are installed to provide power to the data centres in the unlikely event of a power outage of mains electricity supplies. To meet the requirements of a Tier III concurrently maintainable data centre, emergency back-up generators must:

- Start and take full electrical load in less than 2 minutes to minimise the quantity of batteries deployed in the Uninterruptable Power Supply (UPS) whilst the generators start, synchronise and accept the load.
- Have sufficient fuel stored on site to enable generator running at full load for 72 hours of continuous running.
- Be deployed in a resilient configuration such that if a generator is out of service (under maintenance or unavailable) the remaining generators can support the full facility electric load (i.e. N+1 as a minimum).
- Must be tested regularly to ensure that they will operate in the unlikely event of a mains power outage.
- Must be able to operate at low loads, during early deployments as the IT demand grows and when external ambient conditions dictate very small cooling demand in the facility.
- Must be modular to allow for expansion as the data centre load grows.

As the emergency back-up generators are an intermittent source of power and the data centres use ambient conditions for "free cooling" there is no opportunity for using heat recovery systems on the generators to improve overall operating efficiencies.

In addition, the electric loads in the facility can change very quickly in response to changes in IT processing demands and/or external ambient conditions. The emergency back-up generators must therefore be able to respond quickly to changes in load condition.

The available engine technologies to provide this level of duty are, diesel engines, gas spark ignition engines, gas turbines and fast start aero engine derivatives. A high-level comparison of the attributes associated with these four technologies, bearing in mind the specific data centre requirements, is presented in Table 3:

Table 3 – High Level Comparison of Alternative Engine/Fuel Technologies

Attributes	Engine/Fuel Technologies (no heat recovery)			
	Diesel Engine	Gas Engine	Gas Turbine	Aero-Derivative
Start Time to Full Load	<2mins	7-10mins	10-15mins	2-5mins
Reaction to Load Changes	Immediate	Slow	Slow	Slow
Fuel Volatility and Storage Safety Risk	Low	High	High	High
Fuel Supply	Diesel/HVO	Gas, requires a grid connection	Gas, requires a grid connection	Gas, requires a grid connection
Fuel Storage	Simple tanks and gravity connections	Complex, gas compression, pumps and storage	Complex, gas compression, pumps and storage	Complex, gas compression, pumps and storage
Engine Maintenance	Low Frequency, Standard diesel engine technology	High frequency, Standard Gas engine technology	High frequency, Specialist engineering support	High frequency, Specialist engineering support
Cost per MW installed	Lowest cost	10-20% more costly than diesel engines	20-30% more costly than diesel engines	30-40% more costly than diesel engines

The high-level comparison between the technologies demonstrates that the benefits of fast start, reaction to load changes, simpler and safer fuel supply, storage and handling systems associated with a diesel combustion engine outweigh the benefits of the of the other technologies, particularly given the low anticipated run hours each year for the emergency back-up generators deployed at Cody Park.

The above points along with Ark's experience in developing data centres, goes towards demonstrating that plant sizing, number, configuration along with routine maintenance and testing of emergency back-up generation have all been carefully considered and are aligned with the principles of the BAT process, reducing raw material inputs, reducing fuel consumption and therefore reducing more than just emissions to air per MW of IT processing capacity.

The supplier technical datasheets for each of the different generating units installed and planned to be installed as part of this variation are included at Appendix C. All engines are emissions optimised and are capable of being operated with Hydrotreated Vegetable Oil (HVO) in addition to diesel.

The design and configuration of back-up generators at Cody Park has been planned and flexed in response to demand and strategic aims of the campus. Plant sizing, number, configuration along with routine maintenance and testing of emergency back-up generation have all been carefully considered as the data centre campus has developed in line with the principles of the BAT process including technology selection and review of deployment needs, reducing raw material inputs, reducing fuel consumption and reducing more than just emissions to air per MW of IT processing capacity.

2. Emissions to Air, Water and Land

The following table provides an updated inventory of all generator units, their location, reference and capacity. This table should be used in conjunction with site layout drawing (Appendix 1 Drawing 1 Ref 1001 - Campus IED Generator Site Plan v0). The table below lists all generator exhausts for combustion gases. In addition, each generator unit fuel tank has an associated air breather vent to atmosphere.

Table 4 Emission Points to Atmosphere

Emission Point Reference & Location	Manufacturer & Model	Rated source (kw(e)	Rated source (kw(th)	BAT	Parameter	Concentration
A101					Oxides of Nitrogen (NO and NO2 expressed as NO2) Carbon monoxide Sulphur Dioxide	No limits set/No Monitoring Required
G1 EC1	SDMO X1250C	1,000	2,717	Emissions Optimised		
G2 EC1	SDMO X1250C	1,000	2,717	Emissions Optimised		
G3 EC1	SDMO X1250C	1,000	2,717	Emissions Optimised		
G4 EC1	SDMO X1250C	1,000	2,717	Emissions Optimised		
G5 EC2	SDMO X1250C	1,000	2,717	Emissions Optimised		
G6 EC2	SDMO X1250C	1,000	2,717	Emissions Optimised		
G7 EC2	SDMO X1250C	1,000	2,717	Emissions Optimised		
G8 EC2	SDMO X1250C	1,000	2,717	Emissions Optimised		
G9 EC3	SDMO X1250C	1,000	2,717	Emissions Optimised		
G10 EC3	SDMO X1250C	1,000	2,717	Emissions Optimised		
G11 EC3	SDMO X1250C	1,000	2,717	Emissions Optimised		
G12 EC3	SDMO X1250C	1,000	2,717	Emissions Optimised		
A102						
G1 EC1	SDMO X1250C	1,000	2,717	Emissions Optimised		
G2 EC1	SDMO X1250C	1,000	2,717	Emissions Optimised		
G3 EC1	SDMO X1250C	1,000	2,717	Emissions Optimised		
G4 EC1	SDMO X1250C	1,000	2,717	Emissions Optimised		
G5 EC2	SDMO X1250C	1,000	2,717	Emissions Optimised		
G6 EC2	SDMO X1250C	1,000	2,717	Emissions Optimised		
G7 EC2	SDMO X1250C	1,000	2,717	Emissions Optimised		
G8 EC2	SDMO X1250C	1,000	2,717	Emissions Optimised		
G9 EC3	SDMO X1250C	1,000	2,717	Emissions Optimised		
G10 EC3	SDMO X1250C	1,000	2,717	Emissions Optimised		
G11 EC3	SDMO X1250C	1,000	2,717	Emissions Optimised		
G12 EC3	SDMO X1250C	1,000	2,717	Emissions Optimised		
G13 EC4	SDMO X1250C	1,000	2,717	Emissions Optimised		
G14 EC4	SDMO X1250C	1,000	2,717	Emissions Optimised		
G15 EC4	SDMO X1250C	1,000	2,717	Emissions Optimised		
G16 EC4	SDMO X1250C	1,000	2,717	Emissions Optimised		
G17 EC5	SDMO X1250C	1,000	2,717	Emissions Optimised		
G18 EC5	SDMO X1250C	1,000	2,717	Emissions Optimised		
G19 EC5	SDMO X1250C	1,000	2,717	Emissions Optimised		
G20 EC5	SDMO X1250C	1,000	2,717	Emissions Optimised		
G21 EC6	SDMO X1250C	1,000	2,717	Emissions Optimised		
G21 EC6	SDMO X1250C	1,000	2,717	Emissions Optimised		
G22 EC6	SDMO X1250C	1,000	2,717	Emissions Optimised		
G23 EC6	SDMO X1250C	1,000	2,717	Emissions Optimised		
G24 EC6	SDMO X1250C	1,000	2,717	Emissions Optimised		
A103						
G1 EC1	SDMO X2500C	2,000	5,375	Emissions Optimised		
G2 EC1	SDMO X2500C	2,000	5,375	Emissions Optimised		
G3 EC1	SDMO X2500C	2,000	5,375	Emissions Optimised		
G4 EC1	SDMO X2500C	2,000	5,375	Emissions Optimised		
G5 EC2	SDMO X2500C	2,000	5,375	Emissions Optimised		
G6 EC2	SDMO X2500C	2,000	5,375	Emissions Optimised		

G7 EC2	SDMO X2500C	2,000	5,375	Emissions Optimised		
G8 EC2	SDMO X2500C	2,000	5,375	Emissions Optimised		
G9 EC3	SDMO X2500C	2,000	5,375	Emissions Optimised		
G10 EC3	SDMO X2500C	2,000	5,375	Emissions Optimised		
G11 EC3	SDMO X2500C	2,000	5,375	Emissions Optimised		
G12 EC3	SDMO X2500C	2,000	5,375	Emissions Optimised		
G13 EC4	SDMO X2500C	2,000	5,375	Emissions Optimised		
G14 EC4	SDMO X2500C	2,000	5,375	Emissions Optimised		
G15 EC4	SDMO X2500C	2,000	5,375	Emissions Optimised		
G16 EC4	SDMO X2500C	2,000	5,375	Emissions Optimised		
G17 EC5	SDMO X2500C	2,000	5,375	Emissions Optimised		
G18 EC5	SDMO X2500C	2,000	5,375	Emissions Optimised		
G19 EC5	SDMO X2500C	2,000	5,375	Emissions Optimised		
G20 EC5	SDMO X2500C	2,000	5,375	Emissions Optimised		
G21 EC6	SDMO X2500C	2,000	5,375	Emissions Optimised		
G21 EC6	SDMO X2500C	2,000	5,375	Emissions Optimised		
G22 EC6	SDMO X2500C	2,000	5,375	Emissions Optimised		
G23 EC6	SDMO X2500C	2,000	5,375	Emissions Optimised		
G24 EC6	SDMO X2500C	2,000	5,375	Emissions Optimised		
A104						
G1 EC1	MTU DS3300	2368	7350	Emissions Optimised		
G2 EC1	MTU DS3300	2368	7350	Emissions Optimised		
G3 EC1	MTU DS3300	2368	7350	Emissions Optimised		
G5 EC2	MTU DS3300	2368	7350	Emissions Optimised		
G6 EC2	MTU DS3300	2368	7350	Emissions Optimised		
G7 EC2	MTU DS3300	2368	7350	Emissions Optimised		
A105						
G1 EC1	MTU DS2500	2,024	5,650	Emissions Optimised		
G2 EC1	MTU DS2500	2,024	5,650	Emissions Optimised		
G3 EC1	MTU DS2500	2,024	5,650	Emissions Optimised		
G4 EC1	MTU DS2500	2,024	5,650	Emissions Optimised		
G5 EC2	MTU DS2500	2,024	5,650	Emissions Optimised		
G6 EC2	MTU DS2500	2,024	5,650	Emissions Optimised		
G7 EC2	MTU DS2500	2,024	5,650	Emissions Optimised		
G8 EC2	MTU DS2500	2,024	5,650	Emissions Optimised		
G9 EC3	MTU DS2500	2,024	5,650	Emissions Optimised		
G10 EC3	MTU DS2500	2,024	5,650	Emissions Optimised		
G11 EC3	MTU DS2500	2,024	5,650	Emissions Optimised		
G12 EC3	MTU DS2500	2,024	5,650	Emissions Optimised		
G13 EC4	MTU DS2500	2,024	5,650	Emissions Optimised		
G14 EC4	MTU DS2500	2,024	5,650	Emissions Optimised		
G15 EC4	MTU DS2500	2,024	5,650	Emissions Optimised		
G16 EC4	MTU DS2500	2,024	5,650	Emissions Optimised		
G17 EC5	MTU DS2500	2,024	5,650	Emissions Optimised		
G18 EC5	MTU DS2500	2,024	5,650	Emissions Optimised		

There are no changes proposed for the arrangement of discharge of surface water and foul water from the installation for A101-104. A105 drainage arrangement are discussed further in Section 3.4.1.

3. Operating Techniques

3a Technical Standards

Table 5 Technical Standards

Description of the Schedule 1 Activity or DAA	Relevant Technical Guidance Note	Document Reference
S1.1 A1(a): Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts	Best Available Techniques (BAT) Reference Document for Large Combustion Plants	Section 3a Main Application Document Large Combustion Plant BAT Conclusions Appendix B(i)
As above	Data Centre FAQ Headline Approach V10	Section 3a Main Application Document Data Centre FAQ Appendix B(ii)

3.1 Operational Philosophy

The operational control philosophy of the listed activity has not changed as a result of this variation. The emergency backup generator array associated with the facility only operates to produce electricity for the data centre should mains electricity supply be interrupted.

All emergency standby generators are powered by diesel/HVO. The combustion of fuel in the event of a mains electricity supply outage, or for generator testing, are the only activities operated by Ark Data Centres Limited at Cody Park that give rise to the production of air emissions and additional noise as a result of emergency conditions and planned testing.

3.2 Generator Testing

The emergency generators are tested to a monthly/quarterly/annual regime on a rotating basis at days and times as agreed by customer contracts. The testing regimes for each facility are the same, but the timings are different:

- Off-load Generator tests are carried out monthly by group. Each bank of standby generators is tested monthly when Event 1 (b) and Event 2 are not being undertaken. This involves simultaneous operation of the bank at 0% of full load for 15-minutes;
- On-load generator tests (upto 66% load) where each bank of standby generators is tested three times per annum. This involves simultaneous operation of the bank at upto 66% of full load for 15-minutes;
- Service testing when each generator is connected to a load bank (individually) and run at full load for up to 2 hours. Service testing is carried out annually instead of one of the quarterly on-load tests. No other engines are operational during this testing.

The illustrative testing schedule is shown in the last sheet of the 211202 CP Generator Schedule worksheet provided as Attachment (Appendix C iii). The testing schedule shows that maintenance testing is carried out such that no module testing overlaps, the lowest number of generators for each module are tested for each type of test at any one time. Note that this test is for the generators as deployed and does not account for those not yet installed/operating.

As a consequence of this testing regime, each generator typically runs for 4.15 hours a year with a cumulative run-time of around 320 hours a year for the full deployment of generators.

3.3 Grid Reliability

The Cody Park campus is designed, built, commissioned and tested to comply with the requirements of a Tier III concurrently maintainable campus in line with Uptime Institute of America's Tier System. The site is supplied via four diverse 33kV power supplies from two physically separate Distribution Network Operator (DNO) substations. Three are from the Pyestock 132/33kV substation located approximately 1km, North West of the campus and one via the RAE Farnborough 132/90kV substation. These four supplies are connected to two 33/11kV substations Enterprise and Bramshot Lane that can be interconnected. Each substation has two 33kV, 40MVA supplies, configured to provide a firm 90MVA supply from any three of the supplies, ie an N+1 distributed redundant system.

This supply topology means that at full load:

- For a single grid supply failure to the Enterprise Substation the emergency standby generators supporting A101, A102 and A103 (60 generators at full deployment) will start and run until either the failed supply is restored or the interconnector between the Enterprise and Bramshot Lane substation is closed. Closure of the interconnector between the two substations will typically occur in less than six hours.
- For a single grid supply failure to the Bramshot Lane Substation the emergency standby generators supporting A104 and A105 (24 generators at full deployment) will start and run until either the failed supply is restored or the interconnector between the Enterprise and Bramshot Lane substation is closed. Closure of the interconnector between the two substations will typically occur in less than six hours.
- For all the emergency standby generators to start simultaneously two or more of the four supplies to site need to fail simultaneously.

With this level of mains electrical system redundancy, it is therefore anticipated that all the generators are unlikely to operate for extended periods of operation.

As described above the generators are tested monthly to ensure they are ready for use in the event of a mains failure and annually during their main service period.

3b General Requirements

Table 6 General Requirements

Are fugitive emissions an important issue?	No
Is odour an important issue?	No
Is noise and vibration an important issue?	Yes – See Appendix E

3.4 Emissions to Sewer, Surface Water and Groundwater

3.4.1 Surface and Foul Water Drainage

The data centre cooling processes employed on the Cody Park Campus are designed and operated to minimise the use of mechanical cooling systems by using adiabatic (evaporative) cooling technology where the process responds dynamically to the actual IT cooling demand and external ambient conditions. This means that when external ambient conditions dictate the site uses:

- the waste heat generated by the servers to heat the incoming cold air.

- water collected by our rainwater harvesters to provide water for evaporative cooling.
- mechanical cooling for limited periods only.

In an “average” year, Ark data centres will use free cooling for around 98% of the time, with mechanical cooling in use for around 2% of the year. There are no changes to the arrangement for the disposal of process effluent arising from the cooling process. Evidence of acceptance from Thames Water of the discharge of this clean wastewater to foul drain without a trade effluent consent was provided to the EA alongside the original permit application.

There are no changes to the site drainage for the areas serving buildings A101-104 proposed as a result of this variation. The existing secondary and tertiary containment measures have been recently assessed by the local inspector following a compliance inspection carried out 22/12/2021 which specifically addressed fuel storage and handling arrangements at the site. The same measures have been incorporated within the design of the A105 facility and the operational control procedures will be applied to the activities within these areas, when they become operational. These include but are not limited to Fuel Transfers and Emergency Operating Procedures for Spills/Leaks and Fire Response. The drainage arrangements for A105 follow the same principles as those employed for the permitted facilities. Therefore, without prejudicing the outcome of this variation application the local EA regulatory officer has indicated that with the measures the operator is already using (secondary containment with spill alarm, tank gauging, regular site inspections) that the risk of an uncontrolled release from all generators will remain low and therefore effectively managed.

The operator has previously provided details of all as built drainage plans to the EA which for completeness plans for the are completed or still under construction since the site was first permitted (areas A104 and A105) have been included within this variation application (Appendix A Drawings i and ii).

3.4.2 Fuel Storage and Delivery

To meet customer requirements the operator must maintain sufficient fuel on site to operate the standby generators for 72 hours. To achieve this obligation each generator set (new and existing) has a double skinned belly tank manufactured to BS 799: Part 5 Type J (2010) and meets all requirements as set out in Oil Storage Regulations (2001). Each standby generator therefore can hold up to 72 hours of fuel when running at full load.

The inner tank is sized to meet the operating requirement of the standby generator. The outer tank is sized to hold the volume of the inner tank (brimful) plus 20%. The outer tank also contains a leak detection float switch, which is linked to the Hytek Tank Alarm located within the Fill Point Cabinet. The alarm in the fill point cabinet is fed back to the generator controller and then into the facility Energy Monitoring System.

Details of the MTU DS2500 and MTU DS3300 belly tanks and the associated fuel schematics are included as Appendix Cii. The MTU DS2500 belly tank has a useable capacity of 37,908litres. The MTU DS3300 belly tank has a usable capacity of 36,216litres. Unlike the generators deployed on A101, A102 and A103, the new generators on A104 and A105 are not interconnected (See Appendix Cii for Fuel Tank Specification Sheets).

The MTU DS2500 sets are supplied with an integral fuel polishing system. The MTU DS3300 sets have fuel polishing pipework installed for use with a mobile polishing unit, as employed on the originally permitted sets. The double skinned tanks and pipework (compliant with the Oil Storage Regulations) are protected against inadvertent damage by being installed within the secure data centre compound which is a controlled area with limited access to people and vehicles.

Ark operates strict management processes for all work on the live data centres. These processes include Standard Operating Procedures (SOP), Risk Assessments and Method Statements (RAMS), permits to work and change control process. A specialist facilities management contractor oversees the delivery of fuel and maintenance of the associated infrastructure by competent third parties. In addition to SOPs and RAMS for fuel deliveries Ark also has Emergency Operating Procedures (EOP) for fuel spills and leaks. To support the EOP for fuel spills and leaks "Spill Kits" are distributed at every set of generators, with a minimum 1 wheelie bin kit for every two generators. The contents of a "Spill Kit" are listed on the spill kit inspection sheet. Spill kits are inspected monthly as part of the monthly Planned Preventative Maintenance (PPM) schedule.

Overfilling the diesel belly tanks is prevented by an overfill prevention valve attached to the fuel delivery point of each tank. Sight gauges at the fuel delivery point also facilitate the management of the fuel filling process. These sight gauges are in addition to the fuel gauges and alarms displayed by the energy management system on screens in the data centre operating centres.

3.4.3 Waste

There will be no change to the types of waste generated, how they are stored and arrangements for collection and recovery.

3.4.4 Fugitive Emissions to Air

There is no change in the potential for fugitive releases to atmosphere as a result of this variation. The only source of fugitive release is from the vents associated with each of the fuel storage tanks that will occur only during refuelling operations. There is no risk of dust release from the installation through the handling of raw materials or waste. There is no potential for fugitive emissions to air from chillers as cooling requirements are met using a Direct Air Evaporative Cooling plant.

3.4.5 Odour

There are no sources of odour at the site.

3.4.6 Noise

Some potential offsite noise nuisance from the site under 'Normal Operations' when the main sources of noise will be plant which will normally be running, such us the internal plant rooms with associated ventilation inlet and outlet louvers at the buildings' facades and the external roof plant. The operator has identified mitigation plans for A104 which include the installation of acoustic louvres for the ventilation inlet/outlet for this facility in addition to maximum sound power level specification for the inlet and outlet ventilation louvres at A105. This will be further mitigated by the location of a noise barrier that will be constructed at A105.

In 'emergency backup' situations the ground level backup electricity generators associated with main power failure will be the main sources of noise together with operation of roof mounted air-cooled condensing units associated with emergency cooling system that could lead to off-site impact. The acoustic acceptability of the installation has been assessed following a baseline sound survey out at the closest noise-sensitive receptors and through a comprehensive noise modelling exercise that includes the changes proposed by this variation application to the operation of A104 and design of A105 at full capacity (See Appendix E).

3c Types and Amounts of Raw Materials

The type of raw materials handled and stored at the installation will not change as a result of this variation. Table 7 summarises these together with the increase in the maximum potential amount stored and annual throughput as a result of the increased number of generators covered by this variation.

Table 7 Raw Materials Inventory

Schedule 1 Activity	*Description of raw materials and Composition*	*Max Amount (litres)*	*Annual Throughput (ltrs each year)*	*Description of Use*
S1.1 A1(a)	*Diesel/LFO Fuel*	*#2,326,850*	*~44,500*	*Fuel*
*S1.1 A1(a) **	*Oil*	*25,200*	** *<525*	*Lubricant*
*S1.1 A1(a) ****	*Ethylene Glycol*	*4,200*	*****<50*	*Coolant*

The levels of all raw materials are quoted as indicative maxima and could vary over time as a result of operational activities and maintenance.

* Calculations are based on maximum values and based on full site capacity (84 generators x 300 litres per generator (16,200 litres). No additional substances are stored on site as spares in relation to the maintenance of the Standby Generators as all servicing and maintenance is done by a supplier who brings all materials onto site. ** As this is a new site values for annual throughput are based on maintenance conducted at other sites and will be reviewed as part of the annual reporting regime.

*** Calculations are based on maximum values and based on maximu8m capacity (84 generators x 50 litres per generator (4,200 litres). No additional substances are stored on site as spares in relation to the maintenance of the Standby Generators as all servicing and maintenance is done by a supplier who brings all materials onto site.

**** Annual throughput are based on maintenance conducted to date for A101-04.

3d Management Systems

There will be no change in Ark's management system as a result of this variation.

3d Accident Management

There is no change to the accident management plan for the installation as a result of this variation. The existing control measures previously described in the original application are sufficient.

4. Monitoring

4a Describe the measures you use for monitoring emissions

In line with Data Centre FAQ Headline Approach V10 (agreement point 6) as the individual or groups of generators will not run more than 500 hours in either emergency or standby operational mode (including repair and testing) the emission limit values ELVs to air (and thus engine emissions monitoring) are not required within the permit under the IED/MCPD**.**

There is no requirement for emissions monitoring from the process. The operator does not propose any monitoring. However, monitoring ports will be included in the exhaust stacks for emissions monitoring during the annual full load test once every five years.

4b Point source emissions to air only

As above.

5. Environmental Impact Assessment

5a Have your proposals been the subject of an EIA under Council Directive 85/337/EEC?

No

6. Resource Efficiency and Climate Change

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

Ark has a rigorous design process to ensure that its data centres remain innovative, progressive, environmentally friendly, secure and energy efficient. The company recognises the importance of the Design and Development function in ensuring the organisations activities are as energy efficient as possible.

Energy planning activities are undertaken by Ark on an ongoing basis and are included in regular energy reviews. The aim of these activities is to create a method through which energy usage is continually reviewed to create achievable, yet challenging energy objectives which will lead to more effective energy use and consumption. In carrying out these activities, Ark will live by the values stated in their Energy Policy and fulfil the pre-determined requirements stated in their Climate Change Agreement.

In addition, Ark actively engages with their clients to ensure that their activities also support the energy efficiency of the data centres.

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

The estimated energy use for a typical 12-month period when the data centre will be at full capacity.

Table 8 Energy Use

Period	*Electricity (MWh/yr)*	*Natural Gas (MWh)/yr*	*Fuel (litres)/yr*	*Total Emissions (tCO2e)/yr*	*Carbon Intensity (gCO2e)/kWh*
Full Capacity	*~420,000*	*0*	*<45,000*	*<125*	*<0.5*

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

The operator will remain within its current climate change levy agreement.

6d Tell us about, and justify your reasons for, the raw and other materials, other substances and water you will use

There are no changes to the raw and other materials inventory as result of this variation.

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

The existing measures to avoid waste and documented waste management plan are unchanged as a result of this variation.

7. Installations that include a combustion plant (excluding waste incinerators)

Is the aggregated net thermal input of your combustion plant more than 20MW(th)?

Yes

8. Environmental Risk Assessment

The following section addresses the potential impact of the proposed changes on the surrounding area.

Sensitive Receptors

The following sensitive receptors have been identified as being potentially affected by operations at the site. A desk-top study was undertaken to identify any sensitive human receptor (such as residential properties, schools, care homes, health facilities, leisure facilities etc.) in the vicinity of the Site that required specific consideration due to the potential impact at these locations from emissions from the standby generators. These are summarised in Table 9 and shown in Figure 1.

Table 9a Sensitive Receptors - Human

ID	Location	Coordinates		Emission which may impact on the receptor and their relevant pathways
		X	Y	
R1	Peartree Cottages	484481	154759	Noise, Air Emissions
R2	Southwood Golf Club	485284	154771	"
R3	25 Wisley Gardens	484969	154950	"
R4	Busy Bees Nursery	483512	154031	"
R5	16 Marlborough Close	482782	153912	"
R6	128 Old Ively Road	484325	154289	"
R7	Cody Sports and Social Club	483663	154047	"
R8	Hartland Village	483412	154201	"
R9	Hartland Village	483640	154347	"

Emissions from the facility also have the potential to impact on receptors of ecological sensitivity within the vicinity of the Site. A desktop study was undertaken to identify the following sites of ecological or nature conservation importance:

- Special Areas of Conservation (SACs), Special Protected Areas (SPAs) or Ramsar sites within 5km of the standby generators;
- Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), local wildlife sites and ancient woodlands within 2km of the standby generators.

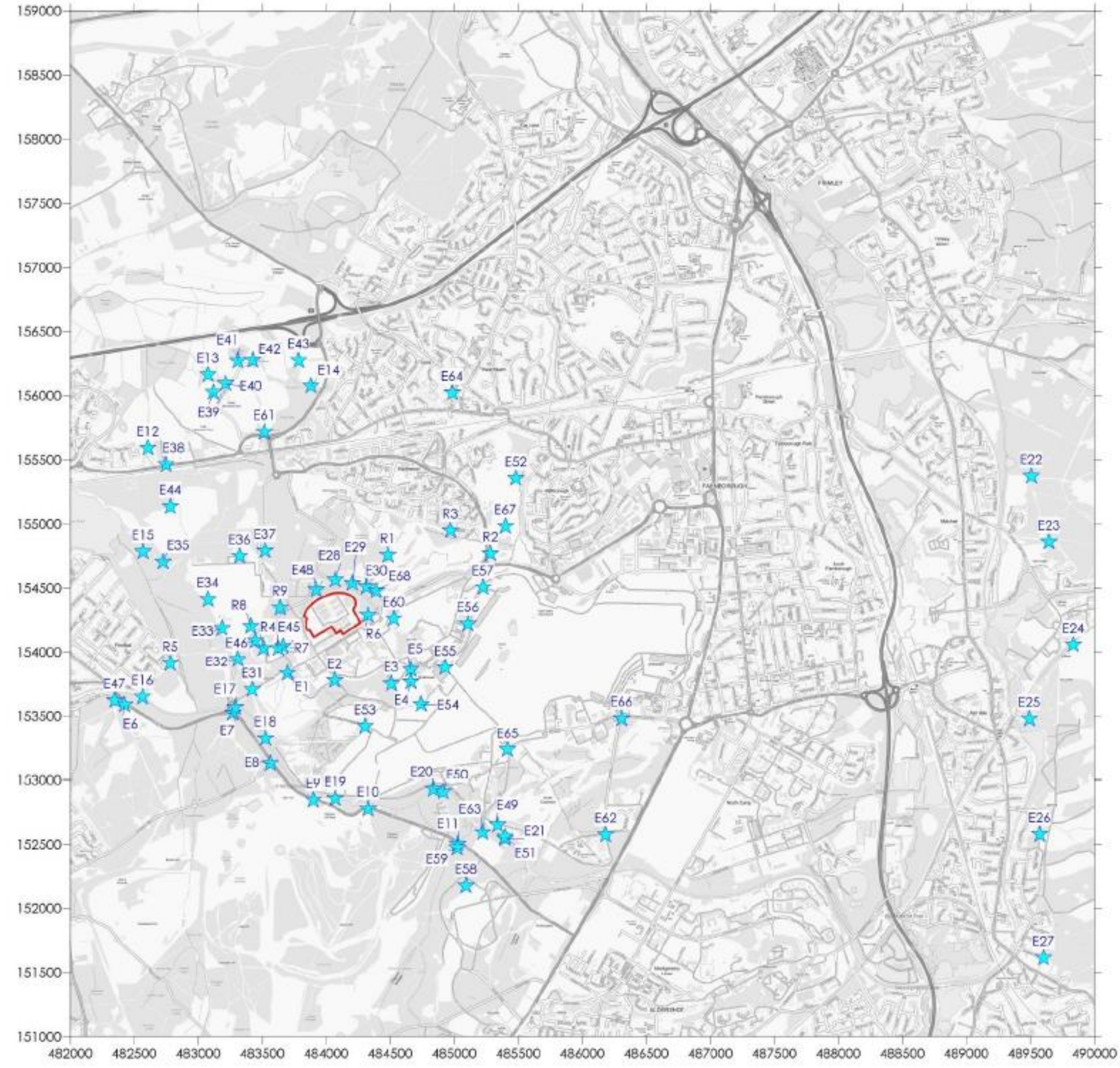
A pre-application request was submitted to the EA in order to identify relevant sites of ecological or nature conservation importance for inclusion in the assessment. The response indicated the following designations within the relevant distances referenced within the table and the closest point from the installation to each designation given.

Table 9b Sensitive Receptors - Ecological

ID	Location	Coordinates		Emission which may impact on the receptor and their relevant pathways
		X	Y	
E1	Thames Basin Heaths SPA and Eelmore Marsh SSSI	483696.6	153834.5	Air Emissions
E2	Thames Basin Heaths SPA and Eelmore Marsh SSSI	484066.4	153779.6	"
E3	Thames Basin Heaths SPA and Eelmore Marsh SSSI	484506.8	153753.5	"
E4	Thames Basin Heaths SPA and Eelmore Marsh SSSI	484661.1	153767.9	"
E5	Thames Basin Heaths SPA and Eelmore Marsh SSSI	484659.7	153863.3	"
E6	Thames Basin Heaths SPA and Bourley and Long Valley SSSI	482425.7	153589.2	"
E7	Thames Basin Heaths SPA and Bourley and Long Valley SSSI	483269.3	153524.0	"
E8	Thames Basin Heaths SPA and Bourley and Long Valley SSSI	483563.0	153127.8	"
E9	Thames Basin Heaths SPA and Bourley and Long Valley SSSI	483898.6	152843.4	"
E10	Thames Basin Heaths SPA and Bourley and Long Valley SSSI	484327.4	152778.2	"
E11	Thames Basin Heaths SPA and Bourley and Long Valley SSSI	485026.6	152507.8	"
E12	Foxlease and Ancells Meadows SSSI	482606.1	155592.8	"
E13	Foxlease and Ancells Meadows SSSI	483076.1	156164.0	"
E14	Foxlease and Ancells Meadows SSSI	483878.3	156076.6	"
E15	Fleet Pond SSSI and LNR	482568.1	154784.9	"
E16	Basingstoke Canal SSSI	482563.7	153648.7	"
E17	Basingstoke Canal SSSI	483289.6	153570.2	"
E18	Basingstoke Canal SSSI	483525.1	153326.9	"
E19	Basingstoke Canal SSSI	484070.5	152856.1	"
E20	Basingstoke Canal SSSI	484835.7	152930.6	"
E21	Basingstoke Canal SSSI	485396.8	152546.1	"
E22	Thursley, Ash, Pirbright & Cobham SAC	489506.7	155372.3	"
E23	Thursley, Ash, Pirbright & Cobham SAC	489645.6	154860.4	"
E24	Thursley, Ash, Pirbright & Cobham SAC	489835.8	154055.9	"
E25	Thursley, Ash, Pirbright & Cobham SAC	489492.0	153478.1	"
E26	Thursley, Ash, Pirbright & Cobham SAC	489572.5	152578.6	"
E27	Thursley, Ash, Pirbright & Cobham SAC	489601.7	151613.2	"
E28	Southwood Woodland LWS	484070.4	154563.0	"
E29	Southwood Woodland LWS	484205.5	154535.5	"
E30	Southwood Woodland LWS	484313.0	154511.9	"
E31	Pyestock Hill/Pondtail Heath LWS	483424.0	153705.7	"
E32	Pyestock Hill/Pondtail Heath LWS	483307.8	153941.1	"
E33	Pyestock Hill/Pondtail Heath LWS	483185.5	154185.8	"
E34	Pyestock Hill/Pondtail Heath LWS	483075.4	154412.1	"
E35	Pyestock Hill/Pondtail Heath LWS	482723.7	154705.7	"
E36	Bramshot Common LWS	483323.1	154748.5	"
E37	Bramshot Common LWS	483521.9	154791.3	"

E38	Sankey Lane Meadow LWS	482747.5	155461.8	"
E39	Foxlease Watch Field LWS	483119.7	156025.7	"
E40	Foxlease Meadow G SINC	483214.7	156093.6	"
E41	Bramshot Copse SINC	483309.7	156270.0	"
E42	Foxlease Meadows, Field 11 (T) SINC	483425.0	156276.8	"
E43	Whitehouse Farm Meadow SINC	483784.6	156273.4	"
E44	Fleet Pond Woods LWS	482781.6	155136.3	"
E45	Pyestock (Playing Field)	483625.1	154029.4	"
E46	Pyestock (Fairway)	483445.6	154091.1	"
E47	Velmead Road Heath LWS	482346.8	153623.3	"
E48	Southwood (Kennels Lane) LWS	483922.8	154487.7	"
E49	The First Grass Heath LWS	485339.0	152652.1	"
E50	Puckridge Hill Heath LWS	484912.8	152906.0	"
E51	Claycart Hill Flash (non SSSI part) LWS	485394.9	152560.2	"
E52	Cove Valley, Southern Grassland LWS	485481.9	155354.8	"
E53	Farnborough Airfield LWS	484302.2	153420.3	"
E54	Farnborough Airfield LWS	484740.2	153592.1	"
E55	Farnborough Airfield LWS	484929.2	153878.4	"
E56	Farnborough Airfield LWS	485106.7	154222.0	"
E57	Farnborough Airfield LWS	485224.1	154505.4	"
E58	Rushmoor Arena LWS	485091.4	152173.9	"
E59	Claycart Bottom/Rushmoor Hill LWS	485024.1	152473.2	"
E60	Ball Hill LWS	484527.0	154263.3	"
E61	Great Bramshott Farm LWS	483517.6	155719.6	"
E62	Land around Blandford House LWS	486183.1	152575.6	"
E63	Claycart Hill Open Space LWS	485221.6	152595.2	"
E64	St John's Churchyard LWS	484983.6	156022.4	"
E65	Watt's Common LWS	485416.8	153235.9	"
E66	Army Golf Course - East LWS	486307.3	153483.2	"
E67	Cove Brook Grassland LWS	485399.2	154980.9	"
E68	Southwood Country Park LWS	484390.3	154479.5	"

Figure 1 Sensitive Receptors – Human and Ecological in the immediate area of the installation.



Impact of Emissions to Air

The principal emissions to atmosphere from the installation are identified in Table 4. This section presents the approach to the assessment of the impact of the emissions on the local receiving environment. For the purpose of this assessment the model presents emissions whilst operating diesel fuel only.

An air quality assessment has been undertaken based on data for the standby generators provided by the equipment suppliers. The pollutants associated with the generators, as provided by the generator manufacturers are nitrogen oxides (NO_x), carbon monoxide (CO) and particulate matter (PM10); therefore the assessment focuses on these pollutants.

Building on the Data Centre FAQ Headline Approach V10 in consultation with EA central permitting and sector leads in agreement with the EA the assessment considers the potential impact from the operation of the standby generators under the following operating scenarios:

- Event 1 (a) - Standby generator test (no load). Each bank of standby generators is tested monthly when Event 1 (b) and Event 2 are not being undertaken. This involves simultaneous operation of the bank at 0% of full load for 15-minutes;
- Event 1 (b) - Standby generator test at its resilience level (66% for A104 and 89% for A105)). Each bank of standby generators is tested three times per annum. This involves simultaneous operation of the bank at its resilience level of full load for 15-minutes;
- Event 2 - Annual service test. Each generator is tested once per annum. This involves operation of a single generator at 100% of full load for 2-hours. No other engines are operational during this period; and,
- Event 3 - Grid outage event. In the event of a power outage all standby generators would operate until supply is resumed. As discussed and agreed with the EA Data Centre Lead, it has been assumed that operation would occur for a maximum of 120 hours. This is based on the resilience of the grid connections to the site, the resilience of the on-site systems and the amount of fuel stored on site as part of contractual obligation. Engine loads during Event 3 can be summarised as follows:
    - A101 - 75%;
    - A102 - 75%;
    - A103 - 50%;
    - A104 - 66%; and,
    - A105 - 89%.

A detailed air quality assessment is presented at Appendix D that assessed releases of nitrogen dioxide, particulate matter and formaldehyde. Based on the modelling results and the existing baseline conditions, the results show that the predicted pollutant concentrations for Event 1, representing standby generator bank testing, were below the relevant EQSs at all receptor locations and are not considered to be significant. Similarly, the predicted pollutant concentrations for Event 2, representing annual standby generator testing, were below the relevant EQSs at all receptor locations. As such, impacts are not considered to be significant.

Predicted pollutant concentrations for Event 3, representing a 120-hour grid outage, were below the relevant EQSs at all human receptor locations, with the exception of the 1-hour mean AQO for NO2. However, following further results analysis and consideration of the risk of potential EQS exceedance, impacts are not deemed to be significant. The risk of EQS exceedance at sensitive ecological receptors during Event 3 was predicted to be below 1%. As such, impacts are not considered to be significant.

An Air Quality Management Plan, based on the agreed sector template has been produced in consultation with the Local Authority. This outlines the response measures to be taken in the event of a National Grid failure and the operation of the generators. This includes considerations of the predicted potential impact indicated by the air dispersion modelling at individual receptors, timescales for response measures, considerations of local conditions relevant during a grid failure, contingency measures and how this plan will be reviewed. The plan has been produced taking account of the full design capacity of the site introduced by this variation (Appendix F)

Point Source Emissions to Sewer, Surface Water and Groundwater

Sections 3b Fugitive Emissions and 3d Accident Management outline that there is no change in the risk to sewer, surface water and groundwater as a result of this variation as summarised in the risk assessment below in Table 10.

Odour

The installation has no discernible odour sources and does not present an odour nuisance risk.

Noise

A noise assessment has been undertaken to assess the impact of noise associated with full Data Centre site operations at Cody Park including the addition of A105 and the changes to A104 in support of this Permit variation application (Appendix E).

The acoustic acceptability of the full Data Centre operation has been demonstrated utilising a baseline sound survey carried out at the nearest noise-sensitive receptors and a comprehensive noise modelling exercise. The assumptions of the noise model are based on source noise measurements carried out at existing and operating Data Centres 101- 104 and technical performance datasheet information from suppliers for new equipment for A105 including the recommended sound reduction measures.

Detailed assessment of operating scenarios have been assessed including 'Normal Operation' scenario assesses acoustic impact of plant which will normally be running, such us the internal plant rooms with associated ventilation inlet and outlet louvers at the buildings' facades and the external roof plant associated with 104 and 105 together with a noise barrier. Further scenarios included different 'Emergency Backup' scenarios to assess the acoustic impact of the different situations, including the extremely unlikely event of roof-mounted air-cooled condensing units associated with emergency cooling system operation and backup electricity generators operation associated with main power failure occurring simultaneously.

The assessment shows that with the mitigation measure 'Normal Operations' are expected to have No Impact or a Low Adverse Noise Impact at the nearest and most exposed noise-sensitive receptors, when assessed in accordance with BS4142:2014. The 'Emergency Generators Backup Operations' and 'Emergency Cooling Backup Operations' to have No Impact, Low Impact and a Significant Adverse noise impact when assessed in accordance with BS4142:2014 2019. However, taking into account the emergency and very occasional occurrence of this scenario, it is considered appropriate to extend the Assessment to comply with BS8233:2014/WHO Guidelines. This Assessment has found that in the worst-case scenario of all emergency plant from all buildings operating at the same time, the BS8233:2014/WHO Guidelines at external amenity areas are achieved at the receptors to the east and slightly exceeded at the future receptors to the north. The Indoor Ambient Noise Levels targets for the night-time operation are slightly exceeded at the closest residential receptors in the area, but it would be within the +5 dB relaxation at which 'reasonable' acoustic conditions can be expected.

The emphasis in the management of noise from the site is on prevention during 'normal' day to day data centre operations, and as such preventative maintenance, management, monitoring and inspection of all routine potential sources of noise. No additional measures are considered necessary at this time.

Table 10 Environmental Risk Assessment

Hazard	Receptor	Pathway	Risk Management Technique	Probability of Exposure	Consequence (Severity)	Overall Residual Risk
Emissions to air – generator emission from Standby and Service generator testing	See Tables 9a and 9b	Air dispersion	Selection, operation and maintenance of combustion units in line with BAT for the sector. Rotational time limited testing.	Low	Low	Low - See Air Quality Dispersion Assessment and Management Plan
Emissions to air – generator emission points Grid outage	See Tables 9a and 9b	Air dispersion	High level of mains electrical system redundancy, selection, operation and maintenance of combustion units in line with BAT for the sector	Low	Medium	Low - See Air Quality Dispersion Assessment and Management Plan
Noise – Normal Data Centre operations	See Tables 9a	Airborne	Specification and selection of equipment. PPM, monitoring and inspection of all routine potential sources of noise	High	Low	Low – See Noise Assessment.
Noise – Grid Outage operations	See Tables 9a	Airborne	Selection, operation and maintenance of combustion units in line with BAT for the sector High level of mains electrical system redundancy,	Low	Low	Low – See Noise Assessment.
Fugitive Emissions to Air – dust, litter etc.	See Tables 9a and 9b	Air dispersion	Housekeeping Standards	Low – no dusty materials	Low	Negligible
Fugitive emissions to air – process	See Tables 9a and 9b	Air dispersion	Contracted maintenance programme.	Low - Potential for emissions during maintenance or in the event of a breakdown	Low – No impact	Negligible

Hazard	Receptor	Pathway	Risk Management Technique	Probability of Exposure	Consequence (Severity)	Overall Residual Risk
Emissions to sewer from discharge point	Water Waste Water Treatment Works	Sewerage drainage system	Specification and selection of equipment. PPM, monitoring and inspection of all routine potential sources of noise Compliance with trade effluent discharge consent	Low (low volumes)	Low – No consent required compliant with consent	Low – site operates within existing consent levels.
Fugitive Emissions to surface water, sewer and groundwater – accidental minor leaks and spills – bulk fuel delivery and storage	Controlled Waters; Water Waste Water Treatment Works	Drainage system; overground.	Tank integrity checks; Containment alarms; Delivery procedures; Spill procedures and training;	Low	Medium – minor impacts with no pollution occurring	Low – minor leaks and spills routinely cleared up with no impact.

Appendices

Appendix A – Site Plans

i) Drawing 1 Cody Park Site Plan (1001 - Campus IED Generator Site Plan v0)

ii) Drawing 2 Air Emission Points (Drawing Emission Points)

iii) Drawing 3 Drainage Plans (i) A104 (ii) A105

Appendix B – BAT Assessment

i) Large Combustion Plant BAT Conclusions

ii) Data Centre FAQ Headline Approach V10 Operator Response

Appendix C – Generator Specification

i) Generator Technical Data Sheets

ii) Belly Tank Specification

iii) 211202 CP Generator Schedule worksheet

Appendix D – Air Quality Assessment

Appendix E – Noise Assessment

Appendix F – Air Quality Management Plan

Appendix G – Climate Change Agreement