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PROPOSED DEVELOPMENT
HAGSHAW LDES LTD
LAND AT CONEXUS WEST
WEST OF JUNCTION 11, M74, COALBURN
LANARK

DESK STUDY REPORT

E13224 NL/NJH **April 2025**

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CONTENTS

TABLES

APPENDICES

1.0 INTRODUCTION

David R Murray & Associates (DRM) were appointed by Hagshaw LDES LTD., to review archive information and thereafter prepare a desk study report on an area of restored land located within the Hagshaw Energy Cluster (HEC) area. The HEC is a strategic location for the establishment of large-scale renewable energy projects with a biomass plant located to the north and multiple wind farms present to the west.

The site is located to the south-west of Junction 11 of the M74, approximately 1.5km to the south of Coalburn and approximately 1.5km to the north of Douglas and is accessed via a private road from Junction 11.

This Desk Study Report is written to accompany a Section 36 Consent Application for:

"The installation of a Long Duration Electricity Storage Scheme ('LDES'), with a storage capacity of up to 6 Gigawatt hours (GWh), a substation, underground cabling, access track, landscaping, biodiversity enhancements and ancillary infrastructure".

The developable area extends to approximately 17 ha of currently unused and restored land which is sub-divided into two smaller and irregularly shaped parcels separated by an existing access road. The northern parcel is a more compact shape whilst the southern parcel is elongated in a north-east to south-west orientation, Appendix A.

This desk study has been prepared to provide further information on the presence of potential mineral, geotechnical or environmental constraints to the development proposed.

It is recognised that intrusive investigation would be necessary at detailed design stage in order to better understand potential constraints and allow the design of any remedial measures required.

The information presented within this report is based on observations made by examination of in-house and external records including historic maps, public body information, previous reports for the site, geological plans, and from a site walkover.

This report has been prepared for the exclusive use of Hagshaw LDES Ltd. and their representatives. Any use of this report by a third party, or any reliance on or decisions made based on it, are the responsibility of such third parties unless written confirmation at the request of Hagshaw LDES Ltd. has been provided by David R. Murray and Associates.

If new information becomes available in respect of the site, and/or legislation changes after the submission of this report and/or one year has elapsed since submission, the report should be referred back to David R. Murray & Associates for comment or amendment to some or all of the report where necessary.

2.0 SITE SETTING & DESCRIPTION

The site is located to the south-west of Junction 11 of the M74, approximately 1.5km to the south of Coalburn and approximately 1.5km to the north of Douglas and is accessed via a private road from Junction 11 (the Poniel interchange). The site is situated within the Hagshaw Energy Cluster (HEC) which is a strategic location for large-scale renewable energy projects.

The Red Line Boundary extends to approximately 46.6 hectares, approximately 17 hectares of which will be developed (including battery compounds and ancillary infrastructure).

The irregularly shaped development areas are sub divided into two parcels of restored land referenced herein as the northern and southern parcels..

The northern parcel is a more compact shape whilst the southern parcel is elongated in a north-east to south-west orientation, Appendix A. These are separated by an existing private access road servicing various wind farm sites and a biomass plant (fuelled by woodchips) located immediately to the north of the road. The centre of the site is situated at grid co-ordinates X 282936 Y 632476.

Photograph looking south showing the biomass plant with the northern parcel and the southern parcel located on the opposite side of the access road. Wind turbine components during delivery are shown in the photograph.

The area to the south of the biomass plant is currently in use as a temporary compound area to support the construction of two wind farms on adjacent land with welfare cabins, parking, a concrete mixing plant and material storage present on a wider area of concrete hardstanding adjacent to the biomass plant.

A former railway line is located along the eastern edge of the southern parcel with this forming the area of highest elevation on the site at around 253mAOD. Ground levels in the area slope down towards the north and north north-west with levels at around 224mAOD on the north-western portion of the site.

To the south of the southern parcel ground levels continue to rise and a cutting is present with a foot bridge crossing this. Drainage ditches are present on both sides of the railway embankment and flow northwards, with one of these then cutting across the northern edge of the sites southern parcel, under the access road and the biomass plant in culverts before discharging to the network of ditches located to the north-west of the site.

A drain taking surface water from the area of hardstanding surrounding the CHP runs across the northern parcel and discharges to the Poniel water to the north. The Alder Burn runs along the western boundary of the site, forming a ponded area prior it being culverted under the access track and continuing its journey north towards the Poniel Water.

Pylon towers carrying overhead electrical cables are present along the eastern boundary of the site's southern parcel. An area of woodland (Long Plantation) is present to the east of these. The area to the west of the site is roughly grassed, marshy and undulating former industrial land with wind turbines currently being established.

Underground electricity cables are currently being laid in an area to the west of the sites southern parcel.

A selection of photographs showing the subject site at the time of the walkover inspection on 27th March 2025 is provided overleaf.

Access road from Poniel Interchange. Electricity pylons running alongside access road towards the wind farms.

Looking west towards existing biomass plant.

Looking south. Wind farms in distance with temporary construction compound located to the south of the biomass plant.

Looking south from north-eastern corner showing former railway embankment and temporary compound area.

Looking west towards temporary compound area

Looking north-west across southern parcel from railway embankment

Looking south. Footbridge over former railway line to the south of the site.

Area adjacent to southern boundary of site. Current works ongoing to lay electricity cables.

Looking north along Alder Burn towards the small pond in the distance. Cable works on higher ground to the right.

Looking south. Alder Burn on right.

Looking north along the relocated track. Pond on Alder Burn shown

Looking north-west over ponded area of Alder Burn

Looking east towards southern parcel and former railway embankment.

Looking west along access road between northern and southern parcels.

Temporary construction compound area

Temporary compound area and concrete mixing plant.

Temporary site compound area to south of biomass plant.

Looking east from north-western corner of site towards biomass plant.

Looking south-east from west boundary.

Looking south along western boundary/fence line

3.0 SITE HISTORY

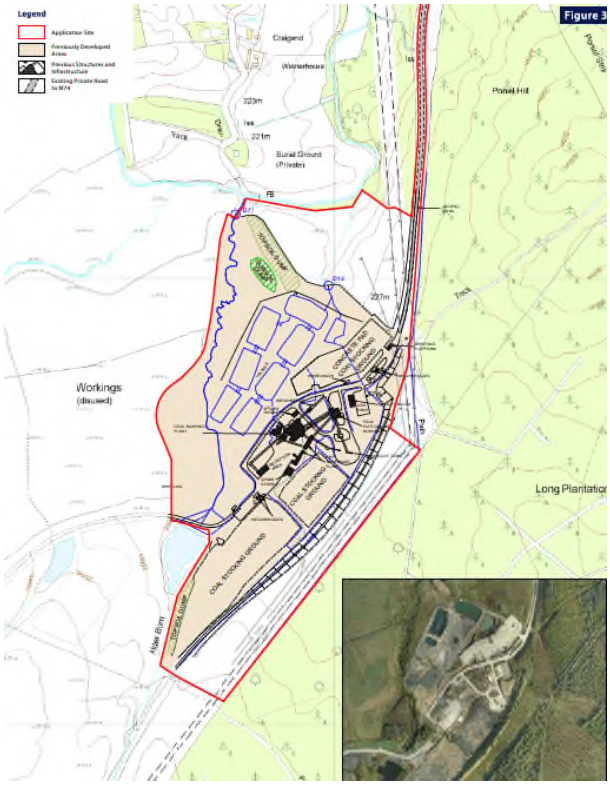
A review of an Envirocheck Report containing Ordnance Survey map extracts, Appendix B, was undertaken to assess historical land uses and major changes which could provide an indication of ground conditions and potential environmental issues. Other than the presence of a railway line, the site remained largely undeveloped until the late 1980's when it was used as a storage and processing area servicing a large open cast coal mine located to the west. Following cessation of mining activity in 2004, the former works were dismantled and material stockpiles removed with settlement lagoons infilled and some levelling earthworks. The site has remained largely overgrown since this time, however the surrounding area has been more extensively developed as a hub for the generation of renewable energy. A summary of the history of the site and surrounding area is provided in Table 1.

Table 1: Historic land use of the site and environs.

Map Survey Date	Subject Site	Site Environs
1858-1864 1:10,560 & 1:2,500	Site largely undeveloped and located in an area of heathy ground. Alderburn Farm is located on the northern parcel with fence lines extending to the south-east and south-west from this building. A footpath runs north-west to south-east across the northern areas of both parcels. A drain/unnamed water course is located eastern edge of the northern parcel.	The Alder Burn, which flows towards the north (where it forms tributary to the Poniel Water) is located to the west of both land parcels although does encroach onto the south-western edge of the northern parcel. A small, ponded, quarry is located to the west of the Alder Burn. A large area of woodland (Long Plantation) is present around 50m to the east, with the town of Douglas present around 1.5 kilometres to the south-east.
1897-1898 1:10,560 & 1:2,500	Much of site is unchanged, however, a railway line, the Muirkirk Branch, now forms the eastern boundary to the southern land parcel before cutting through its southern portion.	Some trees removed within the Long Plantation to the east. More footpaths are labelled within the surrounding area with a footbridge crossing the railway line to the south of the sites southern parcel and an underpass below the railway 100m to the north. The quarry to the west is no longer labelled and instead appears as a small pond. Douglas West station constructed to the south of site (around one 1.5km to the south south-west). Expansion of Douglas to the south-east.
1910-1912 1:2,500 & 1:10,560	Small drain/water course shown within the southern parcel and flows northwards through the eastern edge of the north. This also discharged to the Poniel Water to the north.	Long plantation is criss-crossed with multiple internal footpaths. The railway line is rebranded as the Douglas & Muirkirk extension line. Some small quarries in the surrounding area are disused. Rifle range present to north of Douglas West Station to the south. Gas works and more industrial and residential development within Douglas. Private burial ground 250m to the north of the site.

1957 1:10,000	Alderburn Farm buildings removed from site.	Further expansion within Douglas with expansion of residential development at Douglas West Station. Soil heap (associated with mining) located in this area also at the location of the former rifle range.
1961-1969 1:2,500 & 1:10,560	Pylon mounted electrical cables present, largely between the two land parcels, although the cables do cross the western edge of the southern parcel and eastern edge of the northern parcel.	Original residential development at Douglas West replaced with new housing. Spoil heap in this area is enlarged. Further residential development at Douglas to the south-east.
1989-1995 1:2,500	Limited survey data, railway line is disused and overhead electrical cables and associated pylon towers have been removed. Site is believed to have been used as a coal storage and processing depot at this time with works buildings present on the northern portion of the southern parcel.	Settlement ponds are present to the north-west of the northern parcel, presumably discharging to the Poniel Water. It is known from other sources that a large open cast coal mine Dalquhandy, was present around 500m to the north-west at this time. A new access road (which was private and broadly followed the route of the previous railway line) was present to the north and connected to a roundabout at Junction 11 of the M74.
2001 1:10,000	This survey confirms the presence of the settlement lagoons within the northern land parcel with the main processing buildings and coal storage area located on the southern parcel.	The access road to the north is shown, with a track connecting the open cast coal mine with the processing area. This cut across the line of the Alder Burn with this water course ponded to the south of the track. Most of the buildings at Douglas West have been removed
2006 1:2,500	Following cessation of opencast working, believed to have been in 2004, the former structures on the site were demolished and removed. Some concrete hardstanding remained. The settlement lagoons on the northern parcel were largely infilled although two remained. Most of the site area was shown to be rough and reworked, presumably as a result of levelling works. Only the sliver of land located to the east of the former railway line on the on the southern parcel remained unaltered.	An area of rough and reworked ground was also present to the west of the Alder Burn, to the west of the southern parcel. The ponding of the Alder Burn is still present in this area.
2024 1:10,000	The site is labelled as roughly grassed with some drains running though. All ponded areas now infilled within the northern parcel.	A power station is present to the north-east, this is the biomass plant noted during the walkover, we understand that this utilises the former concrete hardstanding area associated with the coal processing plant. Douglas West Wind Farm established to the west around the former open cast area with multiple turbines already installed. Large electrical distribution station present at Douglas West with numerous pylon towers carrying cables present at this location. Overhead electrical cables are therefore present within the east of the southern parcel. A large depot and bonded warehousing was constructed around 800m to the north north-east and operated by Dewars.

View looking south with the northern parcel of land occupied by settlement lagoons, wash plant and storage of coal on the southern parcel of land with the dismantled railway line clearly visible. Photograph (circa 1996) from Jim Hamilton Coalburn Heritage Society Website.



Extract of plan taken from planning application CL/17/0157 showing the previous coal processing facility layout in relation to the wider planning application boundary. The northern and southern parcels which will contain the LDES proposed are located within this.

4.0 GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

In house and online geological maps as well as those within the Envirocheck Report were reviewed, Appendix B.

4.1. Superficial Geology

Review of the available information shows that made ground is recorded to be present across both parcels of the site as result of the presence of the of the coal processing facility. In particular, areas of infilling would be present on the northern parcel associated with the former settlement lagoons. The materials used to infill the ponds is not known, although is likely have been arisings generated from the opencast operations to the west and as such would largely be expected to comprise reworked rock and clay. Sediments from the washing plant and remnant coal materials area also likely to be present with the latter particularly prevalent on the southern parcel.

Devensian Diamicton glacial till would be present below the made ground materials. The till is typically a firm to very stiff consistency clay with pebble to boulder size rock clasts, and can be softer and siltier where weathered close to ground surface. Irregular bands of sand and gravel also occur within the till deposits

The thickness of drift deposits is not known with certainty, however, historic BGS boreholes, Appendix C, in the wider area, confirm the thickness of drift deposits to be around 10m, albeit the boreholes were drilled prior to the more recent opencast extraction of coal more widely and the general earthworks associated with the coal processing facility and settlement lagoons on the site itself. As such the depth to rockhead may now be more variable.

4.2. Solid Geology

Solid strata underlying the drift deposits have been affected by folding and faulting with two main formation groups present as a result of this. A north-east to south-west orientated fault cuts across the centre of the southern parcel, whilst a more recent fault runs in an east-west orientation through the northern parcel.

Strata dip towards the east and south-east with approximate dip angles of 20° with the entire site underlain by the rocks of the Upper Limestone Formation of Carboniferous age.

These comprise an interbedded sequence of sandstones and mudstones with seams of limestone and generally thin coals. These rocks are in turn underlain by younger strata belonging to the Passage Formation, also of Carboniferous age which comprise a general sequence of sandstones, siltstones and mudstones with occasional coal and limestone seams.

Given the dip of the strata and the presence of the faulting noted above the rocks of the Passage Formation are present at rockhead beneath the eastern half of the sites southern parcel and the north-eastern portion of the sites northern parcel.

The Limestone Coal formation is present at greater depth below the site, and it was the coal seams within this sequence that were subject to extraction by opencast methods further to the west during the late1980's and 1990's. These coal seams underlie the subject site at depth.

4.3. Mineral Stability

The site is not located within a Coal Authority (Mining Remediation Authority) designated high-risk area, with the Coal Authority Consultants report, Appendix D, confirming the following:

- *"No past mining recorded and no probable unrecorded shallow workings with no spine roadway recorded at a shallow depth".*
- *"There are no recorded mine entries within or within 100m of the site boundary".*
- *"The property is not in an area where the Coal Authority has plans to grant a license to remove coal using underground methods."*
- *"The property is not in an area where a license has been granted to remove or otherwise work coal using underground methods."*
- *"The property is not in an area likely to be affected from any planned future underground coal mining."*
- *"The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994."*
- *"The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures."*

Although there is the potential for mineworkings to be present below the site any economic coal seams are at considerable depth.

As such, the site is not at any risk from mineral instability due to the presence of shallow mineworkings. We therefore concur with the assessment and conclusions reached within the Mining Hazards Assessment previously undertaken by the consultants Wardell Armstrong, Appendix E.

Therefore, although the site lies within the planning boundary of a previous open cast coal extraction these excavations did not extend below the site area which was developed for ancillary and processing and distribution usage.

4.4. Quarrying Activities

Review of historical maps and information contained in the Envirocheck Report, Appendix B, confirms that there were no quarrying activities within the site boundary, however, quarrying activities involving the surface removal of sandstone occurred to the north-east of the site within the Long Plantation, recorded on maps from the late 1800s. Minor quarrying was also noted to the west during the 19th Century, whilst extensive excavation associated with the Dalquhandy open cast was undertaken during the 1980's and 1990's.

4.5. Radon

Radon is a colourless, odourless radioactive gas which is formed by the radioactive decay of small amounts of uranium that occur naturally in all rocks and soils. The main danger from high radon exposure is the increased risk of lung cancer. For most people, radon is the single largest source of radiation exposure whether they are at home or at work.

Review of the Envirocheck Report confirms that site is situated in a lower probability radon area, as less than 1% of homes have the potential to be above the action level, and as such no protection measures are necessary particularly as the only proposed building is a substation which will be accessed in-frequently.

4.6. Hydrology

The nearest named surface water feature in the vicinity if the site is the Alder Burn which flows towards the north and is located a short distance to the west of the site area. This burn forms a tributary of the Poniel Water.

A drainage ditch which runs around the northern edge of the southern parcel and subsequently flows across the eastern portion of the sites northern parcel also flows northwards and joins the Poniel Water.

This latter water course flows north-eastwards where it joins with the Douglas Water which forms part of the wider River Clyde catchment area.

Based upon the local topography the general direction of and surface water flow in the immediate vicinity of the site area is likely to be towards the north. The former settlement lagoons on the site also discharged to Poniel Water to the north.

Any contaminated soils or groundwater on the site would be expected to impact upon surface water bodies located towards the north and north-west.

Information on the SEPA water classification hub identifies the Poniel Water to be of moderate quality.

4.7. Hydrogeology

The bedrock underlying the site is classified as a Minor to Moderately Permeable Aquifer, essentially described as fractured or potentially fractured rocks which do not have a high primary permeability or other formations of variable permeability. However, the pathway of any mobile contaminants in the area are likely to be restricted and broken to any aquifer by the presence of low permeability diamicton tills which underlie the site.

Any shallow water is not considered to be a water body as defined in the SEPA position statement document WAT-PS-10 01[(1)], given its likely perched nature within made ground materials above the glacial clays.

An estimate of the hydraulic conductivity of the underlying glacial clays would be of the order of 1.0 x 10^{-6}m/s or lower. This would result in yields of water of less than 10m^3/day. Therefore, in relation to The Water Environment (Controlled Activities) (Scotland) Regulations 2005, the superficial soil or drift would be classified as a non-aquifer.

[(1)] WAT-PS-10 01' Assigning Groundwater Assessment Criteria for Pollutant Inputs, Version 3.0, August 2014.

The underlying bedrock aquifer may be a receptor in terms of its potential as a future drinking water source although this is perhaps unlikely given the long history of mining in the area that may have impacted upon groundwater quality, and this is confirmed by SEPA.

Therefore, the bedrock under the site forms part of the North Douglas Coalfield bedrock groundwater body which is indicated to be of a poor water quality classification on the SEPA water classification hub.

Notwithstanding this, the WAT-PS-10 01 guidance states that future drinking sources should be protected, although there is no groundwater source protection zone within 1km of the site on the Envirocheck Report. It is therefore accepted that there is a requirement to prevent the entry of hazardous substances into all groundwater regardless of whether it has a future resource value or not.

It is considered that the proposed end use would not have a significant adverse impact on any bedrock aquifer, even if a viable one was present.

There is a substantial thickness of drift over the bedrock at this site. The extent and depth of any made ground would need to be identified to assess if deeper foundation solutions would be required. Notwithstanding this, future pathways to the rock are not currently envisaged.

4.8. Flood Risk

Review of the SEPA online mapping confirms that the site is not at risk from flooding from surface water bodies.

SEPA online mapping confirms overland flows during periods of heavier rainfall would lead to the accumulation of water associated with the drainage ditches noted previously in this report.

The control of overland flows would form part of the detailed design for the development proposed (refer to Outline Drainage Strategy accompanying the application submission for more details).

5.0 ENVIRONMENTAL INFORMATION

The Envirocheck Report, Appendix B, contains information on; landfill sites, waste treatment operations, discharge consents and emissions consents, sites holding radioactive substances authorisations and hazardous substances consents, contemporary trade directories and on sites where fuels are stored.

Review of this information confirms that there are no records of the following within or within 200m of the site boundary.

- Contaminated Land Register Entries and Notice
- Enforcement and Prohibition Notices
- Integrated Pollution Controls
- Local Authority Recorded Landfill Sites
- Registered Radioactive Substances
- Local Authority Pollution Prevention and Controls
- Registered Waste Transfer Sites
- Registered Waste Treatment or Disposal Sites
- Notifications of Installations Handling Hazardous Substances
- Controls of Major Accident Hazard (COMAH) Sites
- Explosive Sites
- Planning Hazardous Controls
- Garage and Fuel Stations
- Contemporary Trade Entries
- POI – Recreational and Environmental
- POI – Commercial Services
- POI – Education & Health
- POI – Public Infrastructure

There are four discharge consents located on and immediately adjacent to the site boundary. All are registered to British Coal and are indicated to have been revoked in 1991. All discharged to tributaries of the Poniel Water and were associated with various areas of the former coal processing and washing plant areas. A further discharge consent listing is associated with the former open cast coal extraction area further to the west.

Given that these activities have long since ceased these listings are no longer of any significance.

Two Points of Interest – Manufacturing and Production, are present close to the site. A power station (the biomass plant is present in the north of the site boundary) with an unspecified ‘works’ listed within the southern parcel. This may even relate to the previous coal processing facility.

The various listings and activities identified within this archive have already been noted and discussed previously. These do not alter the general conclusions and recommendations that have bene made with regard to the potential future development of the site for LDES.

5.1. Coal Processing

Although the exact processes previously undertaken on the site by British Coal are not known with any certainty, coal cleaning and processing is generally used to upgrade the value of the coal product by removing impurities.

It is likely that the processes involved at this site comprised physical cleaning which would have involved the crushing and screening of the coal product into fine and coarse fractions.

These are then separated from impurities by floatation (generally using water) whereby the coal floats and rock fragments sink. This allows separation of the coal which is then dried through the removal of the water by screening followed by thermal drying by hot air.

Given the presence of washer houses, settlement lagoons and a boiler house the foregoing is the most likely process with no need for the use of flocculants or chemical processes to clean and segregate the coal.

This process would in theory have led to the very little significant contamination within the site boundary, although the waste from the boiler house or if fuel was stored could potentially have caused some residual contamination. If the boiler house was coal fired, waste ash materials may well have been disposed of on site. Given the age of the former buildings on the site the use of some asbestos containing materials (blue and brown asbestos) is also unlikely although their construction does straddle the period during which the use of this material was being phased out of construction projects. The presence of white asbestos (chrysotile) having been used in buildings is still a possibility.

6.0 SUMMARY OF DESK STUDY INFORMATION

The following issues/potential construction constraints have been identified from the archive information reviewed.

Engineering: Significant made ground is anticipated to be encountered on the site given its history. Subject to site investigation it may be necessary to support future structures using ground improvement techniques with heavier structures potentially requiring to be supported on piles driven into the glacial clay or, alternatively, rockhead. The presence of infilled settlement lagoons may mean that weaker layers of saturated silts are present with such materials potentially requiring to be excavated and the made ground re-engineered.

In order to facilitate the development, it would be necessary to platform the site and divert and infill existing drainage ditches where these are present. The investigation would therefore also determine the suitability of the existing materials for use in the earthworks to platform the site for development.

Environmental: The majority of the made ground would be expected to comprise reworked natural materials such as clay and rock and as such would be largely inert. The presence of ash material from the former boiler house cannot be discounted, likewise, materials associated with the demolition of the former buildings, if rubble remained on site may have the potential to contain asbestos.

The presence of coal within any made ground is also a distinct possibility with these materials potentially being a source of combustion leading to volume change and gas generation. Hydrocarbons may also be present if these was any fuel storage on the site or if the boiler was oil fired (albeit this latter possibility is perhaps unlikely).

The former railway line within the eastern portion of the southern land parcel may represent a more localised risk from the presence of mineral oils and asbestos fibres.

Areas of more significant infilling are likely to be present on the northern parcel of land within the former lagoons and may represent a potential source of gas generation subject to the nature of materials used as infill and how well this was controlled on site. The natural glacial clays and any made ground comprising reworked natural materials (clay and rock) would be less likely to represent a potential source of gassing.

Faulting is present within the rock strata, however, given the depth at which coal seams are present and the absence of mine entries, the potential for mine gas generation is not considered to be realistic source of risk on the site.

Gas monitoring would be required across the site area as part of any future investigation to assess the requirement or otherwise for gas protection on the finished development.

Mining: A review of desktop information confirms the absence of shallow abandoned mineworkings and mine shafts and as such the mineral stability of the site is considered to be satisfactory.

7.0 PRELIMINARY CONCEPTUAL SITE MODEL

One objective of the desk study review was to enable an assessment to be made of potential environmental risks and liabilities that might be associated with the site as a result of both its current and historical usage and the usage of adjacent properties. The information obtained from review of available archive material was then used to prepare a Conceptual Model for the site in terms of potential types and sources of contamination and their potential impact on identified receptors and on the proposed end use of the site.

The Conceptual Site Model (CSM) is used to identify the presence of potential sources and types of contamination either on or within influencing distance of a development site. Where potential sources are identified it is necessary to identify viable routes of exposure (pathways) by which contaminants could migrate and, hence, the potential for contaminants to ultimately impact upon identified receptors. The types of receptors that may be impacted are dependent upon the proposed end usage of a site.

The CSM is also integral to the decision-making process of whether intrusive site investigations are required and, if so, their scope and design, to examine if any contaminants are present and whether viable pathways exist between contaminants and the receptors identified. Where possible the level of likely harm to receptors is risk assessed and recommendations to reduce/remove potential risks to acceptable levels are formulated.

At desk study stage therefore, an assessment is undertaken based on review of historic archive information and published data. The risk assessment was undertaken using a low, moderate and high-risk matrix, depending on the likelihood of contamination being present and the significance of the impact/consequences on the identified receptors assuming a residential end use. This is based upon CIRIA C552.

Table 2: Probability/Consequence Matrix

Probability of a hazard and associated linkage	Consequences of a Pollution Linkage			
	SEVERE	MEDIUM	MILD	MINOR
High Likelihood	Very high	High	Moderate	Moderate/Low
Likely	High	Moderate	Moderate/Low	Low
Low Likelihood	Moderate	Moderate/Low	Low	Very Low
Unlikely	Moderate/Low	Low	Very Low	Very Low

Table 3: Risk Definition

RISK	Description of Risk
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Where intrusive site investigations and risk assessment are carried out the CSM is revised using quantitative data, and where necessary, recommendations to break identified potential pollutant linkages are made. The most suitable form of remediation will depend to a large extent upon the contaminant identified, and the nature of risk and likely receptor. The aim of the remediation is to break the source-pathway–receptor linkage which can be achieved in a variety of ways.

If any of the linkages are broken, the identified risk is deemed to have been removed. For instance, removal of a point source of contamination removes its potential to impact upon the identified receptor and the link between contaminant and receptor is broken.

Likewise, where a barrier is placed between the contaminant source and receptor the linkage is again broken as the receptor cannot come into contact with the contaminant source.

Taking cognisance of DEFRA's R&D Publication, CLR8 and DoE Industry profiles, potential contaminants possibly associated with historical activities on site have been identified in the CSM summary which is provided in Table 4.

Table 4: Preliminary Conceptual Site Model

Location of Potentially Contaminating Activity	Possible Contaminants	Potential Pathways (if contamination was present)	Receptor	Perceived Risk
Extensive made ground present, although largely expected to comprise reworked natural materials. Possible presence of ash waste from former boiler house Possible presence of asbestos within former buildings which have been demolished with residual rubble potentially still present. Possible presence of hydrocarbons from any former fuel storage, or residual oils in area of former railway line. Any residual coal waste being a source of combustion and gas within made ground. Possible gas generated from made ground more generally although unlikely on the basis of the expected composition of made ground. Site is not located in an area likely to be affected by radon gas	No significant contamination expected based upon anticipated ground conditions. However, a general suite of analyses (including heavy metals, pH, sulphate, organic content), PAH's, TPH's and asbestos to be undertaken on samples of soil and groundwater collected from the site during SI. Gas monitoring should also be undertaken during SI to confirm soil gassing risks associated with made ground are, as expected, not significant.	1. Dermal contact and ingestion. 2. Direct dermal contact. 3. Inhalation of dust/fibres/vapours (indoors and outdoors). 4. Contact with buildings/service. 5. Migration of soil gas through service runs and subsequent accumulation of gas in buildings. 6. Leaching of contaminants into groundwater and off-site migration.	Site contractors during development.	1,2,3 (low to very low)
			Future site users	1,2,3,5 (low to very low)
			Adjacent Land Users	3,5,6 (very low)
			Flora and Fauna on the site and surrounding area.	1,2,3 (very low)
			Buildings and Services.	4,5 (low to very low)
			Groundwater and surface waters.	6 (low to very low)

Based on the information reviewed, and given the nature of the development proposed, potential environmental risks are considered to be low to very low. Detailed, development specific intrusive investigation will be necessary to confirm this as part of post consent conditions.

Much of the development proposed would not contain confined spaces within which gases could accumulate and as such potential gas risks would be low.

Gas monitoring would however be required as part of the future investigative works to confirm with particular attention given to the area of the former settlement lagoons.

Although due diligence geotechnical and environmental investigations in line with current guidance and best practice and are necessary to confirm ground conditions across the site area and provide chemical and gas monitoring data upon which more detailed risk assessments can be undertaken, potential risks associated with the development proposed are not anticipated to be significant.

The ground conditions present would not prevent the development of the site for its proposed usage.

8.0 CONCLUSIONS

Hagshaw LDES Ltd are proposing to construct an LDES facility within the Hagshaw Energy Cluster Area located within Conexus West at Junction 11 of the M74.

The development area comprises two irregularly shaped parcels of land which would be utilised for the establishment of an LDES facility comprising, amongst other infrastructure, battery storage containers, transformers, substations, underground cables and drainage infrastructure.

David R Murray & Associates have reviewed available archive information in order to identify risks associated with ground conditions or contamination.

The site is situated in a long-established coal mining area. Deep underground mining has therefore historically been undertaken whilst, in the last 30-40 years, the opencast extraction of coal seams occurred more widely and, in particular, at the Dalquhandy open cast site located around 500m to the west of the site area currently under consideration for development.

However, there are no coal seams of previous potential economic importance present at shallow depth within the red line boundary and as such the mineral stability of the site is considered to be satisfactory.

Other than for the presence of a railway line on its eastern edge and a farmstead on the sites western portion, the site remained largely undeveloped until the late 1980's. From around the mid 1980's until 2004 the site was used as a storage and processing area servicing the Dalquhandy open cast coal mine to the west. Coal was crushed, segregated, washed and dried prior to being transported from the site. The main works buildings were present on the southern portion of the site with settlement lagoons present on the northern portion. The south-eastern portion was used for the stockpiling of unprocessed and processed coal.

Following cessation of mining activity, the former works buildings were dismantled and material stockpiles removed with settlement lagoons infilled and some levelling earthworks. The site has remained largely overgrown since this time, however, the surrounding area has been more extensively developed as a hub for the generation of renewable energy.

Significant made ground is anticipated to be present on the site given its history. This is underlain by glacial clay which would be expected to be a suitable bearing material to support the future development depending upon the depth it is encountered. Subject to site investigation, it may be necessary to support future structures in parts of the site using ground improvement techniques with heavier structures potentially requiring to be supported on piles driven into the glacial clay or, alternatively, rockhead.

In order to facilitate the development, it would also be necessary to platform the site and divert and infill existing drainage ditches where these are present. Future intrusive investigation would therefore also need to determine the suitability of the existing materials for use in the earthworks to platform the site for development.

The majority of the made ground would be expected to comprise reworked natural materials such as clay and rock and as such would be largely inert. The presence of ash material from the former boiler house cannot be discounted, likewise, materials associated with the demolition of the former buildings, if rubble remained on site may have the potential to contain asbestos.

The presence of coal within any made ground is also a distinct possibility with these materials potentially being a source of combustion leading to volume change and gas generation. Hydrocarbons may also be present if these was any fuel storage on the site or if the boiler was oil fired (albeit this latter possibility is perhaps unlikely).

Although it is recognised that development specific intrusive investigation including soil sampling, gas monitoring and water sampling would be required as part of a post consent condition, no significant issues have been identified that would prevent the site from being developed for its intended usage.

Any development would adopt good working practices and adherence to a CEMP involving managing/bunding areas of fuel storage and establishment of temporary basins/swales and use of silt fences to control run-off. These measures would prevent impacts to controlled waters during the development and enabling works.

It is recognised that battery containers and transformers have the potential to cause contamination to soils and, ultimately, the water environment if not properly managed and designed.

Leakages and discharges in addition to fires associated with more traditional batteries have the potential to release mobile and persistent contamination such as heavy metals dielectric fluids and oils. However, as noted in the BSMP, the vanadium flow batteries proposed are chemically and thermally robust, and safe even when exposed to external fire. Independent testing to the UL9540A standard has shown decisively that these batteries have no risk of thermal runaway and as such do not represent a risk of fire.

The development layout also incorporates attenuation, and the site drainage designs would therefore ensure flow rates from areas of hardstanding are managed and that any run-off that may contain contaminates from the development infrastructure is appropriately attenuated and treated.

In summary, whilst due diligence site investigations are required to allow more detailed assessment, there are not considered to be any significant site related technical constraints to development taking place that could not be accommodated utilising standard development practices and design during both the construction and operational phases of the development.

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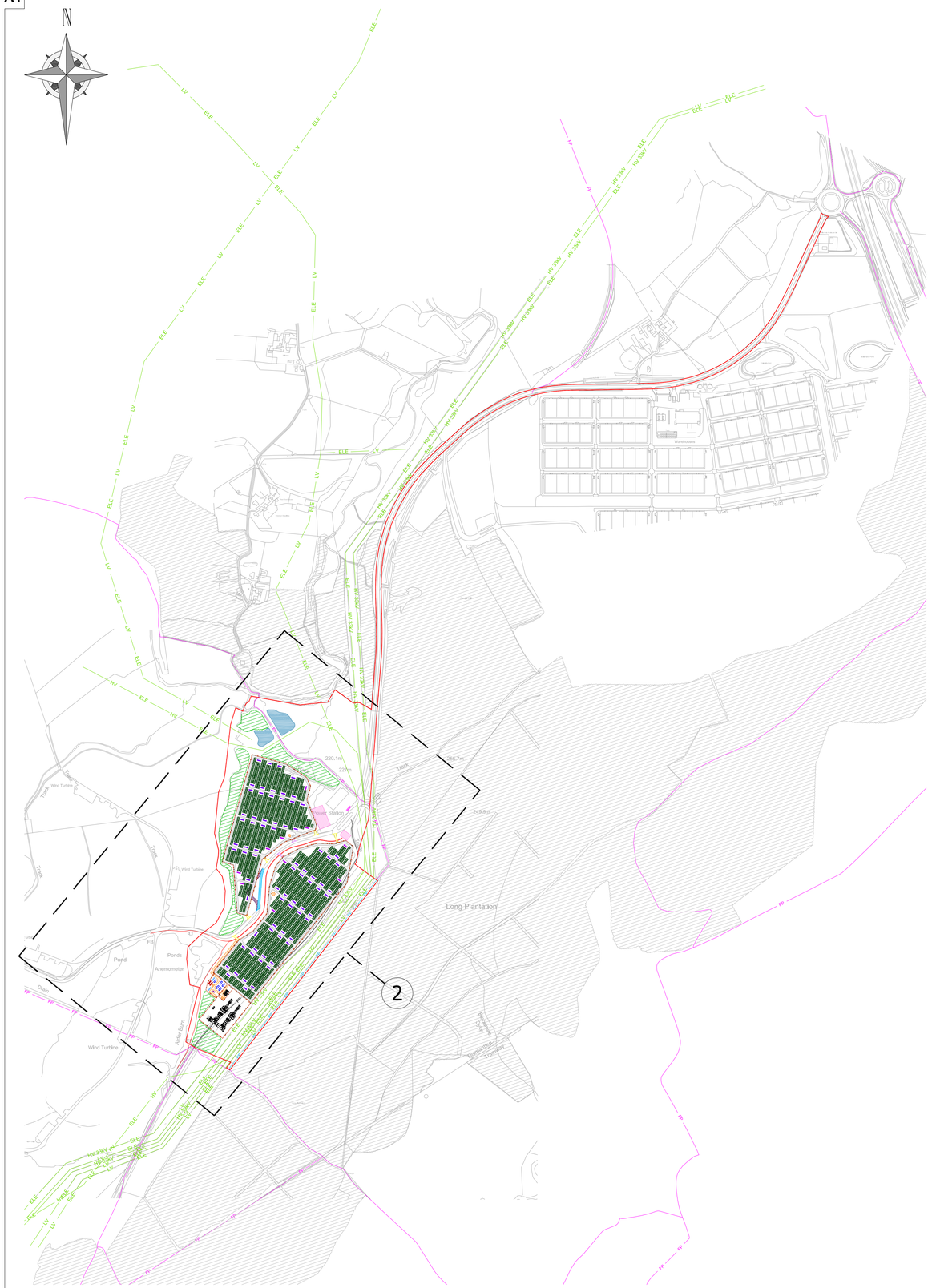
APPENDIX A

SITE LOCATION & DEVELOPMENT PLANS

A1

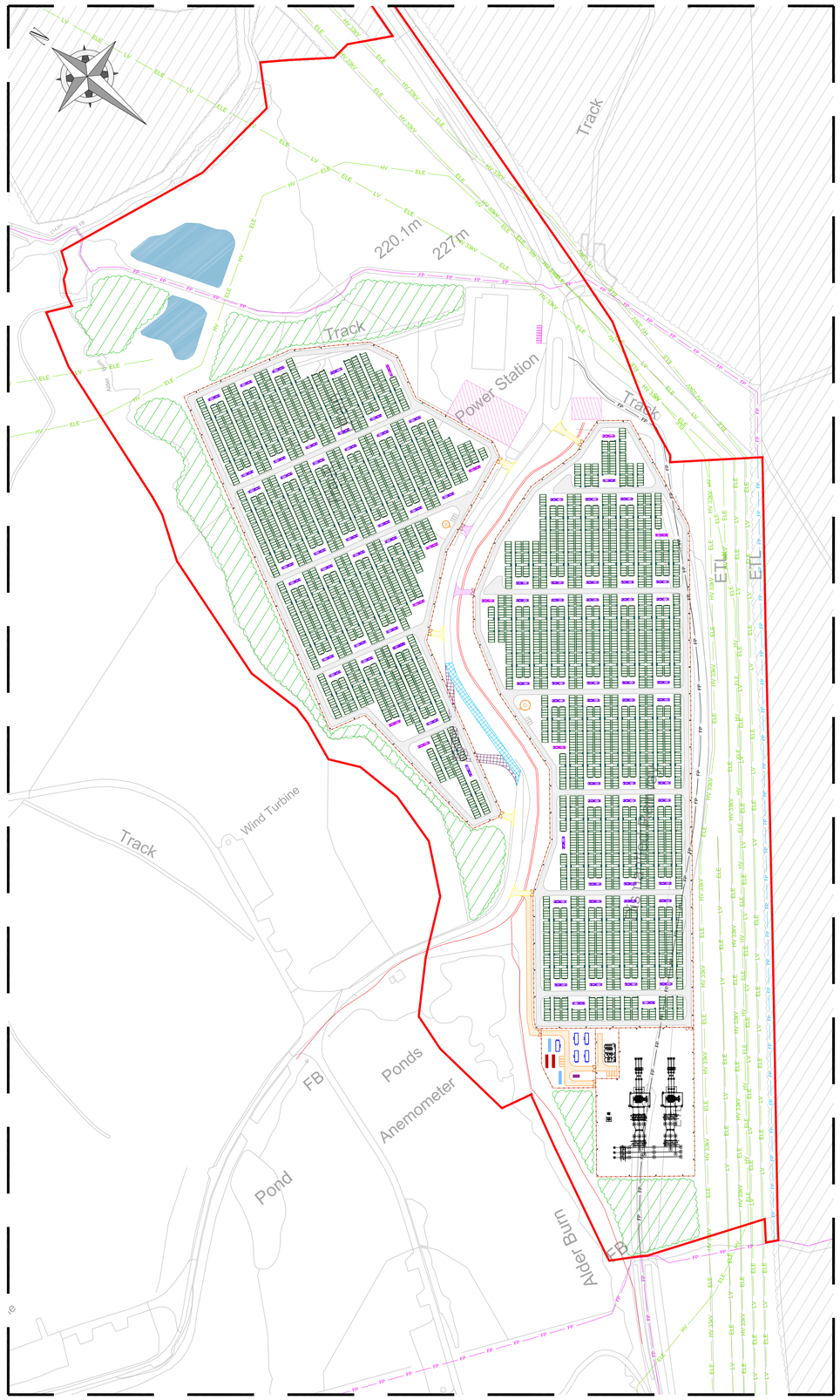


1 INDICATIVE SITE LAYOUT PLAN

Scale: 1:7500@A1

150 300 450 600 750m

SCALE 1:7500



2 INDICATIVE SITE DETAIL

Scale: 1:2500@A1

50 100 150 200 250m

SCALE 1:2500

Scaled dimensions must not be taken from this drawing. All dimensions are to be confirmed on site prior to commencement of work

Revisions:

Revision	Date	Revision Notes	Drawn	Inspected
01	20.02.25	First Issue	JC	TP
02	21.02.25	Minor Site Amendments	JC	TP
03	07.03.25	Site Layout Progressed	JC	TP
04	11.03.25	Amendments to Footpaths, Veg, & Roads	JC	TP
05	12.03.25	Planning Application Boundary Revised	JC	TP
06	18.03.25	Site Layout Progressed	JC	TP
07	19.03.25	Construction Compound and Titles Amended	JC	TP
08	02.04.25	Minor Site Amendments	JC	TP
09	03.04.25	Parking for Operatives Added	JC	TP
10	09.04.25	Revised	MR	TP

LEGEND:

- PLANNING APPLICATION BOUNDARY
- DNO ACCESS
- SITE ACCESS
- INTERNAL ACCESS
- EMERGENCY ACCESS
- PERIMETER FENCELINE
- EXISTING FOOTPATH
- PROPOSED FOOTPATH
- REMOVED FOOTPATH
- EXISTING O/H LV LINE
- PROPOSED KENNOXHEAD O/H LINE
- EXISTING O/H 33kV LINE
- SPT CABLE
- EXISTING ROAD
- REALIGNED ROAD
- EXISTING VEGETATION
- PROPOSED VEGETATION
- ATTENUATION POND
- TEMP. CONSTRUCTION COMPOUND

SITE INFRASTRUCTURE:

- TRIPLE STACKED FLOW BATTERY UNITS
- SINGLE PCS INVERTER
- DOUBLE PCS INVERTER
- STRING CONTROL UNIT
- DC COMBINER
- AC DISTRIBUTION PANEL
- CCTV CAMERA
- SECURITY GATE
- 40ft SPARE PARTS CONTAINER
- 40ft WELFARE CONTAINER
- PARKING FOR OPERATIVES
- CUSTOMER SWITCHGEAR
- ENERGY MANAGEMENT SYSTEM
- 120,000L WATER TANK
- 240,000L WATER TANK
- SUBSTATION

Status:

PLANNING

Project:

Hagshaw LDES

Client:

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Drawing Title:

Indicative Site Layout Plan

Drawn:	Checked:	First Issued:
JC	TP	20.02.2025

Project Code:	Drawing Number:
AEM047	PL-01

Sheet Size:	Scale:	Revision:
A1	A:N	10