Proposed Wardley Anaerobic Digestion Facility
UK Coal Disposal Point, Follingsby Lane, West Boldon
NE10 8YL

Preliminary Land Quality Risk Assessment

SLR Ref: 402-04567-00003-PLQRA

August 2013
EXECUTIVE SUMMARY

In August 2013, SLR Consulting Limited (SLR) was appointed by Imtech to provide consultancy services to support the design and planning application for a proposed Anaerobic Digestion (AD) Facility at the UK Coal Disposal Point, Follingsby Lane, West Boldon NE10 8YL.

This document, a Preliminary Land Quality Risk Assessment, records the findings of a site walkover survey and presents information with respect to the site’s environmental setting, land use history and the potential for contamination. The information has been used to identify the likely contaminant sources, receptors and pathways; to form a preliminary conceptual site model; and to identify potential pollutant linkages (PPL) taking account of the fact that:

- the site was undeveloped and peripheral to an adjacent historic colliery until the 1970s when it was partially covered by spoil heaps and then use as a coal stocking yard until the present.
- the developer will instruct a geo-environmental ground investigation (most likely following receipt of planning approval) and will have the chance to deploy protective measures (e.g. Protectaline water supply pipe; etc) if needs be;
- the commercial / industrial nature of the development will require hard standing across the majority of the site.

Given the proposed use of the site for an Industrial Anaerobic Digestion (AD) Facility, the most likely / significant PPL appear to be:

- **PPL 1a**: Potential Harm to Human Health from Exposure to Contaminants Entering Water Supply Pipework
- **PPL 1b**: Potential Damage to Future Buildings from Exposure to Aggressive Ground and ground instability from potential combustion of buried coal (underground fires) and /or collapse of worked coal seams.
- **PPL 1c&d**: Potential Pollution of Surface Water and Groundwater by Contaminants in Made Ground.
- **PPL 2a&b**: Potential for Harm to Health and Building Damage from Hazardous Gases
- **PPL 2c&d**: Potential Pollution of Surface Water and Groundwater by Landfill Leachate
- **PPL 3a-b**: Potential Harm to Human Health from Exposure to Airborne Asbestos

Our recommendations for further investigation and assessment of PPL 1, PPL2 and PPL3 are presented in Section 5.
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1.0 INTRODUCTION

1.1 Background

In August 2013, SLR Consulting Limited (SLR) was appointed by Imtech to provide consultancy services to support the design and planning application for a proposed Anaerobic Digestion (AD) facility at the UK Coal Disposal Point, Follingsby Lane, West Boldon NE10 8YL, hereafter referred to as the “site”.

This document, a Preliminary Land Quality Risk Assessment (PLQRA), records the findings of a site walkover survey and presents a Phase1 desk study, collating information with respect to the site’s environmental setting, land use history and the potential for contamination.

This report has been prepared by the SLR Land Quality Team, Bristol office, 109 Pembroke Road, Clifton, Bristol, (Tel: 0117 9064280). Please direct all future enquiries regarding the report to this address.

1.2 Proposed Development

By way of introduction, Imtech is a leading technical services provider and is supporting Tamar Energy’s plan to develop the site.

The development site is situated on the UK Coal Ltd, Disposal Point and Coal Stocking Site, which is located off Follingsby Lane, Wardley in the District of South Tyneside Council, and has both rail and road access. The site location is shown on Drawing 001.

An overview of the proposed development is included in Section 3 of GP Planning Ltd’s EIA Scoping Report1 which states that:

“The proposed AD Facility will take in by products of the food industry, and through anaerobic digestion produce biogas and digestate. The digestate will be used as a soil improving material and fertiliser substitute, and the gas will run gas engines, generating up to 3MW of electricity. This will be fed into the local distribution network, or be provided directly to nearby industries. The process is entirely enclosed from start to finish complying with appropriate regulations; no handling, processing or storage takes place outside”.

The proposed development would comprise the following infrastructure:

- Reception building: An industrial style building, circa 36m wide, 60m long and 11m eaves, 13m ridge.
- 3 off Biofilters 12.2m by 2.5m and 2.6m high concrete panels.
- Gatehouse Office/Weighbridge Control single story (brick and tile) with a door and window for supervising single weighbridge.
- 5x Cylindrical digestion tanks, ~ 21m in diameter, up to 15m to the top of the hemispherical dome on top, plastic coated steel cladding.
- 2x Combined Heat and Power Units 12.2m by 2.5m and 2.6m high.
- 1x Spherical Gas Holders 15m in diameter and 15m high.
- ESGB – Emergency Surplus Gas Burner 15m high and 1m diameter.

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1 GP Planning Ltd, EIA Scoping Report. Proposed Anaerobic Digestion Facility, on behalf of Tamar Energy, report ref T004-06, May 2013
- Containerised oils store 12.2m by 2.5m and 2.6m.
- Substation with a single story building to house switchgear, contained in a fenced compound 8m by 8m.
- Connecting pipework.
- Site office and mess facilities within the reception building.
- Parking.
- Sealed concrete pad with completely contained drainage system to prevent potential escape of liquids contaminated with food wastes.
- Pond for the retention of surface water.
- Lighting will be limited to the reception building over the doors. These will be turned off outside of delivery hours.

The proposed development layout is presented in Appendix A.

1.3 Objectives

This PLQRA report presents basic site information and detailed desk study information.

The information obtained has been used to develop a preliminary conceptual model of potential risks to human and environmental receptors. The conceptual model examines the potential for contaminant-pathway-receptor linkages. The risks associated with the potential linkages are discussed and SLR outlines recommended inspection measures. Some of the measures react to perceived risks which arise as a result of the fact that the site was once used as part of an open cast colliery and for coal stocking operations.

Overall, this “precautionary” approach is designed to give confidence to future site users and the local authority that the development site, in the words of the National Planning Policy Framework 2012, is:

…suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation.

It is also our objective to show that the redevelopment will leave the site / the land in a condition where it is not capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990

We trust that South Tyneside Council will be satisfied with the content of this report and agree that further works identified, including inspection actions to deal with (theoretical) contamination as outlined in this document, can be secured via a planning condition. Discharge of any formal planning condition(s) would be subject to the satisfactory completion of the works.

1.4 Scope of Work

The scope of work for the PLQRA was devised by SLR, it included:

- a site walk over inspection to identify and record on and off site land uses, potential areas of concern with respect to soil and groundwater contamination, site geomorphology and potential contaminants of concern;
- a review of geological and hydrogeological data for the property;
• analysis of historical maps to establish the history of the property as well as past on
and off site potentially contaminative activities;
• collection and analysis of environmental data from a proprietary database; and
• reporting.

1.5 Data Sources

This report has been produced following consultation with the sources of information
summarised in Table 1-1.

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>General topography and Site setting</td>
<td>Ordnance Survey (OS), 1:25,000 online digital mapping and aerial photographs, via <a href="http://www.bing.com/maps">www.bing.com/maps</a></td>
</tr>
<tr>
<td>Site and background information</td>
<td>GroundSure Historical Ordnance Survey Map Extracts, EMS-216208-285392, purchased 13th August 2013 (Appendix B).</td>
</tr>
<tr>
<td>Hydrogeology and Geology</td>
<td>Environment Agency (EA) website.</td>
</tr>
<tr>
<td></td>
<td>British Geological Survey (BGS) online digital mapping and borehole logs <a href="http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html">http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html</a></td>
</tr>
</tbody>
</table>
2.0 SITE DETAILS, SETTING AND HISTORY

2.1 Site Vicinity Description

Table 2-1 summarises the property details. Information has been obtained from OS, EA and BGS mapping, data supplied by GroundSure (EnvirolInsight and GeoInsight) and from the Site visit.

<table>
<thead>
<tr>
<th>Address</th>
<th>UK Coal Stocking Site, off Follingsby Lane, West Boldon NE10 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Location</td>
<td>The Site is located at the former Wardley Colliery approximately 1km to the southeast of the A194(M)/A184 motorway interchange junction, and approximately 8km southeast of Newcastle City centre.</td>
</tr>
<tr>
<td>NGR</td>
<td>431453, 560315</td>
</tr>
<tr>
<td>Current Usage</td>
<td>The Site is currently disused and unoccupied</td>
</tr>
<tr>
<td>Site Description</td>
<td>The Site is approximately 2.7 hectares and comprises a generally level former coal stacking and bulking yard with access roads at lower elevations to the west and northwest. The main site area is believed to be surfaced in hardcore</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surrounding Land Use</th>
<th>North</th>
<th>Former opencast coal workings spoil heap, and railhead works to northwest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>West</td>
<td>Access, Road, disused railway line and Follingsby Park Industrial Estate beyond (100m)</td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>Follingsby Lane, with agricultural fields beyond (50m)</td>
</tr>
<tr>
<td></td>
<td>East</td>
<td>Former opencast coal workings stockpile, with agricultural fields beyond (500m)</td>
</tr>
</tbody>
</table>

2.2 Physical Site Setting

A summary of the main physical features of the Site are given in Table 2-2.

<table>
<thead>
<tr>
<th>Gradient</th>
<th>The Site is generally flat, with embankments down to the access road to the west, and a slope up to the open cast workings to the east</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation</td>
<td>The Site has an elevation of between 48m and 52mAOD.</td>
</tr>
</tbody>
</table>

**Geography and Geology**

| Made Ground | There is the potential for a significant layer of Made Ground / colliery spoil to be present across the Site. Reference to BGS online borehole logs indicates that colliery spoil which forms the adjacent open cast spoil heap to the east of the site extends below the site ground level to approximate depths of 23m (or elevation of 49mAOD - see borehole records numbered 5, 6, 11 and 12 included in Appendix E). There are no recorded BGS borehole logs within the current site boundary. |

**Superficial Drift Geology**

| Solid | Indicated to be absent where open cast workings have occurred. The southern edge of the site is indicated to be underlain by Quaternary glacial clays of the Pelaw Clay Member. BGS logs 11 and 12 (Appendix E) indicate this to comprise very stiff to hard mottled yellow grey brown silty sandy Clay with numerous sandstone fragments. |

| Solid | Carboniferous Pennine Middle Coal Measures comprising interbedded mudstone, siltstones and sandstones with coal |
Geology seams.

Radon Gas The Site is in an area which does not require radon protection measures.

Mining, and Ground Stability Hazards The Site is in the location of the former Wardley colliery which comprised both underground and surface open cast workings. In an EIA scoping opinion provided to South Tyneside Council the Coal Authority stated that the site is outside of the defined development High Risk area and no risk assessment of coal mining legacy hazards is required within the Environmental Statement (ES).

Nevertheless, BGS borehole logs indicate the presence of both shallow and deep coal seams in proximity to the site, and Imtech have commissioned a Mining Risk Assessment which will fall outside of the ES scope.

Hydrology

Surface Water The nearest surface water feature is the River Don located 350m to the south of the site. A series of surface water drainage ditches and ponds are present along the western and southern site boundaries, which appear to be associated with the colliery’s surface water management system and discharge to a pair of settlement lagoons to the south east of the site.

River Network The River Don flows west to east c.350m south of the Site and had a biological quality grade E (very poor) and chemical quality grade C in 2009.

Flood Risk The Site lies outside areas indicated to be Zone 2 & 3 Floodplains. The nearest to the Site are: Zone 3 Floodplain 350m southwest.

Surface Water Abstractions There are no surface water abstractions within 1km of the Site.

Aquifer The Pelaw Clay deposits beneath the Site are classified as unproductive strata with the underlying Coal Measures bedrock classified as a Secondary A Aquifer. Groundwater is likely to be shallow (<10m below ground level) and is inferred to flow towards the south / southeast.

Groundwater Abstractions There are no potable groundwater abstractions within 2km of the Site.

Source Protection Zones There are no groundwater source protection zones within 2km of the Site.

2.3 Site History

The following section presents a summary of the Site’s history from a review of OS map extracts. The age and general type of activity and land use can often be determined from the type and layout of structures depicted on OS maps. However, specific elements of site operations cannot normally be determined from such extracts. Large scale (1:2,500 and 1:10,560) historical map extracts were reviewed for selected years between 1856 and 2012. A summary of the findings is given in Table 2-3, and the OS maps provided by GroundSure are included in Appendix B.

Table 2-3: Site History Summary

<table>
<thead>
<tr>
<th>Map Dates</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1856 - 1897</td>
<td><strong>On-site</strong>: The Site is undeveloped fields. A field boundary runs along the sites eastern boundary. <strong>Off-site</strong>: The railway line to the west of the site is present along with Follingsby Lane</td>
</tr>
</tbody>
</table>
to the south. The remaining surrounding area comprises undeveloped fields.

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**1919 / 1921 / 1938**

**On-site:** No significant changes to the Site area apparent on mapping of this era.

**Off-site:** The land adjacent to the railway to the northwest of the site shows embankments and rail sidings which are part of a larger development for Follonsby Colliery located 150m to the north. A well is shown at Follingsby Level crossing 75m to the southwest.

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**1951**

**On-site:** No significant change on Site.

**Off-site:** The land adjacent to the rail sidings to the immediate north of the site now shows spoil heaps associated with Follonsby Colliery.

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**1958 -1967**

**On-site:** No significant change on Site.

**Off-site:** Earthen embankments and rail sidings are now present between the sites western boundary and the railway. Spoil heaps now occupy a much larger area to the north and northeast of the site. A sewage works is now present immediately to the west of the railway line.

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**1973**

**On-site:** The colliery spoil heaps now occupy the northern half of the site.

**Off-site:** The colliery spoil heap now occupies a larger area to the northeast. Follonsby Colliery is now marked as Wardley Colliery. A Freightliner Rail Terminal is shown to the north of the sewage works.

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**1990-1993**

**On-site:** No significant change on Site.

**Off-site:** The area of the colliery spoil heap is now recorded as Open cast workings.

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**1994**

**On-site:** The site layout is now shown as the current, with the haul road and roundabout and lighting towers along the western boundary shown the same as the present.

**Off-site:** The adjacent drainage ditches and surface water settlement lagoons to the southeast are now shown.

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**2002-2012**

**On-site:** No significant change, similar to present day.

**Off-site:** No significant change, similar to present day. Industrial Estate to the west of the railway line now developed.

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In summary, the Site was undeveloped until the 1950s, but was part of the adjacent Follonsby Colliery from the 1920’s.

During the 1970’s the site was covered by a spoil heap associated with the adjacent open cast colliery workings.

By 1994 the site appears to have been developed to its current layout as a coal stocking yard.

### 2.4 Environmental Search Data

The EA web site has been consulted with regard to groundwater abstractions, Source Protection Zones and former landfill sites. The GroundSure EnviroInsight data was also reviewed to gain publicly available environmental data for the Site and its immediate vicinity. The MAGIC website (Multi-Agency Geographic Information for the Countryside) was also consulted regarding any ecologically designated sites within 2km of the subject property.

A copy of the GroundSure information obtained by SLR is contained in Appendix D and a summary of the search information is provided below:

- List 2 Dangerous Substance Inventory Sites – the site is recorded on this register for iron substances discharged to surface water.
- Discharge consents – there are seven consents within 500m of the Site. Four of these relate to the site’s contaminated surface water and treated foul effluent discharges at a location c.310m southeast of the site, at the location of the two large settlement lagoons. These discharge to a tributary of the River Don. The remaining three
consents relate to discharges of miscellaneous/storm water overflow/final/treated sewage to surface waters at offsite properties to the west and south.

- Radioactive Substances Licences – none recorded within 500m of the site.
- Part A (2) and B Activities - A Part B permit is recorded 300m north of the site for RJB Mining.
- EA recorded pollution incidents – there is one EA pollution incident recorded at the Site on 30/09/2003. The pollutant is identified as Construction and Demolition (C and D) Materials and Wastes and appears to relate to flytipping. The incident was designated a Category 3 - Minor Incident for land and Category 4 (no impact) for water and air.
- Landfill sites – there are no recorded landfill sites within 500m of the Site. An operational landfill is recorded 770m to the east of the site, which is recorded for putrescible waste (<10,000 tonnes a year for a pet cemetery).
- Licensed waste management/treatment facilities – there are three current facilities recorded within 1km of the Site; one is 500m to the north at Wardley Colliery disposal Point for Sirius Remediation for < 25,000 tonnes of household, commercial and industrial waste and asbestos. This was surrendered on 22/11/2010. The remaining 2 are associated with an Animal care centre 800m to the east.
- Ecological Designations – there is one ecologically designated site within 3km of the Site. This relates to a Local Nature Reserve located to the north (1,996m) for Pelaw Quarry pond.

Groundwater and surface water abstraction data was discussed in Section 2.2 (page 5).
3.0 SITE INSPECTION

3.1 Walk Over Inspection

The Site inspection was undertaken by SLR on the 15th August 2013 and comprised a walk over of external areas.

Drawing 002 identifies the main features noted during the walkover inspection and photographs are contained in Appendix F.

3.2 Site Description

The Site is broadly rectangular in shape, tapering to the south. The vast majority of the Site (>90%) comprises a disused, unsurfaced coal stocking yard, with the ground predominantly comprising coal dust and spoil, which is partially vegetated with grass and scrub. A tarmac road forms the entire western site boundary with a roundabout and grassed island in the northwest corner. A pond is located adjacent to the roundabout in the northwest corner, and a series of open drainage ditches are present parallel to the road.

A grassed embankment falls approximately 2m down to the road along the western boundary. A 10m high embankment up to the adjacent restored spoil heap forms the entire eastern site boundary.

Building Construction – There are no buildings present within the site. A steel shipping container is present in the northwest corner adjacent to the pond and roundabout. There are several pipes extending from an adjacent cross over road gully into the container, and SLR understands it is used to house plant for a wheel wash for vehicles leaving the site.

Above Ground and Underground Fuel Storage Tanks – There are no tanks present on site.

Waste Storage – At the time of the inspection the Site was not occupied. There were two areas of stockpiled material on site. One is located in the northern part of the site and comprises approximately 2,000m$^3$ of coal dust and colliery spoil. The second is located at the toe of the slope on the eastern boundary and comprises <10m$^3$ of fly tipped waste of mixed construction and demolition rubble, wood and plastic. This material possibly relates to the recorded pollution incident on site.
4.0 OUTLINE CONCEPTUAL MODEL AND PRELIMINARY RISK ASSESSMENT

4.1 Regulatory Context

4.1.1 The Contaminated Land Regime – Overhauled for 2012

Spring 2012 saw substantial changes in the UK’s Contaminated Land Regime with a complete overhaul of the legal guidance\(^2\) and deletion of long-standing pollution control policies\(^3\) in favour of the National Planning Policy Framework\(^4\).

The new Contaminated Land Statutory Guidance is very different from the 2006 issue and consultation draft. Whilst the regime continues to advocate a precautionary approach to dealing with contaminated land, there is clear direction to avoid the “excessive cost burdens” of “wastefully expensive remediation”.

In their Impact Assessment Defra estimate that:

“20%-40% of current remediation work is "unnecessary" and that these costs can be avoided through clearer Guidance and new technical tools to describe the new Category 1-4 system”

For clarity:

- Category 1: describes land which is clearly problematic;
- Categories 2 and 3: cover the less straightforward land where detailed consideration is needed before deciding whether it is Category 2 (contaminated land requiring remedial action) or Category 3 (not contaminated land) - wider socio-economic factors come into play if health risks assessment fails to produce a decision; and
- Category 4: describes land that is clearly not contaminated land.

The new Category 4 test is particularly important in defining when land is clearly not contaminated land in the legal sense; it introduces the idea that it would be exceptional for land: exhibiting normal background levels of contamination; or contaminant levels below published assessment criteria (which are due to be augmented by new screening concentrations / tools) to be considered as contaminated land.

Importantly, the new guidance makes it clear that regulators can only require remediation to a point where land is no longer contaminated land in the legal sense (i.e. the boundary between Categories 2 and 3) and not require “unnecessary” clean up to attain Category 4 standards. This means some landowners / developers will choose a remedial end-point in Category 3 whilst others will still volunteer to clean-up to Category 4 (to deal with perception issues or to please funders, etc).

From this point on, exceedance of a Soil Guideline Value should simply trigger further risk assessment.

With the introduction of clearer legal guidance, the introduction of the concept of “normal” background levels of contaminants and an emphasis on the use of science and risk

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\(^3\) Planning Policy Statement 23: Planning and Pollution Control, ODPM, November 2004.

assessment to make better and more reasonable decisions about when land does (and does not) need to be remediated and to what degree, the government predicts financial savings to:

- businesses and other owners of land with a significant legacy of historical land contamination;
- the construction sector and new home-buyers via a substantial reduction in deadweight remediation costs; and
- the taxpayer from reduced costs for publicly-funded remediation projects.

**National Planning Policy Framework**

This redevelopment project falls under the remit of the Planning Act and may be subject to both local and national planning policies.

Annex 2 of PPS23\(^5\) entitled Planning and Pollution Control advised on the circumstances when it might have been appropriate for local planning authorities to grant planning permission for developments on land affected by contamination. Its replacement, the National Planning Policy Framework (NPPF) of March 2012 has a core aim to:

- encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.

Slightly modifying the messages of Annex 2, the new NPPF says the planning system should contribute to and enhance the natural and local environment by:

- preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and
- remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

Furthermore NPPF says that planning policies and decisions should also ensure that:

- a site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation; and that
- after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990 (meaning Category 3 or 4).

In essence, these simple messages replace all 42 pages of Annex 2 including the example planning conditions in Appendix 2B, and the Model Planning Conditions for development on land affected by contamination set out in a letter to Chief Planning Officers by DCLG in May 2008.

It is clear that the national planning policy directs those involved in development to ensure sites are suitable for use and not be capable of being determined as contaminated land under Part 2A – which means that the category of land, post remediation (if required) should be considered.

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4.2 Preliminary Land Quality Risk Assessment

The normal procedure for assessing land dictates that potential contaminants, pathways and receptors should be considered within the context of contaminant or pollutant linkages. An evaluation of the risks associated with each linkage should drive decisions regarding the status of the land as contaminated and requiring remediation, uncontaminated or requiring further investigation.

The information summarised in the previous sections has been used to identify the likely contaminant sources, receptors and pathways present at the Site. The elements of the preliminary conceptual site model, Table 4-1 below, have been used to consider the potential pollutant linkages (PPL), their significance and acceptability.

It must be remembered that:

- this site was undeveloped and peripheral to the adjacent historic colliery until the 1970s when it was partially been covered by spoil heaps and then used as a coal stocking yard until the present;
- the developer will instruct a geo-environmental ground investigation (most likely following receipt of planning approval) and will have the chance to deploy protective measures (e.g. Protectaline water supply pipe; etc) if needed; and
- the commercial / industrial nature of the development will require hard standing across the majority of the site.

Given the proposed use as an AD facility the most likely / significant PPL appear to be:

- **PPL 1a**: Potential Harm to Human Health from Exposure to Contaminants Entering Water Supply Pipework;
- **PPL 1b**: Potential Damage to Future Buildings from Exposure to Aggressive Ground, ground instability and the potential combustion of buried coal (underground fires);
- **PPL 1c&d**: Potential Pollution of Surface Water and Groundwater by Contaminants in Made Ground;
- **PPL 2a&b**: Potential for Harm to Health and Building Damage from Hazardous Gases;
- **PPL 2c&d**: Potential Pollution of Surface Water and Groundwater by Landfill Leachate, and;
- **PPL 3a-b**: Potential Harm to Human Health from Exposure to Airborne Asbestos.
### Table 4-1: Preliminary Conceptual Site Model

<table>
<thead>
<tr>
<th>Source / Area of Concern</th>
<th>Contaminant(s)</th>
<th>Receptors</th>
<th>Likelihood of PPL Forming &amp; Comment on Consequence</th>
<th>Next Step in Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source 1</strong> – Contaminants in Made Ground / backfill associated with the historic underground and open cast colliery works, spoil heap and coal stocking yard (c.1970s to present)</td>
<td>Various insoluble and soluble contaminants such as PAHs, sulphides, heavy metals</td>
<td>Humans – Indoors: Future workers, &amp; visitors</td>
<td>PPL 1a: Potential harm to health from ingestion of soluble contaminants entering water supply pipework</td>
<td>PPL 1a: Further Investigation &amp; Assessment – see Section 5.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Humans – Outdoors: Future workers &amp; visitors</td>
<td>Unlikely – site to be covered in buildings or hardstanding</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Humans - Neighbours</td>
<td>Unlikely</td>
<td>-</td>
</tr>
<tr>
<td>Property – Built Environment: Future buildings</td>
<td></td>
<td>PPL 1b: Possible that exposure to contaminants in Made Ground could result in deterioration of buried concrete due to sulphate or acid attack.</td>
<td>Possible ground instability from combustion of buried coal.</td>
<td>PPL 1b: Further Investigation &amp; Assessment – see Section 5.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property - Flora / Fauna: Crops</td>
<td>Unlikely – crops will not be grown</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface Water: pond located within the site.</td>
<td>PPL 1c: Possible that soluble contaminants and precipitates could migrate laterally via ground / surface water into the pond and thence offsite</td>
<td>PPL 1c: Further Investigation &amp; Assessment – see Section 5.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Groundwater: Coal measures bedrock is Secondary A Aquifer. Groundwater likely to be shallow (&lt;10m bgl) flowing to S / SE. No licensed groundwater abstractions within 1km, no SPZ within 1km</td>
<td>PPL 1d: Possible that soluble contaminants enter groundwater</td>
<td>PPL 1d: Further Investigation &amp; Assessment – see Section 5.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ecosystems: Local Nature Reserve 2km to North</td>
<td>Unlikely- Not considered to be at risk from the site due to distance and direction</td>
<td>-</td>
</tr>
</tbody>
</table>

*Records show the land in immediate proximity to the site (and probably the site itself) is underlain by Made Ground comprising of colliery spoil. As such, there is potential for a layer of Made Ground of unknown composition to be present under the Site. As well as representing a potential ground stability risk, this Made Ground represents a potential source of contaminants.*
<table>
<thead>
<tr>
<th>Source / Area of Concern</th>
<th>Contaminant(s)</th>
<th>Receptors</th>
<th>Likelihood of PPL Forming &amp; Comment on Consequence</th>
<th>Next Step in Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source 2</strong> – Hazardous gases / vapours and leachate associated with the historic open cast colliery works, spoil heap and coal stocking yard (c.1970s to present)</td>
<td>Hazardous gases (e.g. methane) and typical leachate compounds</td>
<td>Humans – Indoors: Future workers &amp; visitors</td>
<td>PPL 2a: Some potential harm to health from exposure to gases / vapours entering the building via inhalation.</td>
<td>PPL 2a: Further Investigation &amp; Assessment – see Section 5.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Humans – Outdoors: Future workers &amp; visitors</td>
<td>Unlikely given diffusion to atmosphere</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Humans - Neighbours</td>
<td>Unlikely to be significantly impacted by on Site sources</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property – Built Environment: Future buildings</td>
<td>PPL 2b: Potential explosion risk from build-up of gases / vapours under / within the building</td>
<td>PPL 2b: Further Investigation &amp; Assessment – see Section 5.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property – Listed Wall</td>
<td>Unlikely</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Property - Flora / Fauna: Crops</td>
<td>Unlikely – crops will not be grown on site</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface Water: pond located within the site.</td>
<td>PPL 2c: Possible that soluble contaminants and precipitates could migrate laterally via ground / surface water into the pond and thence offsite</td>
<td>-PPL 2c: Further Investigation &amp; Assessment – see Section 5.3</td>
</tr>
<tr>
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<td></td>
<td>Groundwater: Coal measures bedrock is Secondary A Aquifer. Groundwater likely to be shallow (&lt;10m bgl) flowing to S / SE. No licensed groundwater abstractions within 1km, no SPZ within 1km</td>
<td>PPL 2d: Possible that soluble contaminants enter groundwater</td>
<td>-PPL 2d: Further Investigation &amp; Assessment – see Section 5.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ecosystems: Local Nature Reserve 2km to North</td>
<td>Unlikely- Not considered to be at risk from the site due to distance and direction</td>
<td>-</td>
</tr>
<tr>
<td><strong>Source 3</strong> - Contaminants in small stockpile of flytipped C and D waste / possible Asbestos fibres</td>
<td>Various forms of asbestos</td>
<td>Humans – Indoors: Construction workers</td>
<td>PPL 3a: Potential harm to human health from exposure to airborne asbestos via inhalation indoors (from soil brought into building)</td>
<td>PPL 3a: Voluntary Remediation following Waste Classification – see Section 5.4</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Records show the land in immediate proximity to the site (and probably the site itself) is underlain by Made Ground comprising of colliery spoil. As such, there is potential for a layer of Made Ground of unknown composition to be present under the Site. There is a potential for the generation of hazardous ground-gases and leachate from this Made Ground.*

*Small area of fly-tipped waste onsite.*
<table>
<thead>
<tr>
<th>Source / Area of Concern</th>
<th>Contaminant(s)</th>
<th>Receptors</th>
<th>Likelihood of PPL Forming &amp; Comment on Consequence</th>
<th>Next Step in Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humans – Outdoors: Construction workers</td>
<td></td>
<td>PPL 3b: Potential harm to human health from exposure to airborne asbestos via inhalation outdoors (from outdoor soil)</td>
<td>PPL 3b: Voluntary Remediation following Waste Classification – see Section 5.4</td>
<td></td>
</tr>
<tr>
<td>Humans - Neighbours</td>
<td></td>
<td>Unlikely to be significantly impacted by on Site sources</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Property – Built Environment: Future buildings</td>
<td></td>
<td>Unlikely to be significantly impacted by on Site sources</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Property – Listed Wall</td>
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<td>Unlikely</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Property - Flora / Fauna: Crops</td>
<td></td>
<td>Unlikely – crops will not be grown on site</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Surface Water: pond located c.35m west of the Site and drain 35m north.</td>
<td></td>
<td>Unlikely</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Groundwater: River Terrace Sand &amp; Gravels are Secondary A Aquifer, the underlying Chester Pebble Bed Formation is Principal Aquifer. Groundwater likely to be shallow (&lt;5m bgl) flowing W / WNW. No licensed groundwater abstractions within 1km, no SPZ within 0.5km</td>
<td></td>
<td>Unlikely</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Ecosystems: Local Nature Reserve 2km to North</td>
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<td>Unlikely- Not considered to be at risk from the site due to distance and direction</td>
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</table>
5.0 FURTHER INVESTIGATION AND ASSESSMENT

From the list of PPL identified in Section 4, PPL1, PPL2 and PPL3 require further investigation.

5.1 PPL 1a

Potential Harm to Human Health from Exposure to Contaminants Entering Water Supply Pipework

This PPL concerns ground conditions along the route of all proposed water supply pipes.

SLR recommends an intrusive investigation to allow the developer to take account of the chemistry of soils along the route of all proposed water supply pipes, and liaise with the local water authority regarding the selection of materials for any new supply pipe. Many water companies hold fast to the information and guidance produced by the Water Regulations Advisory Scheme entitled The Selection of Materials for Water Supply Pipes to be laid in Contaminated Land.

5.2 PPL 1b and 2a&b

Potential Damage to Future Buildings from Exposure to Aggressive Ground,

Potential Damage to Future Buildings from Ground Instability due to Combustion of Buried Coal

Potential Damage to Future Buildings from Ground Instability due to Collapse of Worked Coal Seams

Potential for Harm to Health and Building Damage from Hazardous Gases

These PPL concern ground conditions across the area of all proposed foundations.

An intrusive investigation and environmental monitoring has been proposed to provide the scheme’s environmental consultant and (foundation) designers with information regarding aggressive ground conditions, potential for combustible coal, and hazardous gases / vapours, with special regard to locations in or near Made Ground associated within the sites historic use as a Colliery. The information should take regard of guidance provided by the BRE in Special Digest 1 Concrete in Aggressive Ground, and the various guidance documents available with respect to hazardous gases / vapours and potential mitigation measures.

A separate Mining Risk Assessment is proposed to address mining related ground instability issues.

5.3 PPL 1c&d and 2c&d

Potential Pollution of Surface Water and Groundwater by Contaminants in Made Ground

Potential Pollution of Surface Water and Groundwater by colliery spoil Leachate

These PPL concern ground conditions associated with historic colliery spoil across the site in general.
An intrusive investigation and environmental monitoring has been proposed to provide the scheme’s environmental consultant with information regarding soil and groundwater chemistry and leachate. Collection of off-site surface water quality data should be considered.

The results of any investigation should be used to inform generic risk assessments, detailed quantitative risk assessment may follow if required. It is likely that South Tyneside Council will require sight of the conclusion to those assessments prior to commencement of development, and will require remedial plans to be put in place and implemented in the event the unacceptable risks to humans or the environment are found.

5.4 PPL 3a-c

*Potential Harm to Human Health from Exposure to Airborne Asbestos*

This PPL concerns a localised area of flytipped C and D waste.

The identified waste should be sampled, tested and classified (including tests for asbestos containing materials) during the proposed site investigation and then disposed offsite / recycled according to the results of the laboratory analysis.
6.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client.

Information reported herein is based on the interpretation of data collected from various sources which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.