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Phase I and II Environmental Site Assessment at AB World Foods, Leigh

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Executive Summary

Introduction	EHS Projects Limited (EHS) was commissioned by AB World Foods Ltd (the 'Client') to undertake a Phase I and II Environmental Site Assessment at the AB World Foods Site located in Leigh, WN7 5RS (hereafter referred to as the 'Site'). The purpose of this investigation work is to determine the site condition upon application of an environmental permit for the Site.
Subject Site	The Site comprises an approximately 3.2ha plot of land centred on National Grid Reference 365080 401050 located on Kiribati Way.
Surrounding Area	The surrounding land uses include: • North – the Site is bound to the north by fields and a playing field; • East – the Site is bound to the East by commercial/light industrial land uses and undeveloped land. • South - the Site is bound to the South by undeveloped brownfield with commercial land uses and a petrol station beyond. • West - the Site is bound immediately to the West by Westleigh Brook with woodland and fields beyond.
Coal Authority Document Review	The Site has been identified as being located within a coal mining affected area, as such review of Coal Authority documentation was undertaken during this assessment. The review found the following: • There are four outcrops of coal that are recorded within the Site boundary and one outcrop of coal that is recorded 6.70m from the Site. • The report details that there has been no past mining recorded within the vicinity of Site. However, the reports found it probable that shallow workings may exist beneath the Site that have not been recorded. • There are no mine entries or shafts recorded within 20m of the Site.
Ground Investigation	The earliest historical mapping available for the Site (1849) shows that the Site comprised undeveloped agricultural land with a tram road running across it, and a brook along the western boundary of the Site. By the late 1890s the tram road is now a railway line and there is an additional railway line running across the Site, there is also a pond close to the north-western boundary of the Site. By the early 1900s, there is a reservoir related to a nearby cotton mill located in the south-eastern corner of the Site and the pond in the north-western boundary of the Site has been infilled. Subsequent years show further development including railway lines and sidings, coal screen, tanks and unspecified building and structures. A slag pile appears in the 1970 map and a subway appears in the late 1970s. The current works appears in the early 2000s. The Site is considered to be of moderate environmental sensitivity based on historic and current land uses, the underlying geology and sensitive groundwater bodies. To determine environmental conditions at the Site, five window sample boreholes were advanced to a maximum depth of 5.0m below ground level (bgl). Soil samples were collected from a range of depths for environmental laboratory testing. Two monitoring wells were installed, and groundwater monitoring was undertaken on one occasion. Groundwater sampling was carried out in one well (WS104) and included measurement of in-situ geochemical parameters. The groundwater samples were collected for laboratory analysis. Ground gas monitoring was performed at each monitoring well location on one occasion to provide a preliminary assessment of ground gas risks.

Ground Investigation Findings	The findings of the site investigation are summarised as follows: The investigations performed to date by EHS found that the ground conditions beneath the Site comprised concrete or asphalt down to a maximum depth of 0.20mbgl which was underlain by Made Ground of sands and gravels at unproven thicknesses of <0.40mbgl and >4.80mbgl. A localised layer of clay was encountered in WS104 between 0.60m and 2.20mbgl. Underlying the Made Ground was either Alluvium comprising a soft to firm dark black silty sandy peaty clay or Till deposits comprising a firm light brown clay. Groundwater was encountered in both of the boreholes that were installed, and levels were recorded at 2.08mbgl (WS104) and 2.90mbgl (WS103). No asbestos was identified in any of the Made Ground samples tested. The Made Ground and natural soil samples subject to laboratory testing identified low concentrations of heavy metals. None of the concentrations exceeded the screening criteria for commercial end use. Although low levels of hydrocarbon and PAH contamination were detected within the soils underlying the Site, none of the concentrations recorded exceed the GAC for the screening values comprising commercial end use. Concentrations of contaminants were identified in the groundwater tested, when screened against the DWS no exceedances were identified. When screened against the EQS exceedances of copper and nickel were identified. One round of gas monitoring was undertaken at the Site in August 2019. The findings from the monitoring indicated that the Site would be classified as a Characteristic Situation 1 (very low risk).
Summary of Environmental Risk	Based on the soil results, EHS does not consider that the contamination identified would trigger a requirement for remediation. Although contaminant concentrations were identified within the soils, none of the concentrations exceed the GACs for a continued commercial land use as currently undertaken at the Site. The groundwater sample obtained from the borehole did not identify any contaminants exceeding the UK DWS. However, when screened against the EQS, exceedances of copper and nickel were identified. The exceedances are considered to be very marginal, therefore it is considered unlikely that the Site poses a significant risk to controlled waters and that no remediation would be necessary.

1 Introduction

1.1 Purpose

EHS Projects Limited (EHS) was commissioned by AB World Foods Limited (the 'Client') to undertake a Phase I and II Environmental Site Assessment at the AB World Foods Site located in Leigh, WN7 5RS (hereafter referred to as the 'Site').

A Site Location Plan is provided as Figure 1 in Annex A.

The purpose of this investigation work is to determine the site condition upon application of an environmental permit for the Site.

1.2 Scope of Services

This report presents the findings of a Phase II Environmental Site Assessment, based on the following Information:

- Historical uses of the Site and surroundings;
- Current use and condition of the Site;
- Environmental setting in terms of geology, hydrogeology, hydrology and surrounding land uses;
- Relevant publicly available environmental records;
- Intrusive investigation including environmental sampling and testing.

This report was conducted with due regard to the following guidance:

The National Planning Policy Framework;

- BS10175 (2013) Investigation of Potentially Contaminated Sites – Code of Practice;
- BS5930 (2015) Code of Practice for Ground Investigations;
- Contaminated Land Report (CLR) 11 Model Procedures for the Management of Land Contamination;
- BS8485 (2015) Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings; and
- CIRIA C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings.

1.3 Previous Reports

No previous reports where made available to EHS at the time or reporting.

1.4 Significant Assumptions

This report presents EHS' observations, findings, and conclusions as they existed on the date that this report was issued. This report is subject to modification if EHS becomes aware of additional information after the date of this report that is material to its findings and conclusions.

The reliability of information provided by others to EHS cannot be guaranteed to be accurate or complete. Performance of this Intrusive Investigation is intended to reduce, but not eliminate, uncertainty of environmental conditions associated with the subject site; therefore, the findings and conclusions made in this report should not be construed to warrant or guarantee the subject site, or express or imply, including without limitation, warranties as to its marketability for a particular use. EHS found no reason to question the validity of information received unless explicitly noted elsewhere in this report.

1.5 User Reliance

This report was prepared for AB World Foods Limited. Reliance on the Report by any other third party is subject to requesting and fully executing a reliance letter between EHS and the third party that acknowledges the EHS Standard Terms and Conditions with the Client, to the same extent as if they were the Client thereunder.

EHS has been provided with information from third parties for information purposes only and without representation or warranty, express or implied as to its accuracy or completeness and without any liability on such third parties part to revise or update the information. Where reliance has been provided by third parties to potential purchasers this is noted in our report.

2 Site Description

2.1 Site Location

The Site comprises an approximate 3.26ha plot of land to the east of Kiribati Way, Leigh, WN7 5RS. It is centred on National Grid Reference 365080, 401050 and is located approximately 6km south-east of Wigan town centre.

The Site location is presented as Figure 1 in Annex A.

2.2 Subject Site and Surrounding Area

The Site comprises a food manufacturing facility located within one building with associated loading, storage and car parking areas.

Topographically the Site is generally flat.

Further details regarding the Site overview can be found in Section 4.0. The Site layout is presented as Figure 2 in Annex A.

The Site is in an area of mixed commercial / light industrial, residential use with some undeveloped land to the north and west of the Site. Land uses in the immediate vicinity include the following principal features.

Table 1: Summary of Surrounding Land Use

Direction	Land Use
North	The Site is bound to the north by fields and a playing field;
East	The Site is bound to the East by commercial/light industrial land uses and undeveloped brownfield.
South	The Site is bound to the South by undeveloped land with commercial land uses and a petrol station beyond.
West	The Site is bound immediately to the West by Westleigh Brook with woodland and fields beyond.

2.3 Previous Environmental Assessments, Investigations or Remediation

No known previous environmental assessments have been made available for review.

3 Review of Publicly Accessible Information

3.1 Environmental Setting

The environmental setting of the Site can influence the susceptibility to, and relative magnitude of, environmental impacts and liabilities associated with on and off-Site sources of contamination. The following sections present a summary of environmental reviews conducted on publicly available records.

3.1.1 Geology and Hydrogeology

British Geological Survey (BGS) geological mapping and Environment Agency (EA) hydrogeological mapping indicate the following geological progression beneath the Site:

Table 2: Summary of Geology and Hydrogeology

Geology	Geology Description	Aquifer Status	Aquifer Description
Superficial: Till, Devensian (majority of the Site)	Clay, Sandy, Gravelly, Silty.	Secondary Undifferentiated Aquifer	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this mean that they layer in question has been previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Superficial: Alluvium **To the west of the Site along Westleigh Brook.**	Clay, Silt, Sand and Gravel.	Secondary (A) Aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifer formerly classified as minor aquifers.
Bedrock: Chester Formation	Sandstone	Secondary (B) Aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the non-aquifers.

The BGS records show three published borehole records located on the Site or in close proximity of the Site. One of these has restricted access and as such cannot be reviewed and documented within this report. The other two boreholes were in close proximity to the eastern boundary of the Site and the logs showed Made Ground to between 0.4mbgl and 0.5mbgl. The Made Ground soils comprised ash and colliery waste. Underlying this was Clay down to between 3.0mbgl and 3.2mbgl with Glacial Till clay underlying to the base of the borehole at 5.0m bgl.

No groundwater abstraction licenses are located within a 500m radius of the Site.

The Site is not located within an Environment Agency (EA) designated groundwater Source Protection Zone (SPZ).

3.1.2 Coal Mining

The database indicates that the Site is within an area affected by coal mining activity. Further details are included in Section 3.3.

3.1.3 Radon

BGS records indicate that the Site is not located within a radon affected area, as <1 % of homes are estimated to be at or above the action level. On this basis, the BGS states that "no radon protective measures are necessary in the construction of new dwellings or extensions".

3.1.4 Hydrology

Environmental records indicate that there are no surface water features on the Site. The nearest surface water feature is the Westleigh Brook, which is located on the west boundary of the Site.

The Site is currently located within a currently defined Flood Risk Zone. The majority of the Site is Flood Zone One (low probability of flooding), with the boundaries on the north, west and south in Flood Zone 2 (medium probability of flooding), with the western boundary along Westleigh Brook Flood Zone 3.

The Site has potential for groundwater flooding to occur at the surface.

No surface water abstractions were identified within a 500m radius of the Site.

3.1.5 Sensitive Land Uses

The Site is located within a predominantly commercial, light industrial and residential area. The nearest residential properties are located on Moorland Road approximately 80m east of the boundary on Robertshaw Street.

The Site is located in a Nitrate Vulnerable Zone (NVZ).

3.1.6 Summary of Sensitive Land Uses

The Site is considered to be of moderate environmental sensitivity, based on the following key factors:

- The Site is located in an area of mixed commercial / light industrial and residential use with some undeveloped land in close proximity.
- The published geology indicates that the Site immediately overlies the Till, Devensian and Alluvium followed by the Chester Formation.
- There are sensitive groundwater bodies beneath the Site. The EA has classified the Till, Devensian as a Secondary Undifferentiated Aquifer, the Alluvium as a Secondary (A) Aquifer and the Chester Formation as a Secondary (B) Aquifer.
- There are no surface water features located on the Site, but Westleigh Brook is located adjacent to the western boundary of the Site.

3.2 Environmental Regulatory Database Review

The following environmental data has been obtained from a Landmark Envirocheck Report (Annex B), which includes a search of databases held by regulatory bodies including the EA, BGS, the Department for the Environment, Food and Rural Affairs (DEFRA), City, District and Borough Councils and County Councils. The table below summarises key features identified on-Site and within the 500m search radius.

Table 3: Summary of Environmental Regulatory Database Review

Database	On-Site	0-500m	Description
Contaminated land register entries	0	0	Not applicable (N/A)
Current registered landfills	1	1	A registered landfill is located on Site with the Site location named as Jackson Brickworks, Wigan Road, Westleigh, Leigh. The licence holder is Waste Management Limited. It's maximum input rate is described as very large with greater than 250,000 tonnes per year delivered to landfill. The landfill accepted a wide range of wastes including industrial non-hazardous waste, pharmaceutical/cosmetic products, animal and food wastes, construction and demolition wastes and unspecified contaminated materials). A registered landfill is located 237m northwest of the Site. The licence holder is Waste Management Ltd. It's maximum input rate id described as very large with greater than 250,000 tonnes per year delivered to landfill. The landfill accepted a wide range of wastes including unspecified contaminated materials, animal and food wastes, construction industrial wastes and metal scrap. The licence has since lapsed/cancelled/defunct/not applicable/surrendered/cancelled.
Closed landfills	0	1	A historic landfill has been recorded 18m southwest of the Site, namely Waste Management (UK Waste) Limited. The last input date of the landfill site was 31st of January 1988 and the specified waste for the landfill was inert, industrial, commercial, household waste in addition to special waste and liquid sludge.

Database	On-Site	0-500m	Description
Current registered waste transfer/ treatment facilities	0	2	Two registered waste transfer sites are located within a 500m radius of the Site. Each of these are reported as 'operational as far as known'. The nearest is located 46m east of the Site, namely D Meads t/a Birchall Skip Hire. The waste transfer site was registered in 1991. Authorised waste for the transfer facilities included a wide range of wastes such as asbestos sheet/piping, contaminated rubble/hardcore, general commercial rubbish and general industrial rubbish. The second waste transfer site was located 63m east of the Site namely T.W. Insultation Co Ltd. The Site was registered in 1985. Authorised waste for the transfer facilities included: bonded and fibrous asbestos, liquid, sludge and unpackaged wastes.
Closed waste transfer/ treatment facilities	0	0	N/A
Authorised industrial processes	1	59	One active authorised land use recorded on the Site for Food Products – manufacturers. Nearby active land uses within 100 metres include: reclamation centres and garage services. Inactive land uses within 100 metres include: waste disposal, scrap metal merchants and car breakers. Industrial processes of note include: freight haulers 142m east and a petrol filling station 149m south east.
Registered radioactive substances	0	0	N/A
Enforcements, prohibitions or prosecutions	0	1	A prosecution for Parsonage Garage was heard in 2000. The prosecution was associated with the 'kept waste but had no waste management licence, did not removal the waste from the Site after the notices was served on him, obstructed an agency office'. The verdict was guilty.
Active Discharge consents	0	4	The nearest active discharge consent is located 28m to the south of the Site. The consent was registered in 2004 believing to the active until the present day. The discharge is a public sewer – storm sewage outfall. All other nearby active discharge consents are also from public sewers for storm sewage outfall.

Database	On-Site	0-500m	Description
Pollution incidents	1	8	One pollution incident to controlled water which occurred on the Site was a Category 3 (minor incident). The incident notes that the pollutant was sewage (other) and was related to a blocked sewer. No other incidents within 500m where greater than Category 3 (minor incident). For full details of the pollution incidents to controlled waters within a 500m radius of the Site, please refer to the environmental data search in Appendix B.
Pollution Controls	0	4	The pollution controls in the area are in relation to the surround land uses. Three are for petrol filling station with the fourth waste oil burners of a car garage. For full details of the pollution control measures, please refer to the environmental data search in Appendix B.
Petrol station entries	0	3	Three fuel stations exist within a 500m radius of the Site, the nearest is located 182m southeast of the Site namely the ASDA Leigh. It is registered as a hyper-market petrol station.

3.3 History of the Site and the Surrounding Area

The history of development on the Site and immediate surrounding area was investigated with reference to historical Ordnance Survey (OS) mapping and aerial photographs. The findings are presented in subsequent sections below.

3.3.1 Historical Mapping

A summary of the development history of the Site and immediate surrounding area obtained from historic OS mapping and aerial photographs (Annex B) is detailed in the table below.

Table 4: Summary of Historical Mapping

Edition and Scale	On-Site Activities	Off-Site Activities (within ~ 250m)
1849 1:10,560	The Site comprises farmland with the Tram Road running across the Site from the northeast to the southwest. Leigh Brook runs along the western boundary of the Site.	The Site is an area of predominantly agricultural use.
1893-1894 1:2,500	The Tram Road is now labelled as the Neral Railway. An additional rail way runs across the north of the Site connecting the Priestner's Colliery to the Bolton Kenyon Line. A pond is located just of the north western boundary of the Site. The brook is now labelled as the Westleigh Brook.	There has been significant industrial and residential development in the area. Industrial land usage include a cotton mill with 10m of the Site and the Priestner colliery within 250m. The Bolton Kenyon Line runs north to south 250m to the east of the Site. A residential development was located within 100m to the east of the Site labelled Kirkhall Lane.
1907-1908 1:2,500	One of the reservoirs of the cotton mill covers the southeast corner of the Site. The pond located just of the north western boundary of the Site has been infilled.	Further development of the cotton milll to the east including the reservoirs that straddle the boundary of the Site. Further development of the colliery to the northwest to include a brick works.
1928 1:2,500	Further development of the railway lines across the north and west of the Site. A tank is located on the western boundary of the Site. A subway is present under the railway lines to the south of the Site.	Further residential development in the surrounding area with the Parsonage Colliery now present 250m to the south. Brick works to the north-east now includes a clay pit and a reservoir.
1936-1937 1:2,500	Further development of Site used as railway sidings including a coal screen covering the majority of the Site.	Further industrial and residential development of the area. Expansion of the clay pit to within 100m of the north-west of the Site.
1952-1955 1:2,500	No significant change.	The Priestly Colliery to the north-east is now disused.
1951-1952 1:10,000	The area to the west of the Site alongside the brook is now shown to be marsh.	No significant change.

Edition and Scale	On-Site Activities	Off-Site Activities (within ~ 250m)
1955-1956 1:10,000	No significant change.	No significant change.
1959-1978 1:1,250	Small structure to the south of the Site.	A slag heap is recorded within 50m of the Site off the western boundary.
1965-1966 1:10,000	No significant change.	No significant change.
1970 1:2,500	Sidings removed from across the Site with railway features only present on the east of the Site. A slag pile is now present across the north western corner of the Site.	No significant change.
1978-1988 1:1,250	The Site is now vacant apart from the small structure and subway to the south. Slag pile still present. Reservoirs attached to the cotton mill no longer present.	No significant change.
1980-1989 1:10,000	Structure to the south has been removed with only subway present.	No significant change.
1984-1991 1:1,250	No significant change.	No significant change.
1984-1991	No significant change.	The slag heap to the west of the Site is now labelled as a disused heap.
1992 1:1,250	No significant change.	Scrapyard is now present just of the eastern boundary of the Site.
1993 1:1,250	No significant change.	No significant change.
1993-1995 1:1,250	No significant change.	Parsonage colliery is no longer present.

Edition and Scale	On-Site Activities	Off-Site Activities (within ~ 250m)
2003 1:10,000	Works now present on the Site; the Site is in its current format. Slag heap and subway no longer present.	Development in the area with the area to the west has become a commercial land use which now contains a superstore.
2005 1:10,00	No significant change.	No significant change.
2009 1:10,000	Road now present along the west and northern boundaries.	No significant change.
2013 1:10,000	No significant change.	No significant change.
2019 1:10,000	No significant change.	No significant change.
2019 Aerial photo	Site is in its current format with a carpark and loading area to the south.	No significant change.

3.3.2 Planning Department Records

There are no planning records on the Site from the online records from 1st January 2003.

3.3.3 Previous Report Findings

No previous reports where made available.

3.3.4 Summary of the History of the Site and Surrounding Area

Based on the information obtained by EHS, the history of the Site and surrounding area can be summarised as follows:

- Earliest available mapping (1849) shows that the Site comprised undeveloped agricultural land with a tram road running across it and a brook along the western boundary of the Site. By the late 1890s the tram road is now a railway line and there is an additional railway line running across the Site, there is also a pond close to the north-western boundary of the Site. By the early 1900s, there is a reservoir related to a nearby cotton mill located in the south-eastern corner of the Site and the pond in the north-western boundary of the Site has been infilled. Subsequent years show further development including railway lines and sidings, coal screen, tanks and unspecified buildings and structures. A slag pile appears in the 1970 map and a subway appears in the late 1970s. The current works appears in the early 2000s .
- Historically the surrounding land comprised undeveloped agricultural land and subsequently became developed with largely industrial and residential properties. Industrial uses included a cotton mill and a colliery.

3.4 Coal Authority Document Review

The Site is located within a coal mining affected area, as such review of Coal Authority documentation has been conducted. The following sections present a summary of a CON29M Coal Mining Report (ref: 51002159475001, dated 6th August 2019) for the Site. It is recommended that prior to any development the Guidance for Developers (Version 4, 2017) is referred to.

The full report is presented in Annex H of this report.

3.4.1 Mining and Geology

There are no recorded coal mine entries known to the Coal Authority within, or within 20m of the boundary of the property. The report indicates that the property is in a surface are that could be affected by underground mining in nine seams of coal at 250m to 900m depth, and was last worked in 1958. The report states that any movement in the ground due to coal mining activity associated with these workings should have stopped by now.

The property is not within a surface area that could be affected by present underground mining. The property is not within the boundary of an opencast Site where coal has been removed by opencast methods. There is currently no license requests outstanding or current licenses in operation to remove coal by opencast methods within 800m of the boundary.

3.4.2 Geological Faults, Fissures and Breaklines

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

The BGS records show a number of faults which potentially cross the Site boundary. The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

3.4.3 Investigative or Remedial Activity

Remedial Activity

The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

Coal Mining Subsidence

No notices have been given, under Section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

Mine Gas

The Coal Authority has no recorded mine gas emissions requiring action.

3.4.4 Licensing and Future Mining Activity

Underground Mining

The Site is not in an area where the Coal Authority has received an application for and is currently considering whether to grant a license to remove or work coal by underground methods. As such, the property is not likely

to be affected from any planned future underground coal mining. However, reserves of coal exist in the local area which could be worked at some point in the future.

The Coal Authority has not received a damage notice or claim for the Site, or any properties within 50m of the Site boundary since 31st October 1994.

Withdrawal of Support Notices

The Site is in an area where a notice to withdraw support has been given in 1954 and is not in an area where a notice has been given under Section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to Owners of Former Copyhold Land

The Site is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

3.4.5 Summary of Coal Authority Data

The report from the Coal Authority summarises the following information:

- There are no recorded coal mine entries within, or within 20m of the Site boundary.
- The Site is in a surface area that could be affected by underground mining in nine seams of coal at 250m to 900m depth, which were last worked in 1958.
- The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.
- The Site is not located within the boundary of an opencast Site.
- The Coal Authority has no record of a mine gas emission requiring action, and the Site has not been subject to remedial works, by or on behalf of the Coal Authority.
- The Coal Authority has not received a damage notice or claim for the Site, or any properties within 50m of the Site boundary since 31st October 1994.

EHS consider that there are no immediate Coal Mining related risks or liabilities that will require action within the context of closure of permitted operations and repurposing of the Site to car parking / open storage land use. The Site is not likely to be affected from any planned future underground coal mining, however coal exists in the local area which could be worked at some point in the future. Any future redevelopment that may occur at the Site may need to consider Coal Mining risks. The Coal Authority is a statutory consultee in the planning process and may require investigation of coal mining features prior to redevelopment. Subject to the findings of any future assessment, remediation may also be required to manage potential coal mining related hazards.

4 Site Assessment

4.1 Methodology and Limiting condition

James Gooding (EHS) visited the Site between 31st July and 2nd of August 2019 undertake the intrusive investigation. During the Site walkover he was accompanied by Site representative Colin Jeffers (AB World Foods).

Every effort was made to inspect all areas of the Site. However, no access to operational buildings due to operational restrictions. The Site comprised one main unit that covered the majority of the Site, the majority of the unit was used for food manufacturing facilities, with the south of unit used for employee welfare and reception area. Access to the operational area of the Site was not granted during the walkover. To the far south of the Site was an employee car park, the south and northwest of the Site where loading yards for the manufacturing unit.

There was a roadway that ran along the western boundary of the Site that allowed vehicle access to the north western loading yard. The north and western areas of the Site were used for storage of raw products and waste. The north-western yard was used for waste storage. There was a large tank located in the north-eastern corner of the Site, with a collection of smaller tanks to the centre east of the Site.

No inspection or assessment was performed on drainage or other such below ground infrastructure.

Photographs of the Site reconnaissance are included in Annex D.

4.2 Site Overview

The Site is located to the north off Kiribati Way. The Site comprises the AB World Foods food manufacturing facilities and associated loading, storage and car parking areas.

4.3 Above/Underground Ground Storage Tanks (AST/UST)

There were two areas with above ground storage tanks observed on the Site, with the locations shown on figure 2 these where believed to be associated with the food manufacturing processes. One large tank is located to the north and a collection of smaller tanks to south-west. The large tank to the north the Site was associated with the water sprinkler system, the collection of tanks to the south-west were used for storage of liquids for food production and comprised two acetic acid and three rapeseed oil tanks.

4.4 Hazardous substances

The operations across the Site may be associated with the use and storage of hazardous substances. Chemicals were observed as being stored in IBC's on drip trays along the east of the Site. Chemicals observed as being stored in IBCs included: Powerfoam 50, Multikleen, Chlorofoam and Klenz 2 all of which are associated with industrial cleaning and food hygiene. All four of these chemicals had labels showing them to be corrosive, with Chlorofoam additionally labelled harmful to the environment. Additionally, there was an area to the north of the Site in the waste storage area labelled 'Waste Products in IBCs' however, due to the Site being in a period of shutdown, there were no IBCs present. The Site was observed to have active machinery such as forklifts and a scissor lift, therefore there are likely to be chemicals associated with their operation however, these were not observed on the walkover.

A locked chemical storage unit was located externally to the north of the Site.

4.5 Electrical Substations

There was one electrical substation located to the south east of the Site, just to the north of the smoking area.

4.6 Drainage

There was observed drainage across the entire Site. Drainage plans were provided for review. It is unknown whether there were soakaways present at the Site. The drainage plans suggest that the surface water drainage discharges to Westleigh Brook.

4.7 Asbestos Containing Materials (ACM)

An asbestos survey was not conducted as part of this scope of works. Although the age of the building indicates that it is unlikely that ACMs are present, there is potential for it to be present within the Made Ground from previous phases of development and infilling of ponds, therefore its presence should not be discounted.

4.8 Evidence of Spills, Staining or Corrosion

There was no evidence of spills, staining or corrosion observed at the Site. However, it is noted that the storage areas were being actively used and full access was not gained, so any potential spills and stains were not able to be observed.

4.9 Non-Natural Mounds or Depressions, Excavations and Fill

No non-natural mounds or depressions were observed.

4.10 Invasive Species

This Phase I ESA did not include an invasive species survey. EHS did not observe any invasive plant species growing at the Site during the walkover.

4.11 Summary of Site Walkover Observations.

- The Site currently comprises an active food manufacturing business with corresponding loading, storage and car parking areas;
- Much of the Site including internal areas of the unit however, access could not be gained due operation restrictions;
- One above ground storage tank associated with the Site sprinkler system;
- There are one area for above ground storage tanks associated with food stuff storage;
- Storage of chemicals in IBCs for industrial cleaning and food hygiene purposes;
- There was an electrical substation located to the southeast of the Site; and
- There was no evidence of spills, staining or corrosion observed at the Site. However, it is noted that not all areas were inspected due to site operations making it inaccessible.

5 Preliminary Environmental Risk Assessment

5.1 Conceptual Site Model

The conceptual Site model has been prepared based upon the desk-based assessment and walkover. The methodology of this risk assessment uses the source-pathway-receptor pollutant linkage to provide a qualitative appraisal of environmental risks and potential liabilities associated with soil and groundwater contamination at the Site.

The Conceptual Site Model (CSM) is prepared based on the current and continued use of the Site for light industrial / commercial purposes.

Table 5: Preliminary Conceptual Site Model

Source	Pathway	Receptor	Risk
On-Site Sources			
Historical railway lines, railway sidings, coal screen, tanks and infilled ponds. Current Site operations including storage of liquids associated with food manufacturing and storage of chemicals used for industrial cleaning and food hygiene purposes. Presence of an electrical substation in the south-eastern part of the Site. Potential for Made Ground from previous phases of development and infilled ponds. Potential contaminants include asbestos, heavy metals, hydrocarbons and PCBs.	Dermal contact, ingestion and inhalation pathways	Future Site users	**Moderate** There is potential for contaminants from historical uses of the Site and the Made Ground that may be present from previous phases of development and infilling of ponds. However, the current Site use (assumed to remain in its current state) is covered in hardstanding which provides a physical barrier against contact with potential contaminants.
		Neighboring residents	**Low to Moderate** Permeability of the underlying geology (Secondary Aquifers) may allow for potential migration of contaminants off-Site. The presence of hardstanding capping will mitigate potential pathways.
		Construction workers	**Low** Risk pathway to be mitigated via Personal Protective Equipment (PPE), good hygiene practices and construction site management.
	Leaching of contaminants and vertical	Controlled waters	**Low to Moderate** Based on the underlying geology being classified as

Source	Pathway	Receptor	Risk
	migration into groundwater and lateral migration into surface water.		Secondary Aquifers there is potential for leaching or migration of contaminants into groundwater or lateral migration into surface waters. The presence of hardstanding capping will mitigate potential pathways.
	Contact with buried services	Buried services	**Low** Should any new services be installed at the Site i.e. water pipes, then the water supply provider should be consulted to determine whether protective barrier pipes are required.
	Migration of ground gases onto Site and ingress into buildings	Future Site users	**Low to Moderate** Potential for Made Ground and historic infilling material underlying the Site, which could act as a source of ground gas.
		Construction workers	**Low** Risk pathway to be managed through good construction practices and mitigation of risks when working in confined spaces.
Off-Site Sources			
Various industrial and commercial land uses. Potential contaminants include asbestos, heavy metals and hydrocarbons.	Dermal contact, ingestion and inhalation pathways	Future Site users	**Low to Moderate** Potential for surrounding land uses to have impacted the Site due to the permeability of the underlying stratums. The Site is underlain by hardstanding creating a physical barrier.
		Construction workers	**Low** Risk pathway to be managed through good construction practices and mitigation of risks when working in confined spaces.
	Migration via groundwater	Controlled waters	**Low to Moderate** The Site and surrounding areas are underlain by permeable superficial deposits and bedrock geology. The Site is located on

Source	Pathway	Receptor	Risk
			Secondary Aquifers, as such there is potential for migration of potential contaminants.
	Migration of ground gases onto Site and ingress into buildings	Future Site Users	**Low** Potential for Made Ground from previous phases of development, which could act as a source of ground gas.

6 Ground Investigation Scope of Works

6.1 Purpose

The purpose of this intrusive investigation is to gather data regarding soil and groundwater conditions beneath the Site. The investigation has been designed to gain general coverage of the Site.

6.2 Scope

The EHS environmental ground investigation was conducted at the Site on the 31st July to the 16th August 2019. The scope of the environmental assessment was as follows:

- Advancing five window sample boreholes (WS101-WS105) to a maximum depth of 5.00m below ground level (bgl);
- The EHS engineer performed inspection of soils within boreholes to facilitate geological logging and to collect representative samples for laboratory analysis;
- Two monitoring wells were installed in the boreholes drilled;
- Groundwater monitoring was undertaken on one occasion. Monitoring included measurement of groundwater elevation, measurement of any phase separated hydrocarbons and collection of samples for groundwater analysis;
- Ground gas monitoring was performed on one occasion to provide a preliminary assessment of ground gas risks. Monitoring comprised field monitoring at each well head to appraise concentrations of bulk ground gases (e.g. methane, carbon monoxide, carbon dioxide and oxygen).

6.3 Investigation Rationale

The ground investigation was designed by EHS on behalf of the Client to gather information on the environmental ground conditions, groundwater and ground-borne gas conditions at the Site. The investigation aimed to provide general Site coverage.

The location of each exploratory hole is presented as Figure 3 in Annex A and Site photographs are presented in Annex D.

Table 6: Summary of Exploratory Locations

Exploratory Hole	Location
WS101	Located in the north eastern corner of the southern car park.
WS102	Located in the south western corner of the southern car park.
WS103	Located in the southern loading bay.
WS104	Located in close proximity to the gate on the western boundary.
WS105	Located to the north of the Site in loading area.

6.4 Methodology

6.4.1 Borehole Investigation

EHS commissioned Geotron UK Limited (drilling contractor) to undertake all window sampling at the Site. All works were supervised by an EHS engineer for environmental assessment purposes.

The works included the following key actions:

- Each of the proposed exploratory hole locations was cleared using a Cable Avoidance Tool (CAT) and Ground Penetrating Radar (GPR) by a trained utility surveyor;
- Concrete coring and window sampling at 5 locations by the drilling contractor;
- EHS performed field inspection and geological logging of drilling arisings;
- 9 soil samples were collected from the boring location for environmental laboratory analysis; and,
- The drilling contractor constructed a ground gas and groundwater monitoring well in all two of the locations drilled WS103 and WS104.

6.4.2 Groundwater and Ground Gas Assessment

Groundwater and ground gas monitoring was conducted by an EHS technician on the 16th August 2018. The groundwater elevation and potential presence of any free phase oils was measured using an oil/water interface probe. Ground gas monitoring was undertaken using a portable gas analyser at each monitoring well head. The field assessment gathered data relating to the concentrations of bulk ground gases (e.g. methane, carbon dioxide, carbon monoxide and oxygen).

6.5 Sampling and Laboratory Analysis

A total of nine soil samples and one groundwater sample was collected for environmental analysis during the investigation works. All soil samples were packed in laboratory provided containers and delivered to I2 Analytical UK Ltd for chemical analysis.

All soil samples were collected in order to provide environmental data on the quality of near surface and shallow soils beneath the Site. Representative samples of Made Ground / Fill and natural deposits were collected where feasible. Groundwater samples were obtained to provide an assessment of groundwater quality beneath the Site. The analytical suite of soils included the following parameters:

- Asbestos (soils only);
- pH
- Ammoniacal nitrogen
- Heavy metals;
- Polycyclic aromatic hydrocarbons (PAH);
- Total petroleum hydrocarbons – Criteria Working Group (TPH-CWG);
- BTEX compounds (namely Benzene, Toluene, Ethylbenzene and Xylenes); and,
- MTBE (methyl tertiary-butyl ether).

One groundwater sample was collected to provide environmental data on the quality of the perched / groundwater underlying the Site. The analytical suite of groundwater included the following parameters:

- Heavy metals;
- PAH;
- TPH CWG;
- BTEX; and
- MTBE.

7 Factual Summary of Investigation Findings

The following section presents a summary of the investigation findings.

7.1 Ground Conditions

The investigation observed that the soils underlying the Site generally comprised the following:

Table 7: Summary of Ground Conditions

Strata	Description	Environment Agency Aquifer Status	Thickness (m)	Depth to top of Strata (m)
Made Ground	Concrete / asphalt was encountered at the surface of the Site (0.15m – 0.20m thickness). This was underlain by sand and gravel with localised clay.	Not Applicable (n/a)	<0.4 – >4.8 (unproven)	0
Superficial Deposits (Alluvium)	Soft to firm black silty sandy peaty Clay.	Secondary (A) Aquifer	0.8	2.2
Superficial Deposits (Suspected Devensian Till)	Firm light brown Clay.	Secondary Undifferentiated Aquifer	>0.5 (unproven)	4.5
Bedrock (Chester Formation)	Based upon the ground conditions observed at the Site, it is not considered that ground conditions indicative of the bedrock geology were encountered.			

Concrete/ asphalt hardstanding was present across the surface of the Site at each exploratory drilling location, with a maximum thickness of 0.2m. Made Ground was identified to a maximum unproven depth of 4.8mbgl. The Made Ground thickness in the south of the Site was unproven due to a buried concrete slab, which was encountered under the car park (WS101 and WS102) and in the north of the Site (WS105), as such these drilling locations were terminated. Made Ground soils were variable in composition comprising a sand or gravel. Sand was fine to coarse grained. Gravel comprised brick, concrete, possible colliery spoil and calcified material. A localised layer of clay was encountered in WS104 between 0.6m and 2.2mbgl.

The Made Ground was underlain by the Alluvium in WS104 at 2.2m to 3.0mbgl only, revealing a recorded thickness of 0.8m. However, the full thickness of the Alluvium cannot be confirmed as 'No Recovery' was recorded from 3.0m to 4.5mbgl in WS104. The Alluvium is described as a 'soft to firm dark black silty sandy peaty clay'. An anoxic odour was noted in the alluvial strata.

Superficial Deposits comprising Till was encountered in WS104. The Till was encountered in WS104 between 4.5m and 5.0mbgl (base of borehole). The Till was described as 'Firm light brown clay'. As noted previously there

was no recovery in WS104 between 3.0m and 4.5mbgl, as such it is not possible to determine the exact depth to the Till.

The borehole logs are presented in full within Annex C.

7.2 Groundwater

Groundwater was recorded during the drilling works at approximately in WS103 and WS104 at approximately 3.0mbgl.

During subsequent monitoring of the boreholes, groundwater was recorded at 2.08mbgl (WS104) and 2.90mbgl (WS103).

7.3 Visual and Olfactory Evidence of Contamination

During drilling potential colliery waste was identified in the Made Ground, WS101 soils had a sheen between 0.2m to 0.6mbgl, an oily hydrocarbon odour was noted in WS103 between 0.5m and 2.3mbgl, and a chemical odour was noted in WS104 between 0.6m and 2.2mbgl.

8 Soil and Groundwater Assessment

8.1 Soil Assessment

In order to assess the significance of any contamination detected, EHS has assessed each contaminant species that is elevated above the laboratory Limit of Detection (LOD) against published screening criteria referred to as Generic Assessment Criteria (GAC). GACs are derived from the following reference material:

- Land Quality Management Limited and Chartered Institute of Environmental Health (November 2014), the LQM/CIEH S4ULs for Human Health Risk Assessment. Document reference: S4UL3435.
- Development of Category 4 Screening Levels for assessment of land affected by contamination – SP10 (September 2014);
- LQM S4Uls: evaluation of 2017 USEPA Toxicological Review of Benzo(a)pyrene; and,
- LQM/CIEH S4ULs for Nickel according to land use (Revised August 2015).

For the purposes of this assessment, EHS has selected GACs for a commercial scenario based on the proposed commercial end use for the Site. It is considered that this approach is sufficiently conservative and best reflects the ongoing use of the Site as a food manufacturing facility.

The following sections provide a summary and comment regarding the EHS phase of investigation and soil testing carried out. The complete laboratory data is presented in Annex F and screening tables are presented in Annex G.

8.1.1 Asbestos

No asbestos containing materials (ACMs) were identified in any of the Made Ground samples tested.

8.1.2 Heavy Metals

Minor elevated concentrations of heavy metals were identified in soil samples (both Made Ground and natural soils). None of the concentrations exceeded the screening criteria.

8.1.3 Hydrocarbons

Minor hydrocarbons concentrations (PAH, aliphatic and aromatic hydrocarbons, BTEX and MTBE) were identified in soil samples (both Made Ground and natural soils). None of the concentrations exceeded the screening criteria.

8.2 Summary of Soil Assessment Findings

The findings of the current investigation are summarised below:

- No asbestos was identified in any of the Made Ground soil samples;
- None of the heavy metal concentrations in the soil samples exceeded the screening criteria;
- None of the PAH, hydrocarbon, BTEX and MTBE concentrations in the soil samples exceeded the screening criteria.

8.3 Groundwater Assessment

In order to appraise the significance of the groundwater concentrations recorded, EHS has assessed each contaminant species that is elevated above the laboratory LOD against the following published guidance values:

- Drinking Water Standards England and Wales (2000) (amended); and

- Environmental Quality Standards (EQS) – selected due to the stream in the northern and western section of the Site.

Groundwater monitoring recorded groundwater in both monitoring wells at 2.08mbgl (WS104) and 2.90mbgl (WS103).

A groundwater sample was taken from one of the two monitoring wells (WS104) and was sent to the laboratory for analytical testing. There was insufficient groundwater in WS103 at the time of sampling to obtain a sample for testing.

When screened against the Drinking Water Standards (DWS) no exceedances were identified. However when screened against the Environmental Quality Standards (EQS) exceedances of copper and nickel were identified. A summary of the exceedances are presented in the table below.

Table 8: Summary of Heavy Metal Exceedances in Groundwater

Contaminant	EQS (µg/l)	Maximum Concentration (µg /kg)	Location of Maximum Concentration	No. of exceedances
Copper	1	1.4	WS104	1
Nickel	4	6.7	WS104	1

The exceedances identified are considered to be very marginal and therefore it is considered unlikely that the Site poses a significant risk to controlled waters.

9 Ground Gas Assessment

Field monitoring for bulk ground gases was performed at two monitoring well locations on the 16th August 2019. The concentrations of the bulk gases recorded are summarised in the table below. The data presented in the table below are maximum readings recorded during the monitoring program. The complete monitoring data set is provided within Annex E.

Table 9: Summary of Ground Gas Data

Location	Methane (%v/v)		CO_2 (%v/v)		CO (ppmv)		Oxygen (%)		Flow Rate (l/hr)		PID (ppm)
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min	Steady	Peak
WS103	ND	ND	1.5	1.5	ND	ND	13.7	13.7	0.0	0.0	ND
WS104	ND	ND	0.3	ND	1	1	7.1	7.1	0.0	0.0	5.1

ND – Not Detected

No methane was detected in any of the monitoring wells. Carbon dioxide was detected in all monitoring wells and ranged from 0.3% to 1.5%. Flow was at 0.0 l/hr. For the purpose of this assessment a worse-case flow rate of 0.1 l/hr has been assumed.

Field monitoring detected a PID concentration value of 5.1ppm in WS104. No PID concentration was detected in WS103.

EHS has assessed the bulk ground gas concentrations in accordance with current guidance (BS8485:2015). Based on the results, a gas screening value (GSV) of 0.0015 l/hr was calculated, which classifies the Site as Characteristic Situation 1 (very low risk).

Ground gas monitoring does not indicate that the Site does not require any ground gas protection measures, however further monitoring should be undertaken to confirm the ground gas regime of the Site.

10 Preliminary Environmental Risk Assessment

The ground investigation performed at the Site by EHS did not identify concentrations of contaminants in the soil that exceed the GAC for a commercial end use.

The Conceptual Site Model (CSM) has presented below to take into consideration the findings from the Phase II intrusive investigation.

10.1 Revised Conceptual Site Model

The methodology of this risk assessment uses the source-pathway-receptor pollutant linkage to provide a qualitative appraisal of environmental risks and potential liabilities associated with soil and groundwater contamination at the Site. The revised CSM has been prepared considering the Site's current and continued use for light industrial / commercial use.

The CSM has been prepared considering the continued use of the Site as a food manufacturing facility.

Table 10: Revised Conceptual Site Model

Source	Pathway	Receptor	Risk
On-Site Sources			
Concentrations of contaminants identified in soil samples.	Dermal contact, ingestion and inhalation pathways	Future Site users	**Low** Findings from the current investigation do not indicate GAC exceedances of heavy metals and hydrocarbon concentrations. No asbestos was identified in any of the Made Ground samples tested. The Site is covered in hardstanding further mitigating any potential risks from contamination.
		Neighboring residents	**Low** Although the permeability of the underlying geology means that there is some potential for migration off-Site, based on the concentrations identified in the soils on Site it is considered unlikely that these concentrations would pose a risk to neighbouring residents should there be any off-Site migration. The presence of hardstanding capping will mitigate potential pathways.

Source	Pathway	Receptor	Risk
		Construction workers	**Low** Risk pathway to be mitigated via Personal Protective Equipment (PPE), good hygiene practices and construction site management.
	Leaching of contaminants and vertical migration into groundwater and lateral migration into surface water.	Controlled waters	**Low** No exceedances of the DWS were identified, however, exceedances of the EQS for copper and nickel were identified in one groundwater sample tested. The exceedances are considered very marginal and it is considered unlikely that the Site poses a risk to controlled waters. The presence of hardstanding capping will mitigate potential pathways.
	Contact with buried services	Buried services	**Low** Should any new services be installed at the Site i.e. water pipes, then the water supply provider should be consulted to determine whether protective barrier pipes are required.
	Migration of ground gases onto Site and ingress into buildings	Future Site users	**Very Low** Gas monitoring undertaken at the Site indicates that the Site would be classified as very low risk. Further monitoring would be required
		Construction workers	**Low** Risk pathway to be managed through good construction practices and mitigation of risks when working in confined spaces.
Off-Site Sources			
Various industrial and commercial land uses. Potential contaminants include asbestos, heavy metals and hydrocarbons.	Dermal contact, ingestion and inhalation pathways	Future Site users	**Low** Based on the soil results from the intrusive investigation, it is considered unlikely that any off-Site sources pose a significant risk to the Site.
		Construction workers	**Low** Risk pathway to be managed through good construction practices and mitigation of risks

Source	Pathway	Receptor	Risk
			when working in confined spaces.
	Leaching of contaminants and vertical migration into groundwater	Controlled waters	**Low to Moderate** The Site and surrounding areas are underlain by permeable superficial deposits and bedrock geology. The Site is located on Secondary Aquifers, as such there is potential for migration of potential contaminants.

11 Findings and Conclusions

11.1 Summary of Findings

The investigations performed to date by EHS found that the ground conditions beneath the Site comprised concrete or asphalt down to a maximum depth of 0.20mbgl which was underlain by Made Ground which was variable in composition comprising a sand or gravel. Sand was fine to coarse grained. Gravel comprised brick, concrete, possible colliery spoil and calcified material. A localised layer of clay was encountered in WS104 between 0.6m and 2.2mbgl.

Underlying the Made Ground was either Alluvium comprising a soft to firm dark black silty sandy peaty clay or Till deposits comprising a firm light brown clay.

Groundwater was encountered in both of the boreholes that were installed, Groundwater levels were 2.08mbgl (WS104) and 2.90mbgl (WS103).

No asbestos was identified in any of the Made Ground samples tested.

The Made Ground and natural soils samples subject to laboratory testing identified low concentrations of heavy metals. None of the concentrations exceeded the screening criteria for commercial end use.

Although low levels of hydrocarbon and PAH contamination were detected within the soils underlying the Site, none of the concentrations recorded exceed the GAC for the screening values comprising commercial end use.

Concentrations of contaminants were identified in the groundwater tested, when screened against the DWS no exceedances were identified. When screened against the EQS exceedances of copper and nickel were identified.

One round of gas monitoring was undertaken at the Site in August 2019. The findings from the monitoring indicated that the Site would be classified as a Characteristic Situation 1 (very low risk).

11.2 Summary of Environmental Risk

EHS does not consider that the contamination identified would trigger a requirement for remediation. Although contaminant concentrations were identified within the soils, none of the concentrations exceed the GACs for a continued commercial land use as currently undertaken at the Site.

The groundwater sample obtained from the borehole did not identify any contaminants exceeding the UK DWS. However, when screened against the EQS, exceedances of copper and nickel were identified. The exceedances are considered to be very marginal, therefore it is considered unlikely that the Site poses a significant risk to controlled waters and that no remediation would be necessary.

Annex A: Figures

Annex B: Envirocheck

Annex C: Exploratory Hole Logs

Annex D: Site Photographs

Annex E: Field Data

Annex F: Laboratory Data

Annex G: Screened Data

Annex H: Coal Authority Report