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Phase 1 Site Investigation Whites Bakery, Barnsley

Client

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1 Introduction

1.1 Terms of Reference

1.1.1 Hannah Reed & Associates Ltd have been commissioned by Mr David White to prepare a Phase 1 Site Investigation for land occupied by Whites Bakery, Barnsley, hereinafter referred to as 'the site'.

1.1.2 The site is approximately centred on National Grid Coordinates E453368 N403847. A location plan is incorporated on the EMap report in Appendix C.

1.1.3 A site walkover was undertaken on 17 August 2010 and an assessment of current activities has been carried out together with a review of historical land use in the district and local environmental conditions.

1.1.4 The results of the investigation are set out in Section 2 of this report and Section 3 assembles a preliminary conceptual model and risk assessment. Section 4 presents conclusions and summary recommendations for any additional works. Appendices A – E provide supporting data.

1.2 Objectives of the Phase 1 Site Investigation

1.2.1 The assessment has been carried out in general accordance with the requirements of BS 10175 (2001) – Code of Practice for the Investigation of Potentially Contaminated Sites.

1.2.2 The investigation is being carried out to assist in ascertaining the suitability of the site for redevelopment and in this regard the following objectives have been adopted:

- To provide information on past and current uses of the site and surrounding area and the nature of hazards and physical constraints;
- To identify potential sources of contamination, likely pathways, receptors and any features of immediate concern;
- To provide information on the geology, hydrogeology and hydrology of the site to assist in establishing the conceptual model;
- To formulate an initial conceptual model of the nature and extent of potential contamination;
- To identify and provide sufficient information to satisfy the requirements of regulatory bodies and other interested parties at the Phase 1 Site Investigation stage of the site assessment;
- To provide recommendations for a Phase 2 intrusive site investigation, if considered necessary.

1.3 Future Site Use

1.3.1 It is understood the proposed development is to entail the construction of an adoptable standard access road and 25 two storey dwellings. The dwellings are a mixture of semi-detached properties with internal and external garages, and apartments with parking spaces.

1.3.2 The existing on-site bakery is proposed to be demolished to make space for the development.

1.3.3 An existing open water course Snape Sike is to be culverted to provide access into the site.

1.3.4 The development is to include an area of hard landscaping for pedestrian access around the new dwellings and any remaining areas are presumed to be soft landscaping.

1.3.5 The intended arrangement of the development is set out on the Proposed Layout Drawing No H21-01 appended at A.

1.3.6 This report has been prepared on the basis of the above provisions and any alteration to the development proposals may result in a need for additional assessment.

1.4 Sources of information

1.4.1 Table 1 sets out information sources that have been consulted in preparing this assessment.

Table 1 – Information sources

Source	Details
Site Walkover	Information about the site was gained from visual inspection during a site walkover on 17 August 2010.
Site Developer	The site developer provided information about the current site and the development proposals
Emapsite Groundsure & Envirosure Report	Appended at C and containing historical mapping and environmental data for the general district.
British Geological Survey (BGS) Geological Map	Sheet No 87 Barnsley 1:50,000 scale Solid and Drift Editions.
Mining Report	Appended at D

2 Findings of the Phase 1 Investigation

2.1 Site walkover Observations

2.1.1 A site walkover was undertaken on 17 May 2011 when the weather was overcast, dry and mild. Photographs are appended at B.

2.1.2 The site covers approximately 0.6Ha and is situated approximately 1.7miles to the south east of Barnsley. The plot is located off Park Road (A61), which is a main road providing access into Barnsley from Junction 36 of the M1.

2.1.3 Topographic survey H21-2 is enclosed in Appendix A, which shows the physical features of the existing site.

2.1.4 The general locality is primarily residential in character. There is Barrow Working Mens Club 80m away at the junction of George Street and Hardwick Close. Current access to the site is past the Working Men's Club. 500m away to the East is Wosbrough Dale Park and 400m to the South is the Wosbrough Basin, and the River Dove. 500m south west of the site is Wosbrough Reservoir.

2.1.5 A single storey portal framed building occupied the south eastern portion of the site known as Whites Bakery with a concrete entrance road and tarmac car parking areas. The land to the West of the carpark is composed of grass, scrub land and bushes / vegetation. A single storey brick building exists just outside the general grounds of the bakery, although the land is within the ownership of the bakery. The building is currently used for storing old equipment from the bakery. The boundary of the site is enclosed with a mixture of close boarded fencing, stone and brick walls, metal fencing. The northern boundary to the site is formed by a retaining structure to support the elevated land to the north of the site.

2.1.6 Various storage containers, stacks of empty pallets and a refrigeration container are located to the rear of the building within the car park perimeter. The container closest to the rear of the bakery is used for the engineers store for maintenance of business vehicles.

2.1.7 An open water course was evident to the south side of the site known as Snape Sike. From records this drain originates in the Ward Green area adjacent to a School, situated to the North West of the site. The Snape Sike continues in culvert, it is believed, along Daw Croft Avenue into Osmond Way and under Park Road before entering the site on the western boundary. The open ditch crosses the site in a West to East direction flowing along the approximate line of the southern boundary before returning to a culvert on the south eastern corner of the site. It is believed the culvert turns south and heads towards the Wosbrough Basin and the River Dove. The actual discharge point of the Snape Sike is not known, however, it is assumed the discharge would be to the River Dove.

2.1.8 The land on which the site is located slopes northwest to southeast at an approximate grade of 1 in 16. The land for the bakery has been cut into the slope to form a level platform for the unit and car parking. A length of gabion

retaining wall has been constructed to support the embankment to the north of the car park area.

2.1.9 The site levels also fall towards the Snape Sike, however it appears the surface water run-off from the impermeable areas are intercepted by channel drains and gullies. The surface water run-off from the car park and yard area is reported to drain into a petrol interceptor located to the south of the building prior to discharging into the Snape Sike close to the downstream headwall.

2.1.10 A foul water drain is reported to run from a domestic property at the North West corner of the site towards the rear of the bakery. The exact route is unknown. The foul water drainage from the bakery converges upon an internal manhole within the reception area prior to heading out of the building in a south-easterly direction. It is reported there is connecting manhole within the grounds of the neighbouring property to the East. From public sewer records there is a surface water and combined sewer running in a north to south direction to the east of the bakery building. The statutory sewer map is included in **Appendix E**

2.1.11 The land parcel to the west of the site has not been significantly altered historically, however, it was reported there has been some minor deposition of inert fill material on top of the existing surface layers in the past few decades.

2.1.12 The adjoining roads Hardwick Close and Park Road are hard paved and adopted and a number of utility services are probably aligned below the footways and carriageways.

2.1.13 It is likely a number of buried mains services are located within the site associated with supplies to the existing property. Telegraph poles are located along the eastern boundary of Hardwick Close. Electric, water and gas supplies feed from the site entrance to the reception area of the building. Trenches have been formed within the concrete site entrance denoting the location of the services routes. There was a gas governor GRP cabinet adjacent to the reception door and an electrical cabinet on the north boundary wall opposite the building adjacent to the site entrance. There are two water meters at the end of Hardwick Close serving the properties.

2.1.14 No visual or olfactory evidence of soil contamination was detected during the site walkover.

2.2 Historical Land Use

2.2.1 Historic Ordnance Survey (OS) maps were acquired as part of an Emap Groundsure and Envirosure report for the site. The historic maps are appended at C along with the general Emap report. A description of the historical use of the site is set out in Table 2 which also reviews the surrounding area to identify potential contamination sources that could impact on the site.

Table 2 – Historic Use of the Site and Surrounding Land

Map Dates	Land use within the site boundary	Potentially significant land use in the district
1890-1892	Open fields	Generally open arable land with a housing estate to the north. There are a few small buildings indicated around the location of the present entrance to the bakery. 300m to the south is a railway linie, school and the Dearne and Dove Steel Works. The Snape Sike is indicated originating at Ward Green Cross Roads, following a south easterly route towards the site. The Sike is indicated to pass beneath Park Road before continuing in an south easterly direction towards the steel works.
1903-1929	No significant changes visible on site	The existing buildings adjacent to the present site entrance have altered slightly. 3 new buildings appear on site approximately on the same footprint of the present bakery. Allotment gardens are denoted to the east and west of the adjacent housing estate. The school to the south has changed to St James's Church.
1938	No significant changes visible on site	New residential development is shown approximately 500m to the north west. The Snape Sike is presumably culverted during the new housing development as the route of the Sike only appears to the North of the new estate and again once it reaches the Bakery site.
1948	No significant changes visible on site	Saville House and another building (possibly a factory) is shown to the South. A school is built in Ward Green adjacent to the origin of Snape Sike.
1951	No significant changes visible on site.	Housing estates appear to the east and west of the site. The steel works are no longer shown to the south.

Map Dates	Land use within the site boundary	Potentially significant land use in the district
1959-1966	New building appears on site. Presumed to be the original bakery.	Further housing estates are developed to the east and west of the site. The factory to the south has been enlarged. The Barrow working mens club appears to the north east of the site. The open route of the Snape Sike is no longer shown to the south of the site and is assumed to be culverted through the new housing estate.
1966-1971	The bakery is expanded	The factory to the south is shown to be expanded again and denoted as a clothing factory. A new building appears to the western portion of the site.
1973 - 1977	No significant changes visible on site.	The clothing factory is shown to have expanded again. The route of the Snape Sike suggests the open water course was culverted beneath the north west corner of the building. Further housing estates have appeared to the west of the site.
1982 - 1987	No significant changes visible on site.	The housing estate to the north has been re-developed to its current layout. The railway to the south is shown to be dismantled.
1987 - 1992	No significant changes visible on site.	No obvious changes to the surrounding area.
1993 - 1994	The bakery is expanded and the carpark is now visible	No obvious changes to the surrounding area.
1995	No significant changes visible on site.	The clothing factory to the south has been replaced with a housing estate.
2002-2011	The bakery is shown to include the canopy to the rear of the building. The downstream section of the Snape Sike is shown to be realigned with an outfall at the south east corner of the site.	No obvious changes to the surrounding area.

2.3 Geology, Hydrogeology and Hydrology

2.3.1 The geological drift map doe not indicate any superficial deposits on the site.

2.3.2 The geological map indicates the site is underlain by Kent's Rock and Pennine Middle Coal Measures Formation of Sandstone, Mudstone and Siltstone from the late Bolsovian (westphalian C) and Duckmantian (westphalian B) era previously labelled as Upper Carboniferous.

2.3.3 There are several recorded fault lines within 500m of the site. All but one of the records are described as an inferred coal seam, with a normal fault indicated 336m northwest of the site.

2.3.4 The solid strata underlying the site are designated by the Environment Agency as a secondary (A) Aquifer. These are 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 aquifers formerly classified as minor aquifers

2.3.5 The solid geology permeability is indicated to vary from Low to high.

2.3.6 The Emap report indicates there are no registered ground water abstractions within 1000m of the site.

2.3.7 The Emap report indicates there are registered surface water abstractions within 1000m of the site. The abstractions are to the south and south west of the site, with the closest at 478m away.

2.3.8 The Emap report indicates there are no registered potable water abstractions within 2000m of the site.

2.3.9 The Emap report indicates there are no ground water Source Protection Zones within 500m of the site.

2.3.10 The Emap report indicates the site is located within a Nitrate Vulnerable Zone.

2.3.11 The Emap report indicates there are two river features within 500m of the site. In both cases these refer to the River Dove.

2.3.12 The Emap report indicates there are two surface water features within 250m of the site. One refers to the Snape Sike on site and the other relates to an un-named water course south west of the site off Haverlands Lane.

2.3.13 The Emap report indicates there are no discharge consents within 500m of the site.

2.4 Environmentally Sensitive Sites

2.4.1 The Emap report indicates there are two records of local Nature Reserves within 500m of the site. These relate to the Worsbrough Country Park between 232m and 432m away to the South of the site.

2.4.2 The Emap report indicates the site is located within a Nitrate Vulnerable Zone.

2.5 Pollution Incidents

2.5.1 The Emap report indicates there are no records of pollution incidents within 250m of the site.

2.6 Contaminated Land

2.6.1 The Emap report indicates there are no locations within 500m of the site determined as contaminated land under Part IIA EPA 1990.

2.7 Dangerous or Hazardous Sites

2.7.1 The Emap report indicates there are no locations within 500m of the site determined as dangerous or hazardous.

2.8 Landfill and other Waste Management Sites

2.8.1 Within the range 501-1000m from the site there are three historic landfill recorded by the Environment Agency. There are no records of the waste licence type, licence issue or surrender date.

2.8.2 Within the range 501m – 1000m from the site there is one non-operational landfill site for inert waste recorded by the Environment Agency.

2.8.3 Within 1500m of the site there are two refuse tips at 602m and 1306m from the site recorded by the Environment Agency.

2.8.4 Within 1500m from the site there are six 'other' designation waste sites recorded by the Environment Agency. Five of the sites to the south and southeast are related to a Household Waster Recycling Centre and Waste Transfer Station. These are related to records for operational waste treatment, non-operational waste treatment and Environment Agency licensed waste sites. The final record is in relation to a metal recycling site a 1230m north of the site.

2.9 Industrial Land Use

2.9.1 Three industrial premises are indicated within 0-50m of the site in the Emap report. The closest is immediately adjacent to the site referenced as Construction Flooring Services. On a search of the premises the address relates to domestic properties on Westfields, Worsbrough. Two further premises 35m to the northwest relate to Adept Auto Services – vehicle testing and repair.

2.9.2 Eleven industrial premises are indicated within 51-250m of the site in the Emap report. Eight of these premises are electrical substations with the closest at 69m to the northwest. The remaining three premises are works or factories with unspecified works.

2.9.3 There are no records of the electric sub-station on the site.

2.9.4 No petrol or fuel sites are indicated within 500m of the site.

2.9.5 No underground high pressure oil and gas pipelines are indicated within 500m of the site.

2.10 Radon

2.10.1 The Emap report indicates the site is located in a radon affected area, as between 1 and 3% of properties are above the action level.

2.10.2 The Emap report indicates no radon protection measures are necessary.

2.11 Flood Risk

2.11.1 The Emap report indicates there are no zone 2 and 3 flood plains within 250m of the site.

2.11.2 The Emap report indicates there is a low susceptibility to groundwater flooding in the area based on the underlying geological conditions. The British Geological Survey confidence rating on this result is low.

2.11.3 The land to the north is higher than the site, but the land to the south falls away from the site towards the River Dove in the valley. The risk of groundwater flooding of the site is considered to be a low.

2.12 Coal Mining

2.12.1 Historical surface ground working features are recorded between 112m – 249m from the site. These relate to unspecified heaps, refuse heaps and a reservoir pond.

2.12.2 Historical underground workings features are recorded between 165m – 972m from the site. These range from air shafts, old adits and collieries. The closest air shaft is 165m to the east to the site.

2.12.3 A mining report obtained from the Coal Authority indicates 8 coal seams have been worked within the zone of influence of the site within the range of 70m to 400m depth. The seams were last worked in 1970. The Coal Authority considers all ground movements associated with these workings should have ceased.

2.12.4 The Coal Authority has not received a damage notice of claim for subsidence of the property since 1 January 1984.

2.12.5 No future coal workings are currently planned either above or below ground. The property is not in an area that is likely to be affected at the surface from any planned future workings. Coal reserves are present in the local area that could be worked in the future.

2.12.6 No mine entries are recorded within 20m of the site boundary and the Coal Authority are not aware of any mine gas emission or mining related hazard that have affected the site.

2.13 Information from Previous Investigations

2.13.1 None available

3 Preliminary Risk Assessment and Conceptual Model

3.1 Introduction

3.1.1 This section of the Phase 1 Site Investigation provides information about the potential source-pathway-receptor linkages that may be present at the site as a result of current or historical land uses.

3.2 Potential Contaminants and Sources

3.2.1 The following sections provide an indication of the potentially contaminative activities that have been carried out throughout the historical use of the site and the surrounding area. Potential associated contaminants are also identified. It should be noted that the activities identified may not have resulted in contamination of the ground.

On Site

3.2.2 The Phase 1 site investigation has revealed the site formed part of a field system alongside a residential estate prior to the current commercial use. The current commercial layout was developed and established between 1959 and 1995. Likely associated contamination from farming methods include but not limited to heavy metals of copper, zinc and cadmium.

3.2.3 The current building and carpark occupying the proposed site displays no obvious evidence of contamination. Due to the age of the existing property, asbestos products within the fabric of the structure could be present as a form of contamination.

3.2.4 The carpark and entrance road is a potential source of contamination including heavy metals and minor fuel/oil spillages. The overall site topography indicates surface water run-off from impermeable areas will drain towards the gullies and channel drains.

3.2.5 The containers on site are used for storing packaging materials and perishable food stuffs. One container closest to the rear of the bakery is used for storing material for servicing the company vehicles, such as oil and lubricating products. The likely associated contamination includes organic chemicals and heavy metals.

3.2.6 Snape Sike is a potential source of contamination as the surface water run-off is directed towards the Sike and intercepted drainage is discharged into the Sike via a petrol interceptor. Likely associated contamination includes heavy metals and organic chemicals.

Off Site

3.2.7 Development in the area has focussed on the residential sector and there are minimal trade activities indicated for the immediate surrounds to the site.

3.2.8 The greatest potential source of contamination to affect the site is probably derived from the nearby Park Road and Harwick Close. Historically Park Road has been a main route to Barnsley and locally gradients indicate surface water from the road could have run-off onto the site, except for the presence of a stone wall to the western boundary of the site. Any contaminants from the highway are therefore likely to have been conveyed off the carriageway via the local longitudinal gradients and the highway drainage system and considered unlikely to have a significant impact on identified receptors. Hardwick Road is an adoptable estate road which was constructed around 1992. The local gradients fall towards the site, but gullies are provided to intercept any surface water run-off from the road. Thus any contaminants from the highway are likely to have been conveyed off the road by the highway drainage system and into the public sewerage system.

3.2.9 Snape Sike is a potential source of contamination, historically and presently due to the upstream catchment area prior to reaching the site. Historically the Sike ran through arable land therefore the likely associated contamination from farming methods include but not limited to heavy metals of copper, zinc and cadmium. Other contamination related to previous mining activities, allotment gardens and development of the respective housing estates is likely and contamination could include heavy metals, organic and inorganic chemicals. Presently the potential source of contamination is from drainage connections from the residential estates and possible combined sewer overflows if they exist upstream. The Snape Sike displays no obvious forms of contamination from the prolific growth of vegetation on either bank and within the ditch.

3.2.10 There are no potential sources of landfill gas indicated that could impact on the site.

3.2.11 Table 3 summarises the potential contaminative land uses on and in the vicinity of the site.

Table 3

Potential Sources	Potential Contaminants
On-site historical	
Farm land	Heavy metals
On Site present day	Organic chemicals and heavy metals
Storage of oils	Organic chemicals and heavy Metals, minor oil and other chemical spillages
Car parks (since 1950's)	Heavy metals, minor fuel/oil spillage
Snape Sike	Organic chemicals and heavy Metals
Fire protection within building and other building products	Asbestos materials
Off-site	
Park Road and Hardwick Close	None identified that would impact on receptors
Snape Sike	Heavy metals, organic and inorganic chemicals

3.3 Potential Pathways and Receptors

3.3.1 Table 4 details and sets out the potential pathways and receptors identified during the Phase 1 investigation for any contaminants that may be present in the ground at the site during and following the proposed development.

Table 4

Potential Pathway	Potential Receptor	Comment
Dermal contact with soil.	Residents during and following development. Construction workers during development.	Direct contact with soils may be possible in the carpark and garden areas during and following development.
Intake via direct ingestion of soil and contaminated dusts outdoors.	Residents during and following development. Construction workers during development.	See above.
Intake via ingestion of produce grown in contaminated soils.	Residents following development.	Consumption of garden produce (fruit and vegetables) can lead to direct exposure to contaminants.
Intake via inhalation of soil vapours and ground gases indoor and outdoor.	Residents during and following development. Construction workers during development.	Inhalation of vapours and gases possible indoor and outdoor.
Underground services	Site residents and site users following redevelopment	Some contamination may migrate through service pipes and may affect human receptors
Direct contact with site soils.	Foundations of proposed buildings.	Chemical elements (eg sulphates) in soils may adversely affect buried concrete.
Migration of contaminants through soil and/or ground water.	Controlled waters: primary aquifer below the site.	Transfer of contaminants is possible into ground water with potential high ground water flow likely to assist widespread dispersal.
	Controlled waters; surface waters	Contaminants could transfer into the surface drainage system serving the district. There is one significant un-named watercourse in the vicinity of the site.
	Off-site residents	The site is located in a residential neighbourhood and surface run-off is considered the most probable means by which transfer of contaminants could occur.

3.4 Preliminary Conceptual Model

3.4.1 The conceptual model for the site following the proposed development identifies all potential pollution linkages based on the information collated in this Phase 1 Site Investigation and an understanding of the way the potential contaminants at the site are likely to behave in the environment. The comments from Table 4 have been considered in producing the conceptual model and source-pathway-receptor linkages that are not likely to be active following redevelopment of the site.

3.4.2 The conceptual model is applicable to the full site

3.4.3 For the conceptual model, contaminants that in most circumstances behave in a similar way in the environment and have been chosen and linked to potential pathways and receptors. Table 5 shows the potential organic contaminants and Table 6 shows the potential in-organic contaminants.

Table 5 Conceptual Model – Organic Contaminants

Receptors and pathways	Total petroleum hydrocarbons	Landfill Gas	Polycyclic aromatic hydrocarbons	Notes
Human Health				
Dermal contact with soils	✓	×	✓	Direct contact of site residents with exposed soil at the site is possible from landscaped areas.
Ingestion of soil	✓	×	✓	
Inhalation of soils vapours / gases	✓	×	✓	
Inhalation of soil dust	✓	×	✓	Hydrocarbon volatility varies and will depend on the individual species present
Ingestion of water from affected service pipes where these are in contact with contaminated soils and water	✓	×	✓	
Buildings				
Concrete foundations	✓	×	✓	Organic compounds can affect building materials but only if present in significant quantities
Controlled Water				
Migration to ground water through infiltration	✓	×	✓	Groundwater can be considered as both a pathway for contamination and as a receptor
Migration to surface water via groundwater	✓	×	✓	

A tick represents a potential source-pathway-receptor link is present on site
A cross represents a potential source-pathway-receptor link is un-likely to be present on site

Table 6 Conceptual Model – In-organic Contaminants

Receptors and pathways	Metals	Asbestos	Sulphates	Notes
Human Health				
Dermal contact with soils	✓	×	×	Direct contact of site residents with exposed soil at the site is possible from landscaped areas.
Ingestion of soil	✓	×	×	
Inhalation of soils vapours / gases	✓	×	×	
Inhalation of soil dust	✓	✓	×	Some metals that may be present can bioaccumulate in biological systems
Ingestion of site grown vegetables	✓	×	×	
Ingestion of water from affected service pipes	×	×	×	
Buildings				
Concrete foundations	×	×	✓	
Controlled Water				
Migration to ground water through infiltration	×	×	✓	Groundwater can be considered as both a pathway for contamination and as a receptor. Metal solubility is complex dependant on factors including soil pH and organic matter content of the soil. Some metals may not be soluble at this site.
Migration to surface water via groundwater	×	×	✓	

A tick represents a potential source-pathway-receptor link is present on site
A cross represents a potential source-pathway-receptor link is un-likely to be present on site

4 Conclusions and Recommendations

4.1 Conclusions

4.1.1 The Phase 1 Site Investigation has revealed the following:

- Prior to the present development the site formed part of a field system alongside a housing estate prior to the current commercial use. The current site layout appears for the first time on the 1993-1994 map. Since the latter date the site has remained largely unaltered.

- The Snape Sike alignment across the site has remained largely unaltered. The open water course has been culverted to the north west and to the south of the site from 1938 onwards.

- The current site includes a single storey portal framed building with a tarmac carpark to the rear and concrete entrance road linking to the public highway. Land to the west is remains as scrub land.

- The surrounding land use is predominantly residential in character.

- The published geology indicates no drift deposits and the solid geology comprises Kent's Rock and Pennine Middle Coal Measures Formation of Sandstone, Mudstone and Siltstone from the late Bolsovian (westphalian C) and Duckmantian (westphalian B) era previously labelled as Upper Carboniferous. The solid strata is designated as a secondary (A) aquifer.

- There are several recorded fault lines within 500m of the site. All but one of the records are described as an inferred coal seam, with a normal fault indicated 336m northwest of the site.

- The solid geology permeability is indicated to vary from Low to high, which could indicate that infiltration structures may be used on site subject to permeability testing. There are no ground water source protection zones within 500m of the site

- The observed topography of the site indicates adequate gradients exist for effective surface water drainage to occur.

- Potential contaminant sources are the potential construction materials within the existing building and historic use of the field system and current car park.

- Radon protection measures are not required for the new dwellings

- Past coal mining is unlikely to present an issue to the development.

4.2 Recommendations

4.2.1 Potential source-pathway-receptors pollutant links relating to the future use of the site have been identified above.

4.2.2 A Phase II Site investigation is recommended to further consider the risks to human health and to confirm whether these pathways are significant and to provide detailed geotechnical data and recommendations on the foundations for the dwellings and roads.

4.2.3 A type 3 asbestos survey should be undertaken in any existing buildings prior to demolition.

4.2.4 Checks should be made to establish the alignment of all buried services below the site prior to excavations commencing. All services should be physically located/exposed by careful excavation. Some service diversions may be required in the development. Existing sewers should be examined using CCTV to check their condition and routes across the site.

4.2.5 During the redevelopment works, it is considered protection of the site workers can be achieved through the provision of appropriate PPE for the period of any ground works.

Appendix A

Proposed Layout Drawing
And
Topographic Survey

Appendix B

Site Photographs

Appendix C

Emap Report

Appendix D

Coal Authority Report

Appendix E

Statutory Sewer Map