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## **PHASE 1: DESKTOP STUDY AND COAL MINING RISK ASSESSMENT REPORT**

### **PROPOSED RESIDENTIAL DEVELOPMENT**

### **ABB STREET**

### **MARSH**

### **HUDDERSFIELD**

### **HD1 4PB**

**Project No: 22-512**

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Date: 15/08/2022

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Date: 15/08/2022

The information and / or advice contained in this Phase 1: Desk Top Study and Coal Mining Risk Assessment Report is based solely on, and is limited to, the boundaries of the site, the immediate area around the site, and the historical use(s) unless otherwise stated. This 'Report' has been prepared to collate information relating to the physical, environmental and industrial setting of the site, and to highlight, where possible, the likely problems that might be encountered when considering the future development of this site for the proposed end use. All comments, opinions, diagrams, cross sections and / or sketches contained within the report, and / or any configuration of the findings is conjectural and given for guidance only and confirmation of the anticipated ground conditions should be considered before development proceeds. Agreement for the use or copying of this report by any Third Party must be obtained in writing from Arc Environmental Limited (ARC). If a change in the proposed land use is envisaged, then a reassessment of the site should be carried out.

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## **1.0 Introduction: -**

Arc Environmental Limited were instructed by Farrar Bamforth Architecture on behalf of Mark Haywood to undertake a Phase 1: Desktop Study (DTS) & Coal Mining Risk Assessment (CMRA) Report for a parcel of land off Abb Street, Marsh, Huddersfield, HD1 4PB. Proposals have made to redevelop the site into two residential properties.

The primary objectives of this report are to assess the geological, geotechnical, and potential ground contamination conditions on and beneath the surface of this site. The report has been carried out generally in accordance with the EA (Environment Agency) guidance for Land Contamination Risk Management (LCRM: October 2020) which has replaced CLR11: Model Procedures for the Management of Land Contamination. Based on all the data reviewed, a preliminary Conceptual Site Model (CSM) has been developed to define the scope and extent of any further investigation works deemed necessary, prior to commencing with any future development works. A site reconnaissance (walkover) survey was completed as part of this study with site photographs included within Appendix I, and all relevant observations noted in Section 2.1 below.

## **2.0 Physical Setting: -**

### **2.1 Site Details: -**

**Table 2.1**

|                                                |                                                                                                                                                                                                                                                                      |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site Name &amp; Address:</b>                | Proposed residential development, Abb Street, Marsh, Huddersfield, HD1 4PB.                                                                                                                                                                                          |
| <b>National Grid Reference:</b>                | 412930, 417330 (representative of the central part of the site).                                                                                                                                                                                                     |
| <b>Description of Location:</b>                | The site is located within an urban setting, c.1.7km to the Northwest of Huddersfield town centre, with the A640, c.100m to the south.                                                                                                                               |
| <b>Site Boundaries:</b>                        | N = Marsh Conservative Club, E = Abb Street, with residential properties beyond, S = Residential properties, with Syringa Street beyond, W = Residential properties, with Colwyn Street beyond.                                                                      |
| <b>Site Shape:</b>                             | The site is approximately rectangular in shape and occupies a total area of c.0.04 Hectares (Ha).                                                                                                                                                                    |
| <b>General Topography:</b>                     | The site is generally level, recorded at c.157m AOD (adjacent contour height).                                                                                                                                                                                       |
| <b>Current Site Structures &amp; Uses:</b>     | The site is currently vacant within a mix of residential and community buildings and the site is currently secured by heras fencing.                                                                                                                                 |
| <b>Development Details:</b>                    | It is proposed to redevelop the site into two residential properties.                                                                                                                                                                                                |
| <b>Summary of Historical Site Information:</b> | Historically a small structure was recorded on the site from c.1907 until c.1918, when the building was extended along the north and eastern borders, which by c.1960 was recorded as a "Works". From c.2018 the works building was no longer recorded (demolished). |
| <b>Site Surfacing:</b>                         | The site surfacing comprises predominantly rough grassland, with an area of semi-matured trees towards the western portion of the site.                                                                                                                              |

## **3.0 Environmental Setting: -**

### **3.1 Site Geology: -**

The geological assessment for this site has been based on geological plans and digital online data published by the British Geological Survey (BGS). The documents below and over the page have been reviewed as part of this study: -

- Online BGS GeoIndex Onshore Data Viewer of Britain.
- BGS Sheet 77, Huddersfield, Solid and Drift, 1:50,000 scale, 2003.
- GeoIndex Online CA Interactive Map Viewer.
- BGS Boreholes (SE11NW/935 & SE11NW/472).

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### **3.0 Environmental Setting (Cont'd): -**

#### **3.1 Site Geology (Cont'd): -**

- Coal Consultants Coal Mining Report; 51003166048001.
- Envirocheck Report (Ref. 296803905\_1\_1).

##### **3.1.1 Made Ground: -**

In accordance with the published BGS maps, the site is not recorded within an area of made ground. However, when considering historical developments onsite and within proximity of the site boundary, made ground is anticipated to be present below most of the proposed development area. Any made ground is anticipated to comprise disturbed natural strata with anthropogenic debris (i.e., brick, concrete, etc).

##### **3.1.2 Superficial Deposits: -**

In accordance with published BGS maps the site is shown to be in an area where superficial deposits are thin or absent.

##### **3.1.3 Solid Geology: -**

In accordance with the published BGS maps and Envirocheck report, the solid geology underlying the site is underlain by the Pennine Lower Coal Measures Formation (PLCM), comprising of interbedded grey mudstone, siltstone, and sandstone, sedimentary rocks formed during the Carboniferous Period, with Soft Bed Flags (SBF) (Sandstone) recorded at rockhead.

#### **3.2 Coal Mining Risk Assessment: -**

According to the Coal Authority (CA) Online Interactive Map Viewer, this area lies within a 'Coal Mining Reporting Area' however, does not lie within a 'Defined Development High Risk Area', an area of Past / probable Shallow Coal Workings and there are no mine entries within proximity to the site.

To assist with this coal mining risk assessment (CMRA) a Consultants Coal Mining Report (reference 51003166048001) has been obtained from the CA for this site, and a copy of which is attached in Appendix II.

The information infers no mine entries recorded within c.100m of the site boundary, no past underground mining or probable unrecorded shallow workings are recorded beneath the site. There are no Spine Roadways at shallow depth, no geological faults, fissures or break lines recorded, and no mine gas recorded within c.500m of the site boundary.

Consequently, from the geological and coal mining data reviewed, it is felt that the mechanisms for future ground subsidence and crown hole failures occurring at the surface in the future as a direct result of shallow coal mining activities below the site are not present and as a result no further assessment or intrusive investigation works are required with regards to historical shallow coal mining activities.

### 3.0 Environmental Setting (Cont'd): -

#### 3.3 Potential Geological Hazards: -

**Table 3.1**

| Potential Geological Hazard: | Comments       |
|------------------------------|----------------|
| Land Slip:                   | Very low risk. |
| Shrinkable Soils:            | No hazard.     |
| Collapsible Soils:           | Very low risk. |
| Compressible Soils:          | No hazard.     |
| Running Sand:                | No hazard.     |
| Ground Dissolution:          | No hazard.     |

#### 3.4 Site Hydrogeology: -

- The site is not located on or within c.1km of a Source Protection Zone (SPZ).
- The site is not located on or within c.500m of a water abstractions.

**Table 3.2**

| STRATA                                                      | Aquifer / Soil Leachability<br>EA Classification | Comments                                                                                                                                                            |
|-------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Groundwater Vulnerability:                                  | Secondary Bedrock Aquifer<br>High Vulnerability  | Productive Bedrock Aquifer, high pollutant Speed – combined.<br>Well-connected fractures.<br>Dilution: >550mm/year                                                  |
| Superficial Aquifer:<br>(None)                              | ~                                                | ~                                                                                                                                                                   |
| Bedrock Aquifer:<br>(Pennine Lower Coal Measures Formation) | Secondary Aquifer - A.                           | Principal and secondary aquifers provide significant quantities of drinking water, and water for business needs. They may also support rivers, lakes, and wetlands. |

#### 3.5 Site Hydrology: -

**Table 3.3**

| SURFACE WATER<br>FEATURE                                                            | Location                                                                                             | Comments                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OS Water Network &<br>GQA Classified River:                                         | None recorded within<br>c.250m.                                                                      | ~                                                                                                                                                                                                                                                                                                                          |
| Unclassified<br>Watercourse(s), Canals,<br>Ponds, Lakes & Other<br>Bodies of Water: | None recorded within<br>c.250m.                                                                      | ~                                                                                                                                                                                                                                                                                                                          |
| Flooding from River or<br>Sea:<br>(Fluvial)                                         | The site does not fall<br>within a designated Flood<br>Zone II or III.                               | Although the site does not fall within a designated Flood Zone II or III, it is recommended that further consultation with the Local Authority (LA) and Environment Agency (EA) should be made with respect to the potential for flood events in this area and to establish local knowledge of periodic flooding problems. |
| Surface Water Flooding:<br>(Pluvial)                                                | The site falls within an<br>area recorded as being at<br>very low risk of surface<br>water flooding. | Surface water flooding occurs when rainwater does not drain away through the standard drainage systems or soak into the ground instead. Appropriate surface management should be adopted to deal with the future management of positively drained surface water.                                                           |

### 3.0 Environmental Setting (Cont'd): -

#### 3.5 Site Hydrology (Cont'd): -

**Table 3.3 (Cont'd): -**

| <u>SURFACE WATER FEATURE</u>           | <u>Location</u>                                                                                            | <u>Comments</u>                                                                               |
|----------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Groundwater Flooding at Surface (BGS): | The site is recorded within an area of limited potential for groundwater flooding to occur at the surface. | This information is based on areas which may be potentially influenced by geological factors. |
| <u>RAINFALL</u>                        | <u>Measurements (mm)</u>                                                                                   | <u>Comments</u>                                                                               |
| Annual:                                | 1041.25                                                                                                    | Based on station average measurements from Birchencliffe during 1991 to 2020.                 |
| Rainfall: Min (May)                    | 61.68                                                                                                      |                                                                                               |
| Rainfall: Max (Dec)                    | 119.41                                                                                                     |                                                                                               |

#### 3.6 Radon Assessment: -

According to the Envirocheck Report, the site is recorded to lie in a lower probability radon area, as less than 1% of homes are above the action level, in accordance with the BGS, National Geoscience Information Service, their assessment suggests that no radon protection measures are necessary for the site. The BRE Digest, BR211 (2015) Radon: Guidance on Protective Measures for New Buildings, records the site to be situated within a clear grid square (1km), and therefore no radon protection measures are required for the site.

#### 3.7 Site Ecology: -

**Table 3.4: -**

| <u>FEATURES</u>              | <u>Location</u>              | <u>Comments</u> |
|------------------------------|------------------------------|-----------------|
| Local Nature Reserves:       | None recorded within c.250m. | ~               |
| Areas of Adopted Green Belt: | None recorded within c.250m. | ~               |
| Special Protection Areas:    | None recorded within c.250m. | ~               |
| Nitrate Vulnerable Zone:     | None recorded within c.250m. | ~               |
| Other:                       | None recorded within c.250m. | ~               |

There was no visual evidence to suggest that the site is affected by the presence of invasive weed species such as Japanese Knotweed, Giant Hogweed or Himalayan Balsam, at the time of the recent site survey, although a site-specific survey has not been carried out. Therefore, site awareness during future investigation works and during the construction phase for any potential invasive weed species would be considered prudent.

#### 3.8 Estimated Soil Chemistry: -

Data provided by the BGS in relation to estimated soil chemistry for several key metals and metalloid elements is summarised in Table 3.5 below and on the following page. Note: the references to the anticipated background concentrations of contaminants, sourced from the BGS, should not be relied upon. They are not site-specific and do not represent the condition of the ground at the proposed development site.

**Table 3.5**

| <u>Element</u>   | <u>Soil Sample Type</u> | <u>Estimated Soil Concentrations (mg/kg)</u> |
|------------------|-------------------------|----------------------------------------------|
| Arsenic          | Rural soil              | 25 - 35                                      |
| Cadmium          | Rural soil              | <1.8                                         |
| Chromium (total) | Rural soil              | 60 - 90                                      |

### 3.0 Environmental Setting (Cont'd): -

#### 3.8 Estimated Soil Chemistry (Cont'd): -

Table 3.5 (Cont'd)

| Element | Soil Sample Type | Estimated Soil Concentrations (mg/kg) |
|---------|------------------|---------------------------------------|
| Lead    | Rural soil       | 100 - 200                             |
| Nickel  | Rural soil       | 15 - 30                               |

### 4.0 Industrial Setting: -

#### 4.1 Site History: -

Copies of historical OS maps covering the site area & adjacent land are included in Appendix II and a summary of the site history based on these plans, is provided in Table 4.1 below.

Table 4.1

Significant features / potential contamination sources highlighted in bold.

| Date                          | Site                                                                                                                                                                                                                                     | Adjacent Areas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| c.1854 – c.1894               | The site is recorded as undeveloped (part of larger field).                                                                                                                                                                              | From c.1854, surrounding the site is sparsely recorded with residential properties, with the majority of land undeveloped, however 'Marsh Grove' and 'Croft House' are recorded within close proximity to the north/northeast of the site. Within the wider geographical area to the south, <b>woollen mills</b> c.500m, <b>sandstone quarries</b> c.500m and a <b>chemical works</b> c.1.20km are recorded. By c.1893 <b>Stanley Woollen Mill</b> is recorded c.250m to the southwest, with community properties recorded between c.100m and c.150m to the south – southwest. <b>Field drains</b> are recorded c.137m to the northwest of the site. Further residential properties are also recorded surrounding the site from c.1893. By c.1894 some of the <b>sandstone quarries</b> are recorded as 'old' (disused / infilled), with the <b>chemical works</b> to the south now recorded as <b>Belle Vue Chemical Works</b> . |
| c.1907 – c.1908               | By c.1907 a <b>small structure</b> is recorded to the central / north of the site.                                                                                                                                                       | From c.1907, a <b>laundry</b> is recorded c.100m to the west of the site. <b>Field drains</b> are no longer recorded (infilled), with a <b>tennis court</b> recorded adjacent to the north-western corner and a <b>bowling green</b> recorded c.150m to the west of the site. The surrounding area remains unchanged. By c.1908 <b>Belle Vue Chemical Works</b> is no longer recorded (disused)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| c.1918 – c.1962               | From c.1918 the <b>structure</b> to the central / north of the site is no longer recorded (demolished), however <b>structures</b> are shown along the northern and eastern boundaries. By c.1960 the structures are recorded as 'works'. | From c.1918 the <b>bowling green</b> and <b>tennis court</b> are no longer recorded, with residential housing now recorded. From c.1930, residential and community properties continue to be developed surrounding the area, with the <b>laundry</b> now recorded as <b>Marsh Works</b> . By c.1961 <b>Stanley Woollen Mill</b> is recorded as <b>Stanley Picture House</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| c.1966 – c.1993               | The site remains unchanged.                                                                                                                                                                                                              | By c.1960 a <b>club</b> is recorded adjacent to the north of the site, with a <b>works</b> recorded c.25m to the east and <b>Marsh Works</b> now recorded as <b>works</b> . The remaining <b>sandstone quarries</b> are no longer recorded (infilled) after c.1962. From c.1993 the <b>woollen mills</b> are no longer recorded (disused).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| c.1995 – c.2022 (Present day) | By c.2018 the <b>works</b> are no longer recorded (demolished), with the site remaining vacant until present day.                                                                                                                        | From c.1995 the surrounding area is recorded to continue to be developed, with 'works' to the east and west no longer recorded (disused / demolished) by c.2021.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## 4.0 Industrial Setting (Cont'd): -

### 4.2 Statutory Requirements / Authorisations: -

Table 4.2

| TYPE                                                   | Location                         | Comments                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enforcement and Prohibition Notices:                   | None recorded within c.250m.     | ~                                                                                                                                                                                                                                                                                                     |
| Integrated Pollution Controls:                         | None recorded within c.250m.     | ~                                                                                                                                                                                                                                                                                                     |
| Local Authority Pollution Prevention and Controls:     | Four recorded within c.250m      | EC Ref. 7, corresponding to Marsh Garage (waste oil burners) permit ref. PPC W 170, status – permitted, located c.56m to the south of the site.                                                                                                                                                       |
|                                                        |                                  | EC Ref. 8, corresponding to Groom Textile Care (dry cleaners) permit ref. PPC W 167, status – permitted, located c.104m to the southeast of the site.                                                                                                                                                 |
|                                                        |                                  | EC Ref. 9, corresponding to Glebe Street Garage (waste oil burners) permit ref. PPC W 169, status – permitted, located c.225m to the southeast.                                                                                                                                                       |
|                                                        |                                  | EC Ref. 9, corresponding to Shell Filling Station (petrol filling station) permit ref. PPC W 111, status – permitted, located c.231m to the east of the site.                                                                                                                                         |
| Prosecutions Relating to Authorised Processes:         | None recorded within c.250m.     | ~                                                                                                                                                                                                                                                                                                     |
| Registered Radioactive Substances:                     | None recorded within c.250m.     | ~                                                                                                                                                                                                                                                                                                     |
| COMAH/Explosive/NI HHS Sites:                          | None recorded within c.250m.     | ~                                                                                                                                                                                                                                                                                                     |
| Planning Hazardous Substances Consents / Enforcements: | None recorded within c.250m.     | ~                                                                                                                                                                                                                                                                                                     |
| Contemporary Trade Entries:                            | Nineteen recorded within c.250m. | EC Ref. (98 – 105) – Six Active entries, corresponding with Marsh garage, domestic appliances – servicing and repair, Groom textile care (laundry), Yorkshire blinds, awnings and canopies, Glebe Street Garage and Shell petrol station, c.57m to c.233m from the site<br>Thirteen Inactive entries. |
| Fuel Station Entries:                                  | Two recorded within c.250m.      | EC Ref. 152 - Shell Huddersfield (Active), c.231m to the east of the site, Westbourne Service Station (obsolete).                                                                                                                                                                                     |
| Points of Interest:                                    | Two recorded on site.            | EC Ref. 170, <b>Manufacturing and Production</b> - corresponding with two works buildings (industrial features), one to the north, one to the northeast of the site.                                                                                                                                  |
| Points of Interest:                                    | Eighteen recorded within c.250m. | EC Ref. 170 - 173, <b>Manufacturing and Production</b> – corresponding with works / factories, c.13m to c.232m from the site.<br>EC Ref. 183 – 184, <b>Public Infrastructure</b> – corresponding with petrol and fuelling stations, c.231m to c.250m from the site.                                   |

### 4.3 Landfill & Waste: -

The following information over the page relates to landfill and waste has been obtained from the Envirocheck Report (attached in Appendix III) site walkover and published data:

- There are no BGS Recorded Landfill Sites, Local Authority Recorded Landfill Sites, Historical Landfill Sites or Registered Landfill sites recorded within c.250m of the site.

## **4.0 Industrial Setting (Cont'd): -**

### **4.3 Landfill & Waste (Cont'd): -**

- There are no Registered Waste Transfer Sites within c.250m of the site.
- There is one area of potentially infilled land (water) recorded, c.137m to the northwest of the site associated with field drains, date of mapping 1854.
- Historical land use (works) on site and off site, within proximity.

Following a review of OS maps and other site-specific data, the risk of hazardous ground gas production / migration is very low in connection with the infilled land. At this stage it is recommended that a programme of ground gas monitoring is not required.

### **4.4 Unexploded Ordnance (UXO) Risk: -**

According to the Unexploded Bomb Risk Map produced by ZeticaUXO, the site lies within a low-risk area in terms of unexploded ordnance (areas indicated as having 15 bombs per 1000 acre or less). Consequently at this stage a Detailed UXO Risk Assessment is not considered necessary. A copy of the ZeticaUXO Unexploded Bomb Risk Map can be seen attached in Appendix II.

### **4.5 Pollution Incidents and Discharge Consents: -**

**Table 4.3**

| <b><u>TYPE</u></b>                                 | <b><u>Location</u></b>       | <b><u>Comments</u></b>                                                                                                                                                                                                           |
|----------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Discharge Consents:</b>                         | None recorded within c.250m. | ~                                                                                                                                                                                                                                |
| <b>Prosecutions Relating to Controlled Waters:</b> | None recorded within c.250m. | ~                                                                                                                                                                                                                                |
| <b>Pollution Incidents to Controlled Waters:</b>   | One recorded within c.250m.  | EC Ref. 13, corresponding with industrial premises (industrial effluent), incident date 17/06/1989 (ref. 100434) Cat. 2 – significant incident, receiving water – freshwater stream / river, c.87m to the northeast of the site. |
| <b>Substantiated Pollution Incident Register:</b>  | None recorded within c.250m. | ~                                                                                                                                                                                                                                |
| <b>Water Industry Act Referrals:</b>               | None recorded within c.250m. | ~                                                                                                                                                                                                                                |

## **5.0 Conceptual Site Model (CSM):-**

The Conceptual Site Model (CSM) is one of the primary planning tools that can be used to support the decision-making process of managing contaminated land and groundwater on any given site and allows a better understanding of what needs to be done to achieve risk management, and from this appropriate remediation techniques, if required for those risk management goals can be chosen. This can be done by undertaking a *source-pathway-receptor* analysis of the site. The anticipated *sources*, *pathways* and *receptors* for this site are summarised in Table 5.1 on the following page.

A graphical representation of the CSM has been produced for the site and can be seen attached in Appendix IV, which also sets out the critical pollutant linkages of concern for this site, with regards to contamination.

## 5.0 Conceptual Site Model (CSM) (Cont'd): -

**Table 5.1**

\*= Not included in the Human Health & Controlled Waters Risk Assessment

|    | <i>Sources (S)</i>                                                                                     |    | <i>Pathways (P)</i>                                     |     | <i>Receptors (R)</i>                                                                        |
|----|--------------------------------------------------------------------------------------------------------|----|---------------------------------------------------------|-----|---------------------------------------------------------------------------------------------|
| S1 | Made ground associated with the historical development of the site and immediate adjacent areas.       | P1 | Ingestion & Dermal Contact.                             | R1  | Human health - future end users.                                                            |
|    |                                                                                                        | P2 | Plant uptake and attached soils.                        | R2  | Controlled Waters: Groundwater within the underlying solid geology (Secondary Aquifer - A). |
|    |                                                                                                        | P3 | Air-inhalation of vapours and direct contact with dust. |     |                                                                                             |
| S2 | Possible localised contamination associated with the former 'works' (fuels, oils, asbestos & solvents) | P4 | Migration through existing services / permeable strata. |     |                                                                                             |
|    |                                                                                                        | P5 | Direct contact with building Materials.                 | R3  | Adjacent sites.                                                                             |
|    |                                                                                                        | P6 | Surface runoff, infiltration & leachate migration.      | R4* | Building materials.                                                                         |
|    |                                                                                                        |    |                                                         | R5* | Flora and fauna.                                                                            |

### 5.1 Geotechnical Considerations: -

- Type, variability, and condition of any made ground deposits across this site.
- Geotechnical parameters of any natural superficial soils and solid geology and depth to suitable load bearing founding strata across the site.
- Stability of excavations within any natural granular deposits and made ground present.
- Possible relic foundations (substructures associated with former 'works').
- Chemical attack on buried concrete (pH and sulphate testing).
- Control of surface water drainage.
- The presence of buried services beneath the site associated with the former on site and adjacent developments.

The information reviewed indicates that the site can be considered as being located within a **LOW** geotechnical risk setting.

To determine the geotechnical considerations above with more certainty, it is recommended that a programme of intrusive geotechnical investigation works is undertaken on this site with associated in-situ geotechnical testing, to aid in assessing the extent of any potential issues prior to commencing with any development in the future.

### 5.2 Sources of Contamination and Probable Contaminants: -

The historical Ordnance Survey maps, Landmark Envirocheck Report and other environmental information reviewed indicates that historically a small structure was recorded on the site from c.1907 until c.1918, when the building was extended along the north and eastern borders. By c.1960 the site was recorded as a 'works'. From c.2018 the 'works' building was no longer recorded (demolished).

Consequently, ground contamination testing will need to be incorporated into the design of any intrusive investigation works to confirm the level of risk posed to human health (future end users).

In addition, laboratory testing should also be undertaken on representative samples taken from site for naturally aggressive chemicals which could have a detrimental effect on building materials and water pipes (i.e., pH value and soluble sulphate, UKWIR suite of testing, etc.) should new water pipes be installed.

## **5.0 Conceptual Site Model (CSM) (Cont'd): -**

### **5.2 Sources of Contamination and Probable Contaminants (Cont'd): -**

#### **5.2.1 Soils – Human Health:**

In consideration of the above it would be prudent to test selected samples of soil from this site for the following analytes:

- Generic contamination suite, typically comprising; Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc, Total Organic Carbon, (TOC) and pH.
- Asbestos screening (and quantification if encountered).
- Speciated Polyaromatic Hydrocarbons (PAHs), Total Petroleum Hydrocarbons (TPHs & BTEX).

It is considered the level of risk posed to human health in connection with any future residential development is as below.

The information reviewed indicates that the site can be considered as being located within a  
**LOW to MODERATE** ground contamination risk setting for Human Health.

#### **5.2.2 Groundwater / Leachate - Controlled Waters:**

The following issues have been taken into consideration when assessing the risks towards Controlled Waters:

- The site is not located on or within c.1km of a Source Protection Zone (SPZ).
- The site is not located on or within c.500m of a Water Abstraction.
- There are no surface water features on or within c.250m of the site boundary.
- The solid geology is a Secondary Aquifer – A (Pennine Lower Coal Measures Formation).

Depending on the results of any soil contamination screening, leachate / water screening may be required on selected samples, if necessary, to determine the risk to Controlled Waters (i.e., groundwater). Similarly, this work should be incorporated within the design of any intrusive ground investigation works.

The information reviewed indicates that the site can be considered as being located within a  
**LOW** ground contamination risk setting for Controlled Waters.

## **6.0 Recommendations for Phase 2: Ground Investigation Works: -**

The conclusions contained within this report have been based on a review of geological plans, historical plans and available environmental data relating to the site and nearby adjacent land and forms the basis of a preliminary risk assessment. The primary benefits of undertaking this report are as follows:

- (i) Identify the geotechnical and/or geoenvironmental characteristics of the ground in sufficient detail to quantify the groundwater flood risk at the site and for the economic design of any future site / proposed development, construction or associated remedial works.

## **6.0 Recommendations for Phase 2: Ground Investigation Works (Cont'd): -**

- (ii) Minimise the risk of unforeseen ground conditions which might cause increased costs and / or programme (construction) delays later.

Therefore, it is recommended that a programme of Phase 2: Ground Investigation (intrusive investigation) works are completed for this site to provide an assessment of the geo-environmental characteristics of the site. These intrusive investigation works should be completed prior to commencing with any future development works and should include for the following or a similar scope of investigation works:

- A series of windowless sampling boreholes up to 6.00m deep with insitu sampling and testing, where possible (i.e., shear vane tests, SPT's). The information obtained will help assist with future foundation designs.
- Completion of insitu variable (falling) head permeability tests to determine the suitability of SUDS drainage system.
- Appropriate laboratory geotechnical testing on the samples recovered from the site, including chemical testing for concrete classification.
- Appropriate laboratory soil contamination screening to determine the potential risks to Human Health, testing to include analytes as highlighted in Section 5.2.
- Appropriate laboratory contamination screening (Leachate/water) to assess the risks to Controlled waters if significant gross contamination is identified.
- Site supervision and production of RAMS and production of interpretive Phase 2: Ground Investigation Report, including a Ground Contamination Risk Assessment.

Prior to site investigation works commencing on site, all existing utilities / services should be identified and recorded, such that any potential damage to services crossing the site can be prevented, as well as ensuring the health and safety of future site workers.

The samples of soil collected should be forwarded to UKAS and MCERTS accredited laboratory to undertake the recommended testing.

### **END OF REPORT**