

TREVOR BASIN WHS ARRIVAL

Phase I Geo-Environmental Desk Study

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1 Introduction

1.1 Background

Arcadis Consulting (UK) Limited was commissioned by Wrexham County Borough Council to complete a Phase 1 Geo-Environmental Desk Study to support the potential development of a new arrival car and coach park at the Pontcysyllte & Canal World Heritage Site, Wrexham, LL14 3NP (the “site”). The proposal also includes a pedestrian and cycle link from the car and coach park to the Trevor Basin World Heritage Site (WHS) and an upgrade to the access road network.

The proposed development of the site is part of the wider Trevor Basin and Surrounding Area Masterplan 2021 and aims to consolidate parking for visitors to the Pontcysyllte & Canal World Heritage Site.

1.2 Purpose of Report

As part of technical feasibility studies for the scheme, there is a requirement to obtain and review information on ground conditions to inform potential development constraints which may impact upon the proposed scheme.

The objectives of this Phase 1 desk study are to:

- Establish the environmental setting of the site including the geology, hydrology, and hydrogeology;
- Evaluate the environmental sensitivity of the site with regards to ecology, previous mining/quarrying activities, ground subsidence etc;
- Assess the likely environmental condition of the site based on its current and historical use, and that of the surrounding area;
- Develop a Conceptual Site Model (CSM) to produce a preliminary risk assessment identifying and qualitatively assessing risks to Human Health and Controlled Water receptors; and
- Provide recommendations for any required intrusive investigation at the site, focussed on assessing potential chemical contamination and geotechnical concerns.

1.3 Scope of Work

To achieve the objectives the following scope of work was undertaken:

- Completion of a site walkover examining the site for potential items and areas of concern, and a review of the information collected for incorporation into the study;
- Review and evaluation of the published and readily available information concerning the site including:
 - Recent Ordnance Survey (OS) maps;
 - Public register and environmental information – provided by Groundsure;
 - Historical Ordnance Survey maps – provided by Groundsure;
 - UK Health Security Agency Atlas of radon in England and Wales;
 - British Geological Survey (BGS) published maps and online GeoIndex including relevant archive borehole records;
 - Natural Resources Wales website; and
 - The local authority planning portal.
- Commission and review of a Coal Authority (CA) report for the site, including any relevant mine abandonment plans;
- Obtaining a preliminary Unexploded Ordnance (UXO) screening assessment, to provide an indication on the likelihood of UXO being present beneath the site;

- Development of a Conceptual Site Model and preparation of a Preliminary Risk Assessment in line with UK regulatory guidance; and
- Determination of any potential constraints that may affect the development of the proposed scheme.

1.4 Reliability of Information / Limitations

Arcadis warrants that the services performed were conducted in a competent and professional manner in accordance with sound consulting practices and procedures.

Arcadis cannot warrant the actual property conditions described in this report beyond matters amenable to confirmation within the limits of this report. The reader is referred to the Study Limitations, presented in Appendix A.

2 Site Setting

2.1 Site Location

The site is located to the west of the village of Cefn-mawr, approximately 7 miles southwest of Wrexham. The site is to the south of the A539, north of the A5 and centered around National Grid Reference 327502 342529. A site location plan is presented in Figure 2-1 below.

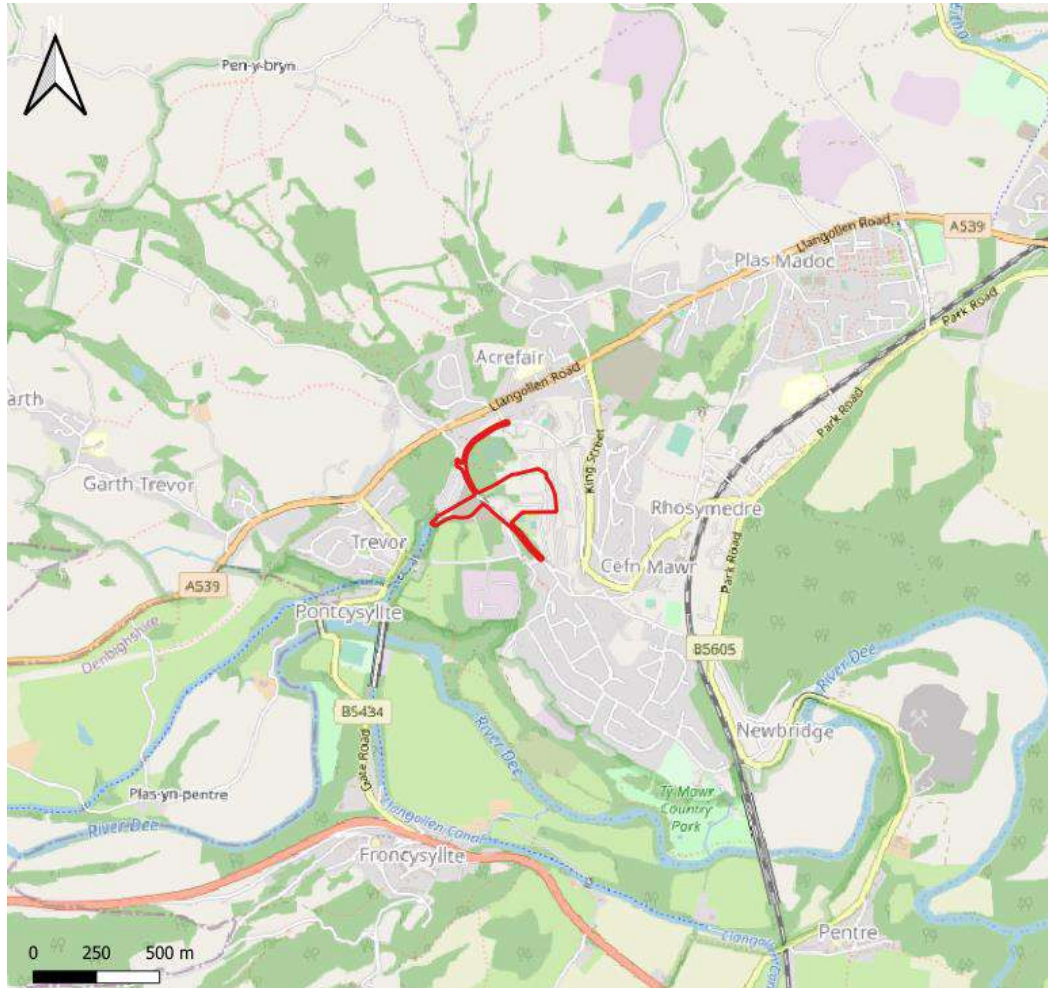


Figure 2-1: Site Location Plan © OpenStreetMap

The site is approximately 5.9 hectares and comprises an area of highway known as Queen Street, with parcels of land to the east and west of the carriageway. For the purpose of this report the site is considered to comprise three distinct areas, with Area A to the west of Queen Street, Area B to the east of Queen Street, and Area C comprising the road itself. Figure 2-2 below shows the current site layout and indicative area locations.



Figure 2-2: Site Layout & Indicative Site Areas © Google Maps 2022

2.2 Site Description

2.2.1 Walkover

A site walkover was completed by Arcadis in February 2023 and was primarily focused on the Area B section of the site as shown in Figure 2-2 above. Representative photographs have been included in Appendix B.

The walkover identified the site to be predominantly covered in hardstanding in the form of concrete and macadam, with areas of scrub vegetation and mature / semi-mature trees (birch and conifers). No structures were identified during the walkover; however, traces of former industrial uses such as tank bases, concrete loading bay areas, and services (drainage and sewerage) were noted across the site. Large areas of the site have been benched into the surrounding landscape to create level platforms which are assumed to have been used for car parking or former industrial processing areas. A visual assessment of the site appears to show that above ground demolition has taken place on the site, but it is likely that any subsurface features or structures will remain in-situ.

Visual evidence of gross contamination was not noted during the walkover.

2.2.2 Topography

The site generally slopes from the north to the south from approximately 104 meters above ordnance datum (m AOD) to approximately 81m AOD. The highest and lowest points on the site are found in Area C, which predominantly comprises Queen Street.

Topographic survey of Area A was limited by areas of dense vegetation, however, in general was found to slope from west (approximately 95.5m AOD) to east (approximately 87.5m AOD), the lowest areas of the site being adjacent to Area C.

Area B was generally found to slope from the northeast (approximately 95.5m AOD) to the southwest (approximately 87.5m AOD), with the lowest area relating to the underpass adjacent to Area C. Large sections of Area B have been benched and levelled, these are assumed to be former car parking or industrial processing areas.

2.2.3 Access

Access to the site is off Queen Street, which makes up the majority of Area C, with Areas A and B accessed through gates adjacent to the car park found in the approximate centre of the site (east of Area C). The site is partly secured by palisade fencing; however, it is unlikely that the barriers would be sufficient to restrict all public access to the site. It should be noted that access to Area A is via an underpass with a height restriction of 4.6m.

2.3 Surrounding Land Use

The current surrounding land uses to the site are as follows. All directions are relative to areas A and B:

- North – The current Pontcysyllte Aqueduct car park and the Cefn cemetery, with the A539 and residential properties beyond.
- East – Disused former industrial land comprising roads, concrete slabs and remnant structures, with residential housing beyond.
- South – Area of mixed agricultural land and residential housing, with a sewage treatment plant beyond.
- West – The Trevor Basin of the Llangollen Canal, with residential properties beyond.

3 Site History

3.1 On-site History

Based on a review of historical maps provided by Groundsure (presented in Appendix C) and historical imagery provided on Google Earth the site history is summarised below. The summary does not intend to detail the full history of the site, however just those features which may have led to contamination or geotechnical issues/impacts.

Table 3-1: On-Site History

Year	On-Site History		
	Area A	Area B	Area C
1873-1875	Canal running northeast to southwest through the area. Some unnamed buildings present adjacent to the canal to the northeast of the area. Railway tracks and a railway depot found on the southwestern boundary of the area.	Plas-Kynaston Chemical works found to the east of the area. Unnamed buildings to the west of the area, assumed to be residential. Canal running along northern and eastern boundary, with a canal basin found to the northeast. An old shaft noted at the south-eastern boundary. Tref-y-nant brook runs through the west of the area, flowing northwest to southeast. Area noted to be marshy to the west.	Northern section of the area is shown to have tracks running east to west (later noted to be a tramway). Some unnamed buildings found to the northwest and central sections of the area. The south of the area crosses undeveloped land and the Tref-y-nant brook. The ground is noted to be marshy.
	Potential contamination sources: Made Ground associated with unnamed buildings. Railway tracks/sidings and depot.	Potential contamination sources: Chemical works. Former coal shafts. Made Ground associated with unnamed buildings.	Potential contamination sources: Tramway tracks. Made Ground associated with unnamed buildings.
1898-1899	Unnamed building now listed as an <i>old kiln</i>. The railway tracks crossing the western section of the site are no longer mapped.	Some expansion to the chemical works. An old shaft is noted towards the centre of the area.	One of the previously unnamed buildings now mapped as an old limekiln.
	Potential contamination sources: Former kiln.	Potential contamination sources: Expansion of chemical works. Former coal shafts.	Potential contamination sources: Former limekiln.
1959-1963	Canal has been partially backfilled at the east of the area. Un-named building has been constructed on former footprint of the canal.	Whole area is now classed as <i>works</i>, with an expansion of industrial buildings associated with the chemical works including pipework and tanks.	The tramlines to the north of the area are no longer mapped. By 1963 the southern end of Area C is mapped as a road,

Year	On-Site History		
	Area A	Area B	Area C
		The canal and canal-basin at the east and northeast of the area have now been backfilled.	following the present-day layout.
	Potential contamination sources: Made Ground associated with infilled canal. Made Ground associated with unnamed building.	Potential contamination sources: Expansion of chemical works. Made Ground associated with infilled canal.	Potential contamination sources: Made Ground associated with construction of new road across marshy land.
1977	Canal is now completely backfilled in the area.	Canal now almost completely backfilled except for a small area of water in the northwest of the area.	No significant change.
	Potential contamination sources: Made Ground associated with infilled canal.	Potential contamination sources: Made Ground associated with infilled canal.	Potential contamination sources: N/A
1985	No significant change	The brook running through the area has been diverted and appears to run along the boundary of Area B and Area C.	No significant change.
	Potential contamination sources: N/A	Potential contamination sources: Made Ground associated with infilled brook.	Potential contamination sources: N/A
2006-2010 (Google Earth imagery)	The east of the area appears to be used as a car and lorry park for nearby industries. By 2010 the unnamed structure has been removed.	No significant change.	No significant change.
	Potential contamination sources: Car and lorry park.	Potential contamination sources: N/A	Potential contamination sources: N/A
2016	Appears to be unused land.	Former chemical works now demolished with remnant concrete pads and roads remaining in place. No structures are mapped on the site.	No significant change.
	Potential contamination sources: N/A	Potential contamination sources: N/A	Potential contamination sources: N/A

3.2 Anecdotal Site History

Unverified information regarding the history of the chemical works (Area B) has been found through internet research. The available information suggests the works originally developed paraffin oils and waxes using by-products of the local mining industry, before expanding to develop Creosote (Coal Tar) and Phenol (Carbolic Acid). It is understood that the works was the world's largest producer of phenol c.1919. Following a change of

ownership, the factory was then used to produce Vanillin, Salicylic Acid and Aspirin for the food, drink and pharmaceutical industries. Later, the factory was again repurposed for the development of rubber products and included the process of sulphur vulcanization.

3.3 Potentially Contaminative History of the Surrounding Area

Based on historical maps provided by Groundsure (presented in Appendix C) the pertinent history of the area surrounding the site is summarised below.

Table 3-2: Off-Site History

Year	Details
1873-1875	The surrounding area is predominantly agricultural to the north, west and south, with a residential area to the east and southeast. Tracks (railway/tramway) are noted running adjacent to the northern boundary of Area C, and the western boundary of Area A. To the west of Area A some of the tracks terminate at the canal basin adjacent to unnamed buildings assumed to be depots. The canal adjacent to the western boundary of Area A extends to the south. A fire clay works, mine shaft, and associated tracks are mapped approximately 50m northwest of Area C. A burial ground is noted at the north of the site, adjacent to the boundary of Area C. The Plas-kynaston (Iron) Foundry is mapped 50m northeast of the Area B (approximately 100m south of Area C), with a gas works and gasometer beyond approximately 200m to the northeast. A pottery is mapped to the south of the site approximately 30m east of Area C (100m south of Area B). Two <i>old shafts</i> are noted adjacent to the boundary of Area C, at the south of the site. Residential properties are found to the south of Area C. Potential contamination sources: Railway/tramway, fireclay works, cemetery, iron foundry, chemical works, pottery, coal mining.
1898	The tracks have been expanded at the north of the site and now connect to shafts found approximately 100m east of Area C (250m north of Area B). Additional shafts, air shafts and old shafts are now mapped 250m to the northeast of Area B. The foundry and chemical works to the north and northeast of Area B have expanded. The pottery to the east of Area C is now noted to be disused. Two quarries and one old quarry are mapped approximately 400m to the east and northeast of the site. Potential contamination sources: Railway, coal mining, chemical works, foundry.
1910	Increased urbanisation to the north and east of the site. An old lime kiln is noted adjacent to the northern boundary of Area B and eastern boundary of Area C. Only one quarry is noted as active 400m east of Area B. Potential contamination sources: Lime kiln.

Year	Details
1949	Increased urbanisation in all areas, with some agricultural land remaining to the west of the site. The foundry to the northeast of Area B has been incorporated into the chemical works, which has expanded to cover a large area from the northeast to the southeast of the site. The gas works to the northeast is no longer mapped and has been replaced with industrial buildings possibly associated with the chemical works. A sewage works is noted 200m southwest of Area C (400m southeast of Area C). Potential contamination sources: Chemical works, sewage works.
1960	An unnamed industrial building has been constructed adjacent to the northern boundary of Area A, and western boundary of Area C. The fireclay works to the northwest of the site are now just listed as works. The sewage works to the southwest of Area C has now expanded to within 100m of the site boundary. Large scale residential development approximately 400m west of the site. Potential contamination sources: Industrial process from unnamed building, sewage works.
1977	The former fireclay works to the northwest of the site is no longer mapped. A cemetery is mapped 50m to the north of Area B, and 50m to the south and east of Area C. The quarry 400m east of the site is now noted to be disused. Potential contamination sources: Cemetery.
1985 - 2010	No significant changes. Potential contamination sources: N/A
2022	The buildings associated with the chemical works have been demolished. Potential contamination sources: Made Ground from demolition processes.

4 Environmental Setting

4.1 Geology

The regional geological information pertaining to the site was gained from a review of the BGS 1:50,000 scale map (Wrexham, Sheet 121, 1993), BGS online GeoIndex website, a site-specific Groundsure Insight report (Appendix E) and a consultant's coal mining report (Appendix D). This was supplemented where possible by archived borehole records available through the BGS GeoIndex (Appendix E).

Table 4-1: Summary of Published Geology

Unit	Published Information	Borehole Record Information
Superficial Deposits		
Artificial	Published records do not indicate the presence of any artificial ground on the site, however Made Ground is likely to be present given the development history of the site.	No boreholes present within close proximity which would accurately represent any Made Ground present on the site.
Superficial	Devensian Till – characterised by a mixture of sediment sizes from clay-boulders which vary in shape and size.	Twelve records (SJ24SE676 - SJ24SE687) are mapped within the Till deposits approx. 330m NE of Area B. All holes were completed using rotary open hole methods in 2007. All recorded the Till as a firm to stiff yellow brown and grey silty CLAY, to a maximum depth of 6.9m bgl (no elevation of the boreholes in m AOD available).
Bedrock		
Bedrock	Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures (Undifferentiated) (PLMC) - interbedded mudstone, siltstone and sandstone, commonly with coal seams.	Twelve records (SJ24SE676 - SJ24SE687) are mapped within the PLMC deposits approx. 330-340m northeast of Area B. Eleven were terminated at 30m bgl, with one extended to 34 m bgl (SJ24SE676). The eleven boreholes terminated at 30m bgl identified mudstone from 4-6.9 m bgl to the base of the holes at 30 m bgl. All identified a single band of coal (ranging in thickness from 0.15-0.2m) at depths between 14.6-16.65 m bgl. SJ24SE676 was extended to 34m bgl. This hole identified mudstone to 32m bgl, with two bands of coal at 16.5 m bgl (0.15m thick) and 31.5m bgl (0.25m thick). Sandstone was identified at 32m bgl to the base of the hole at 34m bgl. SJ24SE5B (~400m northeast of Area B) is mapped within the PLMC deposits and shows a section through Engine Pit in Caegle Colliery. The section identifies 15 coal seams at depths ranging from 0.91-171.6 m bgl. Four records (SJ24SE498- SJ24SE501) are mapped 380-390m southwest of Area A. All were completed in 1989 and drilled using rotary techniques. All found variable bands of sandstone /

Unit	Published Information	Borehole Record Information
		siltstone / mudstone to a maximum depth of 23.1m bgl. Coal bands were identified in SJ24SE498 at 4.3m bgl (0.47m thick) and SJ24SE501 at 1.36 and 19.94m bgl (0.39m and 0.16m thick respectively).
Coal seams	Three coal seams are mapped as sub cropping beneath the site. One seam is mapped to the west of Area A (Wall and Bench Seam), one through the central section of Area B and southern section of Area C (Ruabon Yard Seam), and the third through the east of Area B (Stone Seam).	
Faults	A fault trending northwest to southeast crosses Area C within the north of the site. A second fault trending northeast to southwest lies just beyond the southern boundary of the site, and is mapped 10m southeast of Area C, and 60m SE of Area B at its closest point. No indication of the fault displacement is mapped for either fault.	

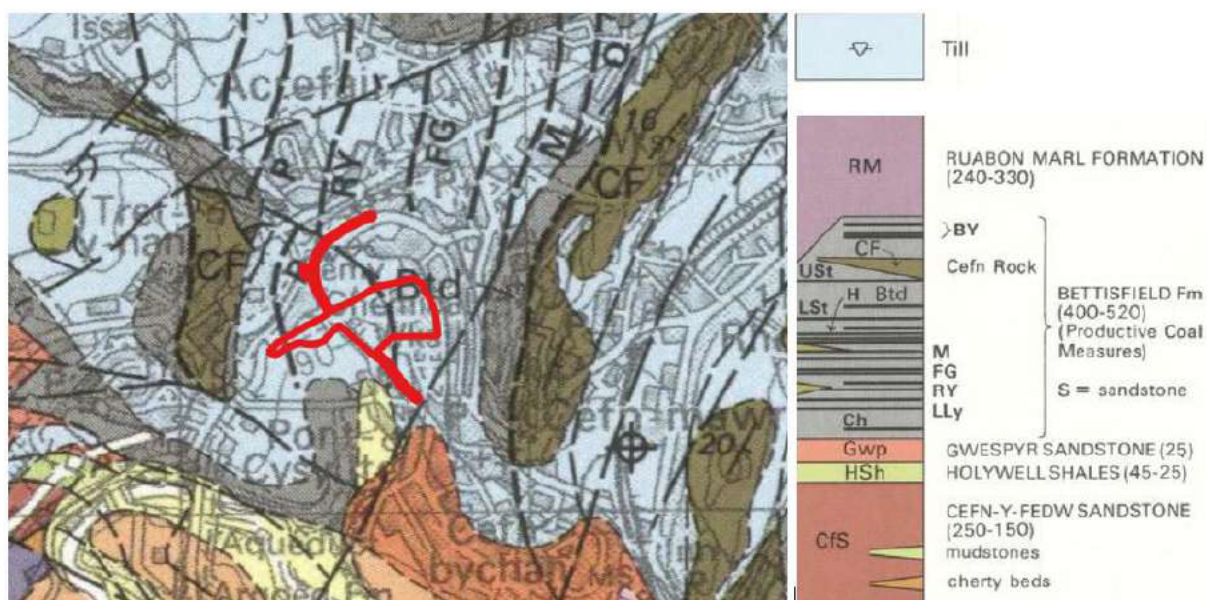


Figure 4-1: Map of Published Geology. Extract of BGS 1:50,000 Series, Sheet 121, Wrexham, Solid and Drift Geology, 1993

Light Blue – Till, Grey - Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures (Undifferentiated) (PLMC). Thin Dashed Line – fault. Thick dashed line – coal outcrop.

4.2 Radon Affected Areas

Review of the Indicative Radon Map of the UK shows that some parts of the searched 1km grid square are in bands of the highest radon potential (greater than 30%).

The Groundsure report, accurate to 50m suggests that the majority of the site lies in an area where between 3-5% of dwellings present would exceed the Radon Action Level. A small area at the southeast of Area C lies within an area where between 5-10% of dwellings would exceed the Radon Action Level.

The reported radon values are obtained from sources relevant to residential properties, however, the Health and Safety Executive guidance for radon in the workplace advises that the values are also indicative of the likely extent of the local radon hazard in all buildings, including workplaces and other enclosed structures.

Any new enclosed structures built on the site will likely require basic radon protection.

4.3 Ground Stability Issues

The Groundsure report indicates the following with regards to ground stability issues:

- Negligible risk from ground dissolution of soluble rocks and compressible deposits.
- Very low risk from shrink swell clays, collapsible deposits and running sands.
- Very low to low risk from landslides.

The ground stability issues listed above do not account for areas of infilled or Made Ground. Historic plans show that significant areas of infilled ground may exist on the site in areas of former canals and brooks.

4.4 Mining Activity

The Groundsure report has identified the site as being within an area which may be affected by coal mining activity and the Coal Authority interactive map viewer shows approximately 50% of the site is located within a Development High Risk Area.

A Consultants Coal Mining Report has been obtained for the site and is presented in Appendix F. The report indicates three seams of coal outcrop on the site, all of which are noted to be workable.

Past underground mining has been recorded across multiple coal seams at variable depths beneath the site. These have been summarised in Table 4 below.

Table 4-2: Summary of Worked Coal Seams Beneath the Site

Seam	Depth (m bgl)	Dip rate of seam (degrees)	Dip direction of seam	Extraction Thickness (cm)	Year last worked	Seam Code
Stone	6	9	East	200	1860	LB025D
Nant (Soft 5 Qtrs)	10	9.5	East	160	1862	LC020D
Ruabon Yard (Soft 5 Qtrs)	11	9	East	110	1862	LD020D
Ruabon Yard (Soft 5 Qtrs)	17	9	East	110	1862	LD020D
Half Yard / Queen	26	9	East	50	1860	-
Wall and Bench	31	9	South-East	110	1860	KE060D
Wall and Bench	55	9	South-East	110	1860	KE060D

Wall and Bench	140	9	South-East	110	1860	KE060D
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Mine abandonment plans (dated 1949) were obtained from the Coal Authority for workings within four seams beneath the site, these are included in Appendix G. Figure 4-2 below shows the outlines of the recorded workings in relation to the site boundary. These plans are not comprehensive and other unrecorded workings may be present beneath the site.

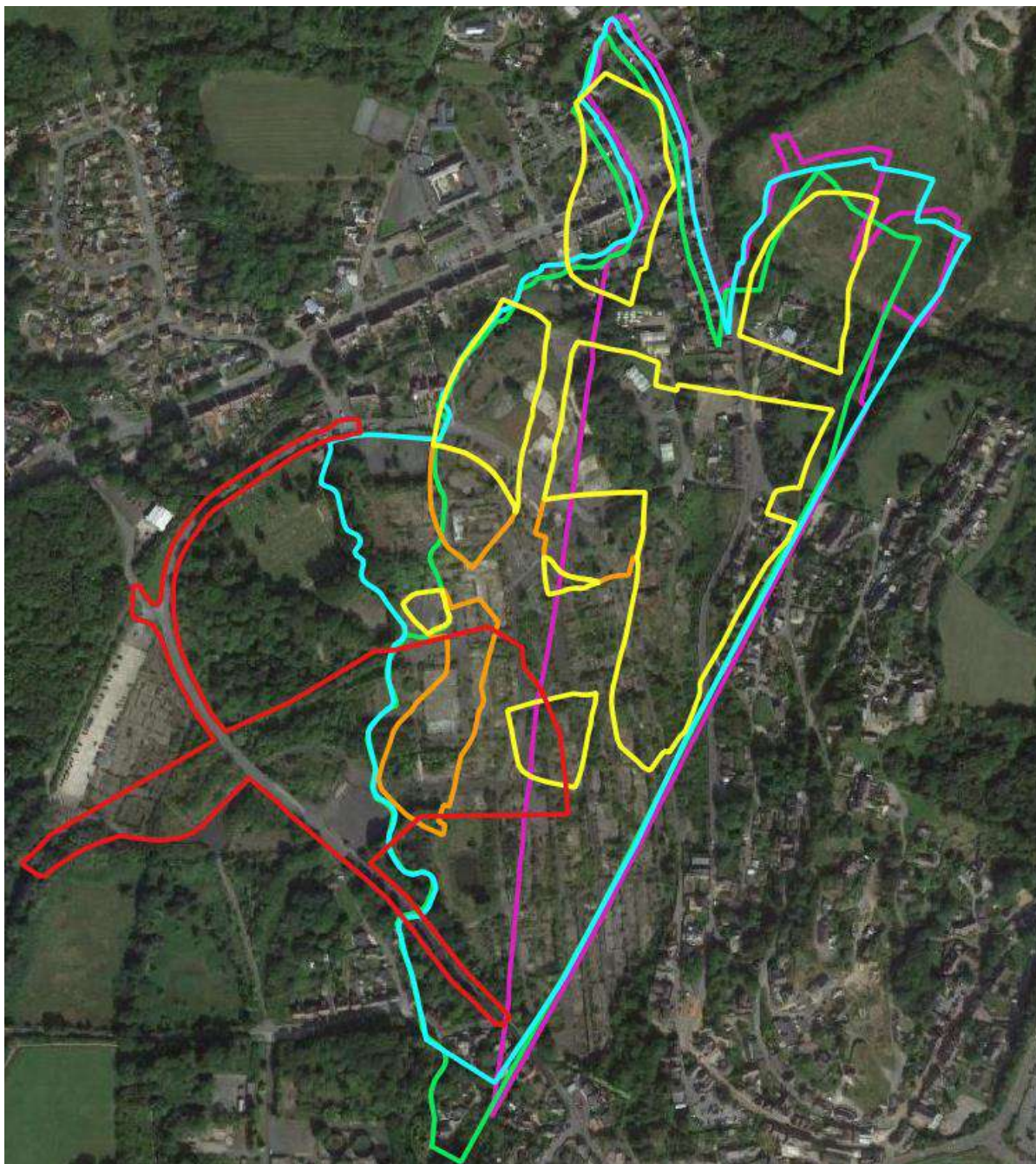


Figure 4-2: Recorded workings obtained from Coal Authority mine abandonment plans © Google Maps 2022

Red Line – site boundary, Pink Line – recorded workings of Stone coal seam, Green Line – recorded workings of Ruabon coal seam, Yellow and Orange Lines – recorded workings of Wall and Bench coal seam

No additional information regarding the coal seams or the workings were included within the mine abandonment plans.

The coal mining report also suggests that there are probable unrecorded workings (shallow and moderate depths) beneath the site. The Coal Authority viewer shows these areas to include the remaining sections of the site outside of the area of recorded workings as shown in Figure 4-2.

The report provides details of 46 mine entries within 100m of the site boundary. The location of these are shown on the Coal Authority plan of the area included in Appendix F. Of these, 5 are noted to be within the site boundary and a further 8 are shown to be within 20m of the site. These are summarised in the table below.

Table 4-3: Summary of Mine Entries Recorded Within the Site Boundary

Shaft reference	Recorded Shaft Depth (m)	Shaft Name	Treatment Details
On-site			
327342-229	36.58	Canal Pit	-
327342-303	26.52	No.7 Pit	-
327342-432	-	North Wales	-
327342-504	-	North Wales	-
327342-505	-	North Wales	-
Within 20m			
327342-458	-	Plas Kynaston Colliery No.3 Shaft	-
327342-230	-	North Wales	-
327342-559	-	North Wales	-
327342-400	-	North Wales	-
327342-562	-	North Wales	-
327342-305	21.03	Plas Kynaston Colliery Kiln Pit No.1 Shaft	The Coal Board agreed to fill this shaft in December 1955 but there is no record to say if this was carried out.
327342-306	21.03	Kiln Pit	-
327342-235	23.77	Wood or Dolydd Pit	Covered during October 1977 using a 4.57m square concrete cap incorporating 12m ³ of concrete with 2 x 3.66m RSJs and wire mesh reinforcement.

There are no details relating to remediation or capping of the on-site coal shafts within the Coal Authority information. Although there has been subsequent development in the areas of these pits, there is no evidence to show that they have been suitably remediated. There remains a potential risk of collapse of abandoned mine shafts in these areas.

The Coal Authority report states that there are no records of mine gas emissions within 500m of the site boundary and the Coal Authority has not received a damage notice or subsidence claim for any property within 50m of the site boundary.

Given there are several shallow coal seams beneath the site which are recorded to have been worked extensively in the past, shallow voiding is likely to be present in the ground. Additionally, there are several mine entries onsite and within the immediate vicinity of the site boundary for which no treatment details are available. Given the dates the seams were last worked (1860-1862) and considering the development that has taken place on the site in the intervening time, the risks from these voids may have previously been mitigated, however, there are no available records to confirm this.

Intrusive ground investigation will be required to confirm the presence and extent of any shallow voiding beneath the site, and to investigate the location of the mine entries recorded onsite.

5 Hydrogeology and Groundwater Vulnerability

5.1 Aquifer Classification

The Groundsure report indicates that the superficial deposits are classed as a Secondary Undifferentiated Aquifer, where a designation of Secondary A or B was not possible due to the variable characteristics of the ground. The deposits, generally, could be considered a non-aquifer, or may be able to support water supplies at a local scale.

The bedrock geology is classified as a Secondary A Aquifer. Generally, these comprise 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.

5.2 Groundwater Vulnerability

An assessment of the vulnerability of the groundwater beneath the site to a pollutant discharged at ground level is presented in the Groundsure report.

Groundwater vulnerability at the site has been assessed as Medium, characterised by the presence of a secondary bedrock aquifer with well-connected fractures and overlying superficial strata.

5.3 Groundwater Abstraction

The Groundsure report did not identify any groundwater abstractions within 1km of the site boundary.

5.4 Source Protection Zones

The site does not lie within 500m of a groundwater Source Protection Zone (SPZ).

6 Hydrology

6.1 Surface Water Features

The Groundsure report indicates that the Tref-y-nant Brook crosses through the site (Areas B and C) flowing from north to south. The brook exits the site and travels adjacent to the western boundary of Area C flowing south.

Two unnamed narrow (<5m in width) water features are found to the north of Area B, and feed into the Tref-y-nant Brook on the northern boundary of Area B.

Two water bodies (pond like features) are found 10m and 30m south of Area B (30m and 70m east of Area C).

Trevor Basin, which is part of the Llangollen Canal is present adjacent to the western boundary of Area A. The Canal flows away from this point to the southwest.

The River Dee is found 460m south of the site at its closest point and flows from west to east.

6.2 Surface Water Body Catchments

The site lies within catchment areas for two surface water bodies which feed into the River Dee.

6.3 Flooding Risk

The Groundsure report indicates that the site is in Flood Zone 1 and is not at risk of flooding from rivers and sea. Offsite areas adjacent to the southern boundary of Area C and northern boundary of Area B are indicated to be within Flood Zone 3. These are associated with the Tref-y-nant Brook.

The area where the Tref-y-nant Brook crosses the site is considered to be at high risk of surface water flooding. The highest risk on site is flooding greater than 1m in depth as a result of a 1 in 30-year extreme rainfall event.

6.4 Surface Water Abstraction

The Groundsure report did not identify any surface water abstractions within 1km of the site boundary.

6.5 Discharge Consents

The Groundsure report includes six active records of licensed discharges to controlled waters within 500m of the site. One of these is located within the site boundary and relates to the discharge from a sewer storm overflow into the Tref-y-nant Brook.

Two additional consents for discharges from sewer storm overflows into the Tref-y-nant Brook are found 47m northwest and 55m southwest of the site.

Although no licensed discharge consent is indicated within the Groundsure report, authorised discharges of substances including iron, zinc, toluene and xylene are noted from the Ruabon Works.

6.6 Pollution Incidents

The Groundsure report includes records of 25 substantiated pollution incidents since 2001 within 500m of the site. Of these 23 were considered to have a minor or no impact to the environment (water, land or air).

Two incidents 233m south and 445m southwest of the site, related to the discharge of non-identified pollutants, were considered to have a significant impact on water and land respectively.

7 Additional Considerations

7.1 Landfills and Waste Management Activities

The Groundsure report did not identify any active or recent landfills within 500m of the site. There are six Natural Resources Wales records of historical landfills and one further record from BGS mapping within 500m of the site.

The closest historical landfill is recorded 16m west of the site (Area C) and relates to the disposal of inert, industrial and household waste at the Edwards Brickyard. The licence for this landfill was active between 1989 and 1995. Additional records are found at distances greater than 150m from the site.

One historical waste site record has been identified within 500m of the site, located 83m to the east. This relates to a waste transfer station including storage of hazardous substances.

Two waste exemption records are recorded within 500m of the site, located 314m to the south and 322m to the northeast. Both relate to the use of waste in construction.

7.2 Current Industrial Land Use

The Groundsure report indicates there are ten potentially active contaminative industrial sites within 250m of the study site, with no current records identified on-site. Offsite records relate to a variety of activities including disused mining shafts, recycling services, electricity sub-stations and manufacture of industrial products. It should be noted that although the Groundsure did not identify former mine shafts on site, these have been reported by the Coal Authority.

There are no open petrol filling stations within 500m of the site. However, an obsolete petrol station is recorded 211m northeast of the site.

The site is recorded as a historical Control of Major Accident Hazards (COMAH) site, relating to its former use as the Ruabon Chemical Works.

A historic consent was held at the site for the use and storage (up to 37 tonnes) of hazardous substances classified as very toxic. No associated enforcements relating to this consent were noted. A further two consents were recorded within 500m of the site located 29m to the southeast and 133m to the east. No enforcement was recorded for either consent.

Five permits relating to the release of substances into the environment are active for the Ruabon Chemical works which incorporates all of Area B. These all relate to the disposal of non-hazardous waste which has undergone physio-chemical treatment. One of the permits is noted as active as of June 2022.

The site is not designated as Contaminated Land under Part 2a of the Environmental Protection Act 1990.

One record of a historical licensed pollutant release (Part A(2)/B) has been noted within 500m of the site. The pollutant release is listed 95m to the east of the site and is associated with the Ruabon Chemical Works. It should be noted that the works extended across Area B. The pollutant release is associated with the use organic chemicals, chemical & acid processes. Enforcement relating to this was undertaken in 2006.

7.3 Environmental Designations

The Groundsure report identified two Sites of Special Scientific Interest (SSSI) within 1km of the site boundary at 439m and 618m to the southwest. Both areas are associated with the River Dee.

One Special Area of Conservation (SAC) has been identified within the Groundsure report. This is located 439m southwest of the site and is associated with the River Dee and Bala Lake.

The Groundsure report identifies twenty-six areas of designated ancient woodland within 1km of the site. These areas are noted to be a mix of restored ancient woodland sites, ancient semi-natural woodland, and plantations on ancient woodland sites. The area closest to the site is found 216m to the northwest.

7.4 Visual and Cultural Designations

As the development relates to infrastructure associated with the Pontcysyllte Aqueduct and Canal World Heritage Site it would be expected that the site may fall within areas with additional protections for the conservation of the WHS. These have been summarised below:

The site is within the Pontcysyllte Aqueduct and Canal buffer zone as designated by Historic England, and the Pontcysyllte Aqueduct and Canal essential setting as designated by CADW (Welsh governing body).

A small section of the site (westernmost section of Area A) which connects the site to the Trevor Basin lies within a conservation area and Area of Outstanding Natural Beauty. This section of the site is also considered to lie within the boundary of the Pontcysyllte Aqueduct and Canal as designated by CADW and Historic England.

Four listed buildings are located 155-168m to the south-west of the site boundary.

7.5 Invasive Plants and Species

A Preliminary Ecological Appraisal completed by Arcadis (10054502-AUK-XX-XX-RP-GE-3-1) indicates the presence of non-native invasive plants species on the site, including Japanese Knotweed.

7.6 Unexploded Ordnance Screening Assessment

The Zetica UXO Risk Map identifies the site as located within an area of low risk from UXO. Records relating to identification of a UXO are present approximately 300m southwest of the site. A copy of the Risk Map is presented in Appendix H.

8 Preliminary Conceptual Site Model

8.1 Introduction

This section summarises the findings of this desk-based assessment and site reconnaissance in the form of a geo-environmental conceptual site model (CSM).

The CSM provides a qualitative evaluation of potentially active “pollutant linkages” at the site; these being plausible scenarios whereby a contamination source is connected to a possible receptor by one or more pathways:

- Potential sources of contamination: these include any actual or potentially contaminating materials and activities, located either on or near the site;
- Potential pathways for contamination migration: these comprise the routes or mechanisms by which contaminants may migrate from the source to the receptor including environmental migration pathways and human health exposure pathways; and
- Potential receptors of contamination including present and/or future land users, ecological systems, water resources and property.

8.2 Potential Contamination Sources

Table 8-1: Potential Sources of Contamination

Source	Potential Contaminants of Concern
On-site	
Multiple areas of infilled ground (canal, brook etc.) (Area A, Area B and Area C)	Metals, Polycyclic Aromatic Hydrocarbons (PAHs), sulphate, asbestos, Total Petroleum Hydrocarbons (TPH) Ground Gas – potentially elevated due to buried organic sediments from the former canal / brook / marshy ground. Further potential risks of ground gas from potential contamination within the Made Ground.
Coal Mining Industry (Area A, Area B and Area C)	TPH, metals, PAH Ground Gas – from historical mines
Railway/ tramway (Area A and Area C)	Fuel oils, PAH, solvents, sulphate, metals
Kiln / lime kiln (Area A and Area C)	PAH
Car and lorry park (Area A)	Fuel oils, PAH, TPH
Former chemical works (Area B)	Metals, PAH, Fuel oils, solvents, sulphate, TPH, creosote, phenol, Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), sulphur, Polychlorinated Biphenyls (PCB's). Ground gas – from contamination resulting from spills

Source	Potential Contaminants of Concern
Off-site	
Coal Mining Industry	Hydrocarbons, metals, ground gas.
Various works, pottery and iron foundry	Metals, PAH, hydrocarbons, solvents, phosphates, sulphates, sulphides, cyanides, creosote, fuel oils, PCB's.
Gas works	PAH, TPH, VOC, SVOC, Fuel oils, sulphates, sulphides, cyanide sulphur, metals, asbestos
Chemical works	Metals, PAH, Fuel oils, solvents, sulphate, TPH, creosote, phenol, VOCs, sulphur, PCB's
Railway Land	Fuel oils, PAH, solvents, sulphate, metals.
Sewage Works	Metals, inorganics, asbestos, hazardous gas generation in buried sludge.
Landfill	Metals, PAHs, sulphate, asbestos, Total Petroleum Hydrocarbons Hazardous gas generation from contamination and organic materials in landfill.
Cemetery	Hazardous gas from organic materials

8.3 Contamination Pathways

Potential migration pathways based on the sites perceived current condition and the proposed car / coach park with associated infrastructure and soft landscaping.

8.3.1 Airborne Migration Pathways

Airborne pathways via which particulate and/or vaporised ground contaminants can migrate to sensitive receptors within soil (air pores), and the above ground atmosphere:

- Significant hard standing is anticipated with the development of the car/ coach park; however, it is understood that any development may incorporate areas of soft landscaping with footpaths and cycle ways which may be used by the general public for leisure activities. As such, particulate inhalation due to dust generation is a potentially active pathway.
- Vapour inhalation pathways in relation to soil are potentially active irrespective of site status. A vapour inhalation pathway in relation to isolated / perched groundwater may be potentially active if a shallow groundwater body with significant contamination is identified during intrusive investigation.
- Vertical migration of permanent ground gases (CO₂, CH₄, O₂), including those generated by potential soil/groundwater contamination from on and off-site sources, and potentially buried organic sediments, would only be considered potentially active if future development includes areas of enclosed spaces. Accumulation of ground gases in confined spaces leading to asphyxiation and/or explosion could then be plausible. It is understood that there are currently no enclosed structures planned as part of this development.

8.3.2 Direct Contact Exposure Pathways

Pathways via which ground contaminants can migrate to human receptors by ingestion and/or absorption:

- The majority of the total site area will be covered in hardstanding. However, areas of soft landscaping and vegetation may be included, with potential for the creation of seating, rest areas and leisure areas. As such, direct contact pathways with the soil are considered active.
- Any services, ducts, or new infrastructure may be placed within Made Ground deposits that could have aggressive properties.
- A direct contact pathway in relation to isolated / perched groundwater may be potentially active if a shallow groundwater body is identified during intrusive investigation. This would primarily effect infrastructure.

8.3.3 Aqueous Migration Pathways

Pathways via which ground contaminants can migrate to controlled water receptors:

- Leaching of contaminants in the shallow soils may occur as a result of infiltration of rainfall through areas not capped with hardstanding, prompting the migration of any dissolved-phase contamination. As such this pathway is considered potentially active.
- Lateral migration of potential on-site contamination is considered active, as groundwater within the Bedrock is considered likely mobile. It is unknown whether a shallow groundwater table exists and what its viability is as a medium for transport of contamination.
- Contaminant migration via surface water runoff into on-site surface water receptors would be plausible if contaminated soils are exposed at the surface.

8.4 Contamination Receptors

With reference to Part 2a of the Environmental Protection Act (1990), the potential receptors to be considered in any contaminated land scenario can be categorised as follows.

8.4.1 Human Health

Based on the proposed development of a car / coach park with infrastructure including updated roads, cycleways and footpaths, the primary receptors of concern with regards to contamination risk are considered to be future recreational users of the site (including visitors to the WHS) and construction workers.

Users of nearby buildings (neighbouring residents) could also be at risk from ground gasses. However, for exposure to occur, active cross-boundary migration pathways would be required. It should be noted that the site is within a wider area of historical development, and any potential contamination identified on the site is likely to be found in the surrounding areas to the same, or greater extent.

The CSM has been designed to consider the long term and sustained risks from the site. It does not account for the risks to short term exposure scenarios, such as construction workers. It is assumed that all construction works will be completed under appropriately robust risk and method statements, with sufficient controls to protect workers from any site risks. Construction works have not been considered further within this assessment.

8.4.2 Infrastructure (Pathways, Carriageways, Landscaping etc)

The proposed development will include infrastructure, the concrete of which could be subject to potential sulphate attack (naturally occurring or originating from contamination).

8.4.3 Controlled Waters

Groundwater beneath the site requires consideration and protection. The superficial deposits beneath the site are classified as a Secondary Undifferentiated Aquifer, while the Bedrock strata is classified as a Secondary A Aquifer. Therefore, there is potential for mobility both laterally and vertically and groundwater resources are considered to potentially be at risk from contamination originating on-site or off-site.

A brook flows through the site, and adjacent to the site boundary, flowing towards the River Dee. Additionally, the Trevor Basin of the Llangollen Canal is found adjacent to the western site boundary. Surface water features are classified as controlled water receptors and therefore these are considered potential receptors.

8.5 Preliminary Qualitative Risk Assessment

Based on the CSM the following table presents the plausible Source-Pollutant-Receptor (SPR) linkages that apply to this site, including the likelihood of risk to receptor.

Table 8-2: Preliminary Conceptual Site Model

Potential Receptor	Potential Source	Potential Pathway	Risk
Future End-Users Recreational Site Users / visitors to the WHS / neighbouring residents	On-Site Sources Infilled ground, historic coal mining activity, railway / tramways, historical kilns, car / lorry park and former chemical works	Dermal Contact & Ingestion Particulate/Fibre Inhalation	Moderate - High
	Off-Site Sources Historical coal mining activity, railway infrastructure, historical foundry, historical chemical works, landfill, cemetery, sewage works and other works	Particulate/Fibre Inhalation Vapour Inhalation	Low - Moderate
	Permanent Ground Gas / Vapor Historic mining, contamination in the Made Ground, and possible buried organic sediments from infilling of canal / brook.	Vapour Inhalation	Low
Controlled Waters On-site and off-site surface water bodies (Llangollen canal and the Tref-y-nant brook) Groundwater in underlying aquifers	Made Ground Historical Spills Other On-Site Sources	Soil Leaching / Aqueous Migration (vertically and laterally) / Surface Water Run-off	Moderate - High
Infrastructure Footpaths, cycle paths, roadways	Sulphate impacted soil and groundwater	Chemical Attack	Moderate
	Ground Gas	Structural Damage due to explosion of combustible gas	Low (no enclosed structures planned)

*Based on a carpark/coach park Land-use Scenario with associated infrastructure, footpaths, cycleways, and areas of soft landscaping. This risk assessment is developed considering no mitigation/remediation measures.

8.6 Overall Environmental Risk

In general, the preliminary risk for the site in the context of the potential future use of the site as a carpark / coach park with associated infrastructure, cycle ways and footpaths, is considered to be moderate; primarily due to:

- The sites development history suggests the presence of significant depths of Made Ground beneath the surface, which have the potential to host contamination from on-site and off-site industries;
- The potentially contaminative historical processes and associated contamination sources on-site; and
- The likelihood for viable/potentially active pathways for potential contamination to significantly affect the soil and groundwater (including migration within), and thereby impact upon receptors.

Near-surface and surface contaminants in areas of the site could impact upon construction workers during redevelopment groundworks activities, however it is envisaged that pre-commencement investigations/surveys, appropriate health and safety risk assessment and personal protective equipment would provide appropriate mitigation for acute exposure.

The preliminary risk to future end-users from potentially contaminated ground is considered moderate to high at this stage, given the redevelopment may include areas of soft landscaping and be designed for recreation purposes. The risk will ultimately depend on the extent and nature of the Made Ground and the level of contaminant present within site soils (to be investigated during a Phase II assessment).

Given the nature of the proposed development, the risk from permanent ground gas is considered low given the lack of confined spaces to allow hazardous ground gases to accumulate. Should the development of any structures be completed on the site in the future this risk will need to be reassessed.

The preliminary environmental risk posed by the site to controlled waters (surface water and groundwater) is considered moderate to high at this stage given the presence of potential historical on-site ground contamination sources and plausible migration pathways, including an on-site surface water feature.

Risks to property including chemical attack are considered moderate at this stage as the aggressivity of site soils is currently unknown. This will be mitigated by survey and design if required.

9 Other Development Constraints

9.1 Preliminary Geotechnical Appraisal

The following table summarises the potential geotechnical constraints associated with site and the further investigation required to address uncertainties.

Table 9-1: Preliminary Geotechnical Constraints

Constraint	Consequence	Further Investigations / Actions
Poor ground conditions	Significant depths of fill material are anticipated to be present on the site in areas where canals and the brook have been backfilled. Additional Made Ground may be present beneath the areas of former development. Any backfill is unlikely to have been systematically compacted during placement and there is the potential for settlement to occur. Differential settlement may also be a concern where development crosses areas of the former canal between the fill material and the surrounding area.	Intrusive investigation to determine near surface and deeper ground conditions.
Buried Structures	The presence of buried structures and/or piles associated with the former industrial site uses may impact development, adding both time and cost to reduce level excavations.	
Soft Spots	Historical mapping shows the site as being formally mapped as marshy and including a brook which has been rerouted. This may have led to localised areas of soft or extremely soft areas. Areas of very soft ground may require stabilization or ground improvement to restrict unacceptable levels of settlement and allow future development.	
Voids due to potential unrecorded shallow underground coal mining	Surface instability, subsidence / settlement due to potential collapse of shallow underground mine workings and onsite mine entries.	
Ground / groundwater aggressive to concrete	Risk of deterioration of below ground concrete and mortar, loss of structural integrity, reduction in design life.	As the aggressivity of the site soils is currently unknown this risk is considered moderate. Sampling and testing of soils and groundwater should be undertaken to determine aggressivity to concrete.

10 Conclusions and Recommendations

This Phase I report presents an assessment of the geo-environmental information pertaining to the site based on readily available desktop / published sources and a site reconnaissance walkover survey.

The objective of this assessment was to collate and review the available geo-environmental and geotechnical information to inform potential development constraints which may impact upon the proposed scheme to develop a new car and coach park, with associated infrastructure including roads, cycleways and footpaths.

10.1 Geo-Environmental Risks

From the review of the available site information, it is plausible that historical land-uses of the site may have generated contamination impacts to soil and/or groundwater. Potential contamination sources have been identified including a former chemical works, historical coal mining, former car/lorry park, lime kilns and historical railways. There are potentially active pollutant linkages between these sources and identified receptors. These risks should be investigated and further assessed by intrusive site investigation, appropriate sampling, analysis and risk assessment.

Under the redevelopment proposals, certain exposure pathways may remain active and therefore may require mitigation by management and design.

10.2 Geotechnical Risks

There is potential for shallow voiding beneath the site due to historical mine workings within several shallow coal seams. Several untreated mine entries are also recorded on the site. There is also the potential for poor ground conditions due to historic backfilling of canals and brooks previously running through the site. Intrusive ground investigation will be required to determine the near surface and deeper ground conditions.

10.3 Recommendations

Prior to any redevelopment of the site, intrusive investigations will be required to establish the nature of the ground conditions, identify any instability issues associated with potential shallow voiding / mine entries resulting from historical mining beneath the site, and the backfill of the former canal and brook, and to obtain development-specific geotechnical design parameters.

Potential pollutant linkages have also been identified which merit further investigation to characterise the ground conditions and therefore the investigation strategy should include an “environmental” investigation; designed to interrogate the Phase I CSM, establish the status of the identified Source-Pathway-Receptor linkages and thereby reduced uncertainties in the preliminary risk assessment.

Appendix A

Study Limitations

IMPORTANT. This appendix should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1 This report has been prepared by Arcadis Consulting (UK) Limited ('Arcadis'), with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with Wrexham County Borough Council (the 'Client'). Arcadis does not accept responsibility for any matters outside the agreed scope.

2 This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing. otherwise in writing. The contents of this report may not be used or relied upon by any person other than this party without the express written consent and authorisation of Arcadis.

3 Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Arcadis is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have unpublished, more stringent objectives. Further work may be required by these parties.

4 All work carried out in preparing this report has used, and is based on, Arcadis' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice, pending changes in legislation, of which Arcadis is aware, have been considered. Following delivery of the report, Arcadis has no obligation to advise the Client or any other party of such changes or their repercussions.

5 This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.

6 Whilst this report and the opinions made are correct to the best of Arcadis' belief, Arcadis cannot guarantee the accuracy or completeness of any information provided by third parties. provided by third parties. Arcadis has taken reasonable steps to ensure that the information sources used for this assessment provided accurate information, and has therefore assumed this to be the case.

7 This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have been received.

8 This report refers, within the limitations stated, to the condition of the site at the time of the inspection. No warranty is given as to the possibility of changes in the condition of the site since the time of the investigation.

9 The content of this report represents the professional opinion of experienced environmental consultants. Arcadis does not provide specialist legal or other professional advice. The advice of other professionals may be required.

10 Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the

discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.

11 If below ground intrusive investigations have been conducted as part of the scope, safe location of exploratory holes has been carried out with reference to the Arcadis ground disturbances procedure. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on site.

12 Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

13 Unless otherwise stated, an inspection of the site has not been undertaken and there may be conditions present at the site which have not been identified within the scope of this assessment.

14 Unless otherwise stated, samples from the site (soil, groundwater, building fabric or other samples) have not been obtained.

15 Arcadis has relied upon the accuracy of documents, oral information and other material and information provided by the Client and others, and Arcadis assumes no liability for the accuracy of such data, although in the event of apparent conflicts in information, Arcadis would highlight this and seek to resolve.

16 Unless otherwise stated, the scope of works has not included an environmental compliance review, health and safety compliance review, hazardous building materials assessment, interviews or contacting Local Authority, requests for information to the petroleum officer, sampling or analyses of soil, ground water, surface water, air or hazardous building materials or a chain of title review.

17 Unless otherwise stated, this assessment has considered the ongoing use of the site and has not been prepared for the purposes of redevelopment which may act as a trigger for site investigation and remediation works not needed for ongoing use.

IMPORTANT. This appendix should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

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2 This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing. otherwise in writing. The contents of this report may not be used or relied upon by any person other than this party without the express written consent and authorisation of Arcadis.

3 Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Arcadis is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have unpublished, more stringent objectives. Further work may be required by these parties.

4 All work carried out in preparing this report has used, and is based on, Arcadis' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice, pending changes in legislation, of which Arcadis is aware, have been considered. Following delivery of the report, Arcadis has no obligation to advise the Client or any other party of such changes or their repercussions.

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17 Unless otherwise stated, this assessment has considered the ongoing use of the site and has not been prepared for the purposes of redevelopment which may act as a trigger for site investigation and remediation works not needed for ongoing use.

Appendix B

Site Walkover Photo Log



Legend

-  Site Boundary
-  Photograph Locations

Notes

Symbols are indicative only and may not represent the exact location of the photography.

TITLE:		Walkover Photograph Location Plan	
SITE:		Pontcysyllte & Canal World Heritage Site	
CLIENT:			
DRG No:		10054502-ARC-XX-XXX-DR-GE-01004	
PROJECT NUMBER:		10054502	
DATE:		04/01/2023	DRAWN BY: RL
SCALE:		1:2,192	PRINT: A3
			

CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	
Plate 1. – View from overpass showing general vegetation, overpass surfacing, and underpass access				
Plate 2. – View from underpass showing general surfacing, topography changes, and height restrictions				

CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	

Plate 3. – Hardstanding surfacing and overgrown vegetation



Plate 4. – Hardstanding surfacing and overgrown vegetation



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REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	
Plate 5. – Hardstanding surfacing and overgrown vegetation				
Plate 6. – Hardstanding surfacing and overgrown vegetation				

CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 ARCADIS Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	
Plate 7. – Hardstanding surfacing and overgrown vegetation				
Plate 8. – Hardstanding surfacing and overgrown vegetation				

CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	

Plate 9. – Hardstanding surfacing and overgrown vegetation



Plate 10. – Hardstanding surfacing and overgrown vegetation. Evidence of historic industrial features



CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	
Plate 11. – Hardstanding surfacing and overgrown vegetation				
Plate 12. – Level change in areas of former industrial features				

CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	
Plate 13. – Hardstanding surfacing and overgrown vegetation				
Plate 14. – Hardstanding surfacing and overgrown vegetation				

CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	

Plate 15. – Hardstanding surfacing and overgrown vegetation



Plate 16. – Level change in area of former industrial feature.



CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	

Plate 17. – Level change in area of former industrial feature.



Plate 18. – Hardstanding surfacing and overgrown vegetation. Evidence of historic industrial features



CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	
Plate 19. – Hardstanding surfacing and overgrown vegetation. Evidence of historic industrial features				
Plate 20. – Hardstanding surfacing and overgrown vegetation				

CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	
Plate 21. – Hardstanding surfacing and overgrown vegetation. Evidence of historic industrial features				
Plate 22. – Hardstanding surfacing and overgrown vegetation. Evidence of historic industrial features				

CLIENT:	Wrexham County Borough Council	DATE:	08.02.2023	 Suite 1A, Four Piccadilly Place Manchester M1 3BN
REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	
Plate 23. – Hardstanding surfacing and overgrown vegetation				
Plate 24. – Hardstanding surfacing and overgrown vegetation				

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REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site	

Plate 25. –
Hardstanding surfacing and overgrown vegetation. Localised fencing.



Plate 26. –
Hardstanding surfacing and overgrown vegetation. Localised fly tipping.

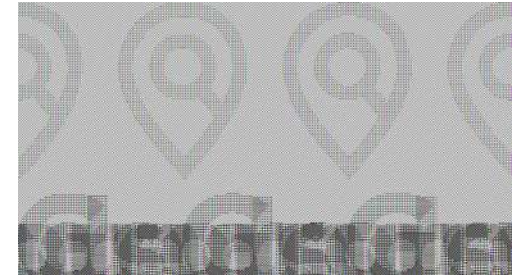
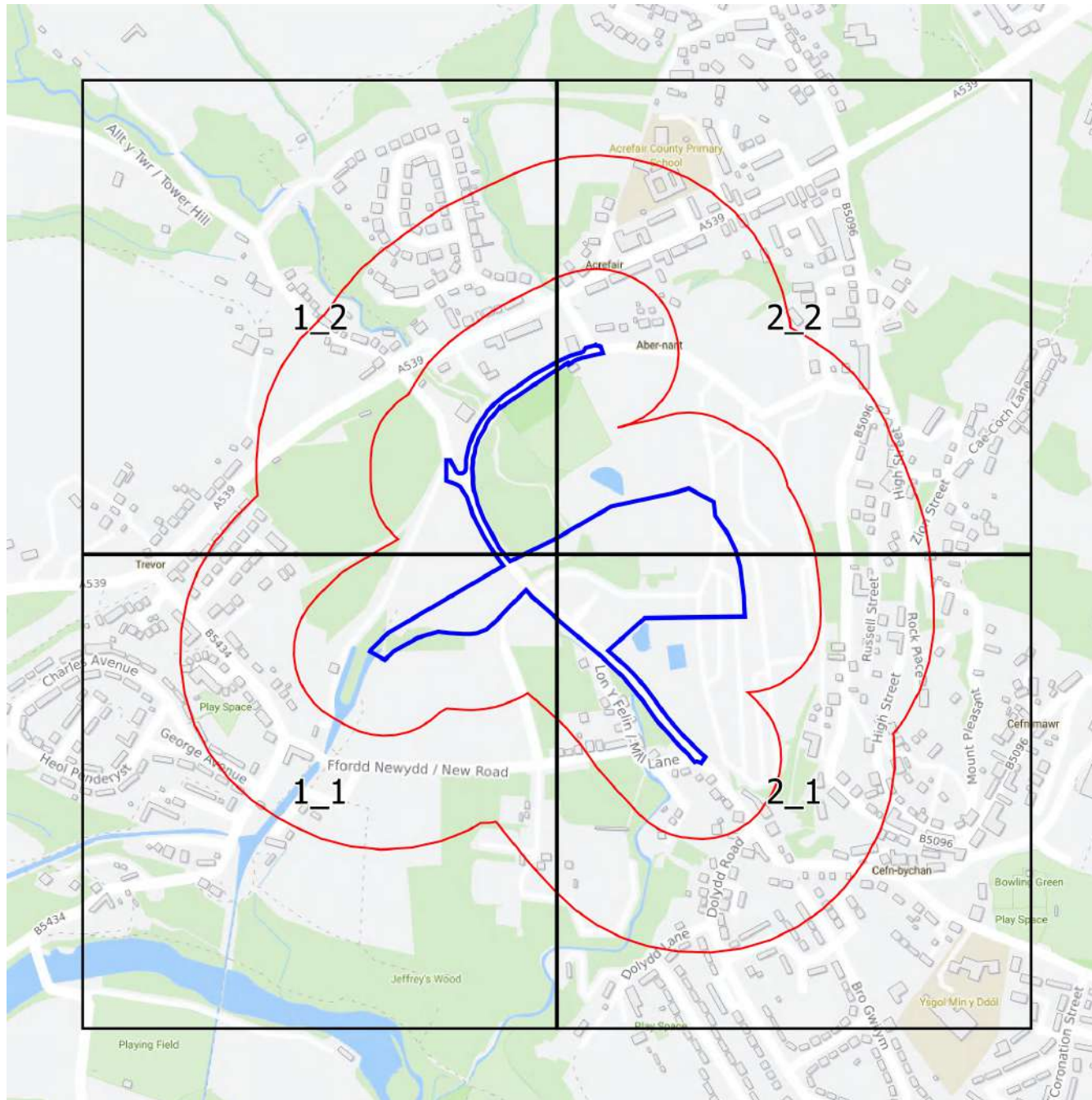


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Plate 27. – Hardstanding surfacing and overgrown vegetation				
Plate 28. – Hardstanding surfacing and overgrown vegetation. Evidence of former boundary fencing.				

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REFERENCE:	10054502	SITE NAME:	Pontcysyllte & Canal World Heritage Site		
Plate 29. – Hardstanding surfacing and overgrown vegetation					

Appendix C

Historic Ordnance Survey Maps



1:2,500 Scale Grid Index

