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Appendix B Create Consulting – Ground Investigation and Basement Impact Assessment

Form

Geo-Environmental Assessment and Basement Impact Assessment 42 ELSWORTHY ROAD, LONDON, NW3 3DL – Volume 1 of 9



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42 ELSWORTHY ROAD, LONDON, NW3 3DL Basement Impact Assessment

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Reference:	CB/CS/P17-1308/01		
Date:	August 2018		

42 ELSWORTHY ROAD, LONDON, NW3 3DL

Basement Impact Assessment

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Registration of Amendments

Revision and Date	Amendment Details	Revision Prepared By	Revision Approved By

1.0 NON TECHNICAL SUMMARY

1.1 The Site is located on the corner of Elsworthy Road and Lower Merton Rise, adjacent to the northwest boundary of Primrose Hill. The site can be centred on national grid reference 527306, 184055. The Site location is shown on Figure 1.1 below.



Figure 1.1: Site Location Plan

1.2 The Site currently comprises a detached property in a residential setting as presented in Figure 1.2 overleaf.



Figure 1.2: Existing Site Plan

- 1.3 The proposed development comprises a basement for living space, with sub-basement area to accommodate a swimming pool.
- 1.4 The following assessments are presented:
 - Desk Study
 - Screening
 - Scoping
 - Additional evidence/assessments include:
 - Site investigation
 - Ground movement assessment
 - Impact Assessment

- 1.5 The authors of the assessments are:
 - Colin Buchanan BSc (Hons), FGS
 - Andrew Warren BSc (Hons), MSc, FGS
 - Robert Griffiths BSc (Hons), MSc, FGS, CGeol
 - Pete Gasparatos BSc MSc DIC Eng MIStructE Eur Ing
- 1.6 The ground and groundwater conditions beneath the site comprise Made Ground to depths of between 1.30m and 1.50m, underlain by Solid strata of the London Clay, recorded to a maximum depth of 15.0m bgl. Standing groundwater (perched groundwater) was recorded at levels of between 3.74m bgl and 8.40m bgl.
- 1.7 The construction methods proposed are a combination of contiguous piles and counterfort (underpinning technique) for the basement walls, with top-down construction for ground excavation in front of the basement wall.
- 1.8 A structural monitoring strategy to control the works and impacts to neighbouring structures will comprise a digital level to detect settlement at ground floor and a Total Station to record the three dimensional position of the retro targets fixed to the party walls. Control stations will be installed outside of the site.
- 1.9 The BIA has assessed land stability and the impacts of the proposed development on neighbouring structures will be in the range of Category 1 (very slight) to Category 2 (slight) on the Burland Scale of impacts. To mitigate against this level of movement, the structural elements of the basement construction will be designed to limit movements to a 'Category 1' classification and a movement monitoring strategy implemented.
- 1.10 The BIA has identified no slope stability impacts. The Site is generally level in relation to the surrounding land and adjacent properties.
- 1.11 The BIA has identified no hydrological impacts. Currently the Site comprises approximately 21% hardstanding (buildings etc.) and no significant change to this is proposed. Therefore, development at the Site is not considered to have an adverse impact upon the wider hydrological environment.
- 1.12 The BIA has identified no hydrogeological impacts. The basement will be constructed completely within London Clay, a non-aquifer. Further, the nearest basement construction to the Site is 1.7m to the east.
- 1.13 The BIA has identified a very low flood risk for the proposed development. The Site is located in an Environment Agency designated '*Flood Zone 1*' area, with less than 1:1,000 probability of fluvial and tidal flooding in any one year.

2.0 INTRODUCTION

Brief

Create Consulting Engineers Ltd (CCE) have been instructed by FORM Structural Design, on behalf of Daniel Austin, to undertake a Geo-Environmental Site Investigation and Basement Impact Assessment in support of a planning application for the development of the land at 42 Elsworthy Road, London, NW3 3DL.

Objectives

To undertake a geo-environmental site assessment in accordance with the Geo-Environmental Site Investigation brief provided by FORM Structural Design, dated 16 March 2017 and to meet the requirements of Camden Planning Guidance (CPG) 4: Basements and Lightwells.

The works will comprise a desk study review of existing information relating to the site and surrounding area and a site investigation, in accordance with best practice and planning guidance such as that set out in the National Planning Policy Framework, 2012 (Ref. I) and the Environment Agency's Model Procedures for the Management of Land Contamination, CLR 11 2004 (Ref. II) and to meet the requirements of CPG 4 (Ref III). A Basement Impact Assessment will then be completed to assess the potential constraints associated with slope stability, groundwater flow and surface water flow / flooding.

Authors

The BIA has been authored/reviewed/approved by:

Report By:	Andrew Warren BSc (Hons), MSc, FGS					
	Senior Geotechnical Consultant, Create Consulting Engineers Ltd					
Technical Review:	Rob Griffiths BSc (Hons), MSc, FGS, CGeol					
	Director, Spectrum Geotechnical Services					
	Pete Gasparatos BSc MSc DIC Eng MIStructE Eur Ing					
	Director, Form Structural Design					
Approved By:	Colin Buchanan BSc (Hons), FGS					
	Technical Director (Structures), Create Consulting Engineers Ltd					

3.0 SOURCES OF INFORMATION

3.1 The information contained in this report is based on a review of already available information pertinent to the site. Key reports, drawings and accessed websites pertinent to this assessment are detailed in Table 3.1 below.

Document/Website	Author/Publisher	Date
Flood maps, groundwater mapping,	Environment Agency (EA)	Accessed June 2017
groundwater abstraction locations, landfill sites,		
pollution incidents and nitrate vulnerable zones		
 www.environment-agency.gov.uk 		
British Geological Survey 1:50,000 series, Solid	British Geological Survey	Accessed June 2017
and Drift, Sheet 256, North London		
BGS Geoindex – Geology and borehole records -	British Geological Survey	Accessed June 2017
www.bgs.ac.uk/geoindex		
Architects Plan	Marek Wojciechowski	Viewed July 2018
	Architects	
Structural Engineers Plans	FORM	Viewed July 2018
www.old-maps.co.uk	Old-maps.co.uk	Accessed April 2017
Groundsure Enviro Insight Report GS-4025537	Groundsure Ltd	27 June 2017
Geo-Environmental Site Investigation Brief	FORM Structural Design	16 March 2017
Flood risk website	https://flood-warning-	Accessed July 2017
	informatin.service.gov.uk	

Table 3.1: Key Information Sources

The following baseline data have been referenced to complete the BIA in relation to the proposed development:

- Site walkover was carried out and a visual inspection of the site, existing structure and exterior of the adjoining properties on 10 May 2017. A summary of the observations made during the site visit are included below, with photographs presented in Appendix A;
- The site history has been assessed by reviewing available historical OS mapping. The historical plans which have been reviewed comprised only readily available records and may be limited; however, the information available to date indicates that additional searches are unlikely to add to our understanding of the site;
- Reference has been made to the BGS 1:50,000 Solid and Drift map of the area, Sheet 256 (North London), which indicates that the Site is underlain by London Clay Formation bedrock;

- The Environment Agency hydrogeology maps for the area classifies the bedrock beneath the site as an Unproductive Aquifer which is described as *'negligible significance for water supply or river base flow';*
- Current/historical hydrological data has been assessed using with reference to Enviro Insight Report (Appendix B) and Lost Rivers of London, Barton 1992;
- Flood risk mapping provided within Groundsure Insight Report (Appendix B);
- LB Camden, Strategic Flood Risk Assessment (produced by URS, 2014);
- LB Camden, Floods in Camden, Report of the Floods Scrutiny Panel (2013);
- LB Camden, Planning Guidance (CPG) Basements (March 2018);
- LB Camden, Camden Geological, Hydrogeological and Hydrological Study Guidance for Subterranean Development (produced by Arup, 2010);
- LB Camden, Local Plan Policy A5 Basements (2017);
- LB Camden's Audit Process Terms of Reference;
- Department for Communities and Local Government. National Planning Policy Framework. March 2012;
- DEFRA / Environment Agency, Model Procedures for the Management of Land Contamination, CLR11, September 2004;
- DEFRA, Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance, April 2012;
- NHBC and Environment Agency. Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008 Volume 1;
- BS8485: 2015 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings;
 - Department of the Environment, Transport and the Regions, Environment Agency and Institute of Environmental Health. Guidelines for Environmental Risk Assessment and Management. HMSO July 2000;
 - CIRIA Guide C580: Embedded Retaining Walls: Guidance on economic design, 2003
 - Eurocode 7: Geotechnical design Part 2 ground investigation and testing, EN 1997-2:2007; and
 - London Borough of Camden, June 2003. Floods in Camden: Report of the Floods Scrutiny Panel.

Existing and Proposed Development

A site walkover was undertaken on 10 May 2017, as detailed in the following paragraphs, with photographs taken during the site walkover presented in Appendix A.

The site occupies an area of land approximately 0.1 hectare. The main residential block is a three storey building with partial lower ground floor (at the front) located in the southeast corner of the site (see Photos 1 and 2, Appendix A). There is a further two storey structure adjoined to the west with integral garage (see Photo 3, Appendix A) and driveway, with side

access to rear gardens. There is also a further access to the rear gardens along the eastern boundary (see Photo 4, Appendix A).

To the rear (north) and side (west) of the buildings comprises gardens with many mature trees and shrubs, with patio areas laid adjacent to the buildings (see Photos 5 and 6, Appendix A). The property is secured to the south and west by a brick wall with entrance via Elsworthy Road.

A plan of the existing Site layout is presented in Figure 3.1 below.



Figure 3.1: Existing Layout of the development site (Source: FormSD Drawing: L(00)01 P1)

The proposed development is to provide an extension to the existing upper and lower ground floor areas of the main residential unit to accommodate further reception areas and amenities. The basement will provide additional living space and space for leisure facilities (swimming pool).

A plan of the proposed development in relation to the existing Site layout is presented in Figure 3.2 below.



Figure 3.2: Proposed development (Source: FormSD Drawing L(23)01 P1)

4.0 PHASE 1 DESK STUDY ASSESSMENT

Site History

4.1 The site history has been assessed by reviewing available historical mapping. The historical plans which have been reviewed comprised only readily available records and may be limited; however, the information available to date indicates that additional searches are unlikely to add to our understanding of the site.

4.2	The historical development of the site is summarised in Table 4.1, below	v.
-----	--	----

Dates	Site Use	Surrounding Land Use
1850-51	The site was undeveloped and show to be	Primrose Hill Tunnel is shown to the north of the
(1:5,280)	locate within Primrose Hill.	site.
1871	The site is shown to be in the path of a	Residential development is shown to the north
(1:1,056)	roadway running through Primrose Hill and	of the site along with the main railway line into
	adjacent to the Eton and Middlesex Cricket	Euston station. The Eton and Middlesex Cricket
	Ground.	Ground is shown directly to the east of the site.
1895	The site is shown to be occupied by the	Elsworthy Place and Lower Merton Rise are
(1:1,056)	existing main building in the southeast corner	shown with surrounding residential dwelling.
	of the site, with adjoining buildings and a	Adjacent to the rear gardens of adjoining
	extended rear garden to the north with a rear	properties to the east appears to comprise a site
	access to the garden from Lower Merton Rise.	for commercial use.
1915-16	No changes evident.	No significant changes evident.
(1:2,500)		
1935	No changes evident.	No significant changes evident.
(1: 2,500)		
1953-54	No changes evident	To the north of the rear gardens of the adjoining
(1:1,250)		properties (to the east) appears to be used for
		commercial purposes with access from the
		extended area of the site. The railway tunnel is
		shown to pass beneath the extended area of the
		site's garden.
1962-69	No changes evident.	No significant changes evident.
(1:1,250)		
1971-72	No changes evident.	The building in the northern part of the
(1:1,250)		extended garden area is shown to be an
		electricity substation.
1988	The existing site boundary is now shown with	The former extended garden area is not shown
(1:1,250)	a small building along the northern boundary.	to have changed, other than the current
		boundary for No. 42 Elsworthy Road now being
		shown.
1991	No changes evident.	No significant changes evident.
(1:10,000)		
Google	No changes evident.	The area to the north of the site is now
Earth 1999		developed with 2No. residential dwellings with
		rear gardens and access.

Dates	Site Use	Surrounding Land Use
Google	No changes evident.	No significant changes evident.
Earth 2003		
Google	No changes evident.	No significant changes evident.
Earth 2015		

Table 4.1: Historical Review

Geology

- 4.3 Reference has been made to the BGS 1:50,000 Solid and Drift map of the area, Sheet 256 (North London), which indicates there are no superficial (drift) deposits located beneath the site and the site is underlain by solid strata of the London Clay Formation. The London Clay comprises clay, silty in part.
- 4.4 Online BGS borehole records at location TQ28SE2056 to 2061, approximately 80m east, recorded the following ground conditions:
 - Topsoil (0 to 0.4m)
 - Made Ground (locally present up to 3.3m)
 - Firm to stiff brown grey laminated fissured CLAY (0.4/3.3m to 20m)
- 4.5 The Groundsure report (Appendix B) provides data on coal and non-coal mining areas and potential ground stability hazards for the UK that may affect the site. The mining and potential ground stability hazards identified in the Groundsure report are summarised in Table 4.2 below.

Details	On-site	Risk
Landslips	No	No Hazard
Bedrock Faults	No	No Hazard
Historical Surface Ground Workings (Saw Pits)	No	No Hazard
Historical Underground Workings	No	No Hazard
Mining Instability	No	No Hazard
Man-Made Mining Cavities	No	No Hazard
Natural Cavities	No	No Hazard
Coal Mining Affected Area	No	No Hazard
Non-Coal Mining Affected Area (rare and localised)	No	No Hazard
Potential for Collapsible Ground Stability Hazards	Yes	Very Low
Potential for Compressible Ground Stability Hazards	Yes	Negligible
Potential for Ground Dissolution Stability Hazards	Yes	Negligible
Potential for Landslide Ground Stability Hazards	Yes	Very Low
Potential for Running Sand Ground Stability Hazards	Yes	Negligible
Potential for Shrinking or Swelling Clay Ground Stability Hazards	Yes	Moderate

Table 4.2: Mining and Potential Ground Stability HazardsRadon

4.6 The site is in a lower probability radon area as less than 1% of properties are above the action level. No radon protective measures are necessary in the construction of new dwellings or extensions.

Hydrogeology

- 4.7 The Environment Agency hydrogeology maps for the area classifies the bedrock beneath the site as an unproductive aquifer which is described as *'negligible significance for water supply or river base flow'*.
- 4.8 According to the Environment Agency, the site is located within a designated Groundwater Source Protection Zone 2 (Outer Catchment).
- 4.9 There are 2No. active groundwater abstraction licences within 1km of the site: located 478m to southeast for potable water supply; and located 529m to the west and used for spray irrigation.

Hydrology, Drainage and Flood Risk

4.10 There are no primary, secondary or tertiary rivers identified within the site boundary or within 500m of the site boundary. There is a culvert identified trending north – south approximately 150m to the west. This is believed to be associated with the lost river Tyburn, as identified in Figure 4.1, below.



Figure 4.1: Lost Rivers of London, Barton 1992

4.11 There are no licensed surface water abstractions within 1km of the site.

Flood Risk Issues

4.12 The site is located in Flood Zone 1 according to the Environment Agency's indicative flood map, indicating that the site has a less than 1:1000 probability of fluvial and tidal flooding in any one year (the lowest level indicated on their mapping) and therefore is at low risk from flooding.

Unexploded Ordnance (UXO)

4.13 An historical record bomb search was undertaken in the vicinity of 42 Elsworthy Road and the results are shown in Figure 4.2 below.



Figure 4.2: WW2 Bomb Location Map (Source: The Bomb Sight Project)

4.14 The findings of the search identified no potential bomb sites within close proximity of the Site and this, together with no local damage evidenced during the historical map review, suggests a low UXO risk on this site.

Trees

4.15 There are a number of mature trees and shrubs within the Site. The rear gardens (to the west and north) are mainly grass with mature and some smaller shrubs.Ecology

4.16 According to data from the Groundsure report, there are no Sites of Special Scientific Interest, Special Areas of Conservation (SAC), Special Protection Areas (SPA), Areas of Natural Outstanding Beauty (AONB), Local Nature Reserves, Nitrate Vulnerable Zones or any other environmental designations within 1km of the site.

Underground Utility Services

4.17 The underground service utility providers were contacted to confirm the location of underground services servicing the site and the local area and the responses to these requests are provided in Appendix C.

London Underground

4.18 The location of the London underground lines were confirmed using the ARCGIS online information providing a true representation of the London underground network in relation to the site, as provided in Figure 4.3.



Figure 4.3 London Underground network

4.19 The London Underground Infrastructure team were contacted to confirm assets will not be affected by the proposed works on this site. It was confirmed that no London Underground assets will be affected by the works at this site and the correspondence is provided in Appendix D.

Overground Railway

4.20 The location of the London over ground lines were confirmed using available historical Ordnance Survey mapping and through information provided by the Network Rail Asset Protection team as illustrated in Figure 4.4 below.



Figure 4.4: Overground Railway Network

4.21 Network Rail confirmed the location of their asset (Appendix E).

Post Office Tunnels

4.22 The location of the post office tunnels were confirmed using online information and provided as Figure 4.5 overleaf.



Figure 4.5: Post Office Tube Railway Route, London

Environmental Regulatory Records

4.23 Information on potentially significant environmental issues and controls at the site and surrounding area may be held on public records by regulatory authorities. This information is sourced directly from the regulatory authorities and from the Groundsure database. Copies of the Groundsure Insight report is provided in Appendix B and a summary is provided in Table 4.3 below.

Public Record	On site or off site	Features					
Landfill & Waste Sites (Environment Agency,	On site	None.					
Local Authority & British Geological Survey)	Off site	None located within 500m of the site.					
Environmental Permits	On site	None.					
Local Authority)	Off site	None located within 500m of the site.					
	On site	No industrial site use identified.					
Current Land Use	Off site	Electricity substations identified 103m to east, 138m to west, 166m to northwest, 219m to northwest and 239m to northeast.					
Historical Land Use	On site	No historical industrial site uses identified.					

Public Record	On site or off site	Features				
	Off site	 The following historical industrial site uses have been identified within 500m if the site: Railway tunnels 22m, 125m and 198m to the north; Former electricity substation located 24m to northwest; Sawmill 420m to the north (1894); Fire station 421m to the north; Tanks 186m to northwest, 382m to west and 455m to south; and Garages located 171m to northeast, 267m to west, 440m to north, 472m to east and 500m to northeast. 				

Table 4.3: Available Environmental Information

Qualitative Risk Assessment

- 4.24 In accordance with guidance outlined by the Environment Agency's Model Procedures for the Management of Land Contamination, CLR11 (2004 (Ref II), a qualitative risk assessment has formulated for the site. A Preliminary Conceptual Model has been developed using potential source-pathway-receptor linkages using a combination of the likelihood of a pollution event to occur, taking account of the presence of a hazard (or source) and integrity of a pathway, versus the consequence of a pollution occurrence, which is essentially a measure of the severity of a hazard to an identified receptor (such as future sensitive end-users).
- 4.25 The presence of contamination (as a potential hazard) does not necessary mean that there is a risk. It is the exposure pathway and the quantity of contamination that reaches the receptor which may determine the effect on a receptor.
- 4.26 The risk classification for both likelihood and consequence is based on methodology presented in Contaminated Land Risk Assessment, A Guide to Good Practice (CIRIA C552, 2001) and has been developed from procedures outlined in the EA's CLR11 Model Procedures. The DETR, with the EA and Institute of Environment & Health, has also published guidance on risk assessment (Guidelines for Environmental Risk Assessment and Management). The guidance states that the designation of risk is based upon a consideration of both:
 - The magnitude of the potential consequence (severity) of risk occurring which takes into account both potential severity of the hazard and sensitivity of the receptor; and
 - The likelihood of an event occurring (probability) which takes into account the both the presence of the hazard and receptor and the integrity of the pathway.
- 4.27 The magnitude of consequence (severity) and likelihood (probability) is defined in the CIRIA guidance, together with examples. The two classifications are then compared to obtain an

estimation of risk for each pollution linkage, ranging from "very high risk" to "very low risk". A description of the risks and likely actions are as follows:

Very High Risk:There is a high probability that severe harm could arise to a designated
receptor from an identified hazard, or, there is evidence that severe harm to a
designated receptor is currently happening.

If this risk is realised, it is likely to result in significant environmental and financial liability to current and/ or future site owners/ occupiers. Urgent investigation (if not already undertaken) and remediation is likely to be required.

High Risk: Harm is likely to arise to a designated receptor from an identified hazard.

If risk is realised, it is likely to present a sizeable environmental and financial liability to current and/ or future site owners/ occupiers. Urgent investigation is required and remediation work may be necessary in the short term and likely over the longer term.

Moderate Risk: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely the harm would be relatively mild.

Investigation is normally required to clarify the risk and determine the potential environmental liability. Some remedial works may be required over the longer term.

Low Risk: It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.

Limited investigation may be recommended to clarify the risk, dependant on the sensitivity of the receptor and view point of those of interest. Any remedial works are likely to be fairly limited.

- **Very Low Risk:** There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is likely to be mild or minor.
- 4.28 The benefit of estimating the risk in this way is that it can be revised after each investigation phase as the conceptual model and corresponding pollution linkages are refined.
- 4.29 The risk assessment is based on the proposed end use of '*residential with private gardens*', as detailed in Table 4.4 below. Should the development proposal change, the risk assessment should be revised accordingly.

Source / Location	Risk / Pollutant	Pathway / Potential Consequence	Receptor	Likelihood of Occurrence	Consequence (severity)	Potential Risk	Possible Mitigation Measures	Res Risk
	Asbestos, metals and hydrocarbons	Direct exposure, inhalation or ingestion of potential contamination in underlying made ground / soils in private garden / soft landscaped areas	Future site residents	Low	Low	Low	No expected made ground expected on site. Soil testing can be undertaken during site investigations to confirm quality of any made	Low
		Direct contact, inhalation and ingestion of potential contamination in made ground / soils during construction works.	Construction/ ground workers	Low	Low	Low		Low
		Leaching from the made ground into groundwater	Controlled Waters (groundwater)	Low	Low	Low		Low
Grou (carbor and m	Ground gas	e underground from Made Ground	Future site residents	Low	Low	Low	No significant made ground expected on the site.	Low
	and methane)		Construction / ground workers	Low	Low	Low	Use of Personal Protective Equipment (PPE) during groundworks will readily mitigate potential risks.	Low
World War 2 Bombs Ordna	Unexploded	The potential for unexploded ordnance (UXO) on the site owing to number and proximity of identified bomb locations	Future site residents	Low	Low	Low	No bomb sites identified within 250m of the siteand no local signs of bomb damage evident duringhistorical map review.PCBs are low mobility and low volatility. Theground conditions is London Clay with negligiblegroundwater and limited lateral migrationpotential. The risk of migration onto subject site isconsidered very low.	Low
	Ordnance (UXO)		Construction / ground workers	Low	Low	Low		Low
Former electrical sub-station	Delychlorinated	Polychlorinated Direct exposure, inhalation or ingestion of potential – biphenyls (PCBs) contamination	Future site residents	Very Low	Very Low	Very Low		Very Low
located 24m to northwest	biphenyls (PCBs)		Construction / ground workers	Very Low	Very Low	Very Low		Very Low
Site buildings	Asbestos- containing materials (ACMs)	Inhalation of asbestos fibres during demolition of existing buildings	Demolition / Construction workers	Moderate	High	Moderate / High	Pre-demolition survey should be undertaken and any ACMs identified and management strategy developed during demolition to mitigate any risks. Use of appropriate PPE would further reduce risk of exposure.	Low

Table 4.4: Qualitative Risk Assessment for Residential (with private gardens) End Use

5.0 SCREENING

5.1 A screening process has been undertaken and the findings are described below:

Question	Response	Details		
1a. Is the site located directly above an aquifer?	No	The solid strata beneath the Site is London Clay, classified by the EA as a non-aquifer. There are no superficial deposits beneath the Site.		
1b. Will the proposed basement extend beneath the water table surface?	No	Groundwater monitoring recorded perched groundwater beneath the Site at levels of between 3.74m bgl and 8.40m bgl.		
2. Is the site within 100mof a watercourse, well (used / disused) or potential spring line?	No	Historical and Ordnance Survey plans do not detail any watercourses within 100m of the Site.		
3. Is the site within the catchment of the	No	The closest Hampstead Heath pond is		
pond chains on Hampstead Heath?		located >1.80km north of the Site		
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No	The percentage of hardstanding will not increase as a result of development at the Site.		
5. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	Due to being located on London Clay, soakaways are not possible at the Site.		
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	No	There are no surface water features within 500m of the Site. The Site is underlain by London Clay and will therefore not impact upon any hydrological features.		

Table 5.1: Groundwater Screening Assessment

Question	Response	Details
1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8)?	No	The Site reduces in elevation from southeast to northwest by 0.70m, over a distance of 42m. See Mobile Survey drawing No. 1851-02 'Ground Floor Plan', presented at the rear of this report.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8)?	No	The Site is generally level.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8)?	No	Figure 1.2, Site Plan, details the Site and surrounding properties, including spot heights. There are no slopes, cuttings, etc, greater than 7 degrees within the vicinity of the Site.
4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately1 in 8)?	No	Figure 1.2, Site Plan, details the Site and surrounding properties, including spot heights. The Site is not located on a hillside with general slope greater than 7 degrees.

Question	Response	Details
5. Is the London Clay the shallowest strata	Yes	The Site is underlain by Made Ground,
at the site?		which is underlain by natural Strata of
		the London Clay, as detailed on the
		Geological Sheet 256 and recorded
		during ground investigation.
6. Will any trees be felled as part of the	No	No trees will be felled as part of the
development and/or are any works		development.
proposed within any tree protection zones		
where trees are to be retained?		
7. Is there a history of seasonal shrink-swell	NO	There is no evidence of shrink-swell
subsidence in the local area and/or		subsidence in the local area / or any
evidence of such effects at the site?		evidence of such effects within the Site
0 la tha aite within 100m of a waterrange	NL-	boundary.
8. Is the site within 100m of a watercourse	NO	Historical and Ordnance Survey plans do
or a potential spring line?		within 100m of the Site. There is no
		within 10011 of the Site. There is no
		100m of the Site to facilitate a spring
9 is the site within an area of previously	No	Analysis of historical and Ordnance
worked ground?	NO	Survey plans do not detail previously
worked ground:		worked ground at the Site
10. Is the site within an aquifer. If so, will the	No	The Site is underlain by London Clay
proposed basement extend beneath the	110	designated by the FA as a 'non-aquifer'
water table such that dewatering may be		designated by the Erras a non-aquiter .
required during construction?		
11. Is the site within 50m of the Hampstead	No	The Site is located >1.8km south of the
Heath Ponds?		Hampstead Heath Ponds.
12. Is the site within 5m of a highway or	Yes	The closest section of basement to
pedestrian right of way?		pedestrian right of way is 1.58m.
13. Will the proposed basement	Yes	No. 40 Elsworthy Road is located 1.70m
significantly increase the differential depth		east of the Site. At this point, formation
of foundations relative to neighbouring		level will be 4.70m bgl.
properties?		
14. Is the site over (or within the exclusion	No	The nearest tunnel (railway) is located
zone of) any tunnels, e.g. railway lines?		29.3m north of the proposed basement,
		which is out of the zone of influence from
		construction

Table 5.2: Slope Stability Screening Assessment

Question	Response	Details		
1. Is the site within the catchment of the	No	The Hampstead Heath Ponds are located		
ponds chains on Hampstead Heath?		>1.8km north of the Site.		
2. As part of the proposed site drainage, will	No	Drainage is currently to the sewer		
surface water flows (e.g. volume of rainfall		network, which will be the method of		
and peak run-off) be materially changed		drainage post development.		
from the existing route?				
3. Will the proposed basement	No	The percentage of hardstanding will not		
development result in a change in the		increase as part of the proposed		
proportion of hard surfaced / paved		development, see architects plans, at the		
external areas?		rear of this report.		

Question	Response	Details
4. Will the proposed basement result in changes to the profile of the inflows	No	Hardstanding at the Site will not increase as a result of the proposed development.
(instantaneous and long-term) of surface water being received by adjacent properties		Therefore, water discharge from the Site will remain static post development.
 5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses? 	No	Hardstanding at the Site will not increase as a result of the proposed development. Therefore, water discharge from the Site will remain static post development.
6. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature.	No	Flood risk maps for the Site indicate a 'low risk' of flooding from surface water (0.1% to 1.0% chance of flooding from surface water in any one year).

Table 5.3: Surface Water and Flooding Screening Assessment

Non-Technical Summary of Screening Process

- 5.2 The Screening process indicates the proposed development is not at risk from or will adversely impact upon groundwater conditions beneath the Site. The site and surrounding land are generally level. No trees will be felled as part of the proposed development and there is no evidence of shrinking and swelling clay at the Site or within the vicinity of the Site. There are no surface water features or springs within 100m of the Site and the Site is outside the catchment area of the Hampstead Heath Ponds. There is a railway tunnel 29.3m north of the Site, which is outside the zone of influence from basement construction. No. 40 Elsworthy Road is located 1.70m east of basement construction. Development will not increase the percentage of hardstanding at the Site. Currently surface water flows to the public sewer network and this will still be the case following development. The Site is at a low risk of flooding from surface water and from rivers.
- 5.3 The screening process identifies the following issues to be carried forward to scoping for further assessment:
 - Basement construction is within five metres of the adjacent public footpath; and
 - The proposed development will increase differential foundation depth with neighbours.
- 5.4 The other potential concerns considered within the screening process have been demonstrated to be not applicable or not significant when applied to the proposed development.

6.0 SCOPING

6.1 In order to establish the likely impacts of the proposed development on neighbouring sites, a scoping exercise for this assessment was undertaken:

Land Stability

6.2 Aspects of the land stability screening process are discussed in Table 6.1 below.

Question	Question	Discussion
No.		
12	Is the Site within 5m of a	As with all excavations there is the potential for ground
	highway or pedestrian right	movement beyond the excavation that may impact
	of way	adjoining properties. To help determine ground
13	Will the proposed basement	conditions, obtain material properties and help
	significantly increase the	determine the groundwater regime beneath the site, a
	differential depth of	ground investigation has been undertaken, as detailed
	foundations relative to	in Section 7.0 of this report. Following the ground
	neighbouring properties	investigation, ground movement assessment for
		proximal properties and infrastructure has been
		undertaken (see Section 8.0 of this report).

Table 6.1 Land stability scoping discussion

7.0 GROUND INVESTIGATION

Site Work

- 7.1 A ground Investigation was carried out on the subject site between 3 and 5 July 2017 to support the basement assessment and design solution for the proposed development.
- 7.2 The investigation comprised the drilling of 2No. cable percussion (BH01 and BH02) boreholes to a maximum depth of 15 metres and 2No. windowless sampler boreholes (WS01 and WS02) to a maximum depth of 5 metres. The purpose of the investigation was to confirm ground conditions at the location of the proposed basement and extension including the groundwater table.
- 7.3 The location of the exploratory holes is illustrated in Figure 7.1 below.



Figure 7.1: Exploratory Hole Locations

7.4 The soil arisings from each borehole were logged by a suitably qualified Engineer, in line with the relevant British Standard (BS 5930 and Eurocode 7). The borehole logs are provided in Appendix F.

- 7.5 Representative disturbed and bulk disturbed samples were taken from the boring tools at regular intervals throughout the depth of the borehole. Undisturbed 100mm diameter samples (U100) were taken in the cohesive material, at regular intervals throughout the depth of the borehole (cable percussion boreholes only) and in-situ Standard Penetration Tests (SPTs) were carried out at varying depths. Disturbed samples were collected and submitted for chemical and geotechnical testing.
- 7.6 On completion of the borehole, a ground gas / groundwater monitoring standpipe was installed in each borehole sealed above the slotted bottom zone of the pipe. A protective cover was installed flush with the ground surface.
- 7.7 Groundwater monitoring was then carried out during on three separate occasions on a monthly basis completion of the site investigation fieldwork and the findings discussed below.

Ground Conditions

7.8 The encountered soil conditions are reported in the borehole logs within Appendix F and summarised below.

<u>Topsoil</u>

7.9 The majority of the rear garden of the site is laid to lawn with a layer of brown organic topsoil between 0.1 and 0.15m thick.

Made Ground

7.10 The Topsoil was underlain by Made Ground, which generally comprising friable reworked clay, with sand, silt and gravel, red brick and red tile fragments and locally with chalk fragments to a maximum depth of 1.5m (ranging from 1.3 to 1.5m across the investigated area).

London Clay

7.11 The underlying natural soils generally comprised medium brown to range (locally mottle grey) firm to stiff silty clay (weathered London Clay) with the occasionally rounded gravel and then forming a stiff blue-grey silty clay (London Clay) from 9 to 11 metres below ground level to a maximum penetration depth of 15m.

Groundwater

7.12 During the drilling works, no groundwater inflow was recorded in any of the boreholes.

7.13 The standing groundwater levels of the installed monitoring wells on the site were then measured on 13 July, 10 August and 20 September 2017. The groundwater levels recorded during the return site visits are provided in Table 7.1 below.

Borehole	Date	Water Level (mbgl) Top of Respon Zone (mbgl)		Base of well (mbgl)	
	13 July 2017	11.16			
BH01	10 Aug 2017	8.4	1.0	15.0	
	20 Sept 2017	5.32			
	13 July 2017	Dry			
BH02	10 Aug 2017	10.2	1.0	15.0	
	20 Sept 2017	7.06			
	13 July 2017	Dry			
WS01	10 Aug 2017	Dry	1.0	5.0	
	20 Sept 2017	4.56			
WS02	13 July 2017	4.61			
	10 Aug 2017	4.33	1.0	5.0	
	20 Sept 2017	3.74			

 Table 7.1: Groundwater Monitoring – July to September 2017

7.14 Given that no groundwater was encountered during the drilling process and groundwater levels measured in each of the boreholes (except WS01) appears to be increasing, it is considered likely that perched groundwater has seeped into the boreholes from fissures or from the more granular made ground materials above the clay and is accumulating within the boreholes.

Geotechnical Laboratory Testing

- 7.15 The samples collected were forwarded to accredited geotechnical testing laboratories.
- 7.16 The moisture content of selected soil samples was determined.
- 7.17 Liquid and plastic limits of selected samples at various depths were determined, as a guide to soil classification and behaviour.
- 7.18 A test specimen was prepared at full diameter from an undisturbed cohesive sample. Undrained Triaxial Compression testing was undertaken on the sample.
- 7.19 Selected samples of soil were analysed to determine the concentration of water soluble sulphate, using the BRE SD1 Pyrite Suite. The pH values were also determined.
- 7.20 The summary of the geotechnical results are provided in Table 7.2 below and the laboratory certificates are included in Appendix G.

Plasticity Index (NHBC modified)								
Borehole No.	Sample depth, m		Index		Soil Class			
BH1	4.0		4	46	CV			
BH1	7.0		Ľ,	50	CV			
BH1	10.0		3	34	СН			
BH1	12.0		3	37	СН			
BH2	3.0		4	19	CV			
BH2	6.5			51	CV			
BH2	13.0		Ľ,	50	CV			
WS01	2.9			53	CV	CV		
	Shear Streng	gth	(unconsolid	ated single	stage triaxial)			
Borehole No.	Sample depth, m	Dı	Dry density Mg/ m ³		Moisture content %	C _u kPa		
BH1	10.0		1.55		22	122		
BH1	12.0		1.66		20	228		
BH2	6.5		1.61		26	180		
			Chemica	l Tests				
Test – sample a	t 3.00 – 13.00m dept	h			Range			
Moisture Content %		20 to 32						
рН	7.2 to 8.4							
Total Sulphate as SO4%<0.010 to 0.42								
Total Sulphurmg/kg0.069 to 0.67								

Table 7.2: Summary of Geotechnical Testing

7.21 The laboratory test results are consistent with and confirm the soil descriptions in the borehole logs.

Contamination Assessment

- 7.22 The made ground encountered across the site predominantly comprised reworked friable clay with sand and gravel and red brick fragments. Groundwater was not encountered during in any of the exploratory holes on this site. No obvious visual or olfactory signs of contamination were observed during the fieldwork.
- 7.23 Samples of made ground were collected from various locations and depths across the site and submitted for chemical testing at Derwentside Testing Services, a UKAS/MCERTS accredited laboratory based in Consett. The testing comprised a range of organic and inorganic parameters including asbestos, metals, Total Petroleum Hydrocarbons (TPH) and Polyaromatic Hydrocarbons (PAH).
- 7.24 The soil characteristics have been assessed with reference to LQM/CIEH 'Suitable 4 Use Levels' (S4ULs) for human health risk assessment (2015). In the case of lead a DEFRA Category 4 Screening Level has been adopted. The soil chemical testing results have been compared to residential end use with home grown produce and using the organic matter results (1%) where appropriate.

7.25 A summary of the chemical test results are provided in Table 7.3 below and laboratory certificates are provided in Appendix H.

					Site Specific Assessment	
Location	WS01	WS01	WS02	BH01	Criteria (SSAC) –	
(mg/kg)	0.3m	1.2m	0.7m	0.3m	Residential with home	
					grown produce	
Material	MG	MG	MG	MG	-	
Asbestos	ND	ND	ND	ND	<0.001%	
Metals						
Arsenic	21	21	13	27	37	
Barium	180	250	100	160	-	
Beryllium	0.9	0.8	0.9	1.0	1.7	
Boron, Water Soluble	0.8	1.1	1.0	1.0	290	
Cadmium	0.2	1.2	0.2	0.3	11	
Total Chromium	33	33	35	29	907	
Hexavalent Chromium	<1.0	<1.0	<1.0	<1.0	6.05	
Copper	69	1200	66	210	2400	
Lead	530	1000	190	360	200	
Mercury	3.8	27	0.64	1.3	40	
Nickel	24	16	31	23	181	
Selenium	<0.5	1.3	<0.5	<0.5	250	
Vanadium	59	52	72	59	406	
Zinc	99	1300	110	130	3700	
Inorganics						
рН	9.4	8.1	8.2	6.6	-	
Cyanide – Total	0.2	4.3	<0.1	0.2	-	
Cyanide – Free	<0.1	<0.1	<0.1	<0.1	-	
Organic Matter (%)	2.3	3.6	0.9	2.3	1 2.5 6	
Sulphate Aq Extract (mg/l)	130	26	23	32	-	
Sulphide	<10	12	12	20	-	
Sulphate, Total (%)	0.12	0.07	0.04	0.07	-	
Petroleum Hydrocarbons EPH (C10-C35)	48	66	<10	42	500	
Polyaromatic Hydrocarbons	5.6	1.9	0.11	6.4	-	
Naphthalene	0.05	0.21	<0.03	<0.03	2.3 5.6 13	
Acenaphthylene	0.03	<0.03	<0.03	<0.03	170 420 920	
Acenaphthene	<0.03	0.11	<0.03	<0.03	210 510 1100	
Fluorene	<0.03	0.05	<0.03	<0.03	170 400 860	
Phenanthrene	0.63	0.59	<0.03	0.53	95 220 440	
Anthracene	0.10	0.11	<0.03	0.11	2400 5400 11000	
Fluoranthene	1.0	0.33	0.06	1.3	280 560 890	
Pyrene	0.85	0.25	0.05	1.1	620 1200 2000	
Benzo(a)anthracene	0.48	0.09	<0.03	0.54	7.2 11 13	
Chrysene	0.55	0.11	<0.03	0.61	15 22 27	
Benzo(b)fluoranthene	0.66	0.08	<0.03	0.71	2.6 3.3 3.7	

					Site Specific Assessment
Location	WS01	WS01	WS02	BH01	Criteria (SSAC) –
(mg/kg)	0.3m	1.2m	0.7m	0.3m	Residential with home
					grown produce
Benzo(k)fluoranthene	0.24	<0.03	<0.03	0.32	77 93 100
Benzo(a)pyrene	0.36	<0.03	<0.03	0.51	2.2 2.7 3
Indeno(123cd)pyrene	0.23	<0.03	<0.03	0.29	27 36 41
Dibenzo(ah)anthracene	0.07	<0.03	<0.03	0.08	0.24 0.28 0.3
Benzo(ghi)perylene	0.29	<0.03	<0.03	0.31	320 340 350
Phenols	<0.3	<0.3	<0.3	<0.3	280 520 1100

Table 7.3: Soil Chemical Testing

Key

Units are mg/kg unless shown otherwise

Concentrations highlighted in red (bold) exceed the site-specific criteria.

MG – made ground

Site specific criteria highlighted in red identify the criteria (driven by organic matter content)

ND – non-detect

- 7.26 All potential organic and inorganic contaminants present within the made ground beneath the garden area were confirmed as being significantly below the assessment criteria for residential end use (with home grown produce) in all the samples collected and tested with the exception of lead. Lead was found to be in concentrations exceeding the screening criteria (200 mg/kg) in three out of the four samples collected, including those collected at a shallow depth (0.3m).
- 7.27 The concentrations of lead identified in the made ground are not considered suitable for a residential (with private garden) end use and a clean cover system should be provided to mitigate any potential risk to future residents.
- 7.28 Asbestos was not detected in any of the samples collected and screened.
- 7.29 A sample was also collected from BH02 (0.4m) and submitted for Waste Acceptance Criteria (WAC) testing. The results of the WAC testing classified the made ground as 'Inert Waste', with the results presented in Appendix H, although the presence of elevated concentrations of lead identified in the made ground in other borehole locations (see Table 7.3 above) may affect this classification.

Ground Gas Monitoring

- 7.30 Ground gas measurements were recorded from each of the monitoring wells installed on three separate occasions (during groundwater monitoring). The monitoring comprised the measurement of concentrations of methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide gases collected within the monitoring well followed by the measurement of gas flow using a GA5000 infrared gas analyser with flow pod.
- 7.31 The results of the gas monitoring undertaken are summarized in Table 7.4 below and full details, are provided in Appendix J.

		BH01	BH02	WS01	WS02
Parameter	Unit				
Methane (CH ₄)	% by volume	0	0	0	0
Carbon Dioxide (CO ₂)	% by volume	1.3 - 3.9	1.0 - 1.8	2.7 – 3.9	2.1 - 3.2
Oxygen (O ₂)	% by volume	17.5 – 18.8	19.1 – 20.6	17.7 - 18.7	17.7 - 19.6
Hydrogen Sulphide (H ₂ S)	Parts per million	0	0 - 1	0 - 1	0-1
Carbon Monoxide (CO)	Parts per million	0 - 1	0	0-1	0 - 1
Gas Flow	Litres per hour	0.3 – 0.5	0.3 – 0.5	0.5 – 3.6	0.5

 Table 7.4: Summary of Ground Gas Monitoring Results

- 7.32 The ground gas concentrations measured from the boreholes confirmed the absence of detectable methane and slightly elevated carbon dioxide (between 1.3 and 3.9% by volume) across the site, with corresponding slightly depleted oxygen concentrations.
- 7.33 The gas flow rates measured from the boreholes ranged between 0.5 and 3.6 litres per hour.
- 7.34 The assessment of gas risk uses the concentration present and the flow rate measured, which gives you the gas screening value (GSV). Using this method, the GSV for the areas identified across this site have been established and a gas risk rating assigned in accordance with the Traffic Light system outlined in the NHBC Guidance on Evaluation of Development Proposals on sites where Methane and Carbon Dioxide are present (March 2007):
 - Green no gas protection required
 - Amber 1 low gas protection required

- Amber 2 high level gas protection
- Red remediation is required
- 7.35 Whilst current guidance requires a minimum of six monitoring visits to be undertaken, an assessment of the worst-case scenario to obtain the maximum gas screening value across the site was undertaken. This derives the gas screening value for the highest gas concentration (3.9% by volume carbon dioxide) and the highest gas flow (3.6 litres/hr) of 0.14 litres / hour, which is significantly below the gas screening criteria where gas protection measures would need to be considered (0.78 litres / hour).
- 7.36 On the basis of this preliminary gas risk assessment, no gas protection measures would be considered necessary for the development works on this Site.

8.0 CONSTRUCTION METHODOLOGY / ENGINEERING STATEMENTS

Outline Geotechnical Design Parameters

8.1 This section of the report should be read in conjunction with Section 7.0 (Ground Conditions).A summary of the geotechnical parameters is provided in Table 8.1 below.

Lithology	Depth to base (mbgl)	Υ (kN/m³)	C _u (kN/m²)	C' (Kn/m²)	
Made Ground	1.40m	18	20	0	
Weathered LC	10	18	120	0	
London Clay	>15	18.4	150	0	
Groundwater	>10m bgl				

Table 8.1: Geotechnical Design Parameters

Design Factors

- Permanent design load: EC7 DA1b
- Base capacity Q_{bu} (Υ_{Rb}) = 1.3 from set R4
- Shaft capacity Q_{su} (Υ_{Rs}) = 1.3 from set R4

Pile Resistance

- 8.2 The following calculations are based on driven pre-cast concrete piles of width 0.60m taken to a depth of 10m below ground level. Ignoring the first 6.70m to allow for basement construction, the following is calculated:
 - Pile resistance R = base resistance + shaft resistance
 - $R_{des} = (Q_{bu} / \Upsilon_{Rb}) + (Q_{su} / \Upsilon_{Rs})$

Base Resistance

- $Q_{bu.des} = (Ap.(s_c.N_c.c_u + \sigma_q) / \Upsilon_{Rb})$ where:
- Ap is the cross sectional area of the pile (Bp2);
- $\sigma_q = \sigma_v$ at base of pile (10m);
- N_c and s_c are bearing capacity factors. Therefore:
- Q_{bu} = (0.28 x (1 x 9 x 120 + 180) / 1.3) = <u>271kN</u>

Shaft Resistance

- $Q_{su.des} = (4B_p.\tau_{int}.dz)/\Upsilon_{Rs}$
- Weathered LC: Q_{su.des} = (4 x 0.60 x 43.83 x 3.33)/1.3 = <u>270Kn</u>
- 8.3 Therefore, design capacity of a 600mm diameter pile of 10.0m length is R_{des}= 271+270 = **<u>541kN</u>**

Presumed Bearing Value

- 8.4 On the basis of the ground model, a presumed bearing value of 150kN/m² is given for a 1.0m strip foundation at 4.15m bgl
- 8.5 A conservative assessment of ground heave due to excavation will be 0.15% of the excavation (Peck 1969). Formation level beneath the swimming pool is indicated to be 6.67m bgl. Therefore, an allowance for heave at this location in the order of $\frac{0.15}{100} \times 6670 = 10mm$ should be made.

Buried Concrete

- 8.6 Based on the chemical laboratory test results (BRE SD1 suite) and in accordance with BRE Special Digest 1: 2005 (Concrete in Aggressive Ground), the following criteria have been determined. A total of 5No. BRE SD1 chemical suits were undertaken on soil samples from the Made Ground, Weathered London Clay and London Clay horizons.
- 8.7 The site is classified as 'natural ground' and the local geology (London Clay) is indicated to contain pyrite (i.e. sulphide) and groundwater conditions are considered to be 'static'. Laboratory chemical testing recorded water soluble sulphate concentrations in the soil of between 10mg/l and 530mg/l, acid soluble sulphate concentrations of between 0.15% and 0.55%. Therefore, the Design Sulphate Class for the site is considered to be "DS-2". pH values of between 7.2 and 8.4 were also recorded. Therefore, the "Aggressive Chemical Environment for Concrete (ACEC)" class for concrete in the ground is indicated to be AC-2.

Outline Temporary and Permanent Works Proposals

- 8.8 For full details of temporary and permanent works including propping and sequencing, please refer to Structural Engineer's Stage 2 Report (Ref 172843 dated July 2018) and Drawings (Appendix K).
- 8.9 In summary, foundation and basement wall construction will include a combination of contiguous piles to 10m bgl and underpinning (planar wall) of the existing building to a depth of 4.15m bgl. A capping beam will be placed on the basement walls and temporary props placed prior to construction.
- 8.10 Excavation in front of the propped basement wall will be by means of top-down construction.

9.0 BASEMENT IMPACT ASSESSMENT

- 9.1 The proposed development is for a basement to provide additional living space, with lower basement area to accommodate a swimming pool. Basement walls will include contiguous piled walls and planar (underpinning technique) walls to a maximum depth of 10.0m bgl. Formation levels for the swimming pool are indicated to be 6.67m bgl.
- 9.2 A site investigation has confirmed ground conditions at the Site and the ground model comprises Made Ground to 1.40m bgl, underlain by weathered London Clay to 10.0m bgl, underlain by London Clay to depths >15.0m. Perched groundwater was recorded beneath the Site at depths of between 3.74m bgl and 8.40m bgl. However, the ground model gives groundwater at >10.0m bgl.
- 9.3 The London Clay is classified as a non-aquifer. The nearest surface water body is >100m from the Site boundary. There are no surface water rivers within 500m of the Site. The proposed development will not increase the percentage of hardstanding at the Site.
- 9.4 The Site is not at risk of flooding from rivers or reservoirs and is at low risk from surface water flooding.
- 9.5 The Site is generally level, as is the surrounding land. The proposed basement extends to within 1.58m of the public footpath within Elsworthy Road. Maximum horizontal ground movement from basement construction is calculated at less than 10mm, which is well within tolerable limits for and services located within the footpath.

Land Stability/Slope Stability

- 9.6 The site investigation has identified a suitable founding stratum of London Clay.
- 9.7 A conservative estimate of heave as a result of basement excavation is 10mm.
- 9.8 The BIA has concluded that there will not be risks or stability impacts to the development or adjacent sites due to slopes.

Hydrogeology and Groundwater Flooding

- 9.9 The BIA has concluded there is a very low risk of groundwater flooding
- 9.10 The BIA has concluded there are no impacts to the wider hydrogeological environment.

Hydrology, Surface Water Flooding and Sewer Flooding

- 9.11 The BIA has concluded there is a very low risk of surface water flooding at the Site.
- 9.12 The BIA has concluded there are no impacts to the wider hydrological environment.

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- 10.4 The report summarises information from a number of external sources and is unable to offer any guarantees or warranties for the completeness or accuracy of information relied upon. Information from third parties has not been verified by Create Consulting Engineers Limited unless otherwise stated in this report.
- 10.5 It should be noted that the risks which are identified in this report are perceived risks based on the available information at the time of writing and that the actual risks associated can only be assessed following a physical investigation of the site.
- 10.6 The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

APPENDICES

APPENDIX A SITE PHOTOGRAPHS



Create Consulting Engineers Limited, 109-112 Temple Chambers, 3-7 Temple Avenue, London EC4Y OHP Tel: 0207 822 2300 Email: www.createconsultingengineers.co.uk





Create Consulting Engineers Limited, 109-112 Temple Chambers, 3-7 Temple Avenue, London EC4Y 0HP Tel: 0207 822 2300 Email: www.createconsultingengineers.co.uk



Photo 5: Western garden area (looking north) Photo 6: southern garden area (looking south)

Geo-Environmental Assessment and Basement Impact Assessment 42 ELSWORTHY ROAD, LONDON, NW3 3DL – Volume 2 of 9



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APPENDIX B

GROUNDSURE ENVIRO INSIGHT REPORT



Create Consulting Engineers Ltd

109-112 Temple Chambers, 3-7 TEMPLE AVENUE, LONDON, EC4Y 0HP Groundsure GS-4025537 Reference: Your Reference: P17-1308 Report Date 27 Jun 2017 Report Delivery Email - pdf Method:

Enviro Insight

Address: 42, ELSWORTHY ROAD, LONDON, NW3 3DL

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviro Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,

, O

Managing Director Groundsure Limited

Enc. Groundsure Enviroinsight

Groundsure LOCATION INTELLIGENCE ENVIRONMENT

Address:	42, ELSWORTHY ROAD, LONDON, NW3 3DL
Date:	27 Jun 2017
Reference:	GS-4025537
Client:	Create Consulting Engineers Ltd

NW

NE

Е



S

SW

Aerial Photograph Capture date:07-Jun-2015Grid Reference:527306,184055Site Size:0.10ha

Report Reference: GS-4025537 Client Reference: P17-1308

2



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Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	4	8	20
1.2 Additional Information - Historical Tank Database	0	0	3	5
1.3 Additional Information – Historical Energy Features Database	0	4	18	38
1.4 Additional Information - Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	3	14
1.6 Potentially Infilled Land	0	4	15	13
Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	0	0
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	0
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0



Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000- 1500
3.1 Landfill Sites						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	0	0	0	0	0	1
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	0	0	0	0	1	2
Section 4: construction	On cit	0	0.50m	51 25	0 2	51 500
Section 4. Current Land Use	On-site	e	0-3011	51-25	0 2	51-500
4.1 Current Industrial Sites Data	0		0	6	No	ot searched
4.2 Records of Petrol and Fuel Sites	0		0	0		0
4.3 National Grid Underground Electricity Cables	0		0	16		16
4.4 National Grid Gas Transmission Pipelines	0		0	0		0
Section 5: Geology						
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No					
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	None					
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.						
Section 6: Hydrogeology and Hydrology	0-500m					
6.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	al No					
6.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes					
	On-site	0-50m	51-250	251-500	501-1000	1000- 2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	3	5	7
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	3
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	3	0	4
6.6 Source Protection Zones (within 500m of the study site)	1	0	1	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	0	0	0	0	Not searched	Not searched



Section 6: Hydrogeology and Hydrology	0-500m					
	On-site	0-50m	51-250	251-500	501-1000	1000- 1500
6.9 Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site?	No	No	No	No	No	No
6.10 Detailed River Network entries within 500m of the site	0	0	1	0	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	No	No	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	No
7.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	No
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	Very Low
7.4 Are there any Flood Defences within 250m of the study site?	No
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
7.6 Are there any areas used for Flood Storage within 250m of the study site?	No
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Not Prone
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Not Applicable

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000- 2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	0	0	0
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	2
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0



Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000- 2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	0	0	0	0	0	0
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 What is the maximum risk of natural ground subsidence?	Moderate
9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Moderate
9.1.2 What is the maximum Landslides hazard rating identified on the study site?	Very Low
9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Negligible
9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Negligible
9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
9.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Negligible
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.
Soction 10: Misson	

Section 10: Mining

10.1 Are there any coal mining areas within 75m of the study site?	No
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	No
10.3 Are there any brine affected areas within 75m of the study site?	No



Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.



1. Historical Land Use





1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 32

ID	Distance [m]	Direction	Use	Date
1A	22	Ν	Tunnel	1968
2A	22	Ν	Tunnel	1989
3A	22	Ν	Tunnel	1973
4A	23	Ν	Tunnels	1957
5B	125	Ν	Tunnel	1968
6B	125	Ν	Tunnel	1989
7B	125	Ν	Tunnel	1973
8AF	128	Ν	Tunnels	1957
9C	196	Ν	Tunnel	1973
10C	196	Ν	Tunnel	1957
11C	196	Ν	Tunnel	1989
12C	196	Ν	Tunnel	1968
13D	277	NE	Cuttings	1957
14D	277	NE	Cuttings	1968
15E	277	NE	Railway Sidings	1968
16E	290	NE	Railway Sidings	1957
17	292	NE	Railway Sidings	1989
18E	293	NE	Railway Sidings	1973
19D	335	NE	Air Shafts	1989
20F	360	NE	Railway Sidings	1882
21	369	NE	Railway Sidings	1894
22F	372	NE	Railway Sidings	1911
23G	379	NE	Air Shafts	1989
24G	395	NE	Railway Building	1948
25F	404	NE	Railway Sidings	1948
26	420	Ν	Sawmill	1894
27H	421	Ν	Fire Station	1989
28H	421	Ν	Fire Station	1973
29H	421	Ν	Fire Station	1968
30H	421	N	Fire Station	1957
31H	421	Ν	Fire Station	1948
32	481	NE	Railway Building	1948



8

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1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary:

Distance (m)	Direction	Use	Date
186	NW	Unspecified Tank	1896
188	NW	Unspecified Tank	1935
188	NW	Unspecified Tank	1915
382	W	Unspecified Tank	1973
382	W	Unspecified Tank	1967
382	W	Unspecified Tank	1962
383	W	Unspecified Tank	1995
455	S	Tank or Trough	1871
	Distance (m) 186 188 188 382 382 382 382 383 455	Distance (m) Direction 186 NW 188 NW 188 NW 382 W 382 W 382 W 383 W 455 S	Distance (m)DirectionUse186NWUnspecified Tank188NWUnspecified Tank188NWUnspecified Tank382WUnspecified Tank382WUnspecified Tank382WUnspecified Tank383WUnspecified Tank383STank or Trough

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary:

ID	Distance (m)	Direction	Use	Date
41J	24	NW	Electricity Substation	1991
42J	24	NW	Electricity Substation	1985
43J	25	NW	Electricity Substation	1972
44J	25	NW	Electricity Substation	1987
45K	100	E	Electricity Substation	1991
46K	100	E	Electricity Substation	1985
47K	100	E	Electricity Substation	1987
48K	100	E	Electricity Substation	1972
49L	139	W	Electricity Substation	1991
50L	140	W	Electricity Substation	1987
51M	168	NW	Electricity Substation	1991
52M	168	NW	Electricity Substation	1985
53M	169	NW	Electricity Substation	1987
54M	169	NW	Electricity Substation	1972
55B	218	NW	Electricity Substation	1991
56B	218	NW	Electricity Substation	1985
57B	219	NW	Electricity Substation	1987
58B	219	NW	Electricity Substation	1972



				LOCATION INTELLIGENCE
59N	236	NE	Electricity Substation	1991
60N	236	NE	Electricity Substation	1985
61N	237	NE	Electricity Substation	1987
62N	237	NE	Electricity Substation	1972
630	280	W	Electricity Substation	1991
640	280	W	Electricity Substation	1971
65P	293	E	Electricity Substation	1991
66P	293	E	Electricity Substation	1983
67P	293	E	Electricity Substation	1972
68Q	306	NE	Electricity Substation	1991
69Q	306	NE	Electricity Substation	1983
70Q	307	NE	Electricity Substation	1972
71Q	307	NE	Electricity Substation	1994
72R	331	NW	Electricity Substation	1953
73R	331	NW	Electricity Substation	1953
74S	355	NE	Electricity Substation	1983
755	356	NE	Electricity Substation	1972
76T	368	NW	Electricity Substation	1991
77T	368	NW	Electricity Substation	1985
78T	370	NW	Electricity Substation	1972
79T	370	NW	Electricity Substation	1987
80U	389	E	Electricity Substation	1952
81U	390	E	Electricity Substation	1953
82V	415	S	Electricity Substation	1991
83V	416	S	Electricity Substation	1971
84W	440	E	Electricity Substation	1983
85W	440	E	Electricity Substation	1991
86W	441	E	Electricity Substation	1994
87W	441	E	Electricity Substation	1972
88X	465	Ν	Electricity Substation	1953
89X	465	Ν	Electricity Substation	1953
90X	468	Ν	Electricity Substation	1991
91X	468	Ν	Electricity Substation	1990
92Y	471	NE	Electricity Substation	1972
93Y	472	NE	Electricity Substation	1983
94Y	472	NE	Electricity Substation	1991
95X	475	Ν	Electricity Substation	1969
96Y	475	NE	Electricity Substation	1994
97Z	499	W	Electricity Substation	1991
98Z	499	W	Electricity Substation	1978
99Z	500	W	Electricity Substation	1992
100Z	500	W	Electricity Substation	1969



0

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary:

Database searched and no data found.

1.5 Additional Information - Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 17

ID	Distance (m)	Direction	Use	Date
101AA	171	NE	Garage	1953
102AA	171	NE	Garage	1966
103AA	178	NE	Garage	1953
104AB	267	W	Garage	1966
105AB	271	W	Garage	1953
106AB	271	W	Garage	1953
107AC	440	Ν	Garages	1969
108AC	440	Ν	Garages	1953
109AC	440	Ν	Garages	1953
110AD	472	E	Garage	1983
111AD	472	E	Garage	1991
112AD	474	E	Garages	1953
113AD	474	E	Garages	1952
114AD	474	E	Garage	1963
115AD	474	E	Garage	1972
116AE	499	NE	Garage	1952
117AE	500	NE	Garage	1953

1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 32

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
118A	22	Ν	Tunnel	1973
119A	22	Ν	Tunnel	1968
120A	22	Ν	Tunnel	1989



			LUC	LATION INTELLIGENCE
121A	23	Ν	Tunnels	1957
122AG	123	W	Air Shaft	1894
123B	125	Ν	Tunnel	1973
124B	125	Ν	Tunnel	1968
125B	125	Ν	Tunnel	1989
126AF	128	Ν	Tunnels	1957
127AG	130	W	Air Shaft	1957
128AG	130	W	Air Shaft	1948
129AG	130	W	Air Shaft	1973
130AG	130	W	Air Shaft	1968
131AG	130	W	Air Shaft	1989
132C	196	Ν	Tunnel	1957
133C	196	Ν	Tunnel	1973
134C	196	Ν	Tunnel	1968
135C	196	Ν	Tunnel	1989
136	217	SW	Ponds	1866
137D	277	NE	Cuttings	1957
138D	277	NE	Cuttings	1968
139AB	311	W	Air Shaft	1948
140D	335	NE	Air Shafts	1989
141	349	SE	Covered Reservoir	1894
142G	379	NE	Air Shafts	1989
143AH	387	SE	Water Body	1957
144AH	387	SE	Reservoir	1948
145AH	387	SE	Covered Reservoir	1973
146AH	387	SE	Reservoir	1968
147AH	387	SE	Covered Reservoir	1989
148AH	389	SE	Reservoir	1866
149AH	391	SE	Reservoir	1920



2. Environmental Permits, Incidents and Registers Map



Dangerous Substances (List 2)

Licenced Discharge Consents

Red List Discharge Consents

Water Industry Referrals

- Part A(2) and Part B Authorised Processes
 - COMAH / NIHHS Sites

Sites Determined as Contaminated Land

Hazardous Substance Consents and Enforcements

Search Buffers (m)



2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

Database searched and no data found.

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

0

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.



2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

Database searched and no data found.	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:	0
Database searched and no data found.	0
2.1.8 Records of Licensed Discharge Consents within 500m of the study site:	
	0
Database searched and no data found.	
2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) with 500m of the study site:	hin
	0
Database searched and no data found.	
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the site:	study
Database searched and no data found.	0
2.2 Dangerous or Hazardous Sites	
Records of COMAH & NIHHS sites within 500m of the study site:	0
Database searched and no data found.	



0

0

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

Database searched and no data found.

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

Database searched and no data found.

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.