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REMEDIATION STATEMENT

for land at

RADCLIFFE HUB, RADCLIFFE

Prepared for

BURY COUNCIL

Report No. 5238-G-R002

Date: April 2023

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APPENDICES

Appendix A – Drawings

Drawing No.	Title
5238-G-D001	Site Location Plan
5238-G-D002	Existing Site Features & Site Photographs
5238-G-D003	Historical Features Plan
5238-G-D004	Exploratory Hole Location Plan
RADHUB-PAL-VV-XX-DR-A-1105 Rev P03	Proposed Site Layout Plan
RADHUB-POZ-V4-B1-DR-A-1201 Rev P07	Lower Ground Floor Plan
RADHUB-POZ-V4-ZZ-DR-A-1400 Rev P04	Proposed Sections – Sheet 1 of 2
RADHUB-POZ-V4-ZZ-DR-A-1401	Proposed Sections – Sheet 2 of 2
RADHUB-AJP-V4-ZZ-DR-S-2000	Site Strip Drawing
RADHUB-AJP-V4-ZZ-DR-S-2001 - PILING MAT	Piling Mat Design

Appendix B – Earthworks Strategy

Appendix C – Radon Report

Appendix D – Cover Soils Protocol

Revision History

From	Date	Comments
5238-G-R002	April 2023	Original Report

REMEDICATION STATEMENT for land at RADCLIFFE HUB, RADCLIFFE

1 INTRODUCTION

1.1 The Commission and Brief

- 1.1.1 ID Geoenvironmental Limited (IDG) were commissioned by Vinci Building (Vinci) on behalf of Bury Council (The Client) to prepare a Remediation Statement for a site at Radcliffe Hub, Radcliffe, hereafter referred to as “the site”.
- 1.1.2 Investigations have taken place at the site with reports issued as documented in Section 2.1. The investigations did not identify any significant contaminant linkages at the site. This document has been prepared at the request of Bury Council to outline the measures required to ensure potential contaminant linkages are managed to minimise harm to human health, property and the environment.
- 1.1.3 The assessment methodology applied in this Statement follows the framework presented in EA document Land Contamination Risk Management (LCRM) and is summarised below:
- Remediation options appraisal
 - Implementation plan
 - Verification plan

1.2 Site Description

- 1.2.1 Site details are summarised in the Table 1.1. A location plan is shown on Drawing No 5238-G-D001 presented in Appendix A.

Table 1.1: Summary of Site Location Details

Location	Radcliffe town centre
NGR	378540, 406950
Approximate Area	0.73Ha

1.3 The Proposed Development

- 1.3.1 It is understood that consideration is being given to redevelopment of the site with a three-storey leisure and community centre that will include a lower ground floor level (i.e. basement). The centre is to include a swimming pool, climbing wall, fitness suite, library and community rooms.
- 1.3.2 Drawing No. RADHUB-PAL-VV-XX-DR-A-1105 Rev P03 presented in Appendix A shows the extent of the proposed building with cross sections (Drawing No. RADHUB-POZ-V4-ZZ-DR-A-1400 Rev P04 & RADHUB-POZ-V4-ZZ-DR-A-1401) also presented in Appendix A that show the proposed floor elevations of the building and indicate the floor level of the basement will be at an elevation of 61.3m AOD.

1.4 Development Ground Levels & Volumetric Assessment

- 1.4.1 Vinci have prepared an Earthworks Strategy a copy of which is presented in Appendix B. A summary is provided below.

- 1.4.2 Made Ground at the site will be excavated (turned over) to a depth of 1.5m below existing ground level to locate and remove redundant foundations, groundbeams or other obstructions. Where obstructions conflict with the foundations to the proposed building they will be removed to their full depth. A 0.5m reduced level excavation will be undertaken around the perimeter of the building footprint.
- 1.4.3 Excavated masonry and concrete, together with demolition arisings will be crushed on site to 6F2 grading for re-use on site.
- 1.4.4 It is estimated that 5160m³ of material will be excavated to the 1.5m reduced level. 3493m³ of arising will be replaced with nominal compaction within the excavation prior to placement of a 600mm thick (2038m³) piling mat and 0.5m thick (475m³) haul road consisting of site generated 6F2 recycled aggregate. The shortfall (843m³) will be made up from demolition arisings estimated to be 700m³ to 1000m³. Excess materials will be exported from site as waste.
- 1.4.5 Volumetric calculations are summarised below.

Table 1.2 Materials Balance Summary

Description	Cut (m ³)	Fill (m ³)	Balance
1.5m turnover excavation	5163		
Compacted fill of excavation		3493	
Piling mat		2038	
Perimeter Haul Road		475	
Balance			-843
Demolition Arisings		1000	
Balance (Disposal off site)			+157

- 1.4.6 On completion of the above, arisings from basement excavations, pool excavation and foundation excavations will be disposed off site.

1.5 Foundations

- 1.5.1 The new leisure and community centre will be constructed with piled foundations.

1.6 Materials Management Plan

- 1.6.1 Remediation works require significant re-profiling of the site. Excavated materials may be considered to be waste by the Environment Agency (EA). Placement of such materials back in the ground may be considered to be a permitted activity. A Materials Management Plan will therefore be prepared for the remediation works in order to ensure that materials are not considered to be waste by the EA.
- 1.6.2 Following agreement with the LPA, this Remediation Statement will form the basis of the MMP.

2 BACKGROUND

2.1 Previous Investigations

- 2.1.1 Arup have previously issued the following reports:

- Constraints Desk Study report for Radcliffe Town Centre (Report Ref. RAD-ARP-RP-CG-0001 Issue 2, dated April 2021) undertaken by Ove Arup & Partner Limited (Arup).

- 2.1.2 IDG have previously issued the following reports:

- Geoenvironmental Appraisal, Report No. 5238-G-R002, dated August 2022

2.1.3 Arup's Desk Study report investigated two parcels of land located to the north and south of Dale Street referenced as the northern block and the southern block. Comparison of the extent of the two blocks investigated in Arup's Desk Study indicates the area identified as the Southern Block in Arup's report has the same extent as the site to be investigated by IDG.

2.1.4 Pertinent desk study information relating to the site presented in Arup's report (i.e. the southern block) is presented below.

Phase 1 Desk Study Report

Table 2.1 - Desk Study Summary

Subject	Comment
Topography	Ground level varies between 66.2m AOD in the north to 61.5m AOD in the south, and 64.8m AOD in the west to 64.2m AOD in the east.
Geology	Glaciofluvial Sheet deposits comprising sand and gravel, overlying Pennine Middle Coal Measures (PMCM) strata comprising mudstone, siltstone and sandstone. There is a NW-SE trending fault in the east of the site, which results in the Nob End Sandstone formation underlying the eastern part of the site.
Radon	A BGS site-specific radon report (December 2022 map) has been obtained from the BGS and is presented in Appendix C. The site lies within an area where between 3-5% of properties are affected by radon. Basic radon protection measures are required in new buildings.
Hydrogeology	The PMCM is classified as a Secondary A Aquifer. The site is not within a groundwater Source Protection Zone.
Hydrology	The River Irwell is situated immediately southeast of the site and flows from the northeast to the southwest.
Landfill Sites	There are no landfills with an active licence within 500m of the site. The Environment Agency records show two historical landfills within 500m of the site: • an inert waste landfill located 183m west of the site, operated by Bury Council and licenced between March and May 1991. • landfill located 265m north of the site which was first recorded to operate from December 1974. The date the landfill ceased operating and the type of waste accepted are unknown. The presence of unrecorded areas of landfilling is unlikely within the site.
History	The site has been occupied by a dye works, market hall, market place, bus station & sub-station.
Mining	Seven coal seams have been worked beneath the site from a depth of 103-486m. The possibility of unrecorded shallow mine workings beneath the site can be discounted

Ground Investigation Report

Table 2.2: Ground Investigation Summary

Subject	Comment
Fieldwork	WS01 – WS04 Window Sampling Boreholes (final depth 3.6 – 6.7m) BH05 – BH07 Rotary Probeholes (final depth 13.5 – 18.0m)
Geology	Made Ground proven to depths of 0.6 – 1.8m Glaciofluvial Sheet Deposits typically comprised brown sandy gravelly clay underlain by grey gravelly sand. PMCM bedrock comprising grey to dark grey thinly laminated Mudstone was encountered in several boreholes at depths ranging from 3.0m bgl in BH05 to 5.2m bgl in WS02 and proven to a maximum depth of 18.0m (BH07).
Groundwater	A shallow groundwater body present within the Glaciofluvial Sheet Deposits rests at depths of between 1.33m bgl (BH06) and 4.17m bgl (WS02). Groundwater present within the PMCM strata at BH07 rests at depths of between 2.65m – 3.20m bgl. The groundwater level in BH07 is approximately 1.0m – 1.5m higher than the top of the PMCM strata and indicates the groundwater within the PMCM strata is under sub-artesian pressure.
Contamination	No evidence of organic or inorganic contamination has been identified in the Made Ground or natural soils tested during the investigation. Samples of the groundwater bodies present within the Glaciofluvial Sheet Deposits and the PMCM strata were tested and no evidence of contamination was identified. Made Ground is considered suitable for re-use on the site.

Subject	Comment
Hazardous Gas	No hazardous ground gas sources have been identified.
Foundations	The leisure and community centre will be constructed piled foundations.
Shrinkable Soils	For the purposes of foundation design, it is recommended that all cohesive soils be regarded as being of medium volume change potential.
Concrete Classification	DS-2, AC-2 for the Made Ground, Glaciofluvial Sheet Deposits and PMCM Mudstone.

2.2 Conceptual Site Model

2.2.1 In terms of the proposed redevelopment, plausible contaminant linkages are summarised in Table 2.3.

Table 2.3: Conceptual Site Model

Sources	Receptors	Plausible Pathways	Potential Remediation Options
Hazardous Gas (radon)	Human Health	Migration of Radon gas through granular strata and ingress into confined spaces leading to adverse health effects	A BGS site-specific radon report (December 2022 radon map) has been obtained from the BGS and is presented in Appendix C. The site lies within an area where between 3-5% of properties are affected by radon. Basic radon protection measures are required in new buildings.

2.2.2 The Conceptual Site Model presented above indicates that remediation works are not required to protect controlled waters at the site.

3 RISK ASSESSMENT & TARGET CONCENTRATIONS

3.1 Remediation Objectives

3.1.1 The remediation objectives for the redevelopment of the site are:

- Break contaminant linkages
- Remove/remediate significant pollution sources identified during the works that present a risk to human health and/or the environment.
- Respond appropriately to the discovery of previously unidentified contamination
- Recover materials for re-use in the proposed development (e.g. recycled aggregates)
- Manage emissions to air and water to protect local residents and the environment during remediation works.
- Allow additional protection measures to be implemented during remediation or construction works (if required).

3.1.2 The potential risks identified will be managed to break the contaminant linkages and enable development of the site for a residential end use.

3.1.3 Remediation and preparatory works will be undertaken by the Contractor to prepare the site for the proposed development. These works are considered to comprise:

- Vegetation and topsoil strip
- Waste removal
- Contamination hotspot removal and treatment/offsite disposal
- Removal of obstructions (e.g. relict foundations)
- Earthworks to alter ground levels
- Provision of a geotechnical stable development platform for properties and infrastructure

3.1.4 A watching brief should be maintained by the supervising engineer during the preparatory works to enable inspection of excavations and general fill materials for previously unidentified

contamination.

3.2 Remediation Criteria

General Fill (Human Health only)

- 3.2.1 Assuming placement of a 0.6m clean cover of validated cover soils in landscaped areas, generic assessment criteria (GACs) for the protection of Human Health for contaminants of concern for materials to remain on site are summarised in Table 3.1.
- 3.2.2 The adoption of the GACs presented in Table 3.1 is considered an appropriate method of assessing risks posed by ground contamination at the site. However, it should be noted that should a significant mobile hydrocarbon contamination be encountered at the site, then a site specific risk assessment to be protective of controlled waters (River Irwell) will be required.
- 3.2.3 It is not possible to devise an assessment concentration for asbestos in soil. However, asbestos screening tests will be used to identify whether site materials contain asbestos. Where asbestos is identified in screening tests, samples will be subjected to quantification tests as required.

Table 3.1: Remediation GACs for General Fill

Determinant	GACs for General Fill to remain on site below hardstand or 600mm clean cover (mg/kg)		
	1% SOM	2.5% SOM	6% SOM
Naphthalene	190	460	1,100
Benzo(a)pyrene	35	35	36
Benzene	27	47	90
Toluene	56000	110000	180000
Ethylbenzene	5700	13000	27000
Xylenes (p-Xylene)	5900	14000	30000
Aliphatic C ₅ -C ₆	3200	5900	12000
Aliphatic C ₆ -C ₈	7800	17000	40000
Aliphatic C ₈ -C ₁₀	2000	4800	11000
Aliphatic C ₁₀ -C ₁₂	9700	23000	47000
Aliphatic C ₁₂ -C ₁₆	59000	82000	90000
Aliphatic C ₁₆ -C ₂₁	1600000	1700000	1800000
Aliphatic C ₂₁ -C ₃₅	1600000	1700000	1800000
Aromatic C ₅ -C ₇	26000	46000	86000
Aromatic C ₇ -C ₈	56000	110000	180000
Aromatic C ₈ -C ₁₀	3500	8100	17000
Aromatic C ₁₀ -C ₁₂	16000	28000	34000
Aromatic C ₁₂ -C ₁₆	36000	37000	38000
Aromatic C ₁₆ -C ₂₁	28000	28000	28000
Aromatic C ₂₁ -C ₃₅	28000	28000	28000
Asbestos Quantification Test (if asbestos detected in screen test)	<0.1%		

- 3.2.4 Some contaminants reach residual saturation before a vapour risk is predicted to occur by the QRA model. However, IDG recognise that it is unacceptable to leave free product in the ground where redevelopment of a site is proposed. Consequently, this Remediation Statement advocates the removal/treatment of soils that contain significant free product in the unlikely event that it is encountered during remediation works.

- 3.2.5 In this context, significant free product is readily identifiable by the naked eye, and pervasive throughout the soil mass, probably with noticeable seepages. Traces of free product in fissures or localised, cobble-sized pockets would not normally be considered significant.

Cover Soils

- 3.2.6 All materials placed within 0.6m of final ground levels in landscaped areas of the development shall comply with the requirements of IDG's Cover Soil Protocol which is presented in Appendix D. It should be noted that assessment criteria for cover soils are based on 3x the residential assessment criteria, rather than GAC for Commercial Use which would be significantly higher.

4 REMEDIATION OPTIONS APPRAISAL

4.1 Introduction

- 4.1.1 Other than a potential for Radon gas, no contaminant linkages have been identified at the site. Therefore, a Remediation Options Appraisal is not required.

5 REMEDIATION STATEMENT

5.1 Overview

- 5.1.1 The following preparatory works are required (*not* subject to verification):
- General site clearance.
 - Demolition of buildings
 - Crushing of all suitable artificial hard material (i.e. concrete/brick etc) for re-use as general fill.
 - Backfill of excavations with nominal compaction.
 - Re-grade of site to levels specified by the Client.
 - Placement of a piling mat.
- 5.1.2 The following remediation works are required (subject to verification):
- Asbestos removal from existing buildings.
 - Turnover of Made Ground with removal of below ground obstructions under Geoenvironmental watching brief.
 - Contingency for Unknowns – Contamination 'Hotspot' Protocol
 - Offsite disposal of surplus or contaminated fill material.
 - Installation of "basic" radon protection measures.
- 5.1.3 The following post construction works are required (subject to verification):
- Import and placement of 'clean' soils as 0.6m thick clean cover layer in landscaped areas.
- 5.1.4 Any major deviation from the works required in this Remediation Statement must be agreed with the Local Planning Authority (LPA). In addition, any unexpected contamination encountered during the remediation works should be brought to the attention of the LPA.
- 5.1.5 Site works shall be supervised throughout by a suitably qualified Engineer, who will report to a Project Manager. Supervision may be part-time for certain activities but must be full-time during the removal of any grossly contaminated soil.

5.2 Site Set-up, Organisation and Safety

- 5.2.1 The Client shall ensure that the Contractor is provided with copies of all reports produced by IDG,

in order that they can carry out their own risk assessments for the works. IDG will provide information on request relating to specific hazards associated with contamination issues respectively.

5.2.2 A Method Statement will be prepared by the Contractor undertaking the remediation and preparatory works. This should demonstrate how the Contractor intends to carry out the works in order to achieve the remediation objectives. In particular, details of the way in which different material types are to be kept separate should be clearly stated. The Contractor's Method Statement should be forwarded to IDG to enable comments to be made prior to works commencing and a pre-start meeting is advised.

5.2.3 The Contractor's Method Statement should include details of how the site will be organised in order to minimise the risks to workers and the public, associated with handling contaminated materials. The following measures may need to be considered:

- Protective clothing, footwear and gloves
- Boot-washing facilities
- Refuelling of mobile plant in a designated area to prevent contamination of soils on site.

5.3 Contractor's Responsibilities

5.3.1 Prior to the commencement of any works the Contractor, in agreement with the Client, will:

- Fulfil any requirements of the Client's contract documentation.
- Establish the boundaries of the site and the working areas.
- Undertake a dilapidation survey of site boundaries, adjacent properties and highways, via dated photographs or video footage.
- Liaise with the Local Authority regarding working hours, noise\dust\odour control, and protected trees.
- Liaise with the Local Water Company regarding any proposed discharge to sewer.
- Complete a full services search and liaise with all relevant utility companies regarding work in close proximity to their apparatus.
- Prepare a detailed Method Statement outlining how the objectives of this Remediation Statement will be achieved.
- Inform the Engineer of any risk, identified and assessed, which could impact upon the Engineer's activities.
- Prepare the necessary COSHH statements and Health & Safety Plan in accordance with CDM regulations.

5.3.2 The Contractor shall satisfy the Health & Safety Executive with regard to all matters concerning the health, safety and welfare of persons on the site.

5.3.3 The Contractor shall ensure that:

- Personnel, plant, materials and other equipment related to the contract are confined within the boundaries of the site.
- Any live services lying within the site boundary are marked and protected, or appropriate arrangements made to truncate them.
- Good practices relating to personal hygiene are adopted.
- Suitable precautions are implemented at all times to prevent off-site migration of contaminants via airborne dust.
- Suitable precautions are taken to prevent the spread of mud and debris on public highways.
- Refuelling of mobile plant is undertaken in a designated area. Above ground oil storage tanks shall comply with the requirements of Pollution Prevention Guideline PPG2. A spill kit shall be kept on site, adjacent to the designated refuelling area.

6 IMPLEMENTATION PLAN - PREPARATORY & REMEDIATION WORKS

6.1 General Site Clearance

- 6.1.1 Any trees currently under a preservation order shall be identified and agreed with relevant authorities prior to the commencement of the works. All trees subject to a TPO shall be protected by chestnut paling with fluorescent tape by the Contractor.
- 6.1.2 The site shall then be cleared of all residual debris, any vegetation, shrubs, bushes and unprotected trees as instructed by the Client.

6.2 Asbestos Removal from Buildings to be Demolished

- 6.2.1 Bury Council have commissioned APEC to undertake Demolition & Refurbishment surveys of the vacant buildings to identify ACM within the buildings scheduled for demolition. Asbestos removal to remove all identified ACM prior to demolition is in progress and will be completed by the end of May 2023.

6.3 Demolition

- 6.3.1 Demolition is due to start July 2023, commencing with full internal soft strip of the buildings. A demolition contractor is yet to be appointed. The appointed contractor will provide a Detailed Method Statement prior to commencement of the works.
- 6.3.2 Building arisings will be processed on site to generate useable 6F2 type material (Section 6.6) which will be incorporated back into the works for bulk fill, capping and pile platform (Section 1.4). The works will be closely monitored and supervised to ensure the safe removal of the building, and in a manner that controls noise, dust and vibration.

6.4 Turnover of Made Ground & Removal of Foundations

- 6.4.1 Made Ground will be 'turned over' to a maximum depth of 1.5m across the footprints of the proposed properties in order to identify and remove obstructions.
- 6.4.2 Turnover of Made Ground will be subject to a "watching brief" by the Geoenvironmental Engineer. The Engineer will attend site following removal of hardstand or concrete floor slab to excavate a number of trial pits to further investigate the Made Ground and to demonstrate the absence of gross contamination prior to turnover. Samples will be obtained from trial pits and tested as set out in Section 7.3 below.
- 6.4.3 The Engineer will, on the basis of visual and olfactory evidence, confirm to the Contractor that turnover of the section of the site inspected can proceed. During the 'turnover' works, the excavated materials should be inspected by the Contractor to ensure there are no areas of previously undetected contamination. Where contamination is encountered the Contractor shall follow the 'Hotspot' Protocol procedure outlined in Section 6.5.
- 6.4.4 The Contractor will record the extents and base of all excavations undertaken during the remediation works by topographic survey. This survey will also record the locations of any below ground obstructions that have been left in-situ.
- 6.4.5 The Contractor will provide the Engineer with a survey detailing the depth and extent of all excavations undertaken during the remediation and preparatory works (i.e. base of Made Ground Survey) for inclusion in the Verification Report. This survey will also record the locations of any below ground obstructions that have been left in-situ.

- 6.4.6 The Contractor shall also provide the Engineer with daily photographic records demonstrating the earthworks undertaken at the site including the re-engineering of any fill materials.

6.5 Contingency for Unknowns – Contamination ‘Hotspot’ Protocol

- 6.5.1 Should unanticipated ground conditions be encountered during the remediation works, the Contractor should immediately seek further advice from the Engineer.
- 6.5.2 Any unanticipated grossly hydrocarbon contaminated soil\fill should be excavated under full time supervision of the Engineer who will be equipped with a portable PID instrument to assist with delineation. All excavated material will be placed in temporary stockpiles on hardstand or visqueen, suitably covered and bunded. The Engineer will verify the excavation and excavated materials as set out in Section 7.4.
- 6.5.3 Excavations should not be left open for longer than is necessary and should be securely cordoned-off using 2m high Herras-type fencing, with appropriate warning signs whenever excavation works are suspended.
- 6.5.4 On completion of soil removal, the Contractor shall record the extent of the excavation by survey and await the Engineer’s instruction to backfill the excavation.

6.6 Crushing of Oversize Hard Materials

- 6.6.1 Production of a selected granular fill should be possible if suitable materials (generated by grubbing-up of concrete slabs, foundations and other relict structures) are crushed.
- 6.6.2 The crushed product should be screened to remove any unsuitable elements and stockpiled for re-use during the subsequent construction works. Generation of a Class 6 material as defined in the Highways Agency Specification (Series 600) should be possible.
- 6.6.3 Dust suppression will be required when crushing operations are taking place. Prior to commencement of crushing operations the Contractor will provide a method statement documenting the dust mitigation measures to be employed.
- 6.6.4 In addition, the Contractor, if instructed to do so by the Engineer, will arrange for air-fibre monitoring to be undertaken during crushing operations if asbestos containing materials are suspected to be present.
- 6.6.5 The Contractor will provide the Engineer with copies of the crusher permits, dust monitoring and if undertaken, air fibre monitoring records, for inclusion in the Verification Report.

6.7 Offsite Disposal of Material (Export to Landfill)

- 6.7.1 Contaminated excavation arisings that are unsuitable for retention and re-use on site shall be placed in temporary stockpiles on polythene sheeting and be suitably covered to minimise the potential for dust\odour nuisance and prevent surface water run-off. The Engineer will sample the stockpiles in accordance with Section 7.4.4. Following receipt of chemical test results stockpiles of material should be exported from site as soon as practically possible.
- 6.7.2 Uncontaminated excavated arisings that are surplus to requirements shall be placed in temporary stockpiles. The Engineer will inspect and sample the stockpiles in accordance with 7.5.2 to enable the Contractor to determine the most appropriate disposal route.
- 6.7.3 Any material exported from site to landfill or other licensed waste facility should be hauled by a registered waste carrier in accordance with the requirements of the Duty of Care Regulations,

2018 and the Landfill (England & Wales) Regulations 2002.

- 6.7.4 A waste consignment note should be completed, signed and retained by the parties involved. The transfer note should include the volume of waste, the nature of the material and a statement of its chemical composition, details of the source and destination sites, and details of the haulier.
- 6.7.5 In order to protect the general public from dust and vapour emissions, wagons that are to be used for the offsite disposal of materials must be sheeted. In addition, the Contractor must ensure that no fluids seep from the wagons.
- 6.7.6 The Contractor must provide the Engineer with copies of the waste consignment notes for any waste materials that are disposed off-site.

6.8 Installation of Basic Radon Protection Measures

- 6.8.1 In accordance BRE 211 "Radon- Guidance on protective measures for new buildings" a radon barrier membrane will be installed across the entire building footprint and continuous across cavities comprising 300 micrometre (1200 gauge) virgin polyethylene or other suitable radon protective product. It should be noted that in basement areas tanking will be installed which will also act as a radon barrier membrane.
- 6.8.2 Following installation the radon barrier membrane will be protected from damage during construction.
- 6.8.3 Prior to installation a Radon Protection Measures Implementation Plan will be prepared in accordance with CIRIA 735 detailing
- drawings detailing the design of the radon protection measures confirming the barrier to be continuous across the building.
 - confirmation of the products to be installed together with their specification sheets
 - details of the qualifications and experience of the installers
 - details of the qualification and experience of the verifying engineers
 - details of the scope of verification testing
 - details of the procedure to follow should the installed barrier membrane be damaged during construction.
 - details of the proposed contents of the radon specific elements of the Verification Report.
- 6.8.4 The Implementation Plan will be issued to the Local Planning Authority for comment and approval before commencement of construction.

7 VERIFICATION PLAN

7.1 Engineer Responsibilities

- 7.1.1 Provided that the Contractor advises their intended programme of works in a timely fashion, the Geoenvironmental Engineer will ensure that the requirements of this Remediation Statement are complied with.
- 7.1.2 Site works shall be supervised throughout by a suitably qualified Engineer. Supervision may be part-time for certain activities but must be full-time during the removal of any grossly contaminated soil.
- 7.1.3 The responsibilities of the Geoenvironmental Engineer shall include the following:
- Supervision of the remediation works outlined above.

- Advice on the correct handling of materials encountered.
- Retrieval of soil samples and the subsequent scheduling of appropriate laboratory analysis to enable verification of various aspects of the works, as required.
- Liaison with statutory authorities as required.

7.2 Asbestos Removal from Buildings

- 7.2.1 The Contractor will provide copies of clearance certificates for all buildings where asbestos was identified in pre-demolition surveys, for inclusion in the Verification Report.

7.3 Turnover of Made Ground- Verification Testing

- 7.3.1 Following removal of hardstand or concrete floor slab the Engineer will excavate an appropriate number of trial pits to further investigate the Made Ground and to obtain samples for chemical testing.
- 7.3.2 A minimum of ten additional samples will be tested for a chemical testing suite to comprise pH, heavy metals, asbestos, total organic carbon, speciated PAH, BTEX and TPHCWG. The engineer may specify additional chemical testing (for example VOC and SVOC testing) on the basis of visual or olfactory evidence obtained during trial pitting. Chemical test result will be assessed against the criteria outlined in Section 3.
- 7.3.3 Trial pit logs, exploratory hole location plan, laboratory chemical test results and assessment summary tables together with a base of Made Ground survey detailing the depth and extent of all excavations undertaken during the remediation and preparatory works will be presented in the Verification Report.

7.4 Contingency for Unknowns – Contamination ‘Hotspot’ Protocol

- 7.4.1 Any unanticipated contaminated soil\fill should be excavated under full time supervision of the Engineer who will be equipped with a portable PID instrument to assist with delineation for hydrocarbon contaminated material. The Engineer will ensure that all excavated material will be placed in temporary stockpiles on hardstand or visqueen, suitably covered and banded.
- 7.4.2 Following the removal of the impacted material; the Engineer will inspect and sample the resultant excavation. A minimum of 5 validation samples will be taken from the excavation sidewalls and base. In larger excavations, additional validation samples will be taken from the exposed excavation surfaces on a 10m grid.
- 7.4.3 Validation samples shall be tested for pH, heavy metals, asbestos, total organic carbon, BTEX, TPHCWG, SVOC and VOC to enable assessment to the contaminants of concern presented Table 3.1. Analysis for other determinants may be appropriate and will be requested by the Engineer as necessary. The Engineer will instruct continued removal of impacted material and re-validate the resultant excavation should the initial validation samples yield concentrations in excess of the assessment criteria outlined in Table 3.1.
- 7.4.4 The Engineer will sample the hotspot arisings at a frequency of 1:250m³, dispatch the sample(s) to a UKAS accredited laboratory where it will be scheduled for an appropriate range of determinands to characterise the contaminated material. On identification of the nature of contaminated material the Engineer will liaise with the LPA's EHO to discuss/obtain approval for an appropriate course of action. Where disposal to landfill is envisaged, Waste Acceptance Criteria (WAC) testing may also be required.
- 7.4.5 Excavated material demonstrated to be unsuitable for retention onsite (i.e. exceeds the GACs presented in Table 3.1) will be disposed offsite to an appropriately licensed facility as set out in

Section 6.7 above.

- 7.4.6 Full details of the location and nature of the contamination hotspot accompanied with chemical test results and the fate of hotspot arisings, together with regulatory correspondence will be provided in the Verification Report.

7.5 Offsite Disposal of Material (Export to Landfill)

- 7.5.1 Contaminated excavation arisings that are unsuitable for retention and re-use on site shall be placed in temporary stockpiles on polythene sheeting and be suitably covered to minimise the potential for dust\odour nuisance and prevent surface water run-off. The Engineer will sample the stockpile(s) in accordance with Section 7.4.4.
- 7.5.2 Uncontaminated excavation arisings that are surplus to requirements shall be placed in temporary stockpiles. The Engineer will sample the stockpile(s) at a frequency of 1:1000m³ for a range of determinants to include pH, metals, speciated PAH, BTEX and TPHCWG. Where disposal to landfill is envisaged, Waste Acceptance Criteria (WAC) testing may also be required.
- 7.5.3 The chemical test results will be required to satisfy the “duty of care” obligations of the licenced waste carrier and receiving landfill.
- 7.5.4 The Contractor must provide the Engineer with copies of the waste consignment notes for any materials that are disposed off-site for inclusion in the Verification Report.

7.6 Radon Protection Measures

- 7.6.1 Radon protective measure will be independently verified in accordance with the verification requirements set out in the Implementation Plan.

8 VERIFICATION REPORT

- 8.1.1 On satisfactory completion of all the Contractor’s preparatory and remediation works the Geoenvironmental Engineer will prepare a Verification Report. Copies of the Verification Report will be issued to the Client and the Local Authority. The Verification Report will stand as certification that the preparatory and remediation works have been carried out in accordance with this Remediation Statement.
- 8.1.2 The Verification Report will include:
- A summary of the remediation works undertaken, including any works associated with unforeseen ground conditions.
 - Verification test results associated with “hot-spot” treatment, including plans showing sample locations & levels, and the extent of any “hot-spot” excavations.
 - Details of the fate of any arisings excavated from contamination “hot-spots”.
 - Details of any materials (general fill and contaminated materials) disposed offsite to include chemical analysis, volumes and waste consignment notes.
 - A copy of the Contractor’s survey detailing the depth and extent of all excavations undertaken during the turnover of made ground.
 - Copies of crusher permits and dust monitoring records associated with crushing of oversize hard materials.
 - Copies of dust monitoring records relating to general site activities and photographic evidence of mitigation measures (if applied).
 - Verification test results associated with proposed source materials for clean cover.
 - Copies of any correspondence with regulators relating to specific aspects of the

remediation works.

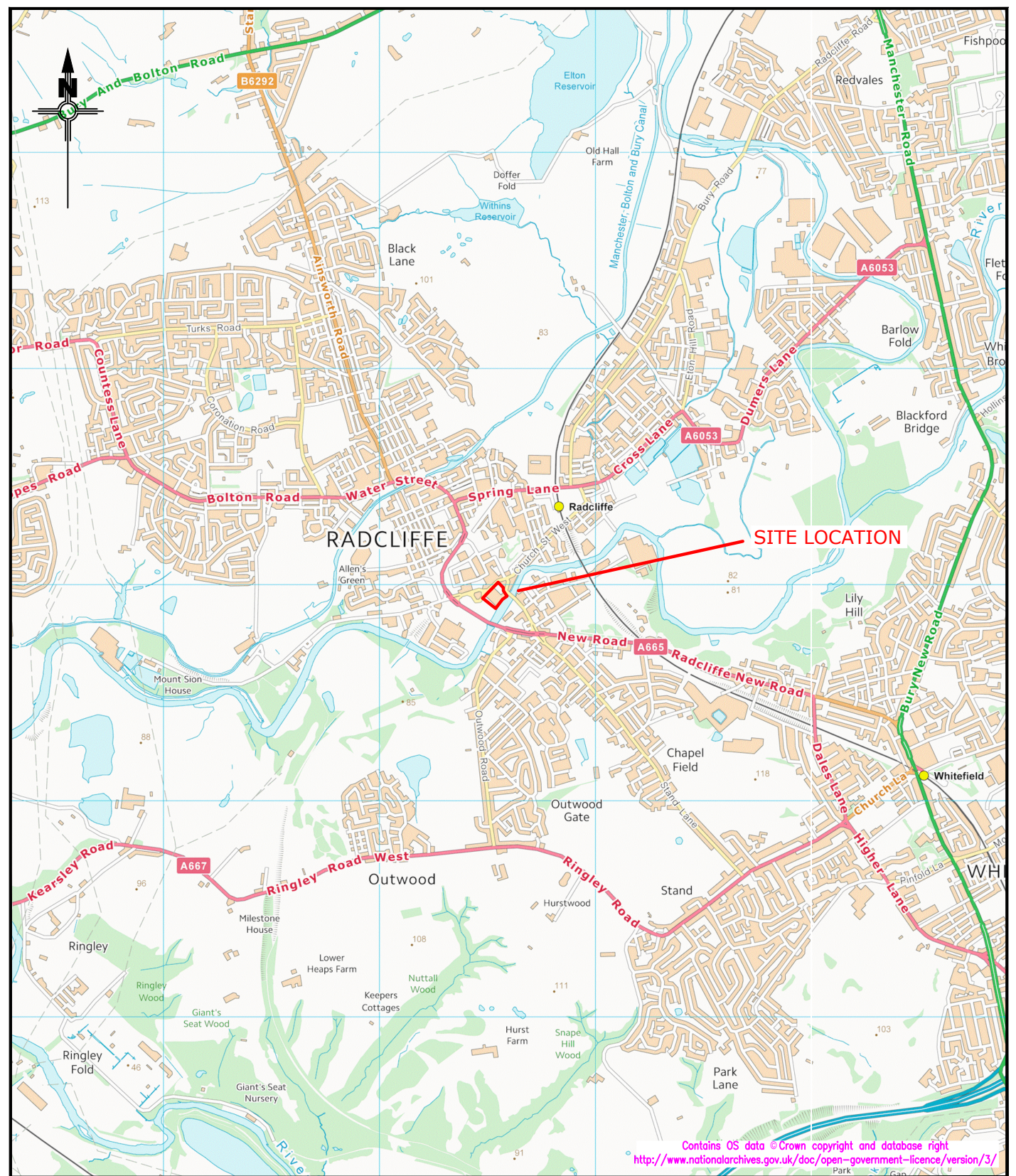
- A summary of any constraints that may have led to the remedial tasks not being completed in specific areas of the site.
- A summary of the remediation works still to be undertaken upon completion of the main remediation and preparatory works by the Contractor (e.g. placement of 0.6m thick cover system in landscaped areas).

9 POST CONSTRUCTION WORKS REQUIRING VALIDATION

9.1 Placement of Soil Cover

- 9.1.1 Whilst Made Ground at the site does not contain elevated concentrations of contaminants which present a risk to end users of the development, clean cover will be placed in landscaped areas of the site.
- 9.1.2 Therefore, on completion of the Construction Phase, clean inert soils (0.6m thick) are required to be placed over the Made Ground in landscaped areas to ensure a contaminant linkage is not present between the Made Ground and future site users. This cover layer is to comprise a minimum of 0.15m topsoil and the balance to be made up of “clean” subsoil.
- 9.1.3 Any site won or imported material for use as cover soil should be validated in accordance with the protocol presented in Appendix D. The protocol includes assessment criteria which should not be exceeded.
- 9.1.4 A validation report will be prepared on successful validation of the clean cover.

Appendix A

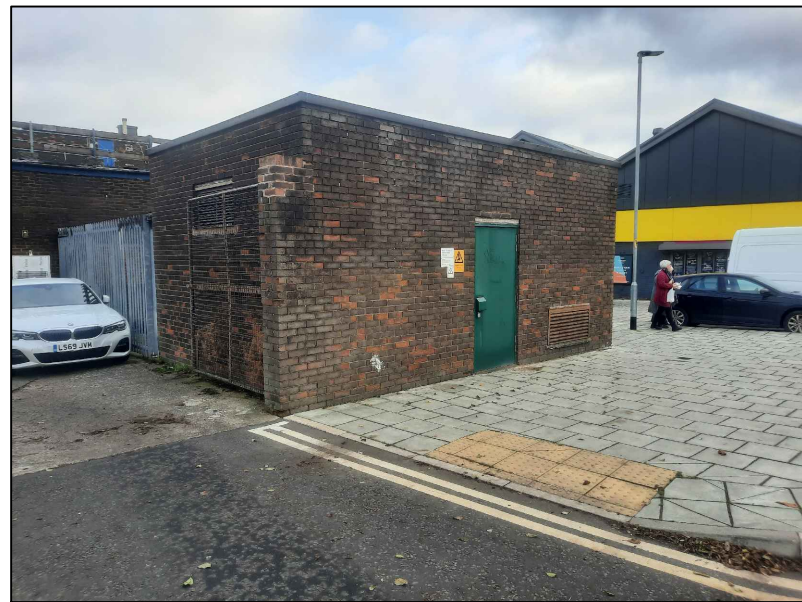
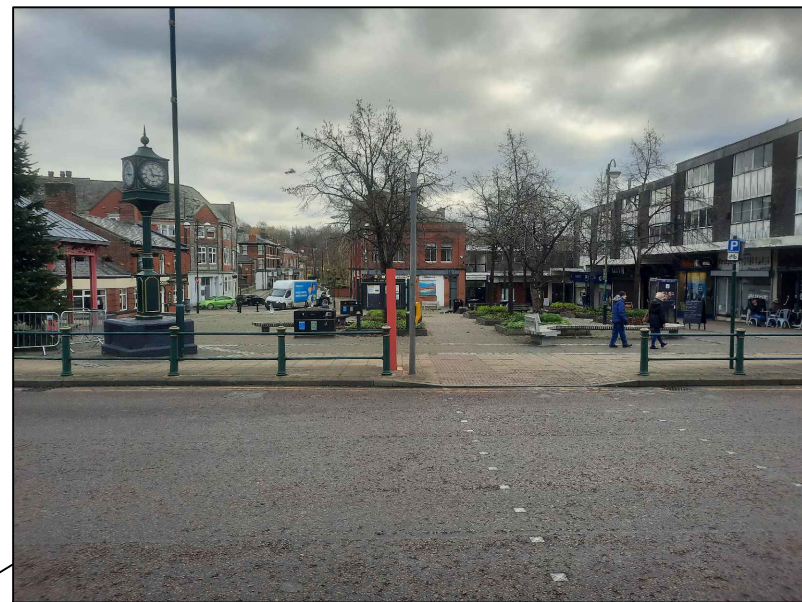
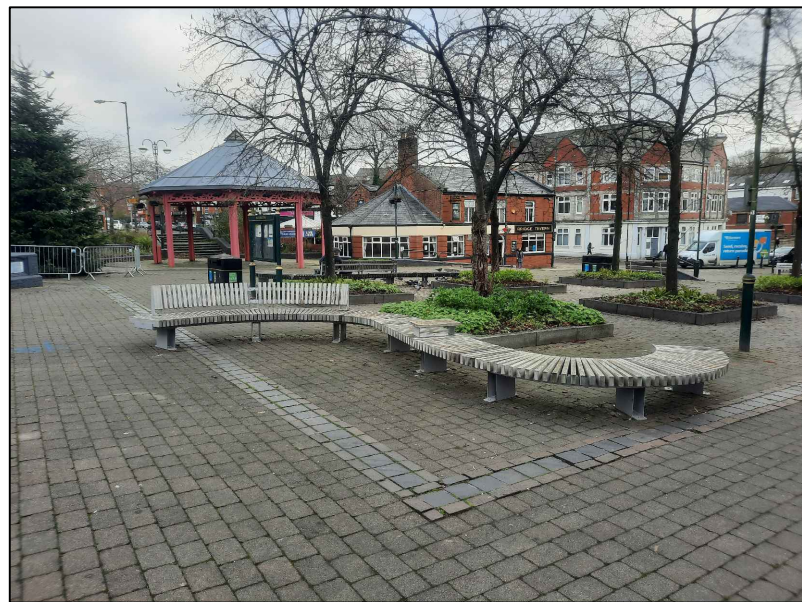
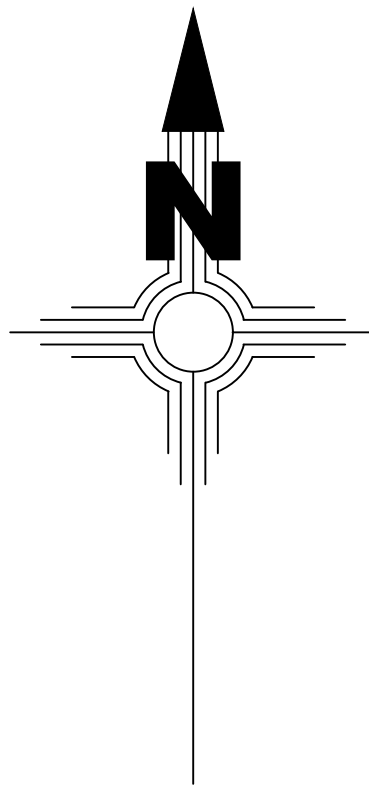


iD GeoEnvironmental Limited

www.id-geo.co.uk email: info@id-geo.co.uk
 Caledonian House, Tatton Street
 Knutsford, Cheshire, WA16 6AG Tel: 01565 755557 Fax: 01565 740263

CLIENT	BURY COUNCIL		
JOB TITLE	RADCLIFFE HUB		
DRAWING TITLE	SITE LOCATION PLAN		

DRAWN BY MJ	SIGNATURE	DATE 26/11/21	STATUS	
APPROVED BRB	SIGNATURE	DATE 26/11/21	SCALE 1:25,000@A4	DRG No. 5238-G-D001



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Radcliffe Bridge

Revision	Description	Date
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Tel: 01565 755557
Fax: 01565 740263

CLIENT

BURY COUNCIL

JOB TITLE

RADCLIFFE HUB

DRAWING TITLE

SITE FEATURES PLAN

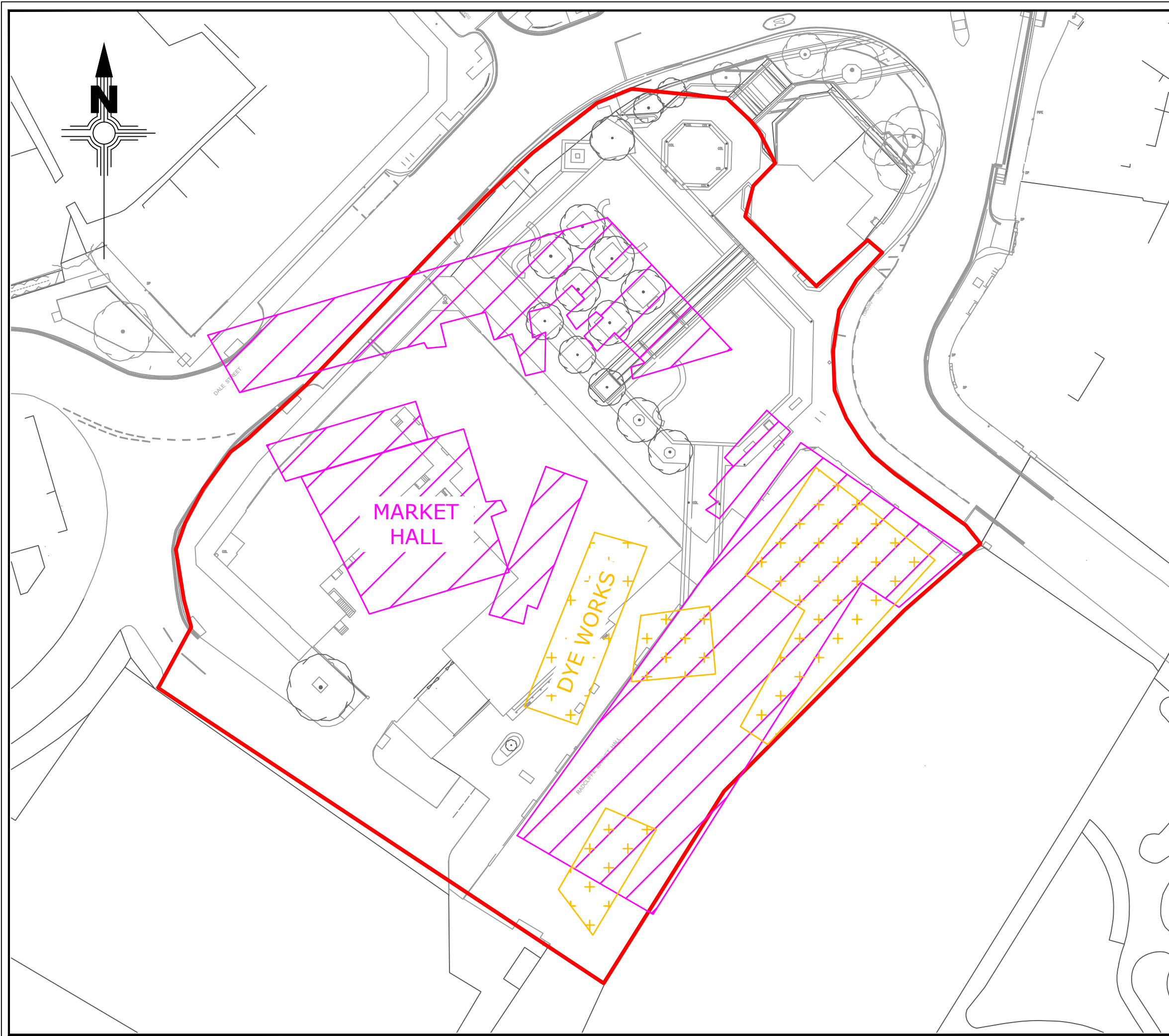
STATUS

FINAL

DRAWN BY	SIGNATURE	DATE
MJ		25/11/21

APPROVED	SIGNATURE	DATE
BRB		25/11/21

SCALE	DRG No.
N.T.S.	5238-G-D002



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- KEY**
- Site Boundary
 - Historical Site Feature - 1848 OS Plan
 - Historical Site Feature - 1893 OS Plan

Revision	Description	Date
----------	-------------	------



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Tel: 01565 755557
Fax: 01565 740263

CLIENT

BURY COUNCIL

JOB TITLE

RADCLIFFE HUB

DRAWING TITLE

**HISTORICAL SITE FEATURES
PLAN**

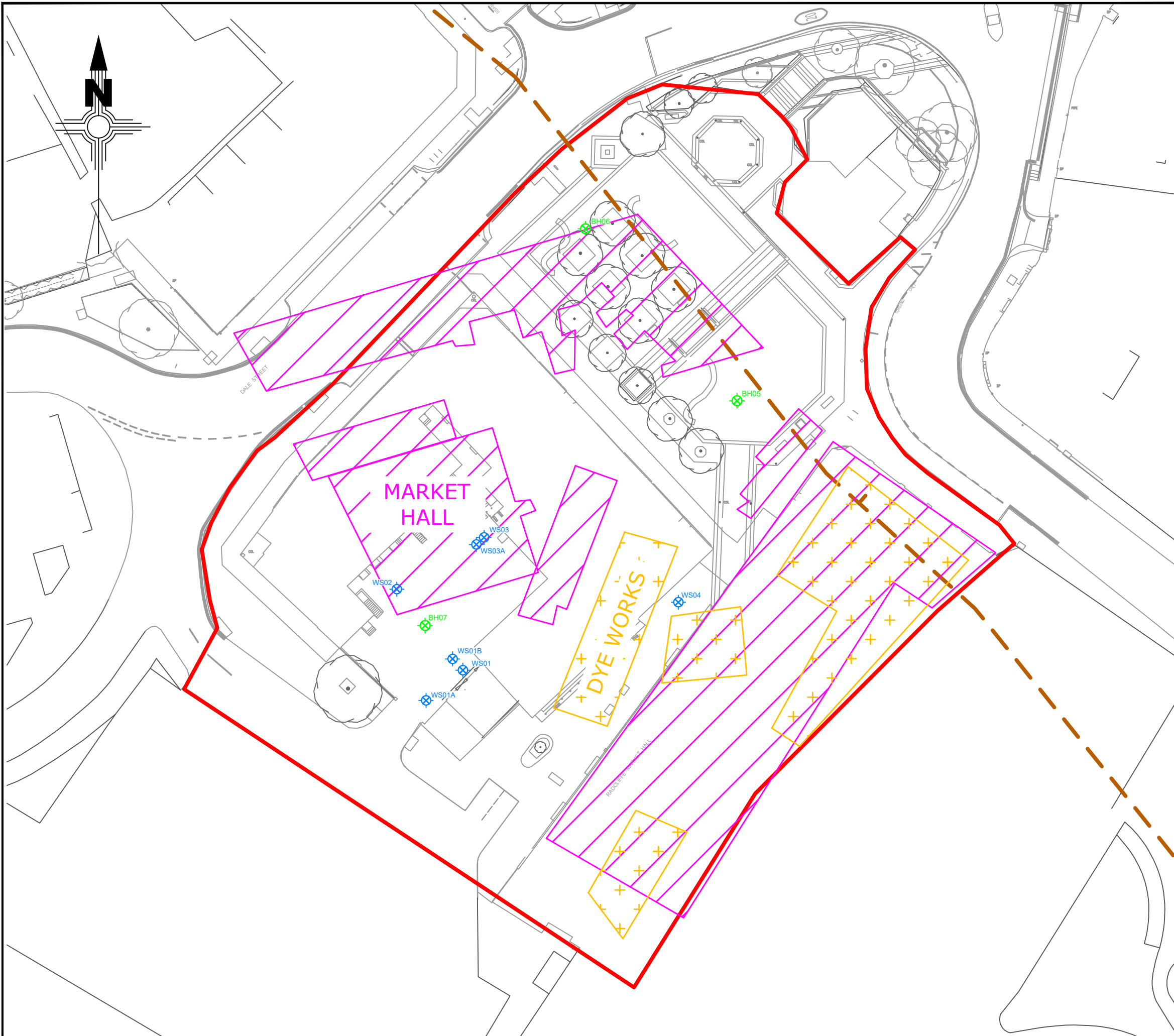
STATUS

FINAL

DRAWN BY MJ	SIGNATURE	DATE 01/12/21
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APPROVED BRB	SIGNATURE	DATE 01/12/21
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SCALE 1:500@A3	DRG No. 5238-G-D003
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- KEY**
- Site Boundary
 - IDG Window Sample Location
 - IDG Rotary Borehole Location
 - Approximate Location of Inferred Geological Fault
 - Historical Site Feature - 1848 OS Plan
 - Historical Site Feature - 1893 OS Plan

Revision	Description	Date
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CLIENT

BURY COUNCIL

JOB TITLE

RADCLIFFE HUB

DRAWING TITLE

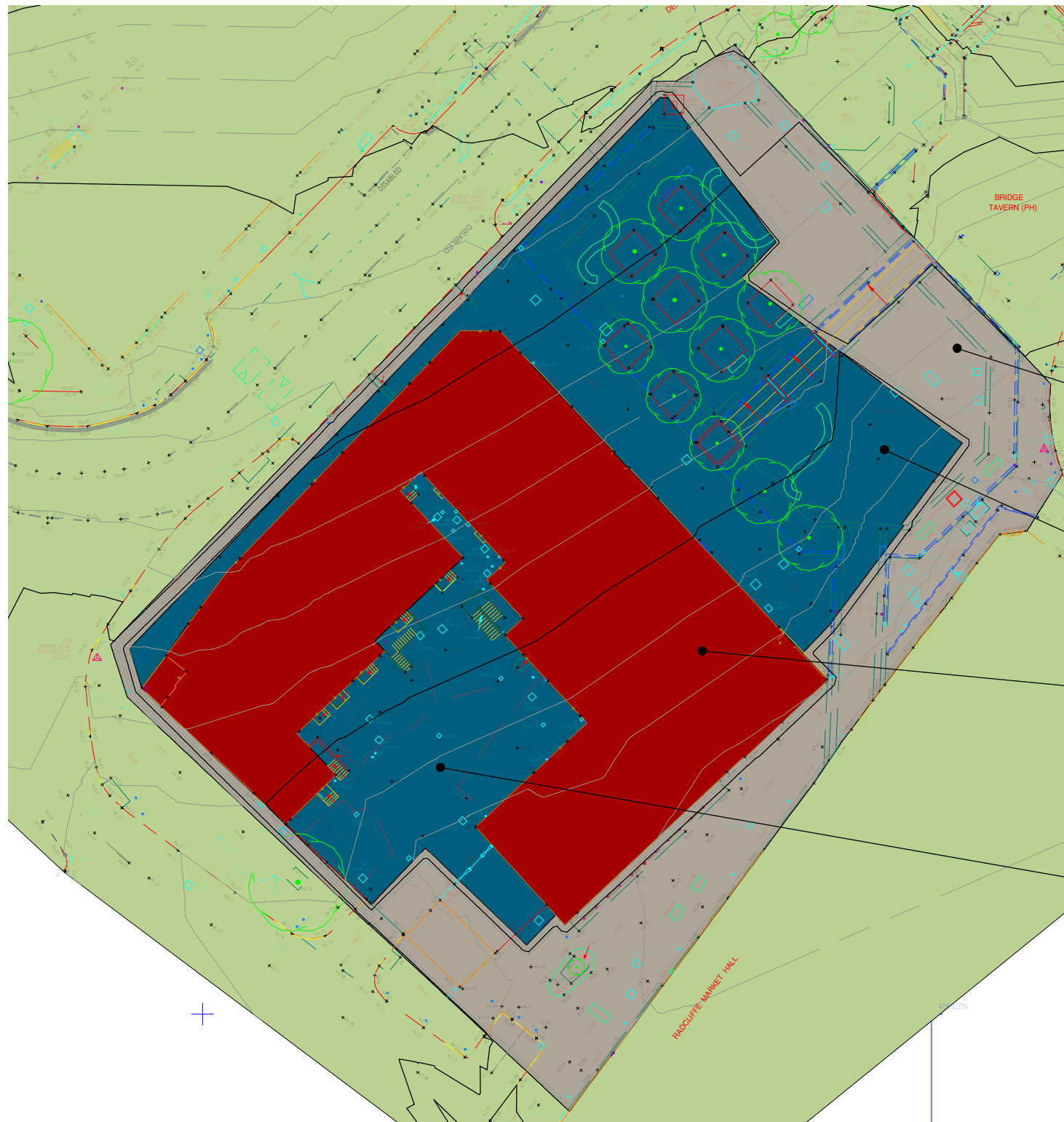
EXPLORATORY HOLE LOCATION PLAN

STATUS

FINAL

DRAWN BY MJ	SIGNATURE	DATE 11-07-22
APPROVED BRB	SIGNATURE	DATE 11-07-22

SCALE 1:500@A3	DRG No. 5238-G-D004
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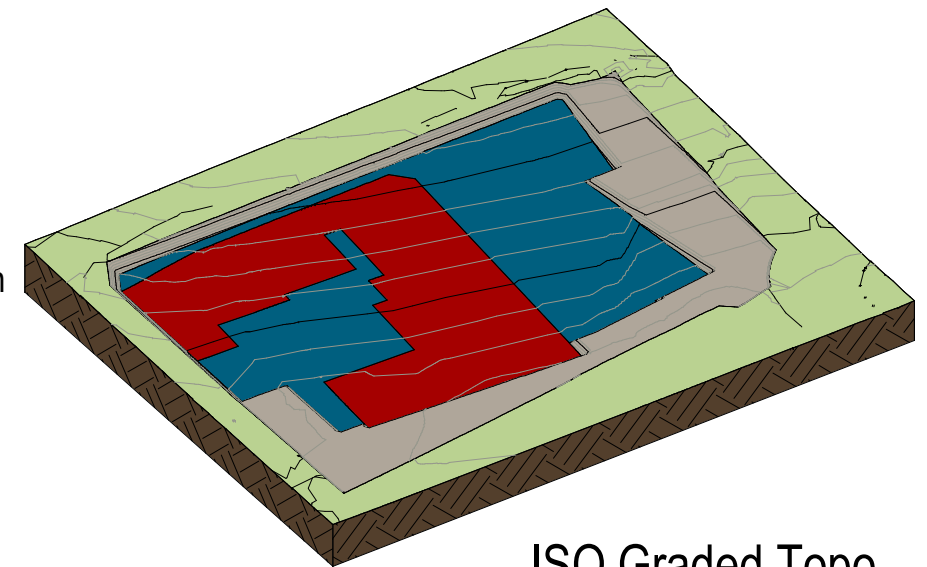
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1 : 500

Name	Cut	Fill
Existing Building Site Strip 1.5m	2090.719 m³	0.000 m³
Graded Topo 0.5m	753.272 m³	2.659 m³
New Building Site Strip North 1.5m	1585.003 m³	0.000 m³
New Building Site Strip South 1.5m	731.469 m³	0.000 m³
	5160.463 m³	2.659 m³

Name	Surface Area
Existing Building Site Strip 1.5m	1387 m²
Graded Topo 0.5m	1496 m²
New Building Site Strip North 1.5m	1074 m²
New Building Site Strip South 1.5m	509 m²

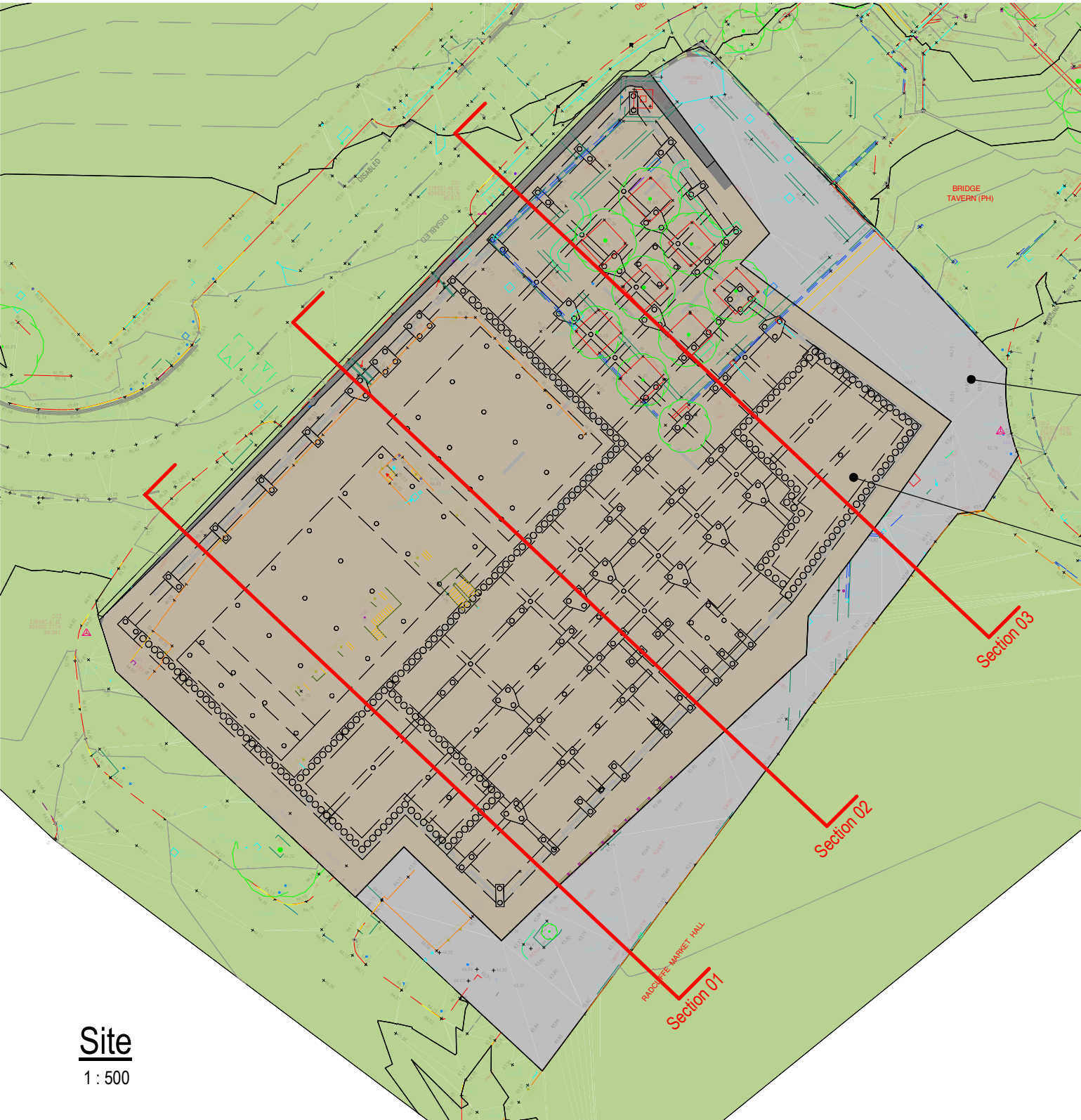
LEGEND

- Denotes existing building reduced level -1.5m from existing site levels
- Denotes new building footprint reduced level -1.5m from existing site levels
- Denotes remainder of site reduced level -0.5m from existing site levels



ISO Graded Topo

REV	DATE	DESCRIPTION	BY	APP	SCALE @ A3: 1:500	DESIGNED: P. Tam	DRAWN: C. Webber	CHECKED: D. Sinclair	APPROVED: D. Sinclair	DATE: January 2023
PROJECT: RADCLIFFE HUB					AJP est. 1978 consulting engineers 0151 227 1462 info@ajpltd.co.uk 1 Dale Street, Liverpool, L2 2ET					
TITLE: SITE STRIP										
STATUS:	PROJECT No. 221-145	PROJECT RADHUB-AJP-V4-ZZ-DR-S-2000	ORIGIN	FUNCT.	SPACIAL	FORM	DISC.	DRAWING No.	REV:	



Site
1 : 500

Topography Schedule		
Name	Cut	Fill
Piling Mat Topo	139.207 m³	3493.489 m³
	139.207 m³	3493.489 m³

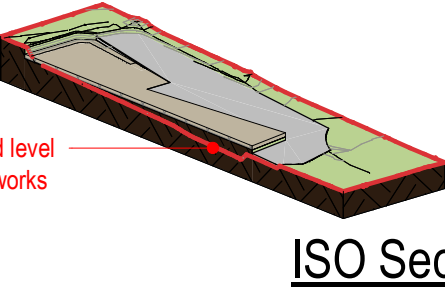
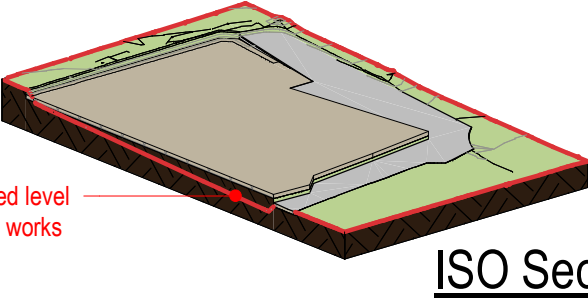
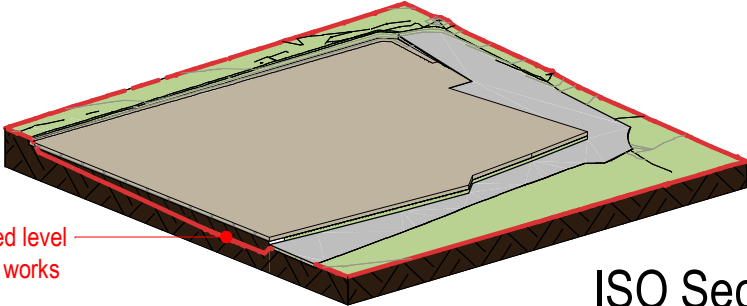
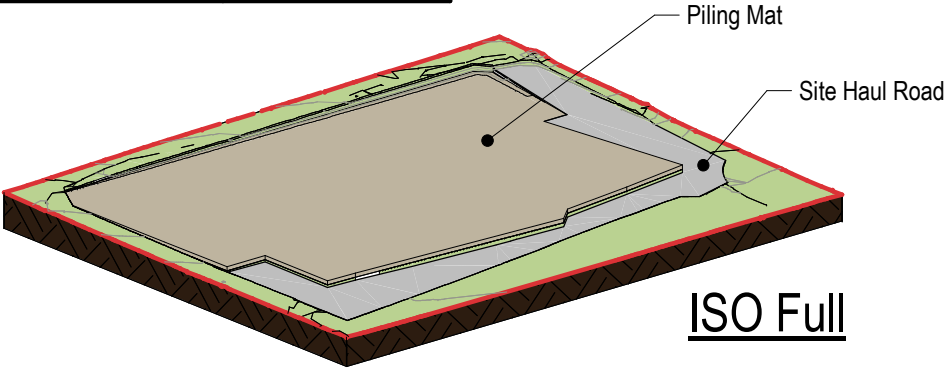
Cut - The amount of material to be removed prior to the installation of the Piling Mat

Fill - The amount of material to be added prior to the installation of the Piling Mat

Description	Area	Volume
600mm Piling Mat	3397 m²	2038.005 m³
500mm Site Haul Road	950 m²	475.204 m³

500mm Thick
Site Haul Road

600mm Thick
Piling Mat

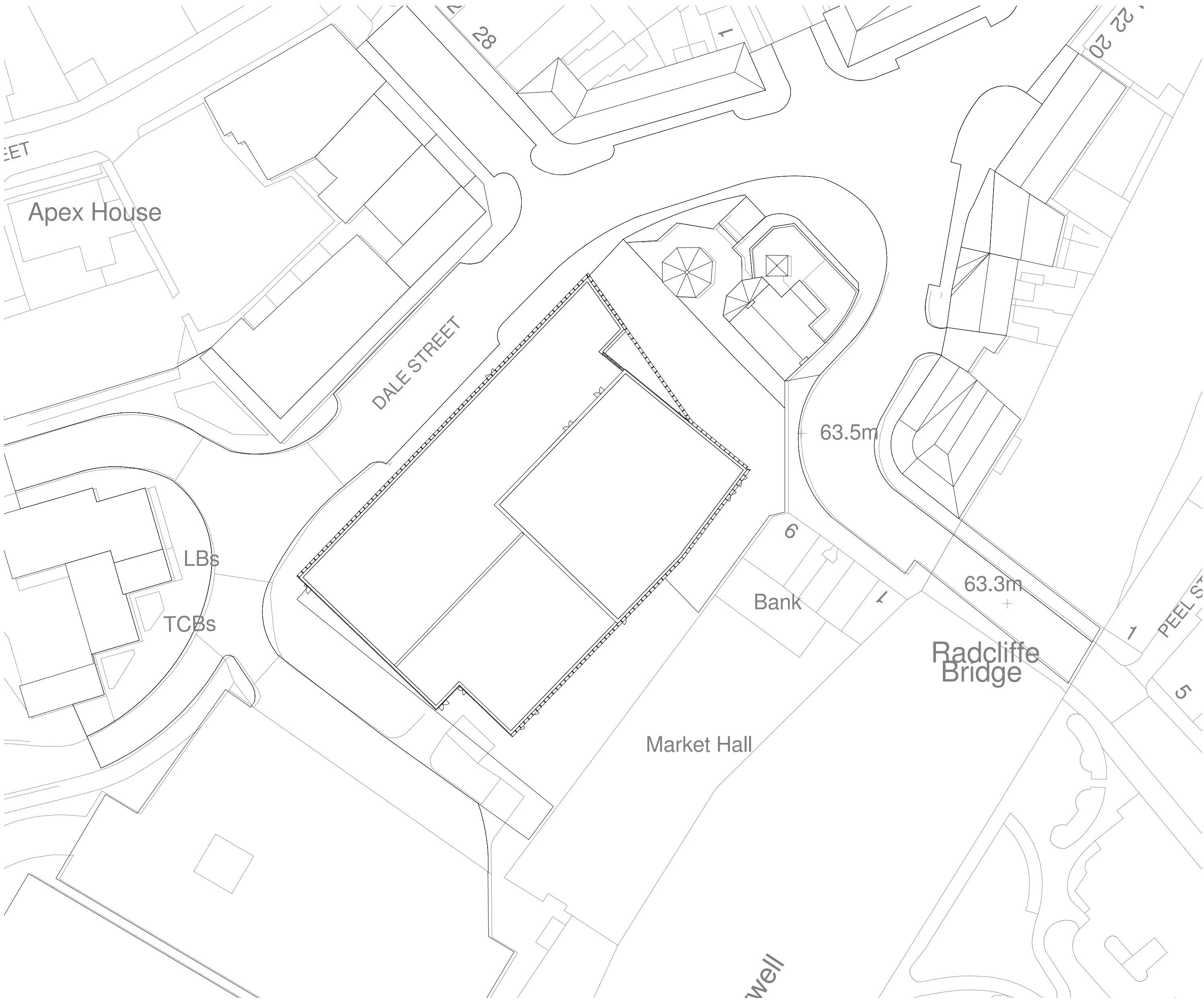


REV	DATE	DESCRIPTION	BY	APP	SCALE @ A3:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
					1:500	P. Tam	C. Webber	D. Sinclair	D. Sinclair	January 2023
PROJECT:					RADCLIFFE CIVID HUB					
TITLE:					PILING MAT					
STATUS:		PROJECT No.	PROJECT	ORIGIN	FUNCT.	SPACIAL	FORM	DISC.	DRAWING No.	REV:
		221-145	RADHUB-AJP-V4-ZZ-DR-S						2001	



consulting engineers

0151 227 1462 info@ajpltd.co.uk 1 Dale Street, Liverpool, L2 2ET



Notes

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Scale Bars		TO BE USED ONLY AS GUIDANCE			
1:100	mm		1000		3000
1:200	mm		5000		8000
1:500	M		5		15
1:1250	M		10		30

KEYPLAN

P3	Updated to suit elevation changes.	DAS	21.04.22
P2	Updated following client comment. Building footprint updated + Stair 1 updated.	DAS	07.04.22
P1	Updated to suit client comment. Building repositioned on site.	DAS	19.01.22
Rev	Description	By	Date

Client VINCI Construction UK Ltd

Job Radcliffe Hub

Drawing Proposed Site Layout Plan

Project Ref.	P5860_1105	Rev	P3
Issue Ref.	RADHUB-PAL-VV-XX-DR-A-1105		

Date	01/19/22	Scale	1 : 500	@ A2
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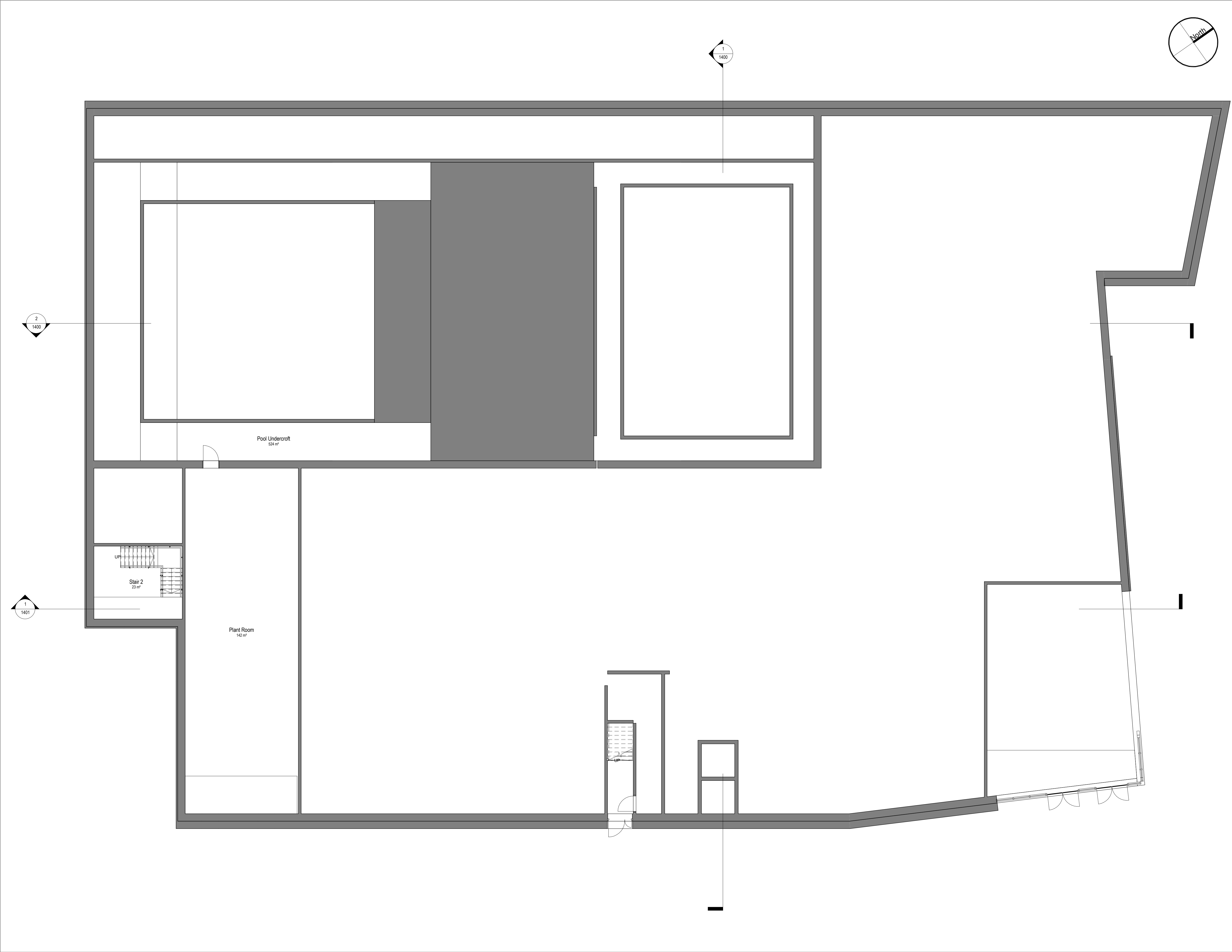
3D CoOrd	DM	2D CoOrd	DAS	Approved	DAS
----------	----	----------	-----	----------	-----

Project Status	Planning	Tender	Construction
	Design	Contract	As Built

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Scale Bars		TO BE USED ONLY AS GUIDANCE			
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1:200	mm	0	1000	2000	3000
1:500	m	0	10	20	30
1:1250	m	0	10	20	30

P7	Updated to suit elevation changes.	DAS	21.04.22
P6	Updated to suit client comment. Clip and Climb adjusted.	DAS	14.04.22
P5	Updated following client comment. Building footprint updated + Stair 1 updated.	DAS	07.04.22
P4	Updated to suit client comment. Drawing reference updated.	DAS	21.01.22
P3	Updated following Design Review. Community room relocated, along with retail and associated accommodation.	DAS	16.12.21
P2	Updated to suit client comments - consultation room and waiting added, store reduced to compensate.	DAS	30.11.21
P1	Further detail added.	DJ	16.11.21
Rev	Description	By	Date
Client	VINCI Construction UK Ltd		
Job	Radcliffe Hub		
Drawing	Lower Ground Floor Plan		
Ref	P5860 1201	Rev	P7
Date	11/02/21	Scale	1 : 100
2D Coord	DM	2D Coord	DAS
3D Coord	DAS	3D Coord	DAS
Planning	Tender	Construction	
Design	Contract	As Built	

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02 - Second Floor
ref. Gnd FFL 10000

01 - First Floor
ref. Gnd FFL 5000

00 - Ground Floor
ref. Datum 65300

-01 - Basement
ref. Gnd FFL -4000

1 Section 3
1:100

1
1400

02 - Second Floor
ref. Gnd FFL 10000

01 - First Floor
ref. Gnd FFL 5000

00 - Ground Floor
ref. Datum 65300

-01 - Basement
ref. Gnd FFL -4000

2 Section 2
1:100

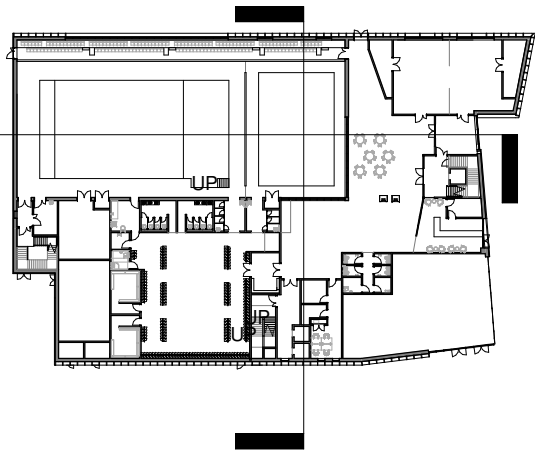
Notes

The Contractor is to check all dimensions and conditions on site before commencing. Do not scale from this drawing.
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Scale Bars TO BE USED ONLY AS GUIDANCE

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1:200	mm	500	1500	2500
1:500	m	10	30	50
1:1250	m	5	15	25

KEYPLAN



P4	Updated to suit current scheme.	DAS	23.05.22
P3	Updated to suit elevation changes.	DAS	21.04.22
P2	Updated to suit client comment. Drawing reference updated.	DAS	21.01.22
P1	Updated to suit current scheme. Layout updated, floor levels updated.	DAS	06.01.22

Rev	Description	By	Date
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VINCI Construction UK Ltd

Radcliffe Hub

Planning - Propsed
Sections - Sheet 1 of 2

P5860 1400 Ref P4

RADHUB-PAL-V0-XX-DR-A-1400

17.11.21 As indicated @ A1

DM DJ DAS

Planning Tender Construction

Design Contract As Built

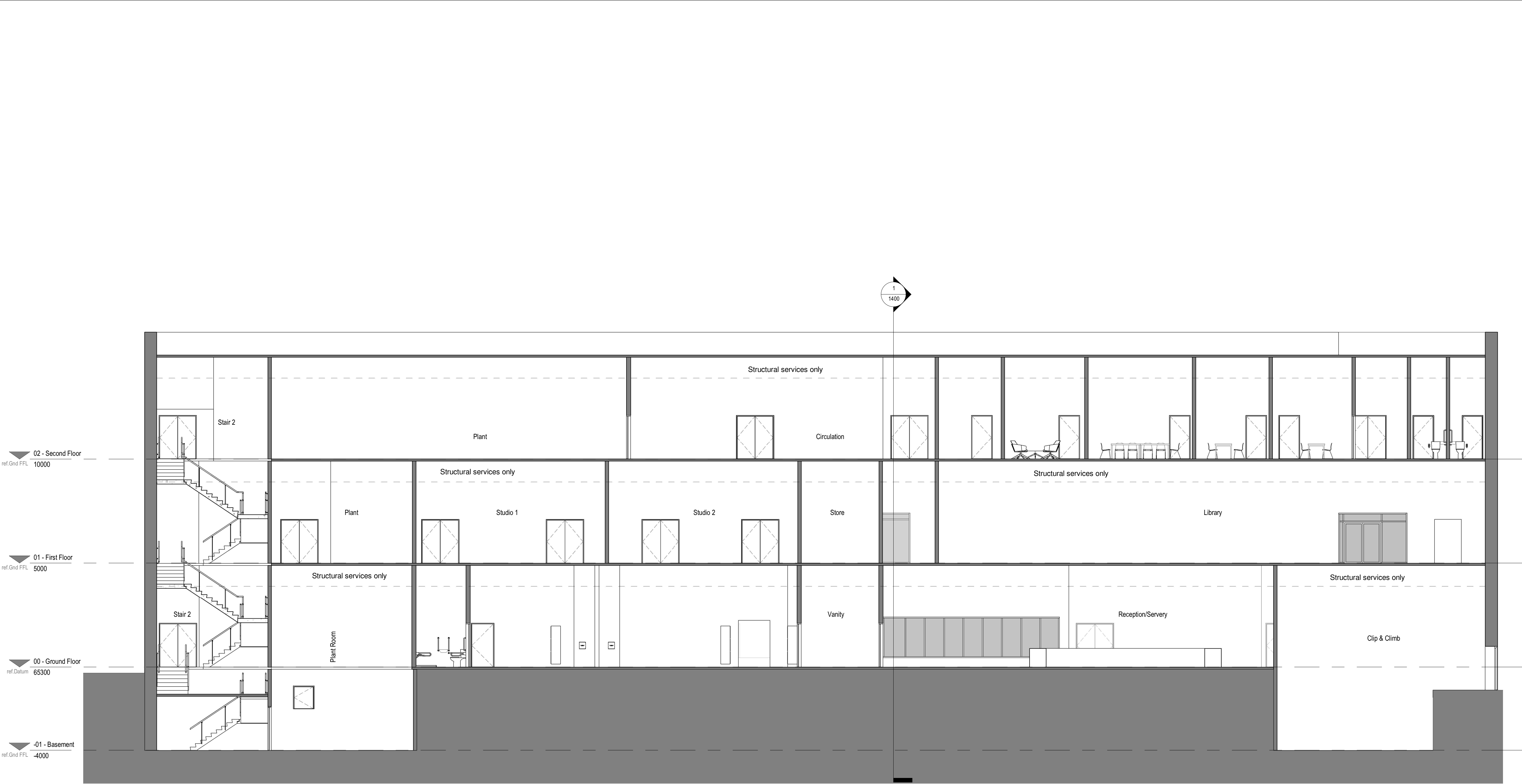
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1 Section 1
1:100

Notes

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Scale Bars TO BE USED ONLY AS GUIDANCE

1:100	mm	1000	3000	5000
1:200	mm	500	1500	2500
1:500	m	5	15	25
1:1250	m	10	30	50

KEYPLAN

Rev	Description	By	Date
Client	VINCI Construction UK Ltd		
Job	Radcliffe Hub		
Drawing	Planning - Proposed Sections 2 of 2		
Issue Ref	P5860_1401	Rev	
Date	01/25/22	Scale	As indicated @ A1
2D Coord	DM	2D Coord	DAS
3D Coord		3D Coord	DAS
Planning	Tender	Construction	
Design	Contract	As Built	

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Appendix B

Earthworks Strategy

Excavate to -1.5m below existing ground level across the footprint of the proposed new Hub Building.

Locate and remove redundant foundations, groundbeams or other obstructions

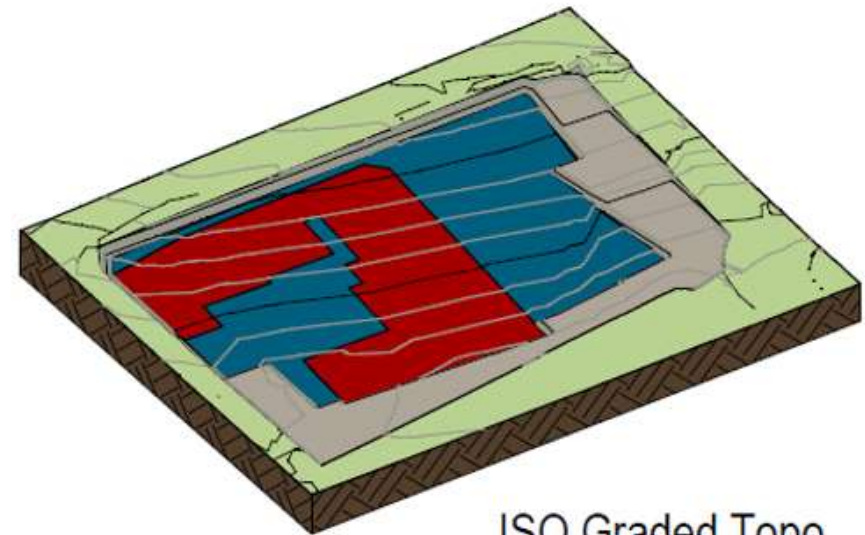
Risk of obstructions at a greater depth lies with the employer

It is anticipated much of the residual obstructions related to the former market hall, and later the bus shelters were excavated to make way for the retail block circa 1970.

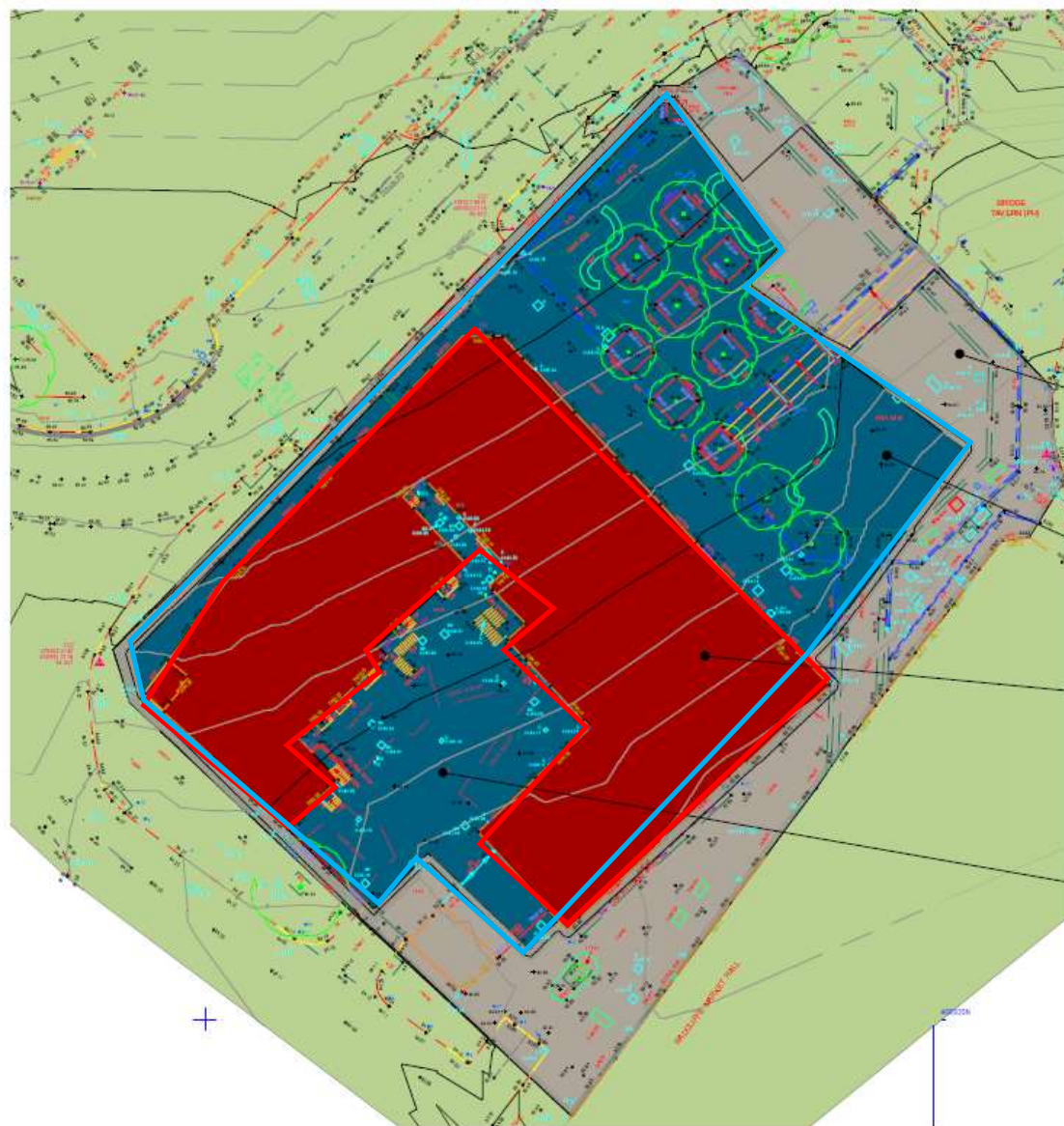
We expect to find and remove foundations and hardstandings related to the 1970's retail block during this work. These will be removed and crushed to contribute to the site won 6F2 volume

Utilise excavated material and demolition arisings to form the bulkfill, and pilemat. Risk allowance has been made for disposal of potentially unsuitable materials. (non haz rate)

500mm RL dig outside of building footprint



ISO Graded Topo

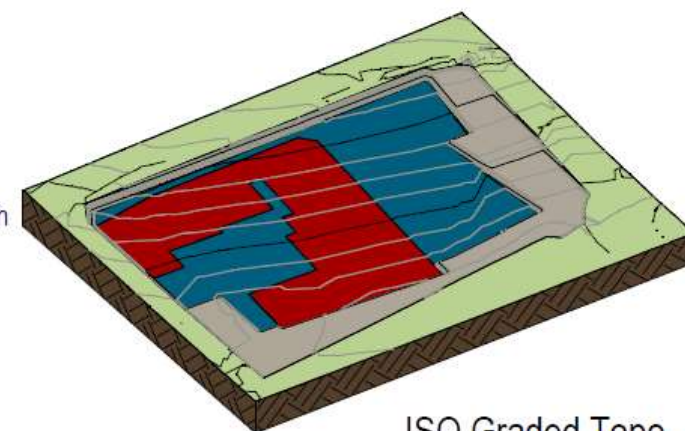


Name	Cut	Fill
Existing Building Site Strip 1.5m	2090.719 m³	0.000 m³
Graded Topo 0.5m	753.272 m³	2.659 m³
New Building Site Strip North 1.5m	1585.003 m³	0.000 m³
New Building Site Strip South 1.5m	731.469 m³	0.000 m³
	5160.463 m³	2.659 m³

Name	Surface Area
Existing Building Site Strip 1.5m	1387 m²
Graded Topo 0.5m	1496 m²
New Building Site Strip North 1.5m	1074 m²
New Building Site Strip South 1.5m	509 m²

LEGEND

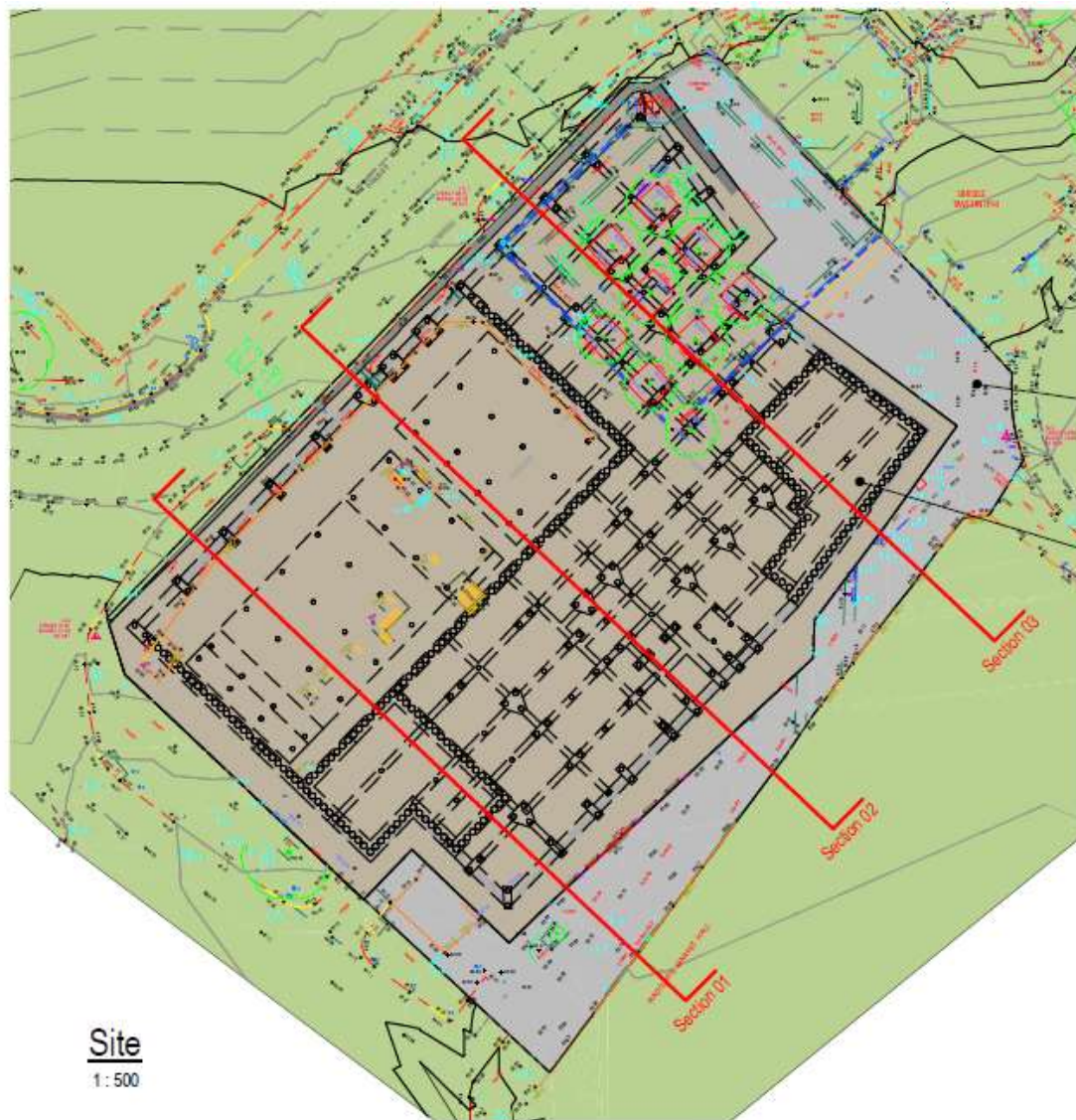
- Denotes existing building reduced level -1.5m from existing site levels
- Denotes new building footprint reduced level -1.5m from existing site levels
- Denotes remainder of site reduced level -0.5m from existing site levels



ISO Graded Topo

Site

1 : 500



Topography Schedule		
Name	Cut	Fill
Piling Mat Topo	139.207 m ³	3493.489 m ³
	139.207 m ³	3493.489 m ³

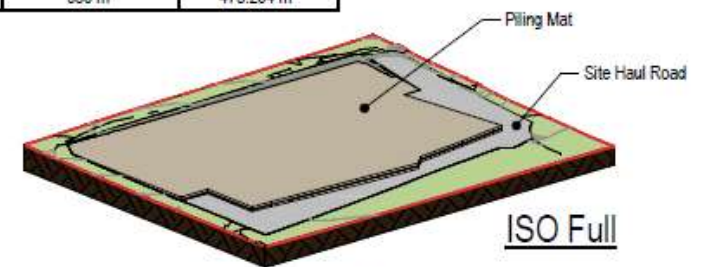
Cut - The amount of material to be removed prior to the installation of the Piling Mat

Fill - The amount of material to be added prior to the installation of the Piling Mat

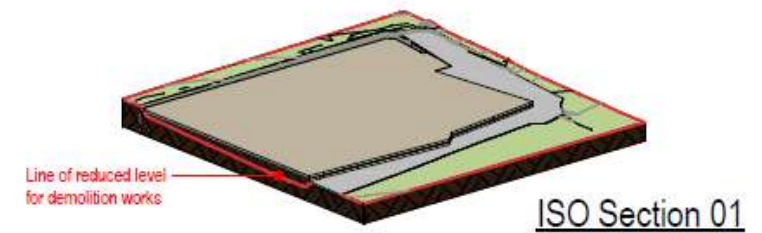
Description	Area	Volume
600mm Piling Mat	3397 m ²	2038.005 m ³
500mm Site Haul Road	950 m ²	475.204 m ³

500mm Thick
Site Haul Road

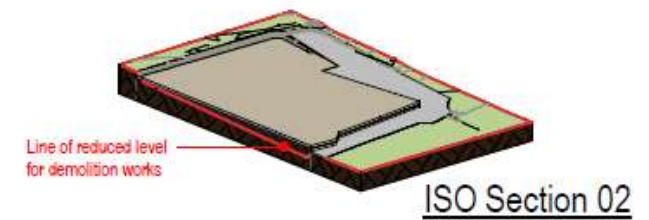
600mm Thick
Piling Mat



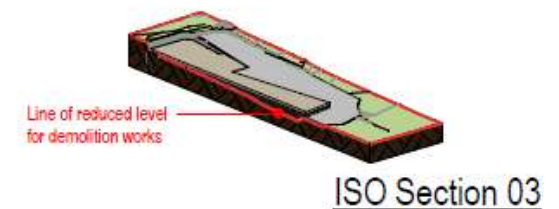
ISO Full



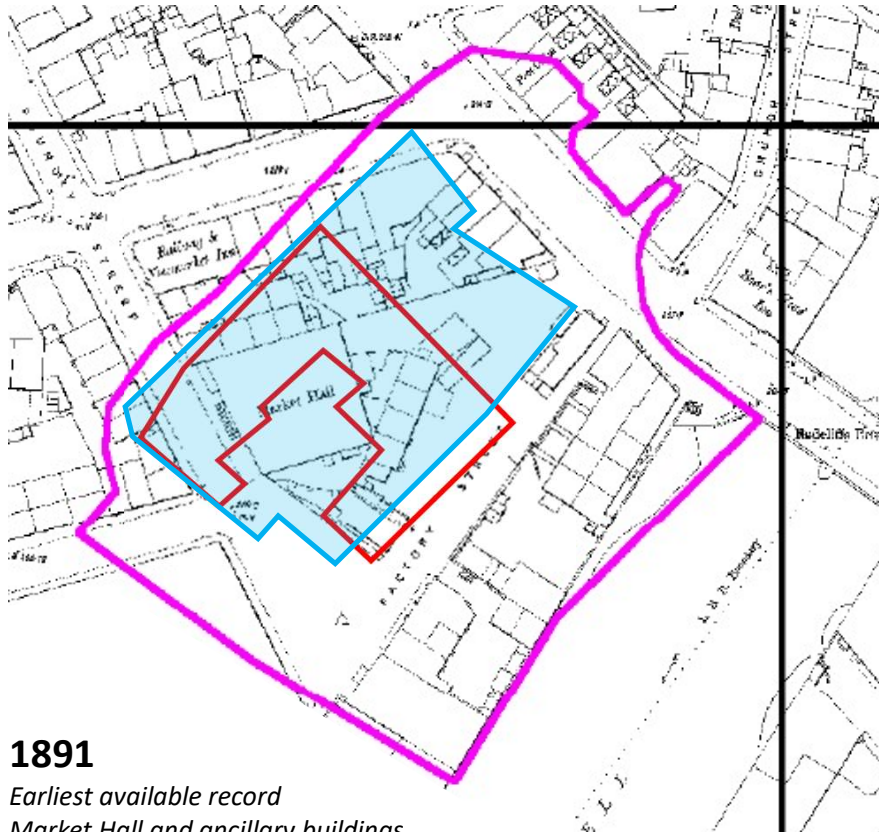
ISO Section 01



ISO Section 02

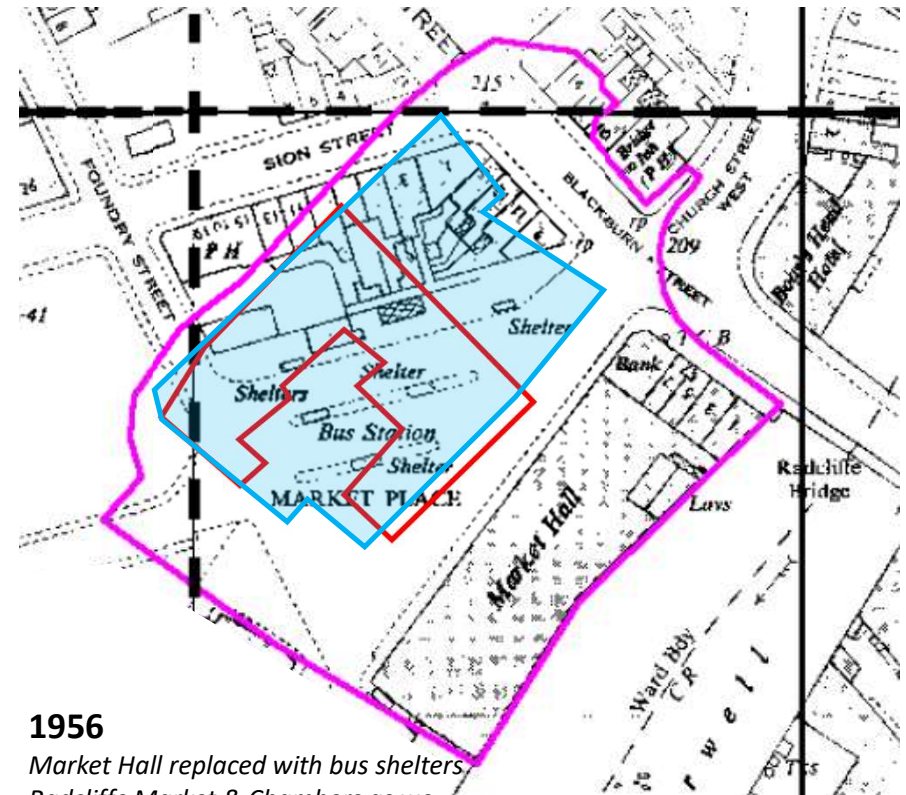


ISO Section 03



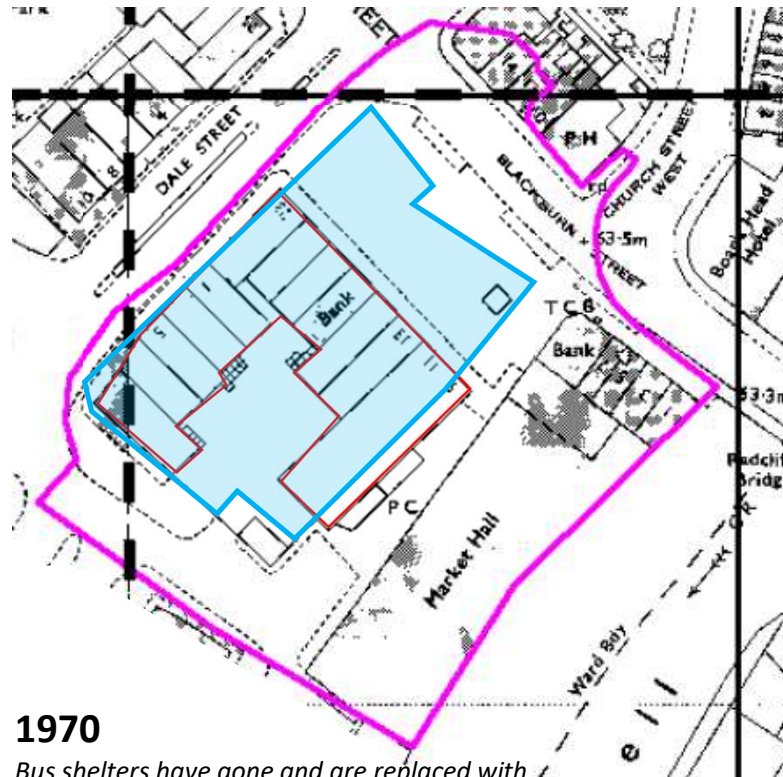
1891

*Earliest available record
Market Hall and ancillary buildings
Dye Works from ~1893*



1956

*Market Hall replaced with bus shelters
Radcliffe Market & Chambers as we
recognize it now appears 1909-1929*



1970

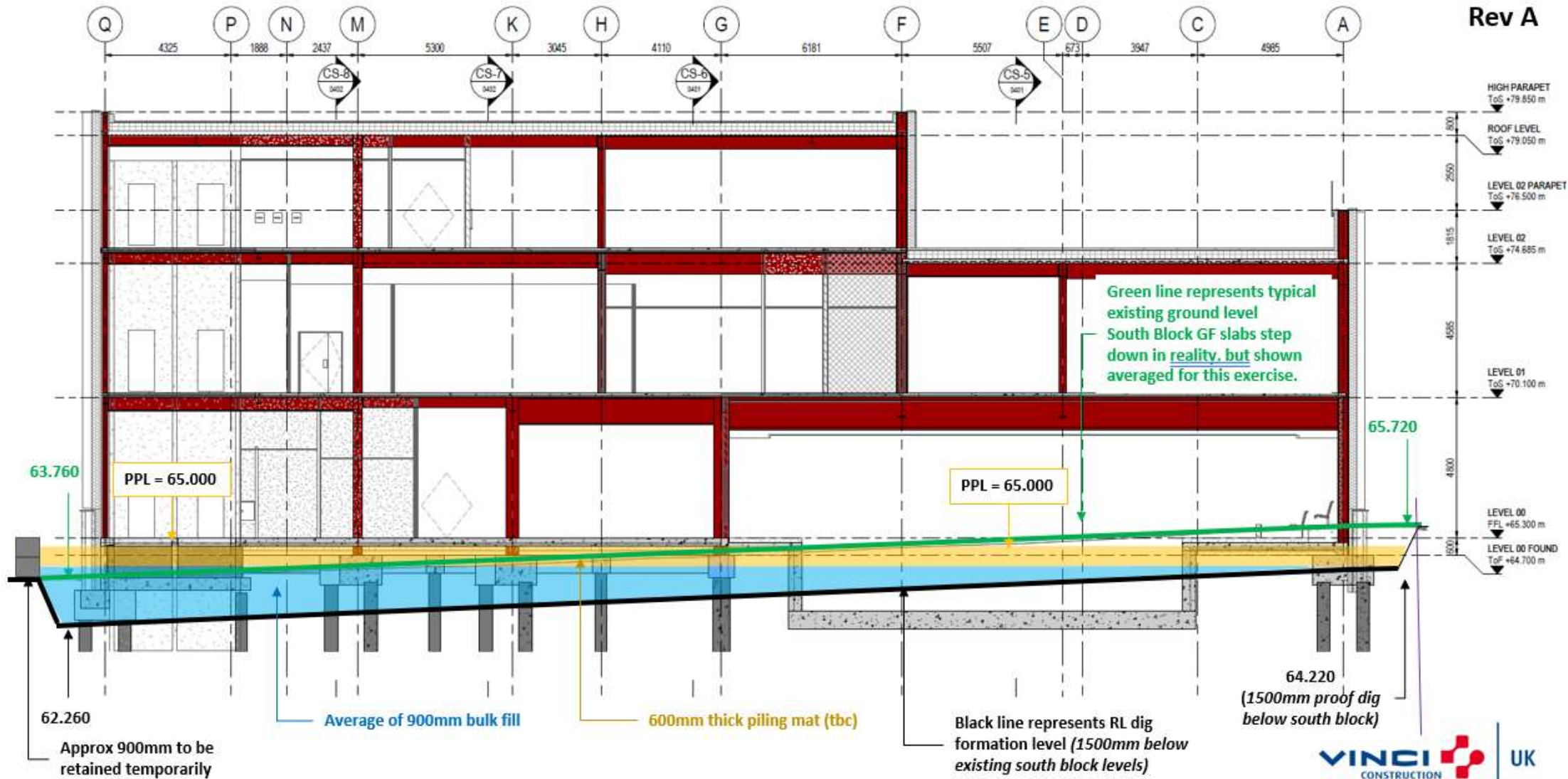
*Bus shelters have gone and are replaced with
"south block" retail building*



RADCLIFFE HUB PROJECT

Typical Cross Section

Rev A



GL Q

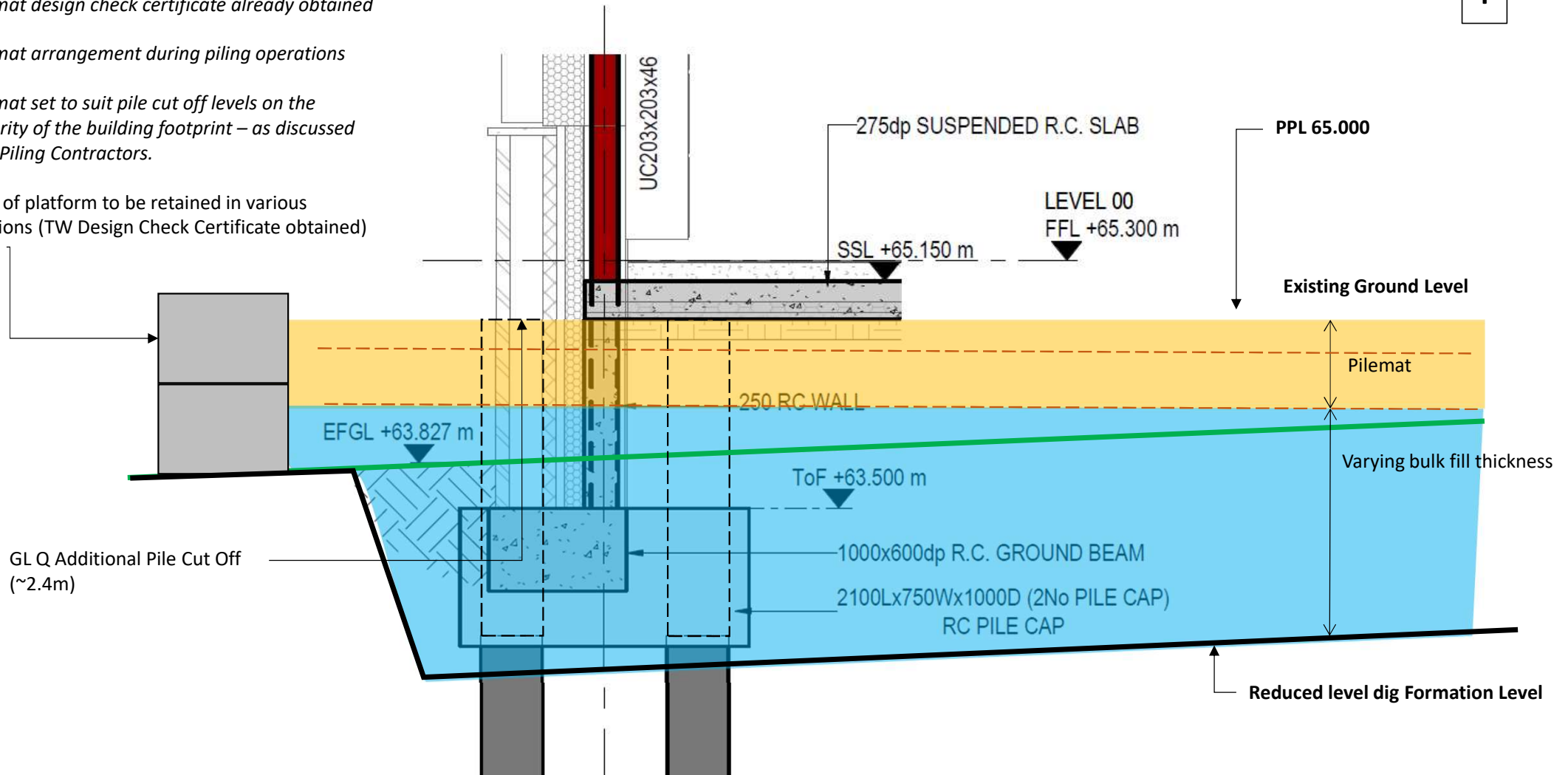
i

Pile mat design check certificate already obtained

Pile mat arrangement during piling operations

Pile mat set to suit pile cut off levels on the majority of the building footprint – as discussed with Piling Contractors.

Edge of platform to be retained in various locations (TW Design Check Certificate obtained)



FOR USE IN STAGE 3 METHODOLOGY NARRATIVE

Appendix C

BRANDON RICE-BIRCHALL
I D GEO ENVIRONMENTAL LTD
CALEDONIAN HOUSE
TATTON STREET
KNUTSFORD
WA16 6AG

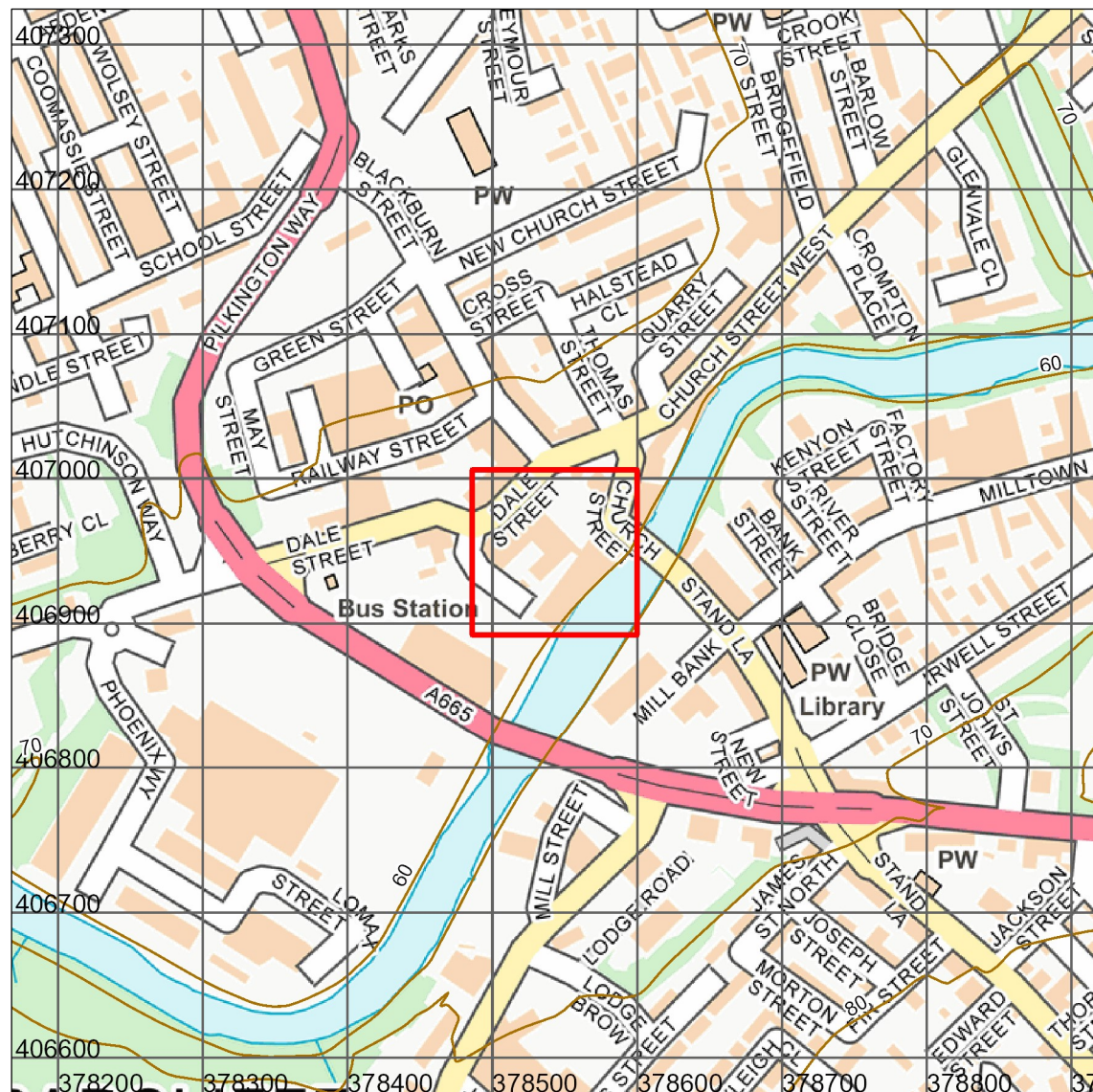
Radon Report

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: **BGS_332484/44389**

Client reference: 5238

Search location



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Search location indicated in red

*This report describes a site located at National Grid Reference 378543, 406949.
Note that for sites of irregular shape, this point may lie outside the site boundary.
Where the client has submitted a site plan the assessment will be based on the area given.*

Radon Report: UK

When extensions are made to existing buildings in high radon areas, or new buildings are constructed in these areas, the Building Regulations for England, Wales, Scotland and Northern Ireland require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations may require either:

1. No protective measures
2. Basic protective measures
3. Full protective measures

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2015 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

Is the property in an area where radon protective measures are required for new buildings or extensions to existing ones as described in publication BR211 (2015 edition) Radon: Guidance on protective measures for new buildings?

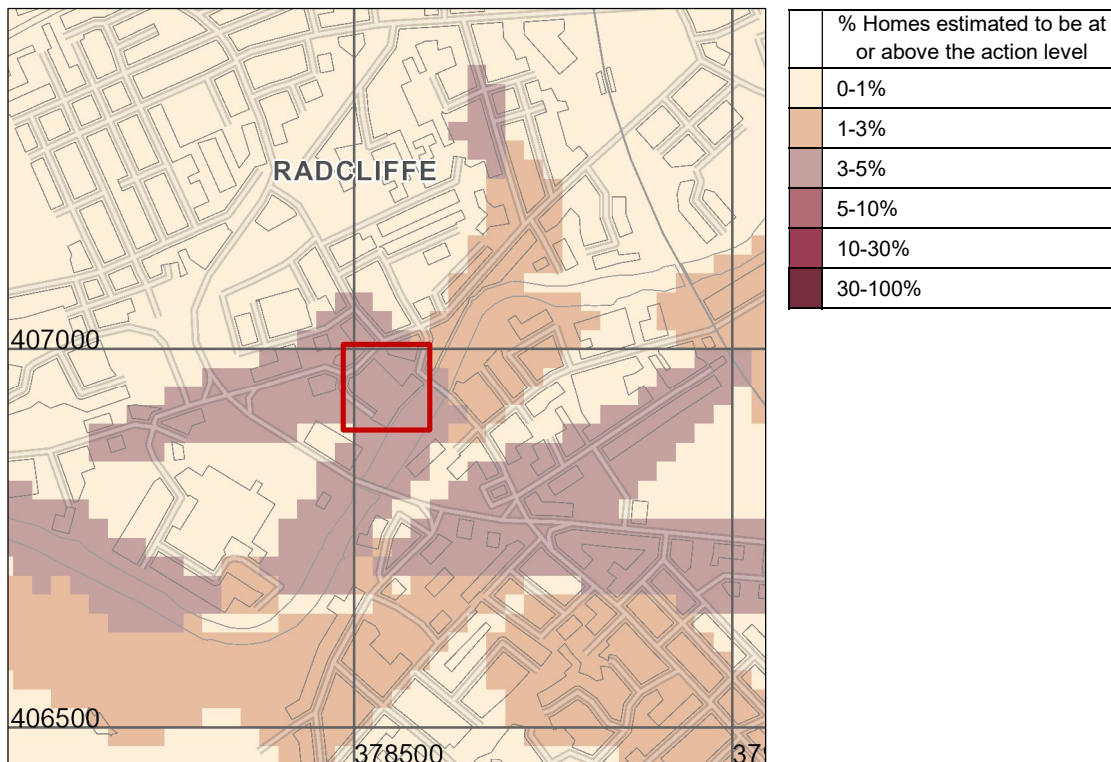
BASIC RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2015 Edition)*. Additional information and guidance is available from the Building Research Establishment website (<http://www.bre.co.uk/radon/>).

Whether or not the radon level in a building is above or below the radon Action Level can only be established by having the building tested. The UKHSA provides a radon testing service which can be accessed at www.ukradon.org or by telephone (01235 822622).

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.

Radon Affected Area



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Scale: 1:10 000 (1cm = 100 m)

Search area indicated in red

Is the property in a radon Affected Area as defined by the UK Health Security Agency (UKHSA) and if so what percentage of homes are estimated to be at or above the Action Level? YES

Additional Information

THE PROPERTY IS IN A RADON AFFECTED AREA WHERE 3 TO 5% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL.

The UKHSA recommends a radon 'Action Level' of 200 Becquerels per cubic metre of air (Bq m^{-3}) for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to be at or above the Action Level the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level at this location. Being in an Affected Area does not necessarily mean there is a high radon level within the property; the only way to determine the radon level is to carry out a radon measurement.

The UKHSA advises that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels at or above the Action Level (200 Bq m⁻³) should be remediated. Householders with levels between the Target Level (100 Bq m⁻³) and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. The UKHSA provides a validated radon testing service which can be accessed at www.ukradon.org.

The information in this report provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as Law Society CON29 Enquiries of the Local Authority (2016); 3.14 Radon Gas: Do records indicate that the property is in a “Radon Affected Area” as identified by the UKHSA. The data can also be used to advise house buyers and sellers in Scotland and Northern Ireland.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were at or above the radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and if the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from the UKHSA at www.ukradon.org.

What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level is at or above the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations 2017 require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace**. BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com

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- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
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**Report issued by
BGS Enquiry Service**

Appendix D

Introduction

Isolation of Made Ground in landscaped areas beneath a cover of “clean” subsoil, and topsoil is often recommended on commercial developments where Made Ground is left in-situ; most notably when it contains some inorganic and organic contaminants at concentrations above guidance threshold values.

A cover is only required in proposed landscaped areas underlain by Made Ground (i.e. not beneath access roads, car parking or commercial units). The soil cover breaks direct contact pollutant linkages between the contaminated fill and future site users. Typically for commercial developments a 300mm thick cover layer is generally acceptable, however this should be confirmed by reference to the site-specific Remediation Strategy as agreed with the Local Authority.

Soil cover validation therefore requires independent assessment of

- The chemical/physical suitability of the soil.
- The thickness of the placed subsoil and topsoil.

Site Won Materials

It is often possible to “win” suitable subsoil and/or topsoil materials from a development site. However, in order to ensure that materials are suitable for use, and remain suitable for use during the development process, careful assessment, segregation and handling of the soil will be required. Natural clay or sand excavated during site remediation works or during development (such as during the excavation of service trenches or foundations) can often be suitable for use as a subsoil. Topsoil can sometimes be won from landscaped areas of the site at an initial stage of development.

Site won materials should be subject to the same validation requirements as for imported materials.

Inspection and Sampling of cover soil at source by IDG

For imported materials soil suitability is best determined by sampling at the **source** at least 7 working days before importation to the development site. If this is achieved, further, on-site (post-placement) chemical suitability testing should not usually be necessary, providing that confirmation can be given that the material arriving at site is the same soil as that tested.

Appropriate methodologies for sampling cover soils at a source site are;

- From a designated stockpile of known volume. The designated stockpile should have no further material placed onto it once sampled by IDG.
- On a grid pattern across a designated area. Sampling should be at an adequate frequency to satisfy the agreed sampling frequency. This sampling methodology is only considered suitable for greenfield sites.

Inspection and Sampling of cover soil following import to site by IDG

In most cases, soil is often delivered to site prior to sampling and chemical testing. Such soils should be stockpiled in a secure location on site and IDG should be contacted to arrange for visual inspection, sampling and chemical testing. It is strongly recommended that soils should not be placed in landscaped areas prior to confirmation of the suitability of the soil by IDG. This normally takes two weeks from initial notification.

Physical Suitability

Suitable soil material should:

- Be clean and free of foreign debris, building waste materials or contaminants.
- Not have a stone content of greater than 20% by visual estimation.
- Have a maximum stone size of 150mm in any one direction.

- Not have been sourced from an area within 7m laterally, or 3m vertically, of Japanese Knotweed plants, and not contain any Japanese Knotweed fragments (rhizomes, leaves, stems etc).

Chemical Suitability

Chemical acceptance criteria for imported soils are presented in Tables 1 & 2. Acceptance criteria based on Human Health Tier 1 assessment criteria for a Commercial Development would result in unacceptably high values for cover soils. IDG have therefore based the acceptance criteria on an arbitrary value set at three times the Tier 1 acceptance criteria for a residential end-use with plant uptake or MAFF criteria for phytotoxic determinants. These values are considered to be conservative in terms of protecting human health and also in providing a set of criteria which will confirm the suitability of subsoil and topsoil as a clean growing medium.

The number of samples taken will be dependent on the nature of the source and the quantity of material to be imported and the testing ratio should be agreed with the Local Authority (EHO) before testing is undertaken. A summary of the sampling requirements and testing criteria are presented in the Table 3.

A less frequent sampling rate may be appropriate for soils from a greenfield source or where large volumes (say >5,000m³) of soil are imported from a single, relatively homogenous source.

Cover layers can often include a “difficult to dig” or capillary break layer of coarse natural or recycled aggregate. Where this aggregate is sourced from recycled materials (such as crushed demolition arisings) asbestos screening tests should also be undertaken.

The Client\Contractor will be notified of the soil’s suitability (or otherwise) immediately following receipt of the results (typically taking 7 working days).

On receipt of written confirmation from IDG, the Client should instruct his Contractor to commence importation. It will probably be necessary to stockpile the cover prior to placement in landscaped areas. IDG should inspect the stockpiled material prior to placement, to confirm that it is the same material as previously tested, **and** the Contractor should provide the Client with appropriate haulage notes.

Assessment Criteria for the Chemical Suitability of Cover Material on a Commercial Development

Table 1 - Common Inorganic Determinants

Contaminant	Cover Material Acceptance Criteria Commercial Development	Comments/Notes
pH	>6 to <8	Initial assessment only
Arsenic	111	3 times residential value (S4UL LQM/CIEH 2015)
Cadmium	33	3 times residential value (S4UL LQM/CIEH 2015)
Chromium III	2730	3 times residential value (S4UL LQM/CIEH 2015)
Chromium VI	18	3 times residential value (S4UL LQM/CIEH 2015)
Lead	600	3 times residential value (C4UL 2014)
Selenium	750	3 times residential value (S4UL LQM/CIEH 2015)
Mercury	120	3 times residential value (S4UL LWQM/CIEH 2015)
Nickel	75	MAFF (1998) The Soil Code (phytotoxicity) for soil with a pH in the range 6-7.
Copper	135	
Zinc	200	
Asbestos	Not detected	Not detected in asbestos screen test. If detected, acceptance criteria is <0.001% by quantitative analysis

IDG Protocol for Soil Cover Validation (Commercial)



Table 2 - Common Organic Determinants

Contaminant	Assessment Concentration (mg/kg)			Source
	% Soil Organic Matter			
	1%	2.5%	6%	
Benzene	0.63	0.69	1.47	IDG Assessment criteria based on 3x S4UL parameters and C4SL exposures for residential with homegrown produce without indoor inhalation pathway
Toluene	840	1011	2310	
Ethyl Benzene	600	759	1740	
Xylenes (p-xylene)	1080	1362	3000	
**Benzo(a)pyrene (as surrogate marker)	4.8	5.85	6.42	
Acenaphthene	666	1584	3450	
Acenaphthylene	540	1293	2862	
Anthracene	7170	16320	32700	
Benz(a)anthracene	27.5	36.9	42.9	
Benzo(a)pyrene	6.75	8.22	9.0	
Benzo(b)fluoranthene	7.89	9.99	11.13	
Benzo(g,h,i)perylene	954	1020	1047	
Benzo(k)fluoranthene	234	279	303	
Chrysene	45.9	66.9	81.3	
Dibenzo(a,h)anthracene	0.75	0.87	0.93	
Fluoranthene	858	1683	2694	
Fluorene	519	1227	2640	
Indeno(1,2,3-cd)pyrene	83.1	109.2	124.2	
Naphthalene	81	193.2	441	
Phenanthrene	291	663	1326	
Pyrene	1866	3750	6120	
GRO C ₅ -C ₆	270*	540*	1140*	IDG Assessment criteria based on 3x S4UL parameters and C4SL exposures for residential with homegrown produce without indoor inhalation pathway
GRO C ₆ -C ₈	450*	1020*	2310*	
GRO C ₈ -C ₁₀	174	390	900	
DRO C ₁₀ -C ₁₂	249	570	1260	
DRO C ₁₂ -C ₁₆	450	990	2010	
DRO C ₁₆ -C ₂₁	810	1650	2820	
LRO C ₂₁ -C ₃₅	3300	4500	5100	
Phenol	456	834	1605	

* BTEX compounds must also be assessed with Aromatic C5-C7, Aromatic C7-C8, GRO C5-C6 and TPH C6-C8 bandings

**Benzo(a)pyrene assessed as surrogate marker for genotoxic PAH. Oral HCV based on minimal risk value (CLAIRE 2014, Appendix E Table 2.2) ID_{Oral} of 0.021 ug/kgBW/day compared to oral, dermal and inhalation exposures and ID_{Inhal} of 0.0003 ug/kgBW/day compared to inhalation exposure.

Summary of Sampling Frequency and Chemical Analysis Suite

A summary table showing recommended sampling frequencies and chemical analysis suites for varying sources of cover soils is presented overleaf.

IDG Protocol for Soil Cover Validation (Commercial)



Table 3: Sampling Frequency and Chemical Analysis Suite Summary Table

	Nature of Source Material	Sampled	Sampling Frequency	Testing Suite	Sampling Requirements	
Site Won Material	Greenfield	On site	1:250m ³ - Topsoil	pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen	Minimum of 3 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.	
			1:500m ³ - Subsoil			
	Brownfield		1:100m ³ - Topsoil	pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site	Minimum of 6 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.	
			1:250m ³ - Subsoil			
Imported Cover Soils	Greenfield	At source	1:250m ³ - Topsoil	pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen	Two sampling methodologies can be used; • Sampling from stockpile. Minimum of 3 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled. • In-situ sampling of cover soils on a grid pattern across a designated area of the site. An adequate number of samples should be taken to satisfy the sampling frequency.	
			1:500m ³ - Subsoil			
		Following delivery to site	1:250m ³ - Topsoil	pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen		Minimum of 3 samples to be tested from each imported batch of stockpiled material. No further material to be added to the stockpile once it has been sampled.
			1:500m ³ - Subsoil			
	Brownfield	At source	1:100m ³ - Topsoil	pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site	Minimum of 6 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.	
			1:250m ³ - Subsoil			
		Following delivery to site	1:100m ³ - Topsoil	pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site	Minimum of 6 samples to be tested from each imported batch of stockpiled material. No further material to be added to the stockpile once it has been sampled.	
			1:250m ³ - Subsoil			
	Recycling Centre	At recycling centre	1:50m ³ – Topsoil & Subsoil	pH, metals, speciated PAH, TPHCWG, BTEX, cyanide, phenols, Total Organic Carbon & Asbestos Screen	Minimum of 6 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.	
		Following delivery to site	1:50m ³ – Topsoil & Subsoil	pH, metals, speciated PAH, TPHCWG, BTEX, cyanide, phenols, Total Organic Carbon & Asbestos Screen	Minimum of 6 samples to be tested from each imported batch of stockpiled material. No further material to be added to the stockpile once it has been sampled.	

Placed Thickness Validation

Placed thickness can only be checked after placement, but should be done before turfing, fencing etc. Thickness will be checked via the excavation of an appropriate number of inspection trial pits.

The thickness of cover is dependent on the nature and degree of contamination (and often the Local Authority whose area the site lies within), but typically a 300mm cover is required for commercial sites.

Soil cover is usually placed many weeks after completion of the preparatory\remedial works, and issue of the associated Verification Report. Consequently, site visits, to generate supplementary letter reports, are typically required after soil cover has been placed.

Issue of Soil Cover Validation Reports

Validation reports will be issued by IDG following the confirmation of the placed thickness of cover soil. Each report will contain the following information:

- Details of the provenance of the subsoil and topsoil.
- Chemical test data.
- An interpretation of the chemical data indicating whether the soils are suitable for use in a clean cover layer.
- A drawing indicating the location of cover thickness validation trial pits.
- Photographs of the excavated trial pits confirming the thickness of placed soils.
- A data table indicating the thickness of cover soils within each trial pit excavated.

Soil Cover Validation Reports will be issued to the Client and Local Authority by email