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NEW VICTORIA, MANCHESTER

REMEDIATION VERIFICATION REPORT

VINCI Construction UK Limited

Report No. 16-K4865-000-ST-R004

2nd June 2023

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BYRNE LOOBY

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1 Introduction

1.1 Background Information

Byrne Looby Partners (UK) Ltd (ByrneLooby) were commissioned by VINCI Construction UK Limited to prepare a Verification Report for the new part commercial / residential development named New Victoria, Manchester.

The report provides verification of site material, compares site conditions and soil chemical parameters to the specification for verification as agreed with Manchester City Council in the agreed Remediation Strategy.

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Part IIA of the Environment Protection Act, 1990;
- Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, April 2012);
- National Planning Policy Framework (HCA, February 2019);
- BS5930:2015: “Code of practice for site investigations”;
- BS10175: 2011 +A2:2017 “Investigation of Potentially Contaminated Sites - Code of Practice”;
- The Building Regulations 2010. Part C (HM Government 2013)
- Environment Agency (2011) Report GPLC1 “Guiding Principles for Land Contamination”;
- Environment Agency (2017) “The Environment Agency’s Approach to Groundwater Protection” November 2017 Version 1.1;
- Environment Agency Guidance (April 2021) Land Contamination Risk Management Land Contamination (LCRM); and,
- Manchester City Council Environmental protection Group Contaminated Land Section (2016) Planning Guidance in Relation to Ground Contamination: Guidance Note for Applicants, Developers, Land Owners and Consultants, Version 6 September 2016

ByrneLooby’s service constraints, report limitations and planning requirements are presented in **Appendix A**.

1.2 Development Proposals

The proposed development of the site is understood to comprise the following:

- Erection of two tower blocks part commercial (ground floor) and residential which are maximum 21No. and 26No. storeys to accommodate 520 apartments, comprising
 - o 178 x 1 bed apartments,
 - o 286 x 2 bed apartments.
 - o 56 x 3 bed apartments)

1.2.1 The proposed site layout is shown in Figure 1.



Figure 1: Extract of VIC-PIE-EZ-ZZ-DR-L-00116_C05 – Planit IE Ltd showing development including soft landscaped areas

The findings and conclusions of the risk assessments have been set out and recommendations given for the proposed Public Open Space residential end use.

1.3 Planning Status & Requirements

The site has been granted planning permission 111777/FO/2016/C1, which was approved on 29 September 2016 and was superseded by Planning permission reference 128667/JO/2020. There is one planning condition relating to the development of a Remediation Strategy and potential contaminated land which is required to be discharged. This is as follows:

Condition 18

- a) *Before each phase (as agreed under Condition 3) of the development hereby approved commences, a report (the Preliminary Risk Assessment) to identify and evaluate all potential sources and impacts of any ground contamination, groundwater contamination and/or ground gas relevant to the site shall be submitted to and approved in writing by the City Council as local planning authority. The Preliminary Risk Assessment shall conform to City Council's current guidance document (Planning Guidance in Relation to Ground Contamination).*

In the event of the Preliminary Risk Assessment identifying risks which in the written opinion of the Local Planning Authority require further investigation, the development shall not commence until a scheme for the investigation of the site and the identification of remediation measures (the Site Investigation Proposal) has been submitted to and approved in writing by the City Council as local planning authority.

The measures for investigating the site identified in the Site Investigation Proposal shall be carried out, before each phase (as agreed under Condition 3) of the development commences and a report prepared outlining what measures, if any, are required to remediate the land (the Site Investigation Report and/or Remediation Strategy) which shall be submitted to and approved in writing by the City Council as local planning authority.

- b) *When each phase (as agreed under Condition 3) of the development commences, the development shall be carried out in accordance with the previously agreed Remediation Strategy and a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority.*

The verification report should demonstrate completion of works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to and approved, in writing, by the local planning authority.

The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. It shall also include any plan (a "long-term monitoring and maintenance plan") for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan.

- c) *In the event that ground contamination, groundwater contamination and/or ground gas, not previously identified, are found to be present on the site at any time before any phase (as agreed under Condition 3) of the development is occupied, then development shall cease and/or the development shall not be occupied until, a report outlining what measures, if any, are required to remediate the land (the Revised Remediation Strategy) is submitted to and approved in writing by the City Council as local planning authority and the development shall be carried out in accordance with the Revised Remediation Strategy, which shall take precedence over any Remediation Strategy or earlier Revised Remediation Strategy.*

Condition 21(a) was satisfied through the submission of a previous reports. This report has been designed to fully discharge Condition 21(b and c) relating to the validation of the remediation strategy.

1.4 Scope of the Verification

The scope of works was to meet the requirements to provide information for final verification purposes for the proposed development as agreed with Manchester City Council. The specific activities carried out are as follows:

- Description of the works;
- Records of all imported topsoil, subsoil and soil conditioning material for the site complete with laboratory test certificates demonstrating that the material is suitable for use (if appropriate);
- Photographic Records;
- Description of how the use of materials links with the Remediation Strategy or Design Statement;
- Reference to site investigation data and risk assessments;
- Details of any unexpected contamination encountered and how it was dealt with;
- In order that regulatory compliance can be confirmed, a copy of all site licenses and consents shall be included.

It should be noted that the validation of the remediation and enabling works within residential building footprints plots 1 and 2 has already been carried out by others and detailed within E3P dated November 2021 (Ref: 14-284-R3-1).

1.5 Previous Investigations

A number of previous site investigations have been carried out at the site including the following information:

- Manchester New Victoria Ground Investigation Report prepared by AEG Ltd (April 2016)
- Earthworks and Remediation Performance Specification prepared by Arup (February 2018)
- Ground Investigation Report prepared by Bridgeway Consulting Limited (March 2012)
- Site Investigation Report Volume 1 Fieldwork and Volume 2 Laboratory Testing report prepared by Soil Mechanics
- Geotechnical Desk Study prepared by Arup (Jun 2008)
- Site Investigation Report prepared by Vertase FLI Limited (April 2018)
- Ground Investigation Report prepared by Arup (May 2016)
- Foundation Works Risk Assessment Report prepared by Arup (April 2018) (Ref: VICARUP-ZZ-XX-RP-CG-001)
- Ground Investigation Addendum Report prepared by Arup (April 2018) (Ref: VICARUP-ZZ-XX-RP-CG-002)
- Performance Specification for Gas Protection Measures prepared by Arup (May 2018) (Ref: VIC-ARUP-ZZ-XX-SP-CG-002)
- Material Management Plan by E3P dated 02/10/2020 - (Ref: 14-284-r2.2)
- Remediation Strategy and Implementation Plan by E3P dated August 2020 – (Ref: 14-284-R1)
- Remediation and Enabling Works Validation Report by E3P dated November 2021 (Ref: 14-284-R3-1)

2 Site Location and Description

2.1 Site Location

The site is located in the City Centre of Manchester, adjacent to Victoria Railway Station. It is bounded by Victoria Station and Metrolink to the west, Cheetham Hill Road to the north and Corporation Street to the east. The site is centred at National Grid Reference (NGR) 384103, 399014, nearest postcode M3 1NX. The site location is shown in Figure 2.

Prior to the start of the construction phase, ground levels in the main area of the site range from 33.25m above Ordnance datum (AOD) in the south-west to 32.75m AOD in the north-east. There is an existing retaining wall which runs from Cheetham Hill Road in the north of the site and curves round in a southerly direction along Corporation Street and Long Millgate gradually reducing in height. The level difference between the main area of the site and Cheetham Hill Road is approximately 5m. Ground levels of the portion of the site bounded by the existing retaining wall and Corporation Street range from 33.25m AOD to 37m AOD; increasing towards the north-east.

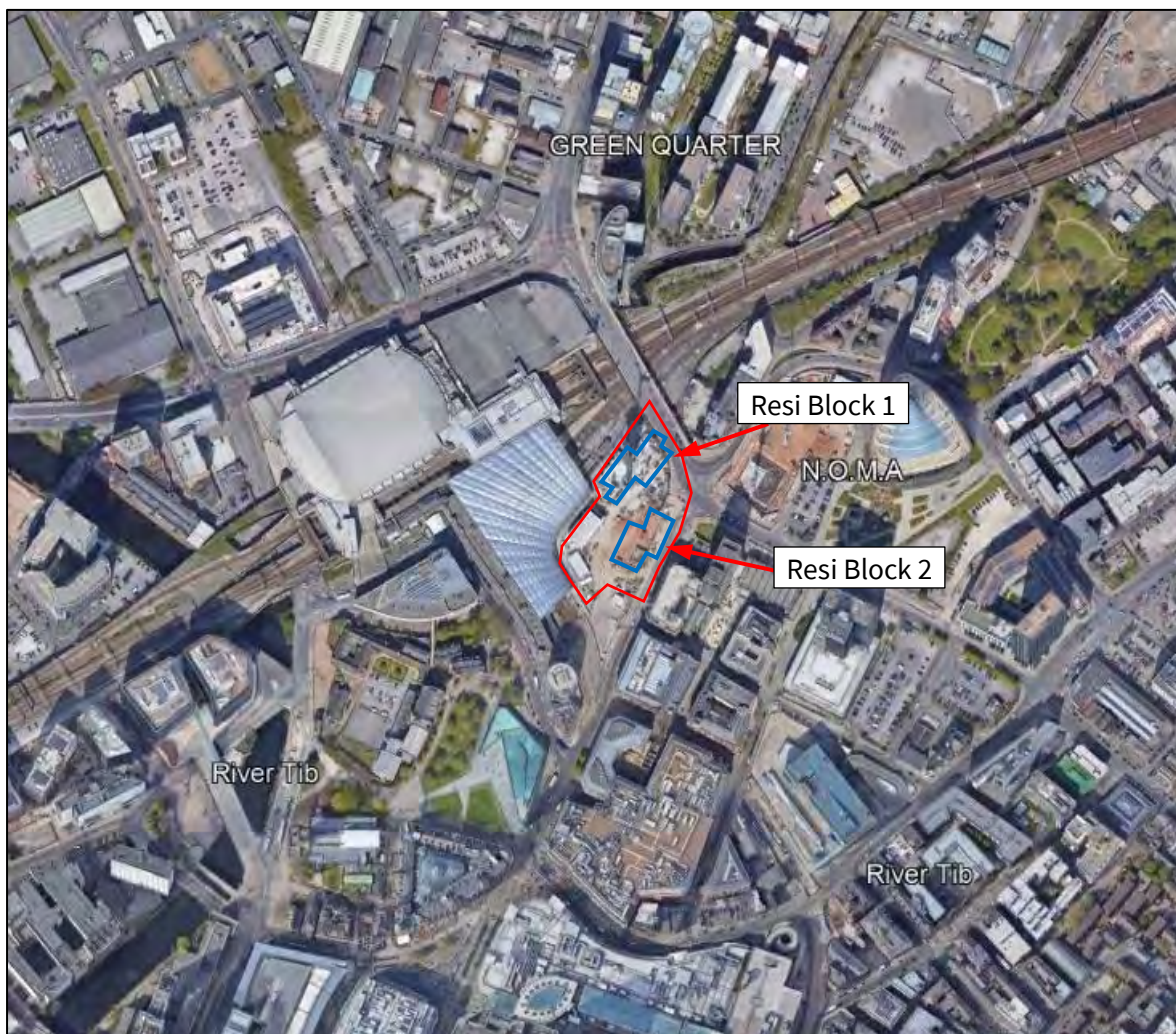


Figure 2: Site Location (Google Earth © 2021)

The construction of the two tower blocks have now been completed. The external areas surrounding the tower blocks comprise a combination of the access roads, block paving and small areas of soft landscaping.

2.2 Site Ownership

2.2.1 Site is understood to be owned by Muse Development.

3 Enabling Works and Verification

3.1 Site Works

E3P were appointed by PP O'Connor (Enabling Works Contractor) as independent Geo-Environmental Consultant to prepare the Remediation Implementation Plan, Material Management Plan (MMP) and Validation Report for the enabling works within blocks 1 and 2. The Validation Report (Ref: 14-284-R3-1) has produced a suitably detailed record to ensure the satisfaction of the relevant planning conditions and geotechnical engineering requirements for Building Control, warranty providers and the future adoption of infrastructure by the Highways Authority and statutory service providers.

The report should be read in conjunction with this report.

4 Gas Protection Verification

4.1 Introduction

The Arup Ground Investigation Addendum Report (VIC-ARUP-ZZ-XX-RP-CG-0002) was carried out to update to the ground contamination risk assessments and provide a remediation strategy.

Within the Arup Report it was considered that site's gas risk has been assessed as Characteristic Situation 2, as defined within CIRIA C665. Allowances were then made for gas protection measures to be installed within the new buildings on site.

A Ground Gas Protection review / design report was carried out by EPG in May 2022 (EPG2022/VC/NV/Q2/L01). The report reviewed the risks from ground gases and the suitability of the proposed gas protection measures.

The EPG review of the ground gas risk to the development indicated that following the process defined in BS8485, the site would be classified as Characteristic Situation CS1 (i.e. no protection measures required). This conclusion was considered appropriate as within the CSM there are no sources of gas below the site that could generate volumes of gas large enough to pose a risk of

hazardous emissions. In addition to this, much of the Made Ground encountered during the previous site investigations, had been removed during the enabling works.

Regardless of the conclusions of the risk assessment, Arup has specified that the gas protection are required and EPG reviewed the suitability of the proposed protection measures.

Building construction

Block 1 has a ground level slab and no basement (it has lift pits that are shallow).

Block 2 is on a sloping site and has a basement retaining wall around two elevations. The walls and slabs require waterproofing. The basement construction comprises contiguous piled walls with in an internal 200mm thick in situ concrete wall. The floor slabs are suspended 300mm thick insitu concrete. This type of construction has a high inherent resistance to ground gas ingress.

Ground Gas Protection

The waterproofing design also provides various levels of ground gas protection. The combinations of waterproofing systems that used are as follows:

- Waterproof concrete and RIW liquid gas membrane
- Waterproof concrete and RIW Structureseal
- Standard concrete slab and RIW gas seal black or RIW liquid gas membrane.

An assessment of the waterproofing to act as the gas protection system is provided in the Table below.

Table 1 – Acceptance Criteria for Re-use of Site Won Soils (Topsoil and Subsoil)

Structural Barrier (Table 5 BS8485)	Points	Membrane (Table 7 of BS8485)	Points	Total Points
Waterproof concrete (note BS8485 makes a distinction between Grade 2 and Grade 3 for waterproof concrete. No such distinction exists in practice and waterproof concrete can be assigned 2.5 points regardless of the Grade of waterproofing (which is an indication of the internal environment requirements and not the performance of the concrete.	2.5	RIW liquid gas membrane –a single component water based styrene-butadiene copolymer.	2.0	4.5
Waterproof concrete	2.5	RIW Structureseal –is a 1.5mm thick polyethylene membrane with a bonded geotextile for preapplied waterproofing applications. this has been assessed by EPG and meets the requirements for a gas membrane in this site application	2.0	4.5

Structural Barrier (Table 5 BS8485)	Points	Membrane (Table 7 of BS8485)	Points	Total Points
Standard concrete slab 300mm thick suspended	1.5	RIW gas seal black or RIW liquid gas membrane	1.0	2.5

In all cases the concrete floor construction and the waterproofing/damp proofing membrane provided are adequate for the gas protection system.

The EPG assessment concluded that is no risk of ground gas emissions at this site, however gas protection has been provided in the form of a combination of reinforced concrete walls and floor slabs and waterproofing/gas membranes. The scope of protection is adequate for the level of risk on this site.

4.2 Verification of Protection Measures

Verification of the Gas Protection measures is required in accordance with CIRIA C735. Verification is defined within CIRIA C735 as:

The process of demonstrating that risk has been reduced to meet remediation criteria and objectives based on a quantitative assessment of remediation performance.

It was proposed to apply a 'Moderate Level' of validation processes on this project.

The installation of the gas protection measures were carried out by Mayo Civils. Independent inspection visits were carried out by RIW and Byrne Looby to review different elements of the protection measures. No non-conformities were identified during the site visits. A copy of the site inspections are given in Appendix C.

Based on the observations made during the site inspections conducted on both buildings, we concluded that an appropriate level of workmanship has been employed during the gas protection installation works, in accordance with the requirement of the design.

5 Verification of Topsoil and Subsoil

5.1 Introduction

The remediation strategy outlined in the Arup Ground Investigation Addendum Report (VIC-ARUP-ZZ-XX-RP-CG-0002) indicated that a clean cover system shall be placed in all areas of soft landscaping to provide a barrier over any contaminated soils and provide a suitable growing medium for the proposed planting.

The depth of clean cover required in the soft landscaping areas were determined within drawing VIC-PIE-EZ-ZZ-DR-L-00202_C01. The depth of the cover system depended on the landuse i.e. deepest within the tree pits. The typical thickness within the different landscaped areas are as follows:

- Semi-mature Tree – 400mm Topsoil / 600mm subsoil
- Ornamental Shrub and Herbaceous Planting – 400mm Topsoil
- Hedge Planting – 600mm Topsoil

It should be noted that no unexpected contaminated material was encountered during the cover system installation.

The soft landscaping can be separated into 11No. separate areas on the site. Figure 3 below the location of the soft landscaped areas.

The Topsoil has been specifically imported to site by Tim O'Hare Associates in order to complete landscaped areas, from a greenfield source reference Rabbit Hill GT2. A Topsoil Analysis Report has been issued prior to delivery to site (Appendix G). The report and results indicates that the material is compliant with the British Standard for Topsoil (BS3882:2015).

Subsoil have been specifically imported to site by Tim O'Hare Associates reference Crown Farm Subsoil. A Subsoil Analysis Report has been issued prior to delivery to site (Appendix G). The report and results indicates that the material is compliant with the British Standard for Subsoil (BS8601:2013). It is understood that the subsoil is as greenfield source – as dug natural sand.



Figure 3: Extract of VIC-PIE-EZ-ZZ-DR-L-00116_C05 – Planit IE Ltd showing development including soft landscaped areas

5.2 Site Works

Once delivered to site, the topsoil and subsoil were stockpiled prior to chemical verification testing for use within the soft landscaped areas. Each stockpile was less than 50m³, therefore three samples per source were taken for verification testing. Two stockpiles for each topsoil and subsoil material were required to be used within the soft landscaped areas, therefore 12 samples (6 x topsoil and 6 subsoil) were taken in total.

Table 2 – Acceptance Criteria for imported (Topsoil and Subsoil) Public Open Space residential end use

Analyte	Soil Re-Use and Importation Criteria SGV / GAC / pC4SL / S4UL (mg/kg)	Reference	Analyte	Soil Re-Use and Importation Criteria SGV / GAC / pC4SL / S4UL (mg/kg)	Reference
Metals			Petroleum Hydrocarbons		
Arsenic	79	C4SL	Aliphatic C5-C6	570000	S4UL
Cadmium	220	C4SL	Aliphatic C6-C8	600000	S4UL
Chromium III	1500	S4UL	Aliphatic C8-C10	13000	S4UL
Chromium, Hexavalent	21	C4SL	Aliphatic >EC10-EC12	13000	S4UL
Copper	12000	S4UL	Aliphatic >EC12-EC16	13000	S4UL
Lead	630	C4SL	Aliphatic >EC16-EC35	250000	S4UL
Mercury	16	S4UL	Aliphatic >EC35-EC40	250000	S4UL
Nickel	230	S4UL	Aromatic C5-C7	56000	S4UL
Phenol - Monohydric	440	S4UL	Aromatic C7-C8	56000	S4UL
Selenium	1100	S4UL	Aromatic C8-C10	5000	S4UL
Zinc	81000	S4UL	Aromatic >EC10-EC12	5000	S4UL
			Aromatic >EC12-EC16	5100	S4UL
Inorganic			Aromatic >EC16-EC21	3800	S4UL
Sulphate	2400***		Aromatic >EC21-EC35	3800	S4UL
Phenol	120	S4UL	Aromatic >EC35-EC40	3800	S4UL
PAH			Asbestos		
				Not detected (<0.001%) for topsoil and subsoil	Lab LoD
Acenaphthene	15000	S4UL			
Acenaphthylene	15000	S4UL			
Anthracene	74000	S4UL			
Benzo(a)anthracene	29	S4UL			
Benzo(a)pyrene	10	S4UL			
Benzo(b)fluoranthene	7.1	C4SL			
Benzo(g,h,i)perylene	640	S4UL			

Analyte	Soil Re-Use and Importation Criteria SGV / GAC / pC4SL / S4UL (mg/kg)	Reference	Analyte	Soil Re-Use and Importation Criteria SGV / GAC / pC4SL / S4UL (mg/kg)	Reference
Benzo(k)fluoranthene	190	S4UL			
Chrysene	57	S4UL			
Dibenzo(a,h)anthracene	0.57	S4UL			
Fluoranthene	3100	S4UL			
Fluorene	9900	S4UL			
Indeno(1,2,3-c,d)pyrene	82	S4UL			
Naphthalene	4900	S4UL			
Phenanthrene	3100	S4UL			
Pyrene	7400	S4UL			

5.3 Verification of Topsoil and Subsoil – Sampling and Testing

Sampling of the imported material was conducted on the 27th March 2023 and 23rd April 2023 by ByrneLooby personnel.

A total of 6 no. samples of topsoil were analysed. From visual observation, the materials constituted topsoil comprising of “Soft dark brown sandy gravelly CLAY. Gravel is subrounded to rounded fine to medium mudstone, quartzite, and sandstone”.

A total of 6 no. samples of subsoil were analysed. From visual observation, the materials constituted subsoil comprising of light brown fine to medium sand.

The soil samples were sent to Derwentside Environmental Testing Services Limited (DETS). This laboratory is UKAS accredited in accordance with ISO17025 and is also MCERTS accredited for soil analysis in accordance with the Environment Agency’s scheme. The laboratory analysis results are presented in **Appendix E**.

The results of the samples collected were screened against Generic Assessment Criteria (GAC) for Human Health Risk Assessment (LQM/CIEH 2015) for a public open space - residential end-use, sandy soil with 1% SOM and pH 7.0 (presented in Table 3 and **Appendix F**).

All the topsoil and subsoil results passed the relevant screening criteria.

5.4 Description of Topsoil and Thickness

Inspection of the cover system installation has been carried out and Verification photographs are presented in **Appendix D**.

At the time of this report Area 4 and Area 7 were incomplete and will be verified at a later date.

All remaining areas have shown to have the required topsoil and subsoil (when required) therefore comply with the requirements detailed in the remediation strategy and detailed drawings.

6 Conclusions

6.1 Ground Gas Protection Measures

The installation of the gas protection measures were carried out by Mayo Civils and independent inspection has shown no non-conformities. It has been concluded that the installation of the gas protection system on the both buildings has been suitable.

6.2 Clean Cover Depth

The remediation strategy and architect drawings outlined the details of the required clean imported topsoil/subsoil within the soft landscaped areas at the proposed development.

Visual inspection visits were performed by ByrneLooby and photographs showing the verification of depth across selected areas were found to comprise a sufficient clean cover system in accordance with the agreed remedial strategy and Manchester City Guidance.

6.3 Import Material

Laboratory chemical analysis results of recovered samples show the samples do not exceed the agreed GACs (1% SOM). Therefore, the imported material are suitable for use and there is no risk to the future users of the site.

Laboratory analysis results of recovered samples show topsoil and subsoil are generally in compliance with BS3883:2015 and BS8601:2013.

6.4 Conclusions

The report indicates the site has met all the requirements of the remediation as outlined in the remediation strategy agreed with the Manchester City Council.

7 References

- BS 5930 : 2015 : Code of practice for site investigation. British Standards Institution.
- BS 3882: 2015 : Specification for topsoil and requirements for use. British Standards Institution.
- BS 8601: 2013 : Specification for subsoil and requirements for use. British Standards Institution.
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- Ministry of Housing, Communities & Local Government: 2019 : National Planning Policy Framework, February 2019.
- NHBC : 2018 : NHBC Standards.
- Statutory Instruments: 2012: Health and Safety. The Control of Asbestos Regulations 2012. No. 632 coming into force 6th April 2012.
- Statutory Instruments: 2012: Environmental Protection, England. Contaminated Land (England) (Amendment) Regulations 2012 No. 263 coming into force 6th April 2012.

8 Drawings

List of Drawings

- VIC-PIE-EZ-ZZ-DR-L-00202_C01 - Landscaped details
- VIC-PIE-EZ-ZZ-DR-L-00116_C05 - Garden areas

SOFTWAREKS SCHEDULE

Code	Species	Common Name	Height	Girth/Size	Root	Habit/Form	Number
NOTE: All trees must be tagged by Landscape Architect prior to delivery to site.							
TREE PLANTING EVERGREEN							
Pn'A'	Pinus nigra 'Austriaca'	Austrian Pine	6m	20 to 25cm	RB	Standard Semi mature specimen, dense uniform canopy, 2m clear stem, underground guyed, 4-6x transplanted	1
Pc	Pinus cembra	Arolla Pine	6m	20 to 25cm	RB	Standard Semi mature specimen, dense uniform canopy, 2m clear stem, underground guyed, 4-6x transplanted	1
TREE PLANTING DEQUOUOS							
Ap'EC	Acer platanoides 'Ebbens Column' (Feathered)	Maple	6m	250 to 300cm	RB	Standard semi mature, feathered from base, underground guyed, 4-6x transplanted	5
Ap'EC	Acer platanoides 'Ebbens Column' (Clear Stem)	Maple	6m	250 to 300cm	RB	Standard semi mature, 2m clear stem, underground guyed, 4-6x transplanted	3

SHRUB AND HERBACEOUS PLANTING (Total Area of Shrub Planting 214m2)					
Species	Height	Container	Spec	Density	
Achillea 'Moonshine'	30-40cm	5L CG	Full Pot	5ltr @ 6/m2	
Alchemilla mollis	30-40cm	3L CG	Full Pot	5ltr @ 6/m2	
Agapanthus africanus 'Albus'	30-40cm	5L CG	Full Pot	5ltr @ 6/m2	
Agastache 'Blackadder'	30-40cm	5L CG	Full Pot	5ltr @ 6/m2	
Buxus sempervirens	60cm	10L CG	Full Pot, clipped to tight ball	10ltr @ 6/m2	
Calamagrostis acutiflora 'Overdam'	30-40cm	5L CG	Full Pot	5ltr @ 6/m2	
Luzula nivea	30-40cm	5L CG	Full Pot	5ltr @ 9/m2	
Perovskia 'Little Spire'	30-40cm	5L CG	Full Pot	5ltr @ 6/m2	
Polystichum munitum	30-40cm	5L CG	Full Pot	5ltr @ 6/m2	
Pinus mugo 'Mops'	30-40cm	5L CG	Full Pot	5ltr @ 6/m2	
Stipa tenuissima	30-40cm	5L CG	Full Pot	5ltr @ 6/m2	
Taxus baccata (hedge)	60cm	10L	Instant pre-grown hedging	4/linear m	
Vinca minor	20-30cm	5L CG	Full Pot	5ltr @ 6/m2	

PLANTING

 **Semi-mature Tree Planting**
Location: site wide
Size: 600cm height
Spec: 2m clear stem
Note: To be planted into 900mm min. deep substrate

 **Multi-stem Tree Planting**
Location: site wide
Size: 300-500cm height
Spec: Min. 3 breaks
Note: To be planted into 900mm min. deep substrate

 **Evergreen Instant Hedging**
Location: to entrance plaza
Size: 600cm height
Note: To be planted into 450mm min. deep substrate

 **Ornamental Low Shrub and Herbaceous Planting**
Location: site wide
Size: 20cm-100cm height
Note: To be planted into 450mm min. deep substrate

 **Turfed Lawn**
Location: South west corner (over culvert) and temporary car park
Spec: Rolled turfled lawn

 **Temporary Semi-mature Tree Planting**
Location: Phase 1 Temporary Car Park
Size: 600cm height
Spec: 2m clear stem
Note: To be planted into 900mm min. deep substrate

 **Below Ground Tree Pit Extent**

Planting notes and workmanship

- Plant handling at the nursery, and during transit up to delivery , shall be in accordance with 'Plant Handling' the booklet published by the Committee for Plant Supply and Establishment (CPSE). The contractor shall comply with clauses 3 & 4 of the above booklet (obtained from the Horticulture Trades Association) which refers to the receipt, unloading and temporary storage of plants.
- Plants shall be first class examples of their species or variety, free from all pests and diseases with good fibrous root systems and materially undamaged. (Refer to relevant sections of BS3936 Parts 1-10 'Specification of Nursery Stock')
- All planting is to be in general compliance with BS4428: 1989 'Code of Practice for general landscape operations (excluding hard surfaces)'.

NOTE: All trees in handstanding are to be planted into urban tree soil
- All trees are to be staked and secured as followed:
i) All semi mature and advance heavy standard trees are to be underground guyed using a triple stake and approved anchor fixing system.
NOTE: All trees in handstanding are to be planted into urban tree soil
- One number 80litre bag of tree planting compost (non peat based) is to be incorporated into two tree pits. Compost must be thoroughly mixed with with excavated (or imported) topsoil. Trees shall be planted in tree pits large enough to accommodate tree roots when fully spread.
- The contractor must ascertain for himself the exact location of any underground services and maintenance points. Root barriers and deflectors are to be installed as required to tree pits and hedgerows to remove potential conflicts with existing and proposed services.
- At the time of planting, areas will be covered by an approved depth of topsoil:
i) Topsoil to hedge area to be min 600mm deep
ii) Topsoil to grass areas to be min 150mm deep
Imported topsoil is to be approved via a sample delivery and soil testing results prior to installation
- Water as necessary to ensure the establishment and continued thriving of planted and grassed matter.
- Carry out all work when soil and weather conditions are suitable:
i) Do not plant during periods of frost or strong winds. Plant only during the following periods
- Bare root deciduous trees and shrubs: Late October to late March
- Container grown plants: At any time if ground water and weather conditions are favourable.
Ensure that adequate watering and weed control is available.
- All planted areas are to be mulched to a consolidated depth of 50mm using an approved Grade A Amenity Bark Mulch.

Workmanship and Maintenance Generally

All works will be subject to the following British Standards :-

Construction:

- BS 4428 : 1989 General Landscape Operations
- BS 3936 : Part 1 1992 Nursery Stock (Specification for trees and shrubs)
- BS 3936 : Part 4 1984 Nursery Stock (Specification for forest trees)
- BS 3936 : Part 9 1987 Nursery Stock (Specification for bulbs, corms and tubers)
- BS 3936 : Part 10 1990 Nursery Stock (Specification for ground cover plants)
- BS 5837 : 2012 Trees in Relation to Construction
- BS 3882 : 1994 Topsoil
- BS 4043 : 1989 Transplanting root based trees
- BS 5236 : 1975 Cultivating and planting advance nursery stock

Maintenance:

- BS 7370:part1: 1991 Grounds maintenance (part 1. Recommendations for establishing and managing grounds maintenance organisations and design considerations
- BS 7370:part2: 1994 Grounds maintenance part 2. Recommendations for the maintenance of hard areas (excluding sports surfaces)
- BS 7370:part3: 1991 Grounds maintenance part 3. Recommendations for maintenance of amenity and functional turf (other than sports turf)
- BS 7370:part4: 1993 Grounds maintenance part 4. Recommendations for maintenance of soft landscape (other than amenity turf)

Revisions:
1. Abeyance notes omitted following client approval.

NOTE: FORMERLY DRAWING PL1487.VW.116

Rev	Date	Status and Description	Drawn	Apprvd.
A5 C05	25/11/2022	CONSTRUCTION	TF	AM
S3 P15	19/10/2022	CLIENT REVIEW/APPROVAL	TF	AM
A5 C04	12/11/2021	STAGE 5	TF	AM
S4 P14	15/09/2021	PLANNING	TF	AM
A5 C03	07/07/2021	STAGE 5	TF	AM
A5 C02	17/06/2021	STAGE 5	TF	AM
A5 C01	07/04/2021	STAGE 5	TF	AM
13	02/12/2020	Free removed due to utility	TF	KR
12	05/06/2020	STAGE 4	AM	AM
11	21/05/2020	STAGE 4	AM	AM
10	23/03/2020	INTERIM STAGE 4	TF	KR
09	20/03/2020	INTERIM STAGE 4	TF	KR
08	03/03/2020	INTERIM STAGE 4	TF	KR
07	06/02/2020	INTERIM STAGE 4	AM	KR
06	16/02/2018	Tender Addendum	AM	AM
05	17/10/2017	Tender	DF	AM
04	18/09/2017	DRAFT	DF	AM
03	30/03/2016	For Planning	JD	KR
02	17/03/2016	For Planning	JD	KR
01	24/02/2016	For Planning	JD	KR
00	04/02/2016	For Planning	JD	KR

- NOTE:
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 - The dimensions of all materials must be checked on site before being laid out.
 - This drawing must be read with the relevant specification clauses and detail drawings
 - Order of construction and setting out to be agreed on site.
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Project

NEW VICTORIA

Client

Muse Developments

Drq title

Softworks GA

Drq nr

VIC-PIE-EZ-ZZ-DR-L-00116

Scale

1:250@A1

Date

24/02/16

Drawn

TF

Status

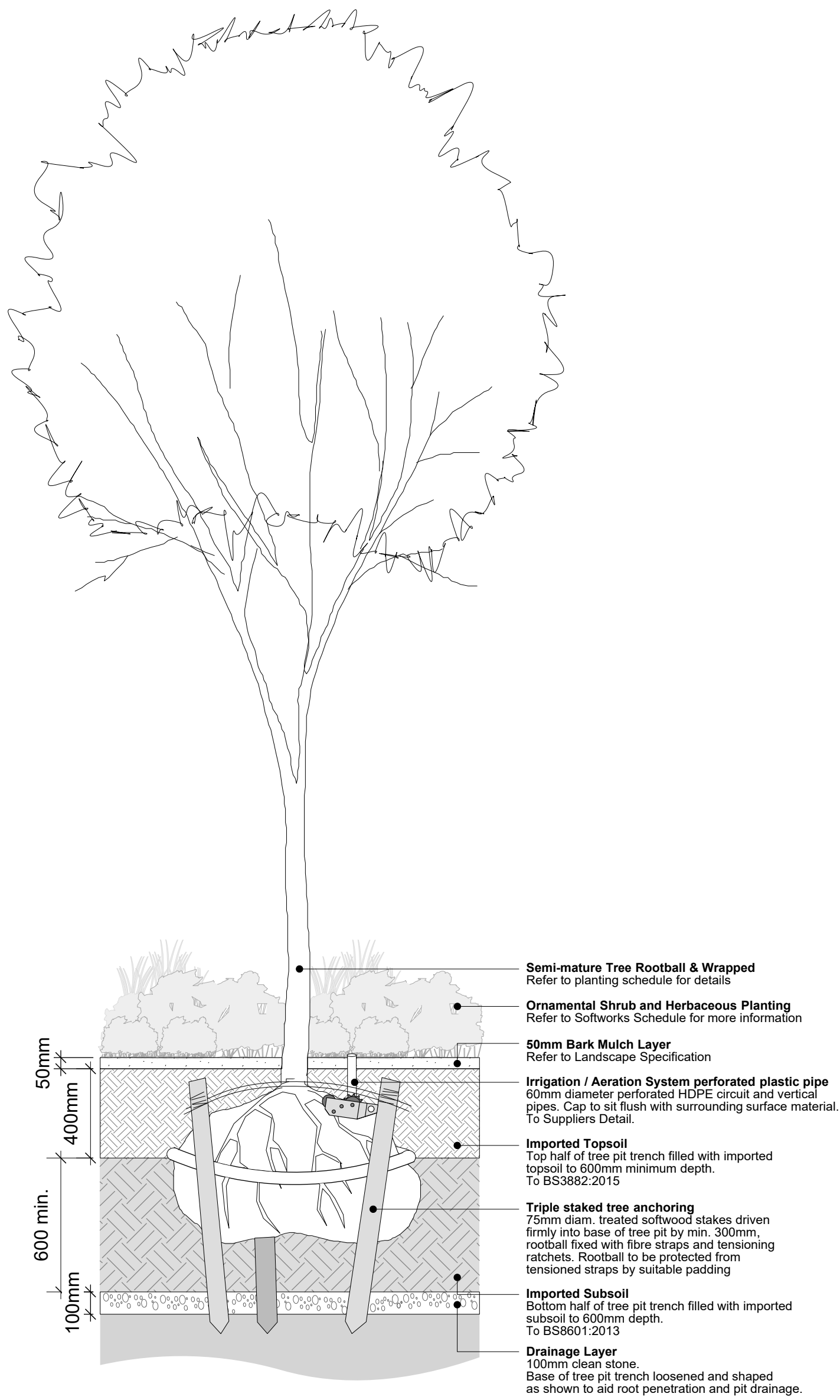
Stage 5

Revision

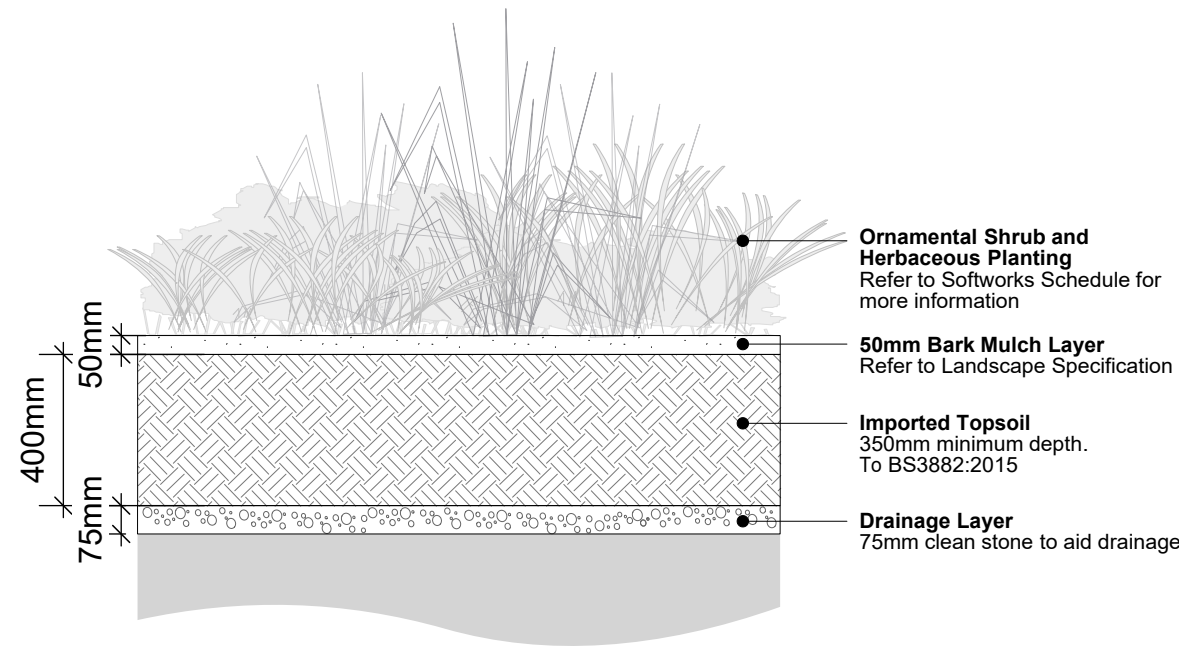
C05

Checked

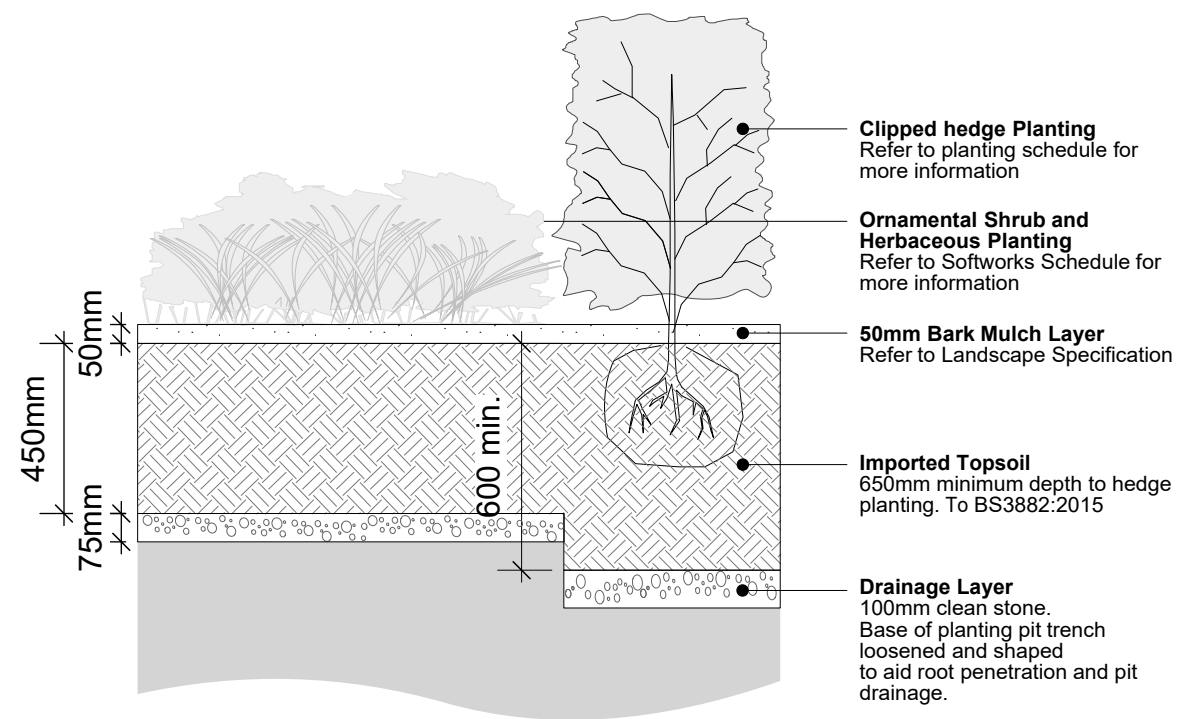
KR/AM



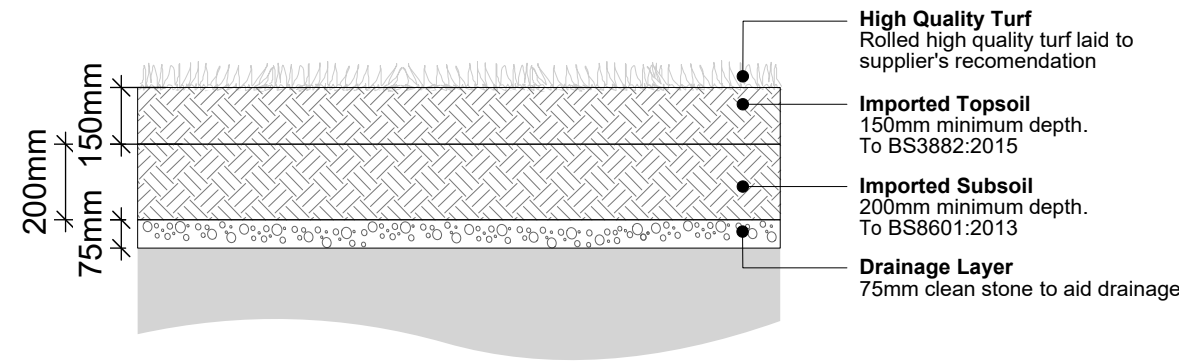
203 Typical Section through Tree Planting in Planting Beds
Section Scale 1:20@A1



204 Typical Section through Ornamental Shrub & Herbaceous Planting
Section Scale 1:20@A1



205 Typical Section through Hedge Planting
Section Scale 1:20@A1



206 Typical Section through Turf Lawn
Section Scale 1:20@A1

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 4. All setting out, levels and dimensions to be agreed on site.
 5. The dimensions of all materials must be checked on site before being laid out.
 6. This drawing must be read with the relevant specification clauses and detail drawings.
 7. Order of construction and setting out to be agreed on site.

NOTE: FORMERLY DRAWING PL1487.VW.202

LOCATION PLAN

A5, C01	07-04-21	Stage 5	TF	AM
01	06-02-20	Issued for Interim Stage 4	SR	KR
Revision	Date	Description	Drawn	Apprvd.

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Client Muse Developments

Project New Victoria, Manchester

Drg Title Softworks Details

Created on 17.10.2017 Created by CL Approved by DF

Scale 1:20 Size A1 Workstage Stage 5

Drg No. VIC-PIE-EZ-ZZ-DR-L-00202 Suitability A5 Revision C01

Appendix A – Service Constraints, Report Limitations & Planning Requirements

Service Constraints, Report Limitations & Planning Requirements

This consultancy contract, report, and the site investigation (together comprise the "Services") were compiled and carried out by ByrneLooby Partners UK Limited (ByrneLooby) for Anwyl Homes (the "client") on the basis of a defined programme and scope of works and the terms of a contract between ByrneLooby and the "client." The Services were performed by ByrneLooby with all reasonable skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by ByrneLooby taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between ByrneLooby and the client. ByrneLooby Partners UK Limited cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered out with the agreed scope of works.

Other than that, expressly contained in the above paragraph, ByrneLooby provides no other representation or warranty whether express or implied, is made in relation to the Services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of ByrneLooby. If a third party relies on this report, it does so wholly at its own and sole risk and ByrneLooby disclaims any liability to such parties.

It is ByrneLooby's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without ByrneLooby's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of ByrneLooby Partners UK Limited.

The report was written in June 2023 and should be read in light of any subsequent changes in legislation, statutory requirements, and industry practices. Ground conditions can also change over time and further investigations, or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of ByrneLooby. In the absence of such written advice of ByrneLooby, reliance on the report in the future shall be at the client's own and sole risk. Should ByrneLooby be requested to review the report in the future, ByrneLooby shall be entitled to additional payment at the then existing rate, or such other terms as may be agreed between ByrneLooby and the client.

The observations and conclusions described in this report are based solely upon the Services that were provided pursuant to the agreement between the client and ByrneLooby. ByrneLooby has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. ByrneLooby is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, ByrneLooby did not seek to evaluate the presence on or off the site of electromagnetic fields or materials in buildings (i.e., materials inside or as part of the building fabric) such as asbestos, lead paint, radioactive or hazardous materials.

The Services are based upon ByrneLooby's observations of existing physical conditions at the site gained from a walkover survey of the site together with ByrneLooby's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst ByrneLooby Partners UK Limited have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. Further ByrneLooby was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. ByrneLooby is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to ByrneLooby and including the doing of any independent investigation of the information provided to ByrneLooby save as otherwise provided in the terms of the contract between the client and ByrneLooby.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and ByrneLooby based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to

describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation, and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A2 2017. For the geotechnical aspects of the report, the general requirements of Eurocode 7 (BS EN 1997-2:2007) are to produce a Ground Investigation Report (GIR) which shall form part of the Geotechnical Design Report (GDR). The geotechnical section of this report is intended to fulfil the general requirements of the GIR as outlined in BS EN 1997-2, Section 6. The GIR contains the factual information including geological features and relevant data, and a geotechnical evaluation of the information stating the assumptions made in the interpretation of the test results. This report shall not be considered as being a GDR.

Planning Requirements

The National Planning Policy Framework (NPPF, 2019) emphasises the presumption in favour of sustainable development. Paragraph 11, which defines the presumption in favour of sustainable development, has two similar clauses which related to potentially contaminated land and sensitive receptors:

11) Plans and decisions should apply a presumption in favour of sustainable development.

*For **plan-making** this means that:*

b) strategic policies should, as a minimum, provide for objectively assessed needs for housing and other uses, as well as any needs that cannot be met within neighbouring areas, unless:

i) the application of policies in this Framework that protect areas or assets of particular importance provides a strong reason for restricting the overall scale, type or distribution of development in the plan area;

*For **decision-taking** this means:*

d) where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:

ii) the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed

In accordance with the NPPF, areas or assets of particular importance are defined as:

Habitats sites (and those sites listed in paragraph 176 – potential Special Protection Areas and Possible Areas of Conservation; listed or proposed Ramsar sites; and sites identified, or required, as compensatory measures for adverse effects on habitats sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites) and/or designated as Sites of Special Scientific Interest; land designated as Green Belt, Local Green Space, an Area of Outstanding Natural Beauty, a National Park (or within the Broads Authority) or defined as Heritage Coast; irreplaceable habitats; designated heritage assets

(and other heritage assets of archaeological interest referred to in footnote 63 (Non-designated heritage assets of archaeological interest, which are demonstrably of equivalent significance to scheduled monuments, should be considered subject to the policies for designated heritage assets.); and areas at risk of flooding or coastal change.

Paragraph 118 states that planning policies and decisions should:

- *give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;*

Paragraph 170 clarifies that enhancing the natural environment includes:

Planning policies and decisions should contribute to and enhance the natural and local environment by:

- *protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
- *recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*
- *maintaining the character of the undeveloped coast, while improving public access to it where appropriate;*
- *minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

Paragraph 180 of NPPF states that planning policies and decisions should ensure the following:

- *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.*

Paragraph 178 of NPPF states that planning policies and decisions for developments should also ensure that:

- a) *a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);*
- b) *after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- c) *adequate site investigation information, prepared by a competent person, is available to inform these assessments.*

Paragraph 179 states that where a site is affected by contamination or land stability issues, responsibility for securing a safe development rest with the developer and/or landowner.

This report has been prepared and authorised by staff that are competent as defined in the NPPF.

Unexploded Ordnance

Clients have a legal duty under the CDM 2015 Regulations to provide designers and contractors with project-specific health and safety information needed to identify hazards and risks. This includes the possibility of unexploded ordnance (UXO) being encountered on the site. Further details are given in CIRIA Report C681 (Stone et al 2009). A non-UXO specialist screening exercise has been carried out for the site by considering any evidence of UK defence activities on or near the site evident from the gathered desk study information and the unexploded aerial delivered bomb (UXB) regional risk maps produced by Zetica. Other data sources are available, but as a first stage screening exercise the freely available Zetica maps have been used. The level of risk stated is that determined by Zetica, a company experience in the desk study, field investigation and clearance of UXO/UXB.

Appendix B – EPG/2022/VC/NV/Q2/L01

24 May 2022

Vinci Construction UK Limited

Ref: EPG/2022/VC/NV/Q2/L01

Dear Sirs

New Victoria Residential Development – Ground Gas Protection

We have reviewed the information relating to site history, ground conditions and the waterproofing reports for the site known as New Victoria in Manchester. Our gas risk assessment and review of the gas protection performance of the waterproofing that has been installed is provided below. This relates to methane, carbon dioxide and radon. This assessment and review can be considered to be the design report for the gas protection. It does not cover the verification of the gas protection which has been completed by others.

Author competence

This report has been prepared by Steve Wilson. He is a Chartered Civil Engineer and a UK Registered Ground Engineering Adviser (ROGEP). He is also a Society for Brownfield Risk Assessment Accredited Risk Assessor (ASoBRA) for ground gas and a CL:AIRE accredited Specialist in Gas Protection Verification (SGPV). Steve has 30 years experience of assessing ground gas risk and design of mitigation schemes for developments. This includes assessment of gas from sources such as various types of landfill sites, coal mines and leaking oil and gas wells.

Steve works on projects around the world but mainly in the UK and Australia. He has contributed to British Standards on ground gas assessment and design for developments and also CIRIA and CL:AIRE reports (bodies recognised for producing independent industry guidance on ground gas for developments). He advises local authorities on planning, Part IIA of the Environmental Protection Act 1990 and other issues relating to ground and landfill gas. He provides expert support to several licensed contaminated sites auditors in Australia and also acts as an expert witness in legal claims and planning.

The Site

The site under consideration is a new residential development at Victoria Station in Manchester, comprising two residential apartment blocks. The site is located immediately to the southeast of Manchester Victoria railway station. The site is bounded by Corporation Street to the southeast, Cheetham Hill Road to the north east, Manchester Victoria railway and Metrolink stations to the south east and west. Long Millgate bisects the east portion of the site. Immediately prior to development the site was used as a hard surfaced public car park.

Site history

The site history is summarised below. Only those aspects relevant to ground gas are discussed. The site history is summarised in the Arup 2016 Ground Investigation Report¹. The site has a long history of changing urban land use since the 1800s. Most significantly it was part of the railway associated with Victoria Station since mid 1800s. Therefore, it is to be expected that Made Ground is present below the site, but that the age of the majority of the Made Ground is such that it contains negligible degradable material and does not pose a risk of hazardous gas emissions to the surface.

There are no high risk sources of ground gas below or near to the site (landfill sites, shallow coal workings or mine entries).

Geology and Ground Conditions

Several phases of ground investigation have been completed at the site. The ground conditions are summarized in the ARUP Specification for the gas protection measures². A summary of the ground conditions is provided in Table 1.

Table 1. Summary of Ground Conditions

Material	Typical Description	Top of Stratum mbgl (mOD)	Proven thickness (m)
Made Ground	Variable in nature and generally described as loose black brown slightly clayey, gravelly sand with some areas described as a gravelly clay. The material contains occasional fragments of glass, wood, ceramic, plastic, brick, concrete, metal, slate, asphalt, coal,	Ground level (32.6 to 35.2)	0.91 to 10.00

¹ Arup, New Victoria, Ground Investigation Report, Reference REP/GEO/21828/01, May 2016

² Arup, New Victoria Manchester, Performance Specification for Gas Protection Measures, Reference VIC-ARUP-ZZ-XX-SP-CG-0002, May 2018

Material	Typical Description	Top of Stratum mbgl (mOD)	Proven thickness (m)
Glacial Deposits (localised areas)	Firm yellow brown slightly sandy gravelly clay with high cobble content.	1.5 (31.5)	0.9
Possible River Terrace Deposits (localised areas)	Loose light brown fine to medium sand and fine to coarse gravel.	9.6 (23.2)	0.8
Sherwood Sandstone bedrock	Very weak to medium strong fine to medium grained sandstone. Increasing strength with depth.	0.9 to 10.4 (22.4 to 34.1)	7.90 (max proven)

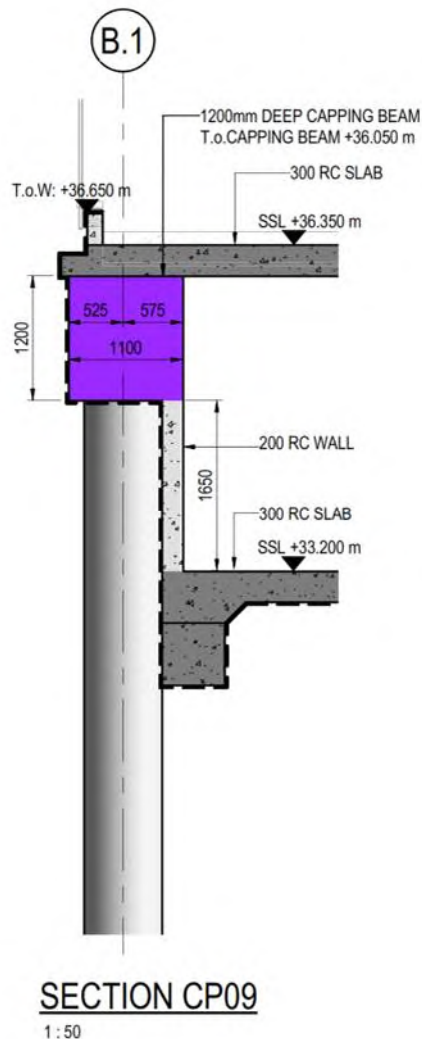
There is no evidence of domestic waste below the site. The TOC content of the finer fraction of the Made Ground varies between 0.5% and 6.8% with an average of 1.6%. This shows there is negligible potential to generate ground gas in large volumes so there is no risk of hazardous emissions.

Groundwater is present in the Sherwood Sandstone at around 8.18m and 9.5m below ground level.

Building construction

Block 1 has a ground level slab and no basement (it has lift pits that are shallow).

Block 2 is on a sloping site and has a basement retaining wall around two elevations. The walls and slabs require waterproofing. The basement construction comprises contiguous piled walls with in an internal 200mm thick in situ concrete wall. The floor slabs are suspended 300mm thick insitu concrete. This type of construction has a high inherent resistance to ground gas ingress. A typical section is shown in Figure 1. There is a section of insitu retaining wall with no piled wall.



The waterproofing for below ground elements has been designed to provide a Grade 2 waterproof environment³. Alan Johnston Partnership Drawing Nos VIC-AJP-01-00L-DR-S-00105 and VIC-AJP-02-00L-DR-S-00105 show that the lower ground floors are not used for habitable space and will be used as refuse and recycling areas, lift lobby, lift shafts, plant rooms, cycle stores, staff rooms and showers and similar. This means that the areas are under the control of the building owners/operators and not individual householders.

The waterproofing/dampproofing design is shown in Figures 2 and 3.

³ Phil Hewitt Associates, Waterproofing Scheme for Development at New Victoria, Manchester, Reference PHA/GEN/L/446, 7/3/2022.

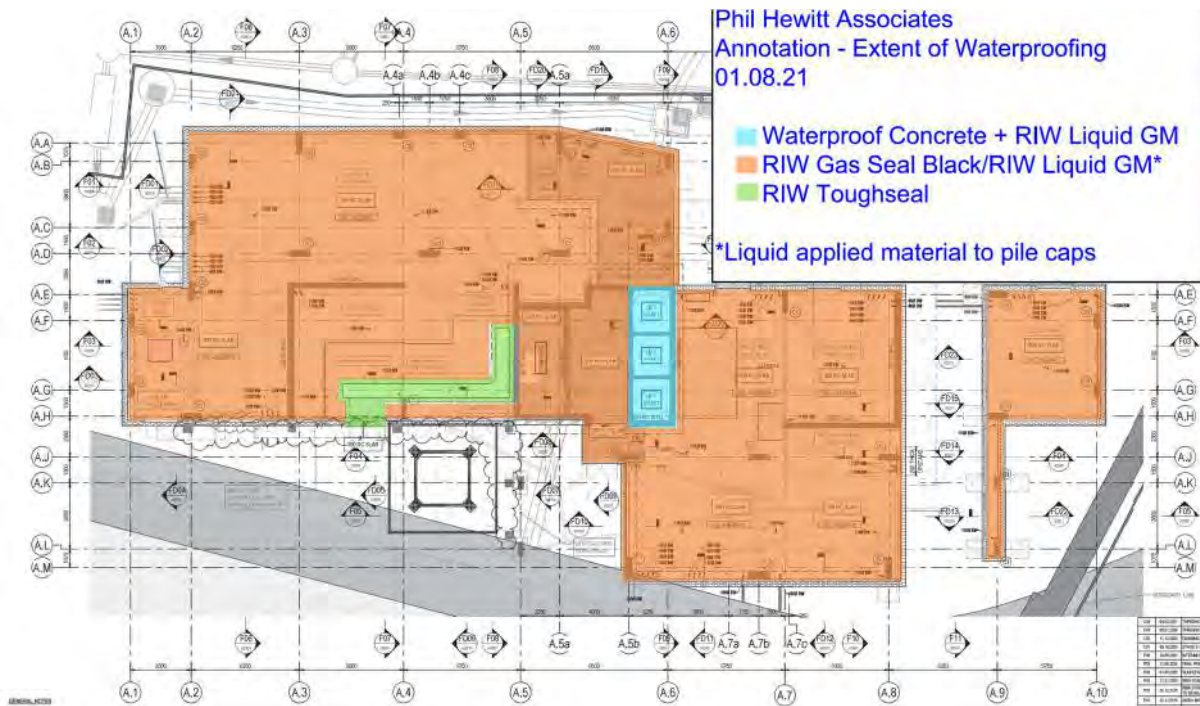


Figure 2 Waterproofing Block 01

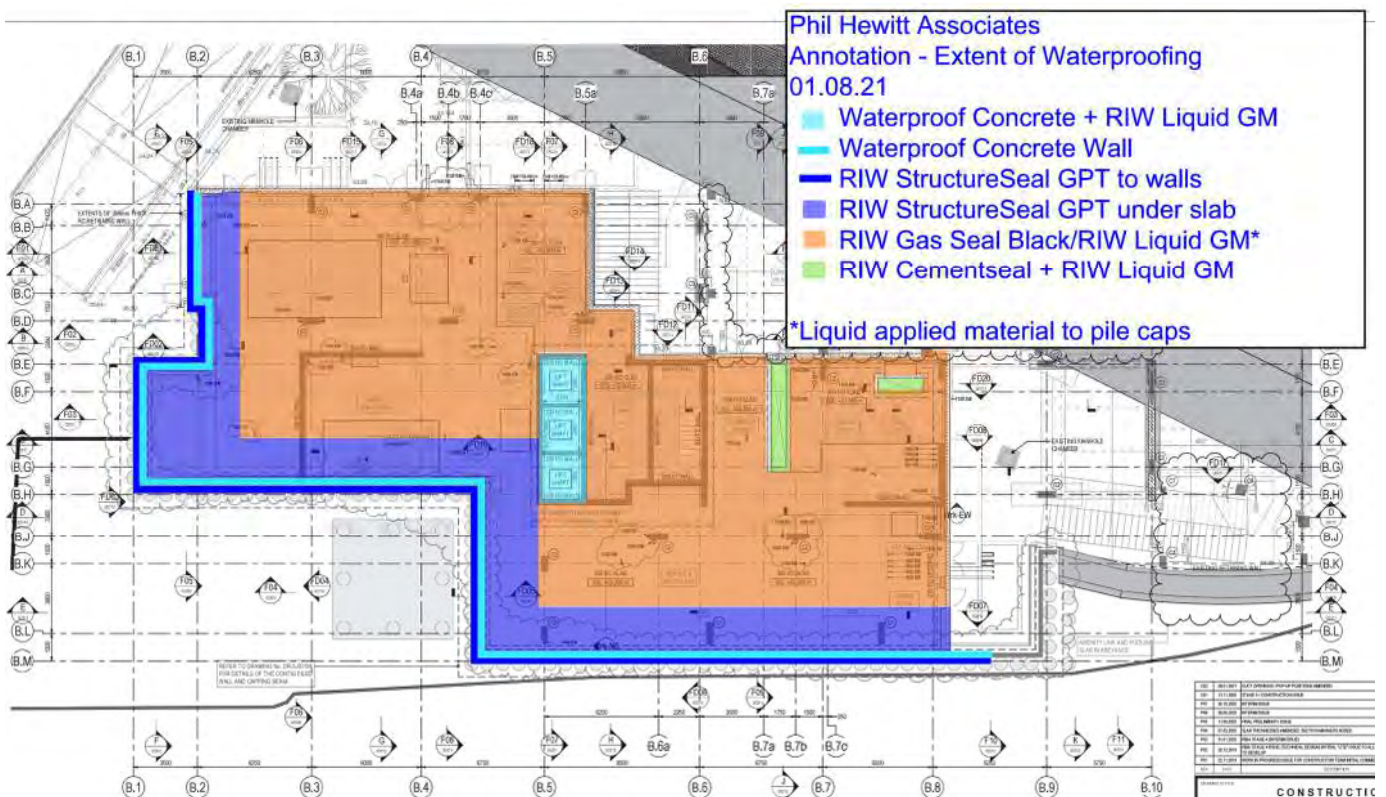


Figure 3 Waterproofing Block 02

Gas monitoring

Gas monitoring has been completed over several phases by ARUP and VertaseFLI Limited. Following the process in BS8485 correctly would classify the site as Characteristic Situation CS1. This is because when considering the CSM there are no sources of gas below the site that could generate volumes of gas large enough to pose a risk of hazardous emissions. Methane has not been detected at elevated concentrations in the wells and the main risk driver is carbon dioxide. This is shown in the ternary plot of results in Figure 4 to be caused by biological respiration. This is a natural process that occurs widely, and the generation rates are negligible (certainly insufficient to cause hazardous emissions into the buildings).

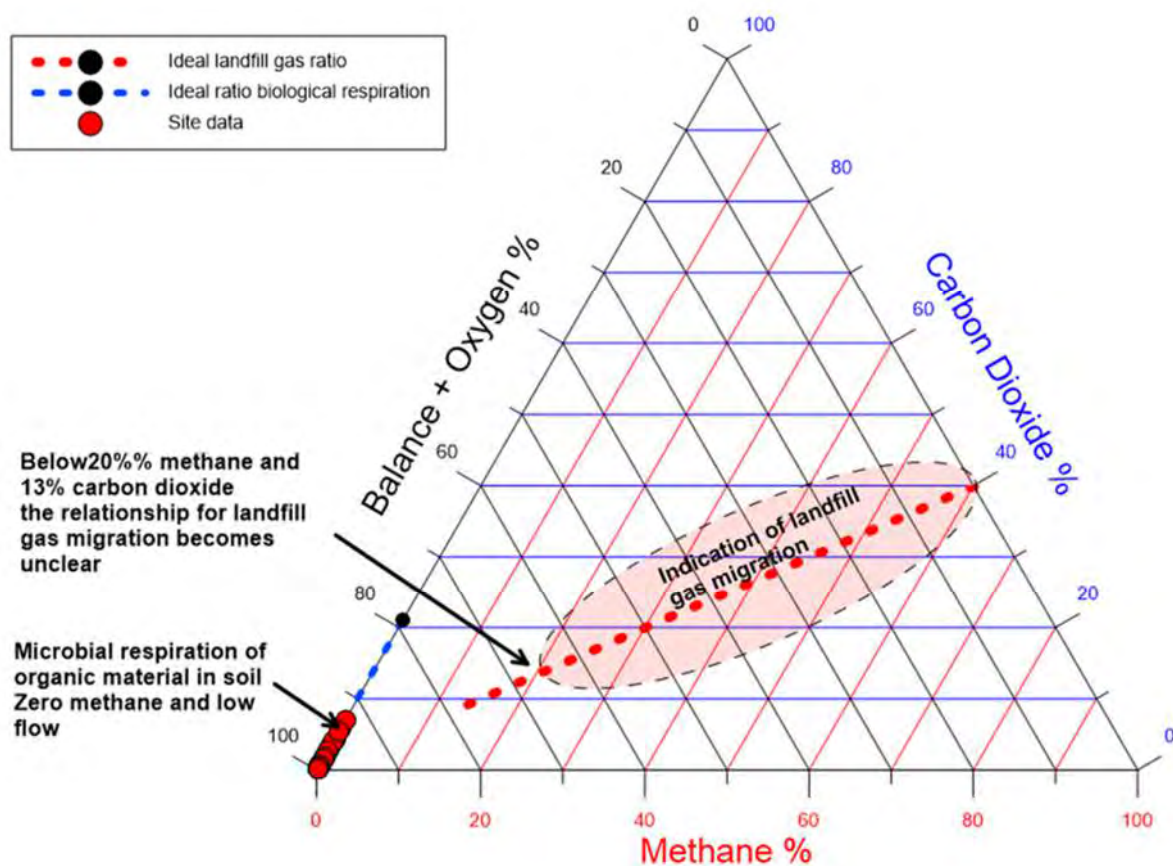


Figure 4 Ternary plot of gas monitoring results

Furthermore, a data quality check of the monitoring response zones shows that the wells in which higher flow rates were recorded are all likely to be influenced by air flow from the underlying sandstone:

- BHA01 – response zone extends close to sandstone. There is a short seal above the sandstone (0.7m) with a 19mm pipe that extends deeper which provides a high risk of connection to the sandstone.
- BHA02 – Extends to the sandstone with short seal (0.9m).
- BHA07 – Response zone extends to the top of the sandstone.

Such results should not be used to assess hazardous gas flow rates or determine gas screening values because they are not representative of diffuse gas flow through the overlying Made Ground.

Notwithstanding the above Arup has specified that gas protection should be provided to meet the requirements of Characteristic Situation CS2 as define in the screening approach in BS8485.

Ground Gas Protection

The waterproofing design also provides various levels of ground gas protection. The combinations of waterproofing systems that have been provided are as follows:

- Waterproof concrete and RIW liquid gas membrane
- Waterproof concrete and RIW Structureseal
- Standard concrete slab and RIW gas seal black or RIW liquid gas membrane.

An assessment of the waterproofing to act as the gas protection system is provided in Table 2.

Table 2 Gas protection system points

Structural Barrier (Table 5 BS8485)	Points	Membrane (Table 7 of BS8485)	Points	Total points
Waterproof concrete (note BS8485 makes a distinction between Grade 2 and Grade 3 for waterproof concrete. No such distinction exists in practice and waterproof concrete can be assigned 2.5 points regardless of the Grade of waterproofing (which is an indication of the internal environment requirements and not the performance of the concrete.	2.5	RIW liquid gas membrane –a single component water based styrene-butadiene copolymer. When applied correctly two coats should produce a dry film thickness of 1mm. The Gas Transmission Rate (as required by BS8485) is not stated. The “methane permeability” is stated on the data sheet but units and test method are not stated. From the value quoted it appears the value is in fact a diffusion coefficient. In any event this has been assessed by EPG and meets the requirements for a gas membrane in this site application	2	4.5
Waterproof concrete	2.5	RIW Structureseal –is a 1.5mm thick polyethylene membrane with a bonded geotextile for preapplied waterproofing applications. this has been assessed by EPG and meets the requirements for a gas membrane in this site application	2	4.5

Structural Barrier (Table 5 BS8485)	Points	Membrane (Table 7 of BS8485)	Points	Total points
Standard concrete slab 300mm thick suspended. The main floor slab does not require waterproofing. The slab is standard concrete and the membrane only acts as a damp proof membrane.	1.5	RIW gas seal black or RIW liquid gas membrane. The RIW gas seal black is only 0.6mm thick overall. The product is not manufactured by RIW but it appears from inspection to be a rebranded product from a other manufacturer. Although not stated on the RIW data sheet the membrane is only 0.4mm thick between the reinforcing scrim. It contains an aluminum core layer from which it derives a very low gas transmission rate. However foil membranes are not normally considered suitable by EPG in below ground and below concrete applications such as this. This is because the foil layer is prone to rupture and/or corrosion (See Lucas and Wilson ⁴) if the thin plastic layer is damaged. However in this site it is acceptable because of the minimal gas risk. It is assigned only one point because of the high risk of defects below this type of floor construction. This is based on an assessment of the likely gas migration through the membrane if the aluminum is corroded	1	2.5

The lower ground floors are considered to be Type C structures as defined in Table 3 of BS8485 (there is central building management of any alterations to the building or its uses). There is in effect single occupancy of the lower ground floor and there will be good ventilation. Therefore, the building gas protection system should provide a total of 2.5 points in accordance with table 4 of BS8485.

In all cases the concrete floor construction and the waterproofing/dampproofing membrane provided are adequate for the gas protection system. Therefore, the detailed design and the specification for the waterproofing also provides the gas protection and a separate design report and drawings are not necessary. The verification plan for the installation (which is required because the system is acting as a gas protection system, following BS8485) was prepared by TerraConsult⁵. The TerraConsult report also includes the design drawings in an Appendix.

The design drawings are considered adequate from a gas protection perspective.

Conclusion

There is no risk of ground gas emissions at this site. However gas protection has been provided in the form of a combination of reinforced concrete walls and floor slabs and waterproofing/gas membranes. The scope of protection is adequate for the level of risk on this site.

⁴ Lucas J and Wilson S (2020) Corrosion and puncture resistance of aluminium foil gas membranes beneath concrete slabs. Geosynthetics International 27 4 August 2020

⁵ TerraConsult, New Victoria, Manchester, Gas Remediation Strategy and Verification Plan.

Please do not hesitate to contact me if you have any questions.

Yours faithfully



Steve Wilson MSc BEng CEng MICE CEnv CSci CWEM MCIWEM FGS
UK Registered Ground Engineering Advisor
Society of Brownfield Risk Assessment Accredited Risk Assessor, Permanent Gas and
Vapour Intrusion

Technical Director
On behalf of The Environmental Protection Group Limited
Tel 07971 277869

Appendix C– Gas Protection Surveillance Visits

Project Name: New Victoria, Manchester
ITP reference: ITP050.2021
Project ITP Number: ITP050.002
Date of surveillance visit: 7th April 2021

Surveillance visit by: Martin Radford RIW Ltd
 Aiden Quinn RIW Ltd
Principle attendee(s): Dave Taylor Mayo Civils

Principle areas inspected:

- Piles heads & capping beam along gridline BM (between B6 & B9)

Observations:

The RIW Structureseal GPT had been installed and was fully bonded to the poured concrete satisfactorily. There was an adaption to the base detail where the RIW Structureseal GPT

Photo 1



was bonded to the RIW Sheetseal GR at the pile head. This was discussed, and agreed as satisfactory provided; The fleece layer on the back of the RIW Structureseal GPT was removed to ensure an intimate bond between the RIW Sheetseal GR which extended from the pile head detail, and returned up the inner face of the shutters, see photo 1.

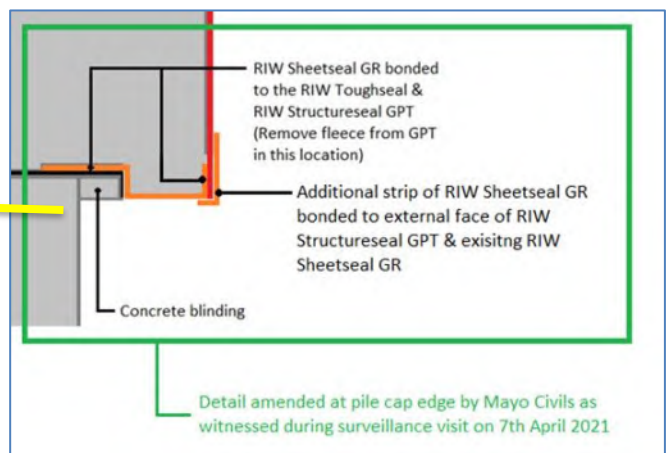


Photo 2



Photo 3



See photo's 2 & 3 above where Mayo Civils are being diligent in identifying and sealing penetrations, such as tie bolt holes and other defects at overlaps within the RIW Structurseal GPT system. Visual inspections should continue to identify other potential defects, such those shown in photo's 4 & 5, and these should be sealed accordingly as work proceeds.

Photo 4



Crease within the membrane and a tie wire penetration need sealing off.

Photo 5



Concrete over spill needs removing prior to completing the pile cap detail. Membrane integrity will need to be confirmed at this location to ensure continuity of water & gas proofing up to DPC.

Photo 6



Ensure RIW Sheestee GR is applied tight to the substrate.

Ensure that the RIW Sheestee GR is installed without any voids between the membrane and the substrate. The membrane needs to follow the contours of the substrate, see photo 6 as an example.

Comments

- Please note, RIW do not sign off installations or workmanship, that is the responsibility of others. RIW will undertake surveillance visit and comment on their products. As such and as discussed on site, please supply regular digital photography of the installation for comment between surveillance visits.
- Please ensure that any changes to the agreed site specific drawings or manufacturer's instructions are discussed and agreed with the design team, manufacturer and approved by the designer who holds design responsibility.
- To date, we understand that the gas proofing installation has not been inspected by the independent validation consultant.

Date of next visit: TBC

RIW Inspection & Test Plan

Project:	Manchester New Victoria	Location:	Todd Street, Manchester, M3 1WY
RIW ITP Reference:	ITP.056.021	ITP Visit Requested By:	Mayo Civils
Project ITP Number:	ITP.056	Name:	Dave Taylor
		Company:	Mayo Civils

Has a Benchmark Sample Panel Been Installed For Comparison?

☐	NO
--------------------------	-----------

Location of Inspection (Include reference to relevant drawings): Residential Block 1 (West side) area shown in GA plan attached at the bottom of report.

Construction Activity (Description): RIW Gas Seal Black – Sheetseal GR detailing around concrete upstands.

Hold / Witness Point (Description):

Inspection Date:	11/08/2021	Undertaken By:	Aiden Quinn (On behalf of RIW Limited)
Inspection Time:	10:30am		

	<u>Principle Attendees</u>	<u>Company</u>	<u>Position</u>
1	Aiden Quinn	RIW	Technical Advisor
2	Dave Taylor	Mayo Civils	Project Manager
3			

Comments / Observations:

Inspection of RIW Gas Seal Black applied underneath Residential Block 1 on the west side. Membrane was well applied and all laps sealed correctly and in accordance with the manufacture recommendations.

Membrane was in good condition with steel in place ready for concrete slab been poured. No damage or penetrations where spotted.

External application of Sheetseal GR all in accordance with manufacture recommendations and mark-ups. Membrane was applied well and all overlaps and corner details very well installed.

Non-Conformities Identified

NO

(If yes, see over)





Gas seal black applied under steel reinforcement prior to slab been poured.



Typical Slab edge detail, Sheetseal GR linked to the Gas Seal Black membrane below slab.



Sheetseal GR applied with block work installed on top of upstand.

Use Sketch box above if required

Non-Conformities and Corrective Measures

Project:	Manchester New Victoria	Location:	Manchester
RIW ITP Reference:	RIW.ITP.056	Project ITP Number:	ITP.056.020

<u>Description of Non-Conformity 1</u>		<u>Non-Conformity 1 - Corrective Measure</u>
1		
2		

Location:

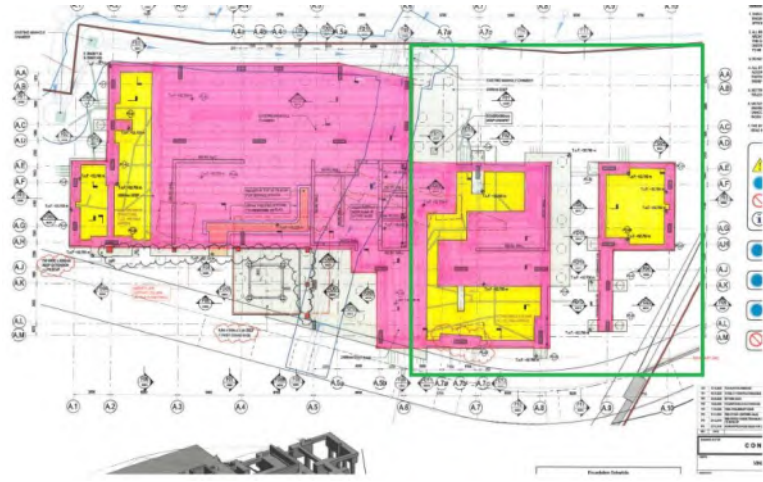
Additional Supportive Comments:

Non conformities to be rectified and record taken

Submitted By: Aiden Quinn **Date:** 11.08.21
(On behalf of RIW Limited)

As part of the agreed Inspection & Test Plan RIW will undertake scheduled and unscheduled visits to inspect product installations at agreed hold, witness or surveillance points. RIW will provide comments and observations, with reference to 'benchmarks' (where applicable), and provide guidance on further corrective action if required. RIW do not provide an installation warranty as the application of the products is beyond our control, and the installer / contractor must therefore warrant the work carried out by them. If required, RIW can provide a list of specialist waterproofing contractors. These companies may be able to provide a company or insurance backed guarantee that covers the installation of the products. It is the responsibility of the contractor to ensure the areas inspected are protected from subsequent damage and notify RIW and / or the installer should any alterations be undertaken to the design or products in the above areas.





RIW Limited, Terrace Road South, Binfield, Berkshire RG42 4PZ
 Technical: technical@riw.co.uk or 01344 397777 Sales: enquiries@riw.co.uk or 01344 397788



RIW Inspection & Test Plan

Project:	Manchester New Victoria	Location:	Todd Street, Manchester, M3 1WY
RIW ITP Reference:	ITP.055	ITP Visit Requested By:	Mayo Civils
Project ITP Number:	ITP055.003	Name:	Dave Taylor
	Company:	Mayo Civils	

Has a Benchmark Sample Panel Been Installed For Comparison?

☐	☒ NO
--------------------------	---

Location of Inspection (Include reference to relevant drawings):

Residential Block 1
Shown at the bottom of the report.

Construction Activity (Description):

Installation of RIW Gas Seal Black onto sand blinding prior to slab been poured.

Hold / Witness Point (Description):

Inspection Date: **30/06/21**

Undertaken By: **Aiden Quinn**

(On behalf of RIW Limited)

Inspection Time: **10:00**

	Principle Attendees	Company	Position
1	Aiden Quinn	RIW	Technical Advisor
2	Dave Taylor	Mayo Civils	Project Manager
3			

Comments / Observations:

RIW Gas seal Black membrane inspected on the residential block 1.

Detailing work around columns and pipe penetrations where applied with care and to a very high standard. There were still areas in which the membrane needed to be applied and some penetrations which hadn't yet been detailed.

The sand blinding which the membrane was applied to was very well compacted and there was no evidence of any sharp stones which could damage the Gas Seal Black.

General overview of the membrane was very good and all overlaps and joints were sealed very well.

Non-Conformities Identified

NO

(If yes, see over)

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Column details applied very well.



Pipe penetration detail sealed with top hat.



General Overview of gas seal black application, all laps correct and sealed well.

Use Sketch box above if required

Non-Conformities and Corrective Measures

Project:	Manchester New Victoria	Location:	Todd Street, Manchester, M3 1WY
-----------------	--------------------------------	------------------	--

RIW ITP Reference:	RIW.ITP.055	Project ITP Number:	ITP.055
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Location:

Non conformities to be rectified and record taken

Date: 05/07/2021

(On behalf of RIW Limited)

[illegible]

RIW Inspection & Test Plan

Project: New Victoria

Location: Manchester

RIW ITP Reference: ITP050.2021

ITP Visit Requested By: Mayo Civils

Project ITP Number: ITP050.004

Name: Dave Taylor

Position: Project Manager

Has a Benchmark Sample Panel Been Installed For Comparison?

☐

NO

Location of Inspection (Include reference to relevant drawings):

Ground bearing raft slab and liner wall in residential block 2

Construction Activity (Description):

Installation of RIW Structureseal GPT applied to the contiguous piled retaining wall and the RIW Gas Seal Black below the ground bearing raft slab

Hold / Witness Point (Description):

N/A

Inspection Date: 16th November 2021

Undertaken By: Martin Radford

(On behalf of RIW Limited)

Inspection Time: 9:30am

	Principle Attendees	Company	Position
1	Martin Radford	RIW Limited	Commercial Sales Leader
2	Andrew Barker	RIW Limited	Technical Advisor
3	Dave Taylor	Mayo Civils	Project Manager

Comments / Observations:

No non-conformities were identified during the visit and the selection of photo's below show an acceptable installation of the RIW Gas Seal Black (below the ground bearing raft slab) and the RIW Structureseal GPT to the contiguous piled retaining wall.

RIW have not received any comments to the contrary from the Independent waterproofing design specialist employed on this project (Phil Hewitt & Associates), so we assume he has confirmed that the installation is aligned and in accordance with their design.

Non-Conformities Identified

☐

NO

(If yes, see over)





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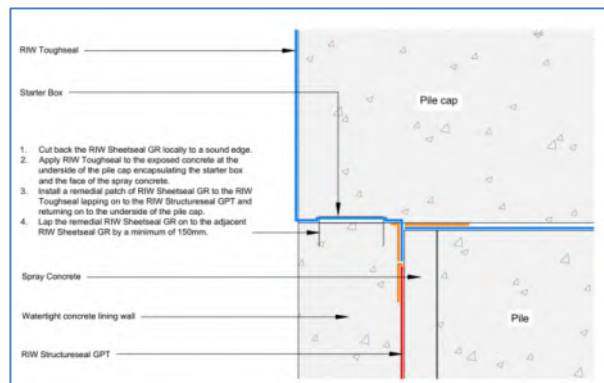


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Small remedial work at gridline B4/B5 to the RIW Sheetseal GR
Undertaken post ITP050.004 visit and fully in accordance with RIW-NVM-007



Non-Conformities and Corrective Measures

Project: New Victoria

Location: Manchester

RIW ITP Reference: ITP050.2021

Project ITP Number: ITP050.004

	<u>Description of Non-Conformity 1</u>	<u>Non-Conformity 1 - Corrective Measure</u>
1		

Location:

Corrected whilst RIW on site?

	<u>Description of Non-Conformity 2</u>	<u>Non-Conformity 2 - Corrective Measure</u>
2		

Location:

Corrected whilst RIW on site?

	<u>Description of Non-Conformity 3</u>	<u>Non-Conformity 3 - Corrective Measure</u>
3		

Location:

Corrected whilst RIW on site?

	<u>Description of Non-Conformity 4</u>	<u>Non-Conformity 4 - Corrective Measure</u>
4		

Location:

Corrected whilst RIW on site?

	<u>Description of Non-Conformity 5</u>	<u>Non-Conformity 5 - Corrective Measure</u>
5		

Location:

Corrected whilst RIW on site?

Additional Supportive Comments:

Continue on additional sheet if required

Submitted By: Martin Radford

Date: 16th November 2021

(On behalf of RIW Limited)

As part of the agreed Inspection & Test Plan RIW will undertake scheduled and unscheduled visits to inspect product installations at agreed hold, witness or surveillance points. RIW will provide comments and observations, with reference to 'benchmarks' (where applicable), and provide guidance on further corrective action if required. RIW do not provide an installation warranty as the application of the products is beyond our control, and the installer / contractor must therefore warrant the work carried out by them. If required, RIW can provide a list of specialist waterproofing contractors. These companies may be able to provide a company or insurance backed guarantee that covers the installation of the products. It is the responsibility of the contractor to ensure the areas inspected are protected from subsequent damage and notify RIW and / or the installer should any alterations be undertaken to the design or products in the above areas.

RIW Limited, Terrace Road South, Binfield, Berkshire RG42 4PZ

Technical: technical@riw.co.uk or 01344 397777 Sales: enquiries@riw.co.uk or 01344 397788



Tuesday 14 September 2021
Ref: 16-04865-000/GEO/LT/01

+44 (0) 1925 291 111
sthelens@byrneblooby.com
www.byrnelooby.com

Theo Coleman <Theo.Coleman@vinciconstruction.co.uk>

VINCI Construction UK Limited

New Victoria Development
Long Millgate
Manchester
M3 1NX

Re: New Victoria, Manchester – 16-04865-000
Gas Protection inspection Site Visit – Pre- Verification Report

Dear Theo,

Byrne Looby Partners (UK) Limited (ByrneLooby) has been instructed to carry out an independent site inspection of the gas protection measures installed on residential building 1 at the New Victoria development in Manchester. The site visit

ByrneLooby (formerly TerraConsult Ltd) previously carried out ground gas risk assessment for the two proposed residential multi-storey apartment blocks. The conclusion of the gas risk assessment indicated that due to the carbon dioxide concentrations Characteristic Situation 2 gas protection measures should be adopted for the development in line with BS8485:2015+A1:2019.

Based on BS8485:2015 + A1:2019 Table 3 the new building can be classed as a Type C buildings (commercial/ Public buildings) and from Table 4 of this standard a Score of 2.5 points of protection will be required for Characteristic Situation 2 ground gas conditions.

- Cast in-situ, monolithic, reinforced ground-bearing raft or reinforced, cast in-situ, suspended floor slab with minimal penetrations cast in (up to 1.5 protection points if well-reinforced to control cracking – Table 5 of BS 8485:2015) or a cast in-situ, ground-bearing floor slab (with only nominal mesh reinforcement at 0.5 protection points);
- Basement floor and walls to BS 8102:2009, Grade 3 waterproofing - See notes in BS8485:2015+A1:2019 at 2.5 protection points
- Gas-resistant membrane meeting the criteria in Table 7 of BS 84585:2015 and meeting the criteria in BS ISO 15105-1. Independent verification of the installation of the membrane according to CIRIA C735 (2 protection points).

Verification is required in accordance with CIRIA C735. Verification is defined within CIRIA C735 as:

The process of demonstrating that risk has been reduced to meet remediation criteria and objectives based on a quantitative assessment of remediation performance.

Following the installation of each component that contributes to the gas protection score, verification is required, in accordance with BS8485 and CIRIA document C735 'Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases' (2014).

BS8485 states that "The installation and verification report should present an accurate description of the measures actually applied and present the evidence gathered to confirm that installed measures are suitable for purpose.

The risk based approach identified within CIRIA C735 guides the verification plan to consider the following:

- Site specific gas regime
- No. of plots
- Complexity of the design and installation
- Qualifications and experience of the workforce (Construction Skills level 2 NVQ diploma)

The site is considered as the following:

- Well characterised as CS2 - Green
- Proposed commercial development is large - red
- The foundations and gas protections measures are relatively complex - red
- Gas protection measures will be installed by combination of general builders (sub-floor void etc) with the membrane installed by a specialist contractor, which have extensive experience at installing gas protection systems - orange

The factors above have shown a range of 'green' to red as identified in Figure 3.1 of CIRIA C735. Therefore, the role of the independent verification of the gas protection measures is important. It is proposed to apply a 'Moderate Level' of validation processes on this project.

Verification/validation of gas membrane installation

- inspection of the products being used (membrane, tape, propriety top hats etc.) to ensure they are as specified
- laps are sufficient in length with edges, seams, service penetrations all sealed.

A site visit was carried out on the 29th June 2021. The chosen gas membrane is the RIW – Gas seal black, which is a four-layer, low density polyethylene membrane reinforcing grid with an integral aluminium foil. The membrane was inspected and no tears or punctures in the membrane were found. There was sufficient overlap of at least 150mm between membrane sheets with RIW 50mm double sided butyl tape and RIW foil tape used to connect the membranes. The joins and seams were inspected by the Byrne Looby personnel and deemed suitable. However, at the time of the inspection, the gas protection measures were incomplete. It is understood further inspection of the gas protection measures have been carried out by others.

Photographic records of the site inspection are recorded in Appendix A. Records of the site visit are recorded in Appendix B on the has verification inspection sheet as per C735.

Yours sincerely
For ByrneLooby,

J Thorburn
BSc FGS
Principal Geologist

APPENDIX A – SITE INSPECTION PHOTO RECORDS

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD

DOCUMENT CONTROL			
Revision	Date	Prepared by	Checked & Review by
00	29/06/2021	J Thorburn	Kourosh Azimi

VISIT DETAILS	
Client Name.	Vinci Construction
Site name	New Victoria, Manchester
Project description	Ground Gas Protection Verification site visit – Residential Building 1
Date of visit	29/06/2021
BL Engineer(s) in attendance	J Thorburn
Also in attendance	-
Weather	Dry, sunny intervals
Site Location	New Victoria, Manchester.

PHOTOGRAPHIC RECORD.



Figure 1: Photo showing the sand blinding layer prior to the membrane installation

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 2: Photo showing the extent of membrane installation at time of visit

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 3: Photo showing sand blinding and service penetrations and overlapping along membrane prior to sealing

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 4: Membrane installation along building edge and columns

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 5: Membrane installation along building edge and columns

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 6: Membrane installation along building edge, service penetrations and columns

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 7: Membrane installation with manhole penetrations prior to completion

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 8: Membrane installation with manhole penetrations

DOCUMENT NO.	16-K4865-002
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 9: Membrane installation with manhole penetrations

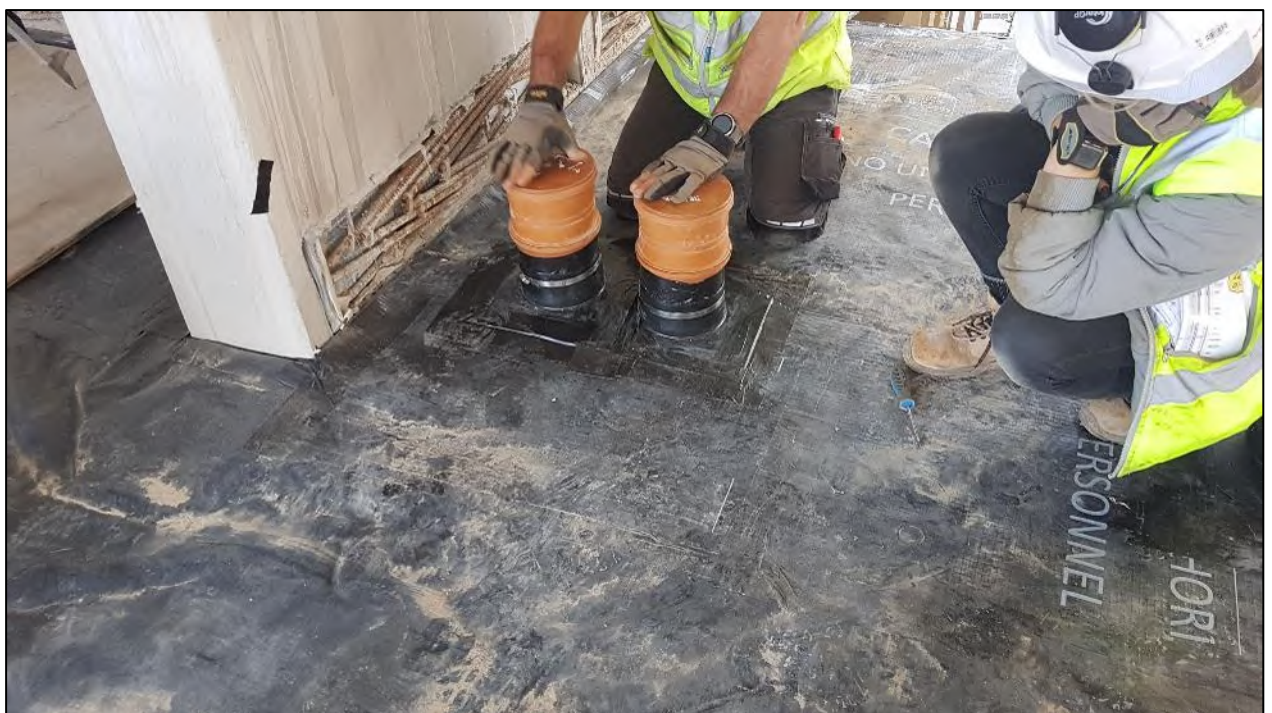


Figure 10: Membrane installation with service penetrations completed

APPENDIX B – GAS PROTECTION VALIDATION RECORD

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: New Vic, Resi Building 1		Gas characteristic situation: CS2
Job number: 16-04865-000		Type of development and building/block checked: Multi-storey resi apartment block
Date: 29/06/2021		Building description:
Visit by: J Thorburn		Foundation type: Basement / reinforced slab
Weather at time of inspection: Dry		Gas protection type: passive
No.	Item	Comments (installation measure were not complete at time of visit)
1 Gas Membrane		
1.1	Condition of sub-grade and underside of gas membrane	Single sized sand used as blinding layer to reduce chance of penetrations through membrane
1.2	Gas membrane type	RIW GAS SEAL BLACK - four-layer, low density polyethylene membrane reinforcing grid with an integral aluminium foil.
1.3	Gas membrane condition	No signs of heavy traffic, tears, rips or stretching
1.4	Joining tape product	RIW gas seal tape - double-sided self-adhesive butyl tape for sealing between overlaps in the membrane
1.5	Lapping design	min 150mm overlapping
1.6	Laps, welds and joints seals	appropriate joining/double sided tape
1.7	Service entries seals	appropriate top hat arrangement observed at various stages of completion during site visit
2 Passive Venting		
2.1	Sub-floor void :	N/A
2.2	External wall airbricks	N/A
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	N/A
3 Active Venting		
3.1.	System details	N/A
Additional notes:		

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt / damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel {type/specification}? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?)- size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed In accordance with design drawings? If open-topped gravel - gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location /condition /number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description
	See appendix A - Site Photo record

The gas protection measures inspected:	a Are acceptable and comply with the specification - however incomplete at time of site visit
	b Are acceptable but attention is drawn to issues related to item no.-
	c Are not acceptable due to the issues related to item no.-xxx

Name: J Thorburn

Signature: *J Thorburn*

Date:29/06/21

APPENDIX C – GAS RESISTANT MATERIALS DATA SHEETS



CE n55Plus

CI/SfB

Tn6

L14143

June 2020

RIW GAS SEAL BLACK

Gas Seal Black is a four-layer, low density polyethylene membrane reinforcing grid with an integral aluminium foil.

BENEFITS

- | Compliant with BS 8485: 2015
- | Manufactured from virgin material, not recycled waste
- | Separate damp proof membrane not required
- | Robust jointing and sealing system
- | Welded joints possible
- | Single wound membrane with zero creases
- | Two colour membrane for on-site quality control
- | Suitable for use where radon, carbon dioxide, methane and hydrocarbon vapours are present
- | Complies with latest codes of practice as published by CIRIA and BRE

APPLICATIONS

- | Combined ground floor damp proof membrane and gas barrier

APPLIED TO

- | Sand blinding
- | Suspended floors
- | Ground bearing slabs

REMEMBER IT'S

waterproof RIW

RIW GAS SEAL BLACK

TYPICAL USES

Gas Seal Black is typically used as a low density, polyethylene gas barrier and damp proof membrane in concrete floors above and below the slab.

The installed product protects the structure against moisture, radon, methane, carbon dioxide and hydrocarbon vapours from the ground.

The product is suitable for use on ground bearing reinforced concrete slabs, suspended beam and block floors or precast concrete slabs.

When used for hydrocarbons, the product must be applied on top of the slab, with the ground below vented.

DURABILITY

Subject to normal conditions of use Gas Seal Black will remain effective against the ingress of water and water vapour, and will restrict the ingress of radon, methane, carbon dioxide and hydrocarbon vapours during the lifetime of the building.

SPECIFICATION

J40 Flexible sheet waterproofing / damp proofing
Clause 140 Loose laid polyethylene gas retardant damp proofing.

Please consult RIW for further information.

INDEPENDENT AUTHORITY

Gas Seal Black has been awarded a BBA Certificate No. 14/5156 covering its use as a low density, polyethylene gas barrier and damp proof membrane in concrete ground floors, above and below the slab not subject to hydrostatic pressure, to protect the building against moisture, radon, methane and carbon dioxide from the ground.

CE Marked to BS EN 13967 & A1. For Declaration of Performance see:

<http://www.riw.co.uk/technical-downloads/ce-marking>

PERFORMANCE & COMPOSITION

Form	loose laid composite sheet
Colour	black/white
Overall thickness	0.6mm
Roll size	2m wide x 50m long*
Weight	350g/m ² = 35kg/roll
Laps	150mm
Tensile strength MD EN 12311-1 CD	600N/50mm 480N/50mm
Elongation EN12311-1	20%
Nail tear resistance MD EN 12311 -1 CD	330N 400N
Radon permeability K124/02/95	8.0 x 10 ⁻¹⁵ m ² s ⁻¹
Methane gas permeability BS ISO 15105-1	<0.09ml·m ² ·day ⁻¹ ·atm ⁻¹
Carbon dioxide permeability BS ISO 15105-1	<0.09ml·m ² ·day ⁻¹ ·atm ⁻¹

The above performance figures are typical values and should not be considered a product specification. *Other roll sizes available.

ANCILLARY PRODUCTS

RIW produce a range of ancillary products for use with Gas Seal Black which include:

Gas Seal Tape – double-sided self-adhesive butyl tape for sealing between overlaps in the membrane.

Lap Tape – single-sided self-adhesive PVC tape for sealing edges of lapped product.

Lap Tape RB – reinforced single-sided self-adhesive bitumen tape for sealing edges of lapped product and repairs to membrane.

Preformed pipe collars – flexible collar for sealing around pipe penetrations.

Preformed Gas cloaks – standard or bespoke cloak units to facilitate membrane application.

Geo-fleece – textile fleece for protection of applied gas membranes.

Sheetseal GR – self-adhesive sheet membrane for gas resistant waterproofing applications.

Gas Seal GR DPC – gas resistant damp proof course/cavity tray for building into masonry.

Geo-vent – cusped HDPE venting geo-composite incorporating geotextile to one side.

Geo-vent T connectors – geo-vent end connector incorporating 25mm slot for geo-vent.

Peri-vent sets – periscopic vent complete with airbrick and geo-vent adaptor.

Venting bollards and ground level vent boxes are also available.

CONSTRUCTION

GENERAL

All construction should conform with the Building Regulations, Codes of Practice and British Standards in current use at the time the building is being constructed.

PREPARATION

The membrane should be laid on a smooth surface, free from voids, hollows and objects which may damage the membrane. If used below a ground bearing slab, the product may be laid on a sand blinding.

APPLICATION

The completed gas proofing system must cover the entire footprint of the building.

Gas Seal Black should be unrolled onto the prepared surface, and be smoothed out as necessary. The product must be installed with the black side uppermost.

Subsequent rolls should then be lapped onto the previous roll by 150mm, and be sealed using Gas Seal Tape placed centrally in the lap. Lap Tape should then be laid over the edge of the upper sheet, by 50mm, and be adhered down onto the lower sheet.

Pipe penetrations should be sealed using Preformed Pipe Collars; sealed to the membrane, and pipe using Gas Seal Tape and Lap Tape; see Pipe Penetration Detail.

Gas Seal GR DPC should be used to provide continuity through the walls, with Gas Seal Black lapped and sealed onto it using Gas Seal Tape and Lap Tape as before.

Damaged areas should be patch repaired as necessary, using similar lapping/sealing details.

Gas Seal Black will achieve 2 Points in accordance with BS 8485: 2015 when installed by qualified specialists and independently validated. Where additional points are required, our Passive Venting System may need to be incorporated.

SPECIFIC USES

Gas Seal Black should be installed with the ancillary products required, in accordance with current guidance for gas protection systems; including BRE211 / 414, CIRIA C665 & BS 8485: 2015.

SAFETY

Full health and safety instructions are contained on the product material safety data sheets, and these must be referred to before use.

SUPPLY

AVAILABILITY

All products can be obtained through Builders Merchants or approved stockists. A list of approved stockists is available from RIW's offices.

PACKAGING

Gas Seal Black 2m wide x 50m long rolls

STORAGE

The rolls must be stacked on a flat surface, kept under cover and protected from sunlight and mechanical damage.

TECHNICAL SERVICES

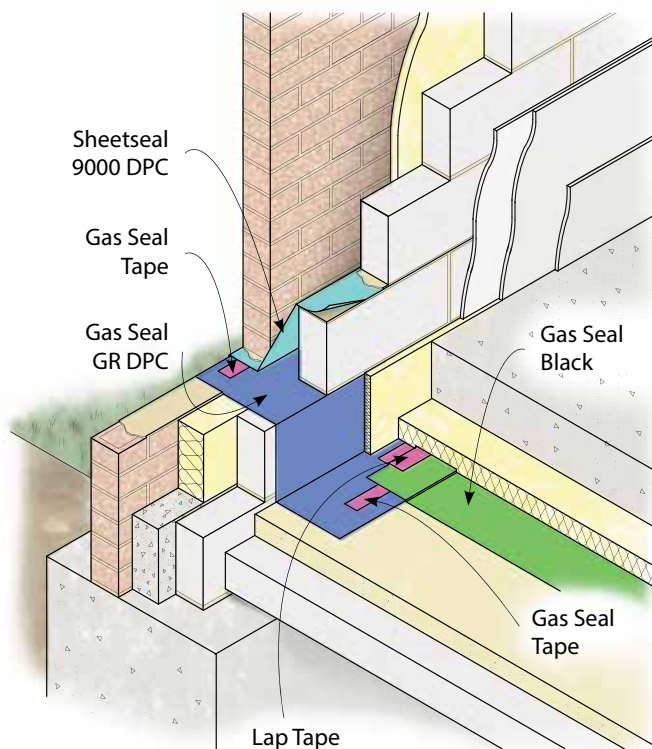
The Technical Department is available to advise on individual projects and to prepare or assist in the preparation of specifications and drawings. We can also offer design guidance to satisfy the requirements of BS 8485:2015 and CIRIA C735.

A list of experienced applicators of our materials is available from RIW's offices, along with a list of independent consultants providing validation and integrity testing services.

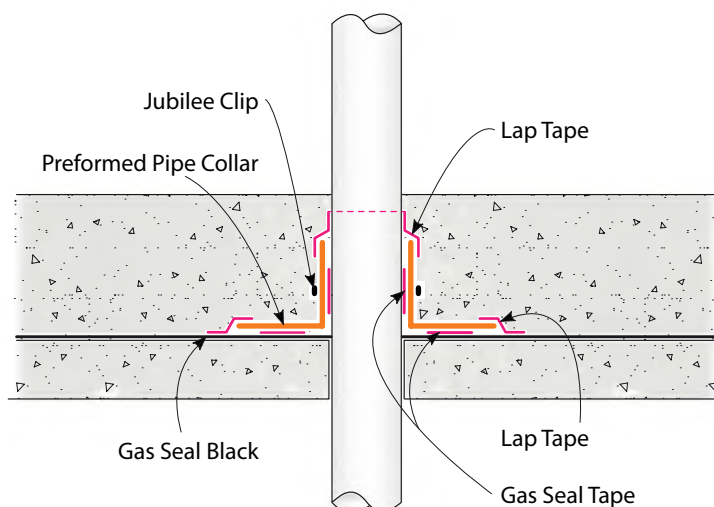
COMPATIBILITY TABLE

	BRE 211 Radon	CIRIA 665 Characteristic Situation 2	BS 8485: 2015 Characteristic Situation 2	CIRIA 665 Characteristic Situation 3-6	BS 8485: 2015 Characteristic Situation 3-6	NHBC Amber 1	NHBC Amber 2 & Red
Radon	YES	n/a	n/a	n/a	n/a	n/a	n/a
Carbon Dioxide	n/a	YES	YES	YES	YES	YES	YES
Methane	n/a	YES	YES	YES	YES	YES	YES
Hydrocarbon Vapours	n/a	YES*	YES*	YES*	YES*	YES*	YES*

* Suitable in some applications. Contact RIW Technical.
available from RIW's offices.



Typical Ground Bearing Slab



Pipe Penetration Detail

The information in this literature was correct at the time of going to press. However, we are committed to continually improving our products and reserve the right to change product specifications.

For the latest information, please consult RIW. Conditions of use are beyond our control, therefore we cannot warrant the results to be obtained.

RIW Limited

580-581 Ipswich Road, Slough, SL1 4EQ

Technical enquires tel: **01753 944200**

Commercial enquires tel: **01753 944210**

www.riw.co.uk

REMEMBER IT'S
waterproof **RIW**

Wednesday 1 December 2021

Ref: 16-04865-003/ENV/LT/01

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Theo Coleman <Theo.Coleman@vinciconstruction.co.uk>

VINCI Construction UK Limited

New Victoria Development

Long Millgate

Manchester

M3 1NX

Re: New Victoria, Manchester – 16-04865-000**Gas Protection inspection Site Visit – Pre- Verification Report - Residential Building 2**

Dear Theo,

Byrne Looby Partners (UK) Limited (ByrneLooby) has been instructed to carry out an independent site inspection of the gas protection measures installed on residential building 2 at the New Victoria development in Manchester.

ByrneLooby (formerly TerraConsult Ltd) previously carried out ground gas risk assessment for the two proposed residential multi-storey apartment blocks. The conclusion of the gas risk assessment indicated that due to the carbon dioxide concentrations Characteristic Situation 2 gas protection measures should be adopted for the development in line with BS8485:2015+A1:2019.

Based on BS8485:2015 + A1:2019 Table 3 the new building can be classed as a Type C buildings (commercial/ Public buildings) and from Table 4 of this standard a Score of 2.5 points of protection will be required for Characteristic Situation 2 ground gas conditions.

- Cast in-situ, monolithic, reinforced ground-bearing raft or reinforced, cast in-situ, suspended floor slab with minimal penetrations cast in (up to 1.5 protection points if well-reinforced to control cracking – Table 5 of BS 8485:2015) or a cast in-situ, ground-bearing floor slab (with only nominal mesh reinforcement at 0.5 protection points);
- Basement floor and walls to BS 8102:2009, Grade 3 waterproofing - See notes in BS8485:2015+A1:2019 at 2.5 protection points
- Gas-resistant membrane meeting the criteria in Table 7 of BS 84585:2015 and meeting the criteria in BS ISO 15105-1. Independent verification of the installation of the membrane according to CIRIA C735 (2 protection points).

Verification is required in accordance with CIRIA C735. Verification is defined within CIRIA C735 as:

The process of demonstrating that risk has been reduced to meet remediation criteria and objectives based on a quantitative assessment of remediation performance.

Following the installation of each component that contributes to the gas protection score, verification is required, in accordance with BS8485 and CIRIA document C735 'Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases' (2014).

BS8485 states that "The installation and verification report should present an accurate description of the measures actually applied and present the evidence gathered to confirm that installed measures are suitable for purpose.

The risk based approach identified within CIRIA C735 guides the verification plan to consider the following:

- Site specific gas regime
- No. of plots
- Complexity of the design and installation
- Qualifications and experience of the workforce (Construction Skills level 2 NVQ diploma)

The site is considered as the following:

- Well characterised as CS2 - Green
- Proposed commercial development is large - red
- The foundations and gas protections measures are relatively complex - red
- Gas protection measures will be installed by combination of general builders (sub-floor void etc) with the membrane installed by a specialist contractor, which have extensive experience at installing gas protection systems - orange

The factors above have shown a range of 'green' to red as identified in Figure 3.1 of CIRIA C735. Therefore, the role of the independent verification of the gas protection measures is important. It is proposed to apply a 'Moderate Level' of validation processes on this project.

Verification/validation of gas membrane installation

- inspection of the products being used (membrane, tape, propriety top hats etc.) to ensure they are as specified
- laps are sufficient in length with edges, seams, service penetrations all sealed.

The chosen gas membrane is the RIW – Gas seal black, which is a four-layer, low density polyethylene membrane reinforcing grid with an integral aluminium foil.

Two site visits were carried out on the 8th November and 16th November 2021. During the two visits the gas protections measures were at different stages in different parts of the building.

On the first visit, the northern part of the building had already had the membrane installed and the concrete slab had been cast. The eastern boundary has been constructed using a contiguous pile wall. The protection measures along the eastern boundary were continuing. The protection measures were not started within the southern part of the building.

By the second visit, the membrane within the southern part of the building had been completed. Inspection of the membrane installation was carried out before the concrete was poured for the slab. No tears or punctures in the membrane were found. There was sufficient overlap of at least 150mm between membrane sheets with RIW 50mm double sided butyl tape and RIW foil tape used to connect the membranes. The joins and seams were inspected by the Byrne Looby personnel and deemed suitable.

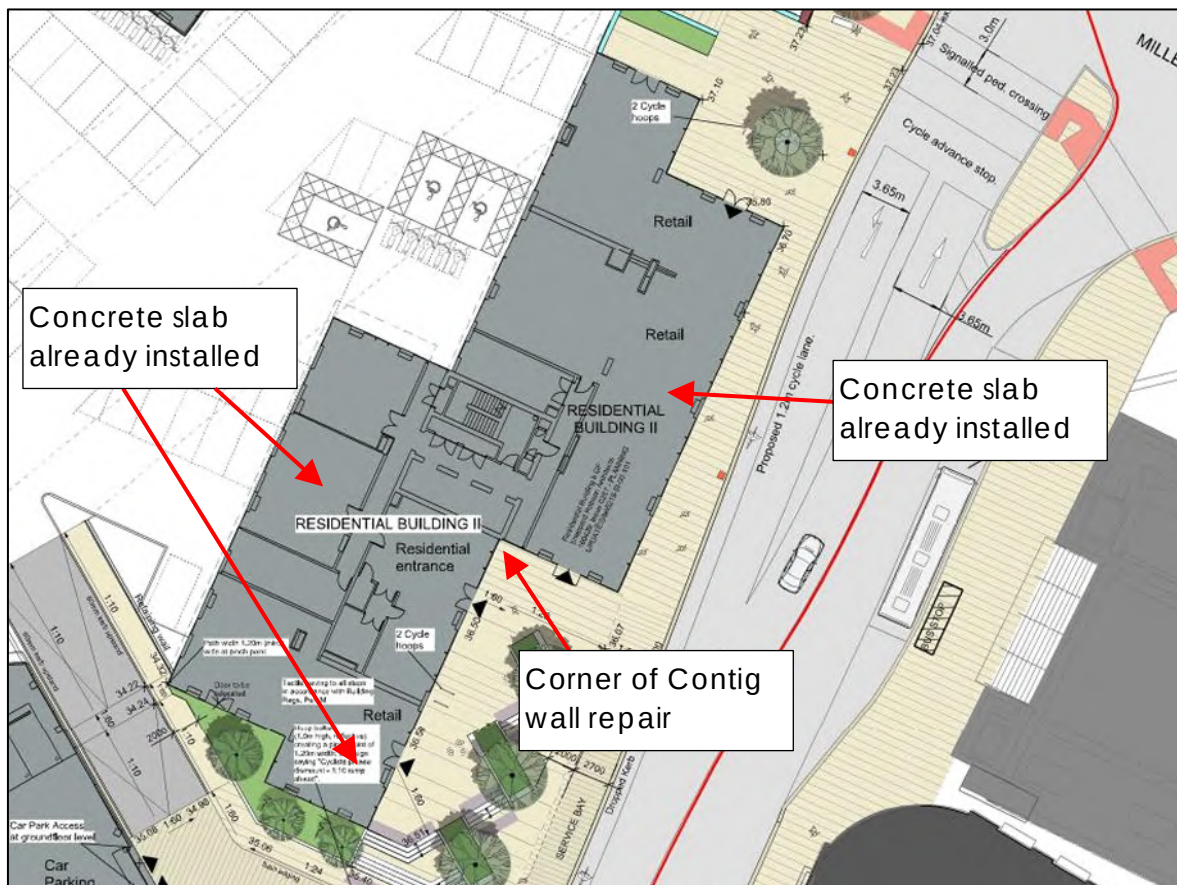


Figure 1: Extract of Development Plan (Planit – IE LLP – PL1487.106)



Figure 2: Photos showing defect and repair on corner of contiguous pile wall.

During both visits it was highlighted to BL by the client that there was a defect on one of the corners of the contiguous pile wall. It is understood that the RIW liquid membrane and foil tape has been used to patch the damage. Details of the repair were designed by RIW and drawings will be provided with the completion report.

At the time of the inspection, the gas protection measures were incomplete. It is understood further inspection of the gas protection measures will be carried out by others.

Photographic records of the site inspection are recorded in Appendix A. Records of the site visit are recorded in Appendix B on the has verification inspection sheet as per C735.

Yours sincerely
For ByrneLooby,

J Thorburn
BSc FGS
Principal Geologist

APPENDIX A – SITE INSPECTION PHOTO RECORDS

DOCUMENT NO.	16-K4865-003
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD

DOCUMENT CONTROL

Revision	Date	Prepared by	Checked & Review by
00	30/11/2021	J Thorburn	Kourosh Azimi

VISIT DETAILS

Client Name.	Vinci Construction
Site name	New Victoria, Manchester
Project description	Ground Gas Protection Verification site visit – Residential Building 2
Date of visit	08/11/2021 & 16/11/2021
BL Engineer(s) in attendance	J Thorburn
Also in attendance	-
Weather	Dry, overcast
Site Location	New Victoria, Manchester.

PHOTOGRAPHIC RECORD – 08/11/2021



DOCUMENT NO.	16-K4865-003
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 1: Photo showing SE area prior to installation



Figure 2: Photo showing southern area prior to installation

DOCUMENT NO.	16-K4865-003
PROJECT	New Victoria, Manchester
JOB NUMBER	16-K4865

SITE VISIT RECORD



Figure 3: Photo showing area prior to installation



Figure 4: Service ducts prior to installation