



INVESTIGATE



REMEDiate



REGENERate



VERIFICATION REPORT

**FOR
PLOTS 2-4 LAUND ROAD,
SALENDINE NOOK,
HUDDERSFIELD,**

**PREPARED FOR
CREATIVE DEVELOPMENTS
(HUDDERSFIELD) LIMITED**

**REPORT NO. NE3941C
AUGUST 2021**

SUB SURFACE NORTH EAST LIMITED

RCM Business Centre

Dewsbury Road

Ossett

West Yorkshire

WF5 9ND

Tel: (01924) 278181 Fax: (01924) 283455

Email: dsimpson@subsurface.co.uk

Website: www.subsurface.co.uk



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**GAS PROTECTION MEASURES VERIFICATION REPORT FOR PLOTS 2-4
LAUND ROAD, SALENDINE NOOK, HUDDERSFIELD**

CLIENT: CREATIVE DEVELOPMENTS (HUDDERSFIELD) LIMITED

ARCHITECT: NORTHERN DESIGN PARTNERSHIP

1. INTRODUCTION

This Verification Report has been prepared in accordance with emailed instructions dated 23rd June 2020 from the Client. The brief was set out in our estimate, ref. E6654B and dated 22nd June 2020.

It should be noted that the following reports have previously been issued for this site which should be read in conjunction with this report:

- Phase I Desk Study Reference: A0697/17, November 2017 undertaken by Earth Environmental & Geotechnical Ltd (EEG)
- Phase II Ground Investigation Reference: A0697/17, October 2019 undertaken by Earth, Environmental & Geotechnical Ltd (EEG)
- Addendum Phase II Investigation Reference: A0697/20, January 2020 undertaken by Earth Environmental & Geotechnical Ltd (EEG)

1.1 Site Location and Description

The site is located off Laund Road to the northwest of Huddersfield town centre. The site is roughly L-shaped with maximum approximate dimensions of 70m by 30m. The National Grid Reference for the centre of the site is 410379E, 418266N.

The site is accessed off Laund Road and is bound by open land with some houses to the north and east, by residential properties and gardens to the north west and along the southern side, and by Laund Road to the south west.

The site rises up from Laund Road to the main flat part of the site in its rear northern half, with the land beyond rising up further. Some retaining features are present along parts of the southern boundary and part is a sloping garden area, bordered by mature and semi mature trees and bushes.

1.2 Proposed Development & Purpose of the Verification Report

The site is currently being developed as residential housing as depicted on Figure 2.

This ground gas risk assessment focuses on Plot 2 (single detached house) and Plots 3 & 4 (semi-detached pair of houses).

The purpose of this Verification Report is to confirm that the ground gas remediation scheme has been implemented in accordance with best practice guidance and is sufficient to provide CS2 level protection as recommended by EEG Report ref. A0697/20.

NE3941C Laund Road, Huddersfield

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

2. VERIFICATION

2.1 Specification and Methodology

There is a low risk (CS2) of carbon dioxide or methane ingress to the proposed building and consequently remedial measures were required to protect the end users of the site.

In order to provide CS2 level protection the Client has adopted a passive ventilated sub-floor clear void (a score of 1.5 in BS8485:2015) in combination with a proprietary gas barrier membrane (a score of 2.0 in BS8485:2015), giving a total score of 3.5 in BS8485:2015.

In order to prevent the ingress of ground gases the protective membrane was required to meet the following criteria:

- sufficiently impervious to gases with a methane gas transmission rate of <40.0 ml/day/m²/atm (average) for sheets and joints (tested in accordance with BS.ISO.15105-1 manometric method).
- sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions.
- sufficiently strong to withstand in-service stresses due to say settlement if placed below a floor slab.
- sufficiently strong to withstand the installation process and following trades (penetration from steel fibres in fibre reinforced concrete/ penetration from reinforcement ties/ tearing due to working above it or dropped tools) until covered.
- after installation being capable of providing a complete barrier to the entry of the relevant gas.
- verified in accordance with CIRIA C735 [N1]

The chosen Visqueen Gas Barrier product meets the above criteria and a technical data sheet for the Visqueen membrane is appended.

2.2 Verification Inspections

The site was visited on five occasions by a qualified Geoenvironmental Engineer from Sub Surface Consultants Limited to inspect the membrane installation and to confirm that the gas barrier membrane was installed in accordance with both the manufacturer's instructions and the guidelines given in BRE BR414.

A summary of the site visits is given in the following table:

TABLE 1 VERIFICATION SITE VISITS

Date	Area Inspected	Comments
22/10/2020 & 27/10/2020	Plot 2	Inspection of sub floor void and installation of membrane along external walls of Plot 2.
31/03/2021	Plot 2	Inspection of completed Plot 2 membrane.
25/03/2021	Plots 3 & 4	Inspection of sub floor void and installation of membrane along external walls of both Plots 3 & 4.
13/07/2021	Plots 3 & 4	Inspection of completed Plot 3 & 4 membrane.

Copies of photographs taken during the site inspections are appended.

2.3 Summary of Findings

We can confirm that in our opinion the membrane was installed to the required standard by competent operatives and that in our opinion CS2 level protection has been achieved.

In particular the following items were observed:

- The main joints in the membrane were overlapped by a minimum 200mm, the lapped faces were taped with Visqueen double sided dealing tape, and the top edge of the overlap was taped over with duct tape.
- No punctures or damage were observed and all penetrations were sealed using combinations of Visqueen Gas Barrier membrane, Visqueen double sided tape, and over-sealed with duct tape.
- The gas membrane spanned the cavity and was continuous across the internal features.
- The sub floor ventilation was unobstructed and vented freely to atmosphere via vent bricks in the external wall and vent pipes in sleeper walls.

We can confirm the Visqueen Gas Barrier membrane is the correct product to provide the required level of protection and a copy of the technical data sheet for the membrane is appended.

2.4 Contingency Planning

No unforeseen conditions were encountered and no contingency plans were required to be implemented during the membrane installation.

3. GENERAL

This Verification Report should be submitted to Kirklees Council Planning Department.

We trust that this report fulfils your present requirements but if you have any queries or we can be of further assistance please contact the undersigned or David Simpson at our Ossett office.

SUB SURFACE CONSULTANTS LIMITED
REPORT No. NE3941C
AUGUST 2021

REDACTED

D. Ravenscroft-Jones Cert Nat Sci (Open), BSc (Hons.), MSc, CEnv, MIEEnvSc, AMRSC
Senior Geoenvironmental Engineer
For and on behalf of
Sub Surface Consultants Limited

REDACTED

C. A. Marsden ~~B.Sc.~~ (Hons.), C.Eng., M.I.C.E.
Director
For and on behalf of
Sub Surface Consultants Limited.

GAS PROTECTION VALIDATION RECORD

 SUB SURFACE LIMITED SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907		REMEDATION VERIFICATION	
Site LAUND ROAD, SALENDINE NOOK, HUDDERSFIELD Client CREATIVE DEVELOPMENTS (HUDDERSFIELD) LIMITED Engineer NORTHERN DESIGN PARTNERSHIP			Job Number NE3941C Sheet 1/2
GAS PROTECTION VALIDATION RECORD			
Plot Number(s) 2		Building Description: 2 Storey Detached Residential House Foundation Type: Suspended Floor	Inspected By: DS Date: 31/03/2021 Photographed Y / N: Y
Protection Type: Passive membrane and sub floor ventilation			
Ventilated Sub Floor			
Component	Inspected Y/N	Notes/recommendations	
Void Former Type	X	N/A	
Void Height	✓	0.30m to 0.40m where checked. Ground surface comprised 6F2 made up of crushed sandstone gravel and occasional brick.	
Gravel	X	N/A	
Vent Pipe	X	N/A	
Airbricks	✓	Spacing varied between 1.5m and 2.4m centres.	
Sleeper Walls	✓	Vented at pipe conduits.	
Vent Trench	X	N/A	
Gas Barrier			
Component	Inspected Y/N	Notes/Recommendations	
Membrane	✓	Visqueen Gas Membrane Product Code FNPYF559. Inspected in secure store prior to installation.	
Extent	✓	Full footprint of the plot.	
Underside	✓	Resting directly on beam and block suspended floor.	
Slab/membrane condition	✓	In good condition with no visible damage or repairs.	
Laps and Joints	✓	All joints were lapped with double sided tape between sheets with minimum 200mm overlap, and taped on top with duct tape.	
DPC	✓	200mm to 300mm projection, all in good condition.	
Service entries and seals	✓	All sealed and over-taped as per membrane joints.	
Cavity	✓	Membrane taken across cavity in all areas.	
Remarks		This Plot has Passed / Failed PASSED	Engineer D. Simpson BSc (Hons), FGS
		Signed REDACTED	

 SUB SURFACE LIMITED SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907		REMEDATION VERIFICATION																												
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GAS PROTECTION VALIDATION RECORD																														
Plot Number(s) 3 & 4		Building Description: 2 Storey Semi-Detached Residential House Foundation Type: Suspended Floor	Inspected By: DS Photographed Y / N: Y Date: 13/07/2021																											
Protection Type: Passive membrane and sub floor ventilation																														
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GAS MEMBRANE SPECIFICATION

Visqueen Gas Barrier

Features and benefits

- BBA certified - third party accreditation
- Complies with BS 8485:2015 + A1:2019 - industry standard for methane and carbon dioxide protection
- Flexible - easy to detail and install on site
- Multi functional - also acts as a radon and damp proof membrane
- Dual jointing methods - lap joints can be taped or heat welded

Product description

Visqueen Gas Barrier is a multi-layer reinforced polyethylene gas barrier with a 20 micron aluminium foil. The barrier is coloured blue on the upper surface and silver on the reverse. The product is supplied in single wound rolls (not folded), 2m x 50m.

Approvals and standards

- Third party accreditation (BBA 13/5069)
- Conforms to the specification requirements of BS 8485:2015 + A1:2019
- Suitable for all Characteristic Gas Situation (CS) ground gas regimes
- Conforms to the specification requirements of NHBC Amber 1 and Amber 2 applications
- Conforms to the specification requirements of BR 211:2015
- CE Mark EN 13967:2017
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

Usage

Visqueen Gas Barrier is suitable for use in all types of buildings to prevent the ingress of harmful levels of ground gases e.g. methane, carbon dioxide and radon.

The barrier can be positioned above or below a solid concrete ground floor slab or above a precast suspended segmental ground floor system, e.g. beam and block floor.

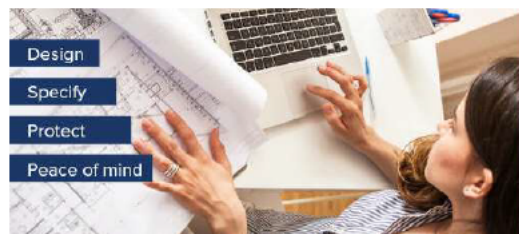
The barrier can also be used as a high performance radon membrane and/or damp proof membrane.

The product is not intended for use where there is a risk of hydrostatic pressure.

System components

- VisqueenPro Double Sided Jointing Tape, 50mm x 10m
- Visqueen Gas Resistant Foil Lap Tape, 75mm x 50m
- Visqueen GR Lap Tape, 150mm x 10m
- Visqueen Ultimate Top Hat Units
- Visqueen Preformed Units
- VisqueenPro Detailing Strip, 300mm x 10m, 500mm x 10m
- Visqueen TreadGUARD 300, 2m x 75m
- Visqueen TreadGUARD 1500, 1m x 2m

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Visqueen Gas Barrier

Storage and handling

Visqueen Gas Barrier should be stored horizontally, under cover in its original packaging.

Care should be taken when handling the product in line with current manual handling regulations.

Preparation

Visqueen Gas Barrier should be installed on a smooth continuous surface e.g. grouted beam and block floor, a compacted blinding layer e.g. 50mm thick sand blinding, or smooth concrete blinding. The substrate should be free from irregularities such as voids or protrusions.

The barrier can be cut with a sharp retractable safety knife or robust scissors.

When installing the membrane in demanding site conditions, use Visqueen GR Lap Tape in place of Visqueen Gas Resistant Foil Lap Tape.

Installation

Visqueen Gas Barrier should be loose laid on the substrate with the blue side up so as to avoid sunlight glare.

The barrier should be clean and dry at the time of jointing. It should be overlapped by at least 150mm, bonded with Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Gas Resistant Foil Lap Tape.

Alternatively lap joints can be heat welded to achieve an effective seal. Welded lap joints can be less than 150mm provided the joint integrity is not compromised.

Airtight seals should be formed around all service entry points. Visqueen Preformed Top Hat Units should be used for sealing service entry pipes. The base of the top hat and the upstand should be bonded using Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Gas Resistant Foil Lap Tape. The upstand should be secured with the supplied jubilee clip.

Forming an effective barrier to gases may give rise to complex three-dimensional detailing where, it is recommended Visqueen Preformed Units are used e.g. corners. Alternatively Visqueen Pro Detailing Strip can be used to seal awkward junctions.

If the barrier is punctured or perforated a patch of the same material should be lapped at least 150mm beyond the limits of the puncture and bonded with Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Gas Resistant Foil Lap Tape. Alternatively a patch can be formed using Visqueen Pro Detailing Strip and lapped at least 150mm beyond the extents of the puncture.

The barrier should be covered by a protective layer as soon as possible after installation to prevent damage e.g. from following trades. Care should be taken to ensure that the membrane is not punctured, stretched or displaced when applying a screed or final floor covering. A minimum thickness of 50mm screed is recommended. When reinforced concrete is to be laid over the barrier the wire reinforcements and spacers must be prevented from puncturing the barrier. Where there is a high risk of potential damage, the barrier should be covered with Visqueen TreadGuard protection, screed, or other approved protection material before positioning the reinforcement.

Usable temperature range

It is recommended that Visqueen Gas Barrier and all associated system components should not be installed below 5°C.

Additional information

When used in accordance BS8485:2015 + A1:2019 a subfloor ventilation system or pressure relief maybe required
Where hydrocarbon or VOC contamination is present use Visqueen Ultimate VOC or HC Blok gas protection systems
To assist build sequencing, Visqueen GR DPC is available for gas protection through the wall constructions
For suspended beam and block floor detailing see GB-01
Visqueen Preformed Top Hat Units should be used at service pipe penetrations see GB-51
For internal and external corners Visqueen Ultimate Preformed Units should be used see PFU-553
To seal around steel columns use Visqueen Pro Detailing Strip see GB-52
For additional detailing information, contact Visqueen Technical Services +44 (0) 333 202 6800

The information in this datasheet was correct at the time of publication. It is the user's responsibility to obtain the latest version of the datasheet as it is updated on a regular basis. The information contained in the latest datasheet supersedes all previously published editions.

Visqueen Gas Barrier

Property	Test method	Units	Compliance criteria	Result
Dimensions	EN 1848-2	m		2 x 50
Overall thickness including scrim mesh	EN 1849-2	mm	+/-10%	0.52
Mass	EN 1849-2	g/m ²	-0%/+5%	400
Tensile strength - MD	EN 12311	N	MLV	350
Tensile strength - CD	EN 12311	N	MLV	350
Tensile elongation - MD	EN 12311	%	MLV	20
Tensile elongation - CD	EN 12311	%	MLV	21
Joint strength	EN 12317-2	N	MLV	332
Watertightness 2kPa	EN 1928	-	Pass/Fail	Pass
Resistance to impact	EN 12691	mm	MDV	150
Dart impact	BS 2782	g	MDV	731
Low temperature flexibility	EN 495-5	°C	MDV	-40
Durability against ageing	EN 1296 and EN 1928	-	Pass/Fail	Pass
Durability chemical resistance	EN 1847	-	Pass/Fail	Pass
Resistance to tearing (nail shank) CD	EN 12310-1	N	MDV	358
Resistance to tearing (nail shank) MD	EN 12310-1	N	MDV	368
Resistance to static loading	EN 12730	kg	MLV	20
Water vapour transmission - resistance	EN 1931	MNs/g	MDV	7000
Water vapour transmission - permeability	EN 1931	g/m ² /d	MDV	0.03
Visible defects	EN 1850 -2	-	Pass/Fail	Pass
Reaction to fire	EN 13501-1	Class	MDV	F
BS 8485:2015 + A1:2019 testing requirements				
Mass	EN 1849-2	g/m ²	Average >370	400
Methane permeability	ISO 15105-1	mls/m ² /d/atm	Pass/Fail	<0.15
Puncture CBR	BS EN ISO 12236	N	MDV	1114
Tensiles yield strength MD	ASTM D4885-01	kN/m	MDV	12.5
Tensiles yield strength CD	ASTM D4885-02	kN/m	MDV	7.3
Resistance to static loading	EN 12730	kg	>MLV	20
Yield elongation CD	ASTM D4885-04	%	MDV	19
Tear resistance - trouser method A - MD	BS ISO 34-1	kN/m	MDV	48.2
Tear resistance - trouser method A - CD	BS ISO 34-1	kN/m	MDV	44.8
Tear resistance - angle method B - MD	BS ISO 34-1	N	MDV	53.5
Tear resistance - angle method B - CD	BS ISO 34-1	N	MDV	60.6

Health and safety information

Refer to the Visqueen Gas Barrier material safety datasheet (MSDS).

Visqueen Gas Barrier

About Visqueen

The Visqueen name has long been recognised as one of the leading manufacturers of high quality advanced membrane technologies and design based solutions by specifiers, distributors, builders merchants and contractors throughout the UK and Europe.

For further guidance on the Visqueen services shown below, please refer to the relevant section of the Visqueen website (www.visqueen.com) or contact Visqueen Technical Services on +44 (0) 333 202 6800 or enquiries@visqueen.com

Complete Range, Complete Solution



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Waterproofing



Gas
Protection



Damp Proof
Membrane



Tapes



Damp Proof
Course



Stormwater



Vapour
Control

Visqueen Technical Support

Visqueen combine an extensive product portfolio with industry leading levels of service and support which includes guidance over the phone, bespoke CAD drawings to help with complex detailing, electronic NBS specifications and access to a dedicated team of highly knowledgeable and experienced field based Technical Support Managers.

Visqueen Technical Support is available to all our customers including architects, specifiers, distributors, builders merchants, contractors and end users. All of our technical team have been awarded the industry recognised qualification Certificated Surveyor in Structural Waterproofing (CSSW).

Visqueen CPD Seminars

The Visqueen Continuing Professional Development (CPD) Seminars provide up-to-date information on changes within Building Regulations/Building Standards and nationally recognised industry guidance affecting damp proofing, water vapour control, hazardous ground gas protection and below ground structural waterproofing.

The one hour seminars have been produced for design specialists within the construction sector and are delivered by our team of Technical Support Managers.

Visqueen PI designs and special projects

From initial design to the completed project, Visqueen are with you every step of the way. Whether it be hazardous ground gas protection and/or below ground waterproofing protection employing barrier, structurally integral or drained systems, Visqueen can offer professional indemnity (PI) insurance for bespoke Visqueen design solutions.

Visqueen Technical Support Managers work with all stakeholders to provide cost effective Visqueen solutions offering complete peace of mind throughout the construction phase and beyond.

Visqueen Training Academy

Based at our manufacturing facility in Derbyshire, the Visqueen Training Academy is available to support Visqueen customers throughout the UK by providing a wide range of both theory and practical skills related training.

Courses include one day product awareness training for our distributors and builders merchants to help them in their day-to-day jobs, through to intensive three day courses giving detailed hands-on training in the practical skills required for safe and robust product installation.

PHOTOGRAPHS

S S SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907	Photographs
Site: PLOTS 2-4 LAUND ROAD, SALENDINE NOOK, HUDDERSFIELD Client: CREATIVE DEVELOPMENTS (HUDDERSFIELD) LIMITED Engineer: NORTHERN DESIGN PARTNERSHIP	Job Number: NE3941C Sheet: 1/5

TRIAL PIT PHOTOGRAPHS



Gas Barrier Membrane: Visqueen Gas Barrier



Visqueen DPM jointing tape



SUB SURFACE

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Client: CREATIVE DEVELOPMENTS (HUDDERSFIELD) LIMITED

Engineer: NORTHERN DESIGN PARTNERSHIP

Job Number:

NE3941C

Sheet:

2/5

PLOT 2 PRESSURE RELIEF AND MEMBRANE INSTALLATION: 22-27/10/2020



Detail of sub floor void at service entry



DPC detail



Details of gas membrane during installation;
crossing the cavity at the external walls and
continuous beneath internal walls.

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Client: CREATIVE DEVELOPMENTS (HUDDERSFIELD) LIMITED		Sheet: 3/5	
Engineer: NORTHERN DESIGN PARTNERSHIP			

PLOT 2 COMPLETED MEMBRANE:31/03/2021

Details of gas membrane installed in Plot 2 on completion.





SUB SURFACE

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Job Number:

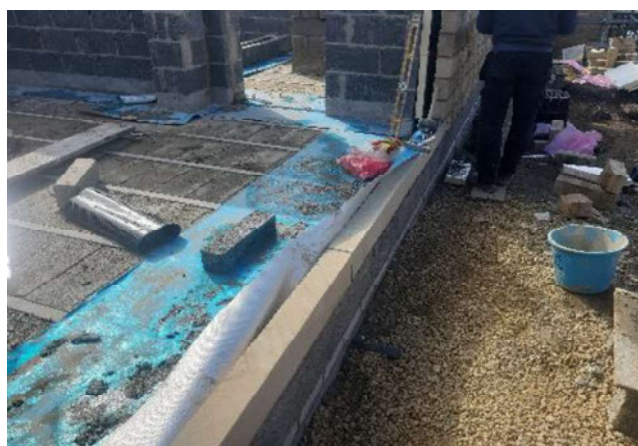
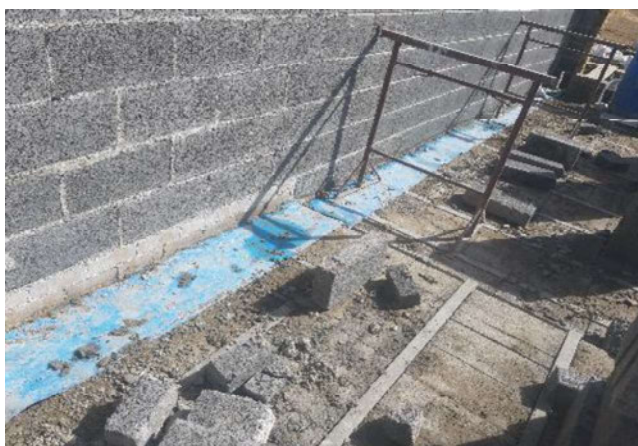
NE3941C

Sheet:

4/5

PLOTS 3 & 4 MEMBRANE INSTALLATION: 25/03/2021

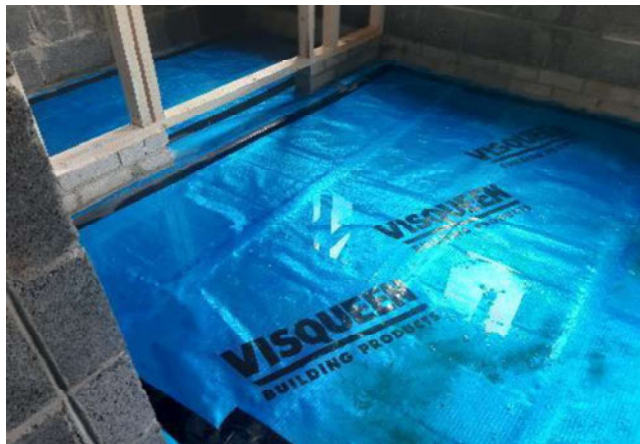
**Details of gas membrane in during installation to Plot 3 & 4;
crossing the cavity at the external walls and continuous beneath internal walls.**



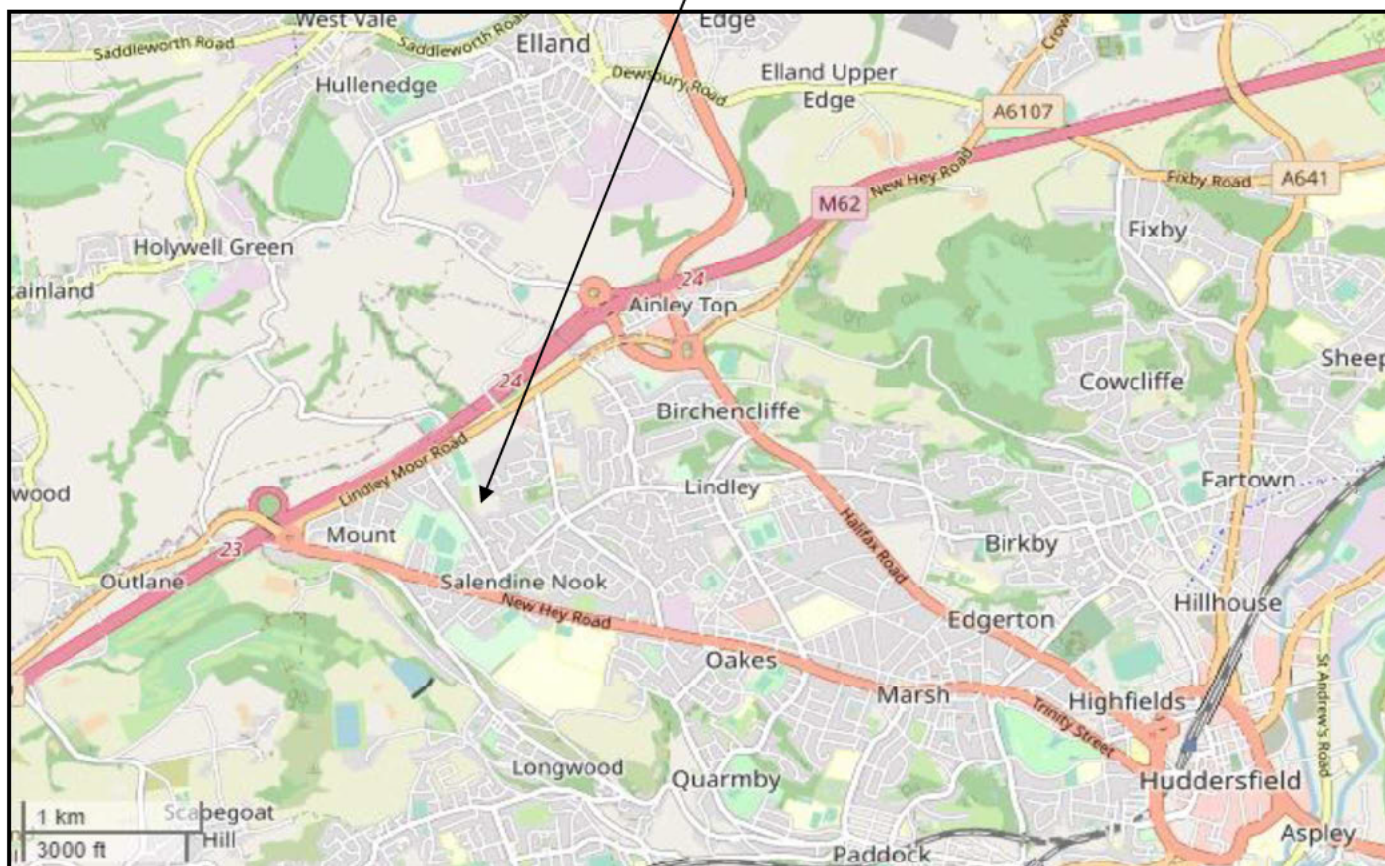
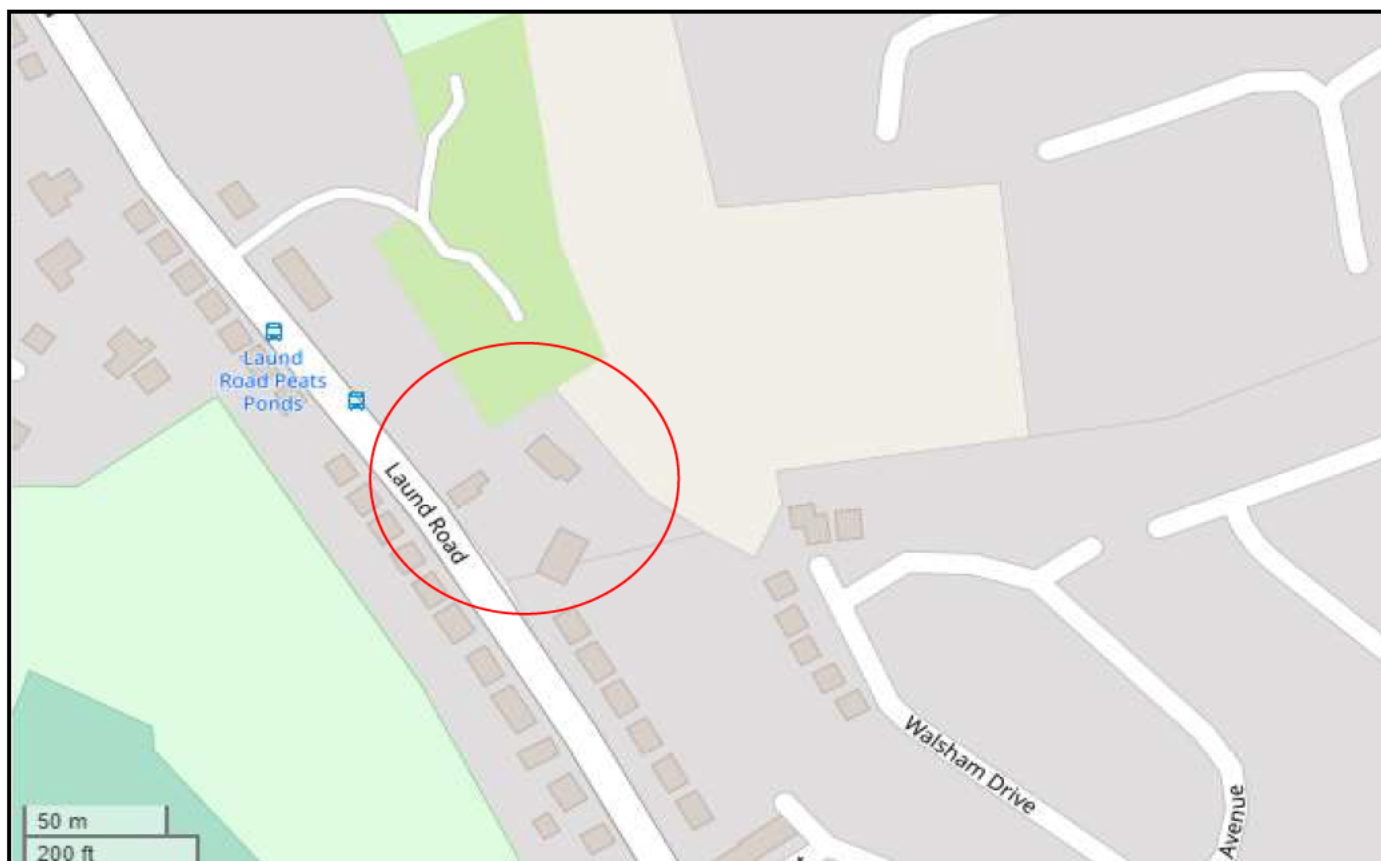
S S SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907	Photographs
Site: PLOTS 2-4 LAUND ROAD, SALENDINE NOOK, HUDDERSFIELD Client: CREATIVE DEVELOPMENTS (HUDDERSFIELD) LIMITED Engineer: NORTHERN DESIGN PARTNERSHIP	Job Number: NE3941C Sheet: 5/5

PLOTS 3 & 4 COMPLETED MEMBRANE: 13/07/2021

Details of gas membrane in Plots 3 & 4 on completion.



FIGURES



SUB SURFACE

SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site Location

Site
**PLOTS 2 TO 4, LAUND ROAD, SALENDINE NOOK,
HUDDERSFIELD**

Client
CREATIVE DEVELOPMENTS (HUDDERSFIELD) LIMITED

Date Drawn
06/08/2021

Date Checked



Job No.
NE3941C

Drawn By
DJ

Checked By

Scale
As Shown

Figure No.
1

