



**CONSTRUCTION PHASE
REMEDIATION METHOD STATEMENT**

**35 Peterborough Road
Crowland**

Ref.1009/JH/RMSv2

December 2020

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TABLE OF CONTENTS

1.0	INTRODUCTION	2
1.1	Background	2
1.2	Purpose of Report	2
1.3	Reference Documents.....	2
1.4	Limitations.....	3
2.0	SUMMARY OF CONTAMINATION HISTORY	4
2.1	Conceptual Model.....	4
2.2	Remediation works – Enabling Phase	4
3.0	CONSTRUCTION PHASE REMEDIATION METHOD STATEMENT	6
3.1	Construction outline	7
3.2	Task C1: Appointment of an appropriate Construction Phase contractor	7
3.3	Task C2: Placement of Clean Service Corridors.....	8
3.4	Task C3: Installation of Cover System in Landscaping Areas	8
3.5	Task C4: Installation of Vapour Membrane	11
3.6	Task C5: Verification and Reporting.....	12
3.7	Discovery Strategy for unexpected contamination	13

APPENDIX A: Figures

- Figure 1: Site plan
- Figure 2: Enabling Phase remediation areas
- Figure 3: Construction drawing (Plot 3)
- Figure 4: Cover layer boundary sections
- Figure 5: Locations for vapour membrane installation

APPENDIX B: Technical data for specified barrier pipe and vapour membrane

1.0 INTRODUCTION

1.1 Background

Sherwood Environmental Ltd were appointed by Blackjack Estates Ltd to develop a Construction Phase Remediation Method Statement (RMS) for the 35 Peterborough Road site, Crowland, South Holland, PE6 0BB in preparation for redevelopment.

The site covers approximately 0.2 ha, is approximately level and was formerly occupied by a small chemical works. It is located in a residential area bounded by Peterborough Road to the east with residential properties on the other sides. A footpath runs to the south of the site. Contamination associated with the former site operations was remediated in 2018 through excavation and off-site disposal. The site is currently clear and covered with a mix of open ground and hard standing.

The site secured planning approval in April 2020 (Ref: H02-0901-18). The proposed redevelopment will comprise five detached houses with an associated access road. The plan of the proposed development is included as Figure 1.

1.2 Purpose of Report

Enabling Phase Remediation works to remove contaminated soils were completed in January 2019 and a Verification Report was issued by FLI-QDS Ltd in May 2019. The Verification report was submitted to South Holland District Council and the Environment Agency. It was agreed that the works had achieved targets and the relevant planning condition (PC3) could be discharged.

This RMS provides additional information on the remediation works required during the construction phase and enables discharge of the pre-start Planning Condition 4 of H02-0901-18.

The scope of the RMS comprises:

- a summary of the conceptual model and previous works;
- specification for construction phase remediation works.

1.3 Reference Documents

In preparing the RMS the following documents (and all documents referenced within) were consulted and should be read in conjunction with this report:

- QDS Remediation, July 2017. Site Investigation at Peterborough Road, Crowland
- Hydrock Consultants, October 2017. Desk Study, Quantitative Risk Assessment and Remedial Strategy at Peterborough Road, Crowland
- FLI-QDS, November 2018. Remediation Implementation Plan at Peterborough Road, Crowland

- FLI-QDS, May 2019. Verification Report at Peterborough Road, Crowland

1.4 Limitations

The report has been prepared by Sherwood on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, all potential environmental constraints or liabilities associated with the site may not have been revealed. The work has been carried out in general accordance with recognised best practice as detailed in industry and regulator guidance documents.

The report has been prepared for the exclusive benefit of Blackjack Properties and those parties designated by them for the purpose of providing information on the remediation and validation works to be undertaken during the construction phase of the development. The report contents should only be used in that context. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report.

Sherwood has used reasonable skill, care and diligence in the design of the remediation of the site. The inherent variation of ground conditions allows only definition of the actual conditions at the locations and depths of trial pits and boreholes at the time of the investigation. At intermediate locations, conditions can only be inferred.

Information provided by third parties has been used in good faith and is taken at face value. However, Sherwood cannot guarantee the accuracy or completeness of any information provided by others.

2.0 SUMMARY OF CONTAMINATION HISTORY

The information and conceptual model are taken from previous documents. Site investigations are known as far back as 2010 and a previous partial programme of remediation was implemented in 2011.

2.1 Conceptual Model

The site was occupied as a corn mill in the nineteenth century. By 1975 a chemical works was established on site. It was derelict by 1999 and had been demolished by 2002.

The site geology comprises made ground over superficial deposits including the Abbey Sands, peat and alluvium, with Oxford Clay at depth. Groundwater was located at 1.5 – 2.5 metres below ground level (bgl) with a likely direction of movement towards the west or south-west. The Abbey Sands are classified as a Secondary A aquifer while the Oxford Clay is classified as Unproductive Strata.

Contamination was identified in the soils and groundwater underlying the site, most likely associated with leaks and spills from the former site use. A range of Volatile Organic Compounds (VOCs) was identified, of which the most significant were BTEX and chlorinated hydrocarbons.

Two hotspots were identified, the most significant was Hotspot A covering the western end of the site, a smaller and shallower Hotspot B was identified in the centre of the site. Asbestos sheeting and fibres were also identified in isolated locations.

Boreholes to the west of the site identified elevated concentrations of chlorinated hydrocarbons indicating that groundwater contamination may have migrated up to 25m off-site.

2.2 Remediation works – Enabling Phase

A quantitative risk assessment process found that the contaminant levels presented a risk to human health, specifically to potential future site occupiers and that remediation was required to reduce the risk to acceptable levels. Remedial targets protective of human health were defined using RTM modelling.

Potential remediation designs were assessed via an options appraisal. It was concluded that on-site treatment was not viable due to the size of the site and available timescales so excavation of the contamination was selected as the optimal approach.

Evidence of contaminant degradation was observed at the site and field monitoring showed that subsurface conditions are favourable for reductive dechlorination. In-situ bio-remediation was used to provide longer term improvements in groundwater quality outside of excavation area, though it was not considered an adequate solution for the highly impacted source zone soils.

A Remedial Method Statement was prepared to define the scope and the enabling works were completed by January 2019. Contaminated soils were excavated to a maximum depth of four metres to a base of firm clay and a total of 580 m³ of soils were removed off-site. Asbestos sheeting and fragments were handpicked during the works and a small volume of asbestos impacted soils sent to a specialist treatment centre. The locations of the excavations are shown in Figure 2.

A 250 mm layer of crushed limestone was placed at the base of the excavation to provide geotechnical stability and allow the emplacement of the reductive dechlorination bioremediation substrate within a permeable medium below the water table. The excavation was backfilled with imported virgin clay in 300mm layers and compacted. The excavation was capped with 300mm of crushed limestone.

Verification sampling was undertaken to confirm the contamination had been successfully removed. The base and sides of the excavation were sampled and analysed; concentrations were confirmed to be below targets. Surface soils were tested site wide and contaminant concentrations found to be at least an order of magnitude below the targets.

A separate remediation programme was agreed for the off-site contamination plume. This will be undertaken by Caldic UK, the original site owners.

3.0 CONSTRUCTION PHASE REMEDIATION METHOD STATEMENT

The Enabling Phase works have provided a site remediated to the existing ground level. The remaining remediation works relate to the Construction Phase and include:

- Task C1: Appointment of an appropriate construction phase contractor
- Task C2: Placement of below ground services
- Task C3: Installation of cover system for landscaping areas
- Task C4: Installation of vapour resistant gas proof membrane for proposed buildings
- Task C5: Validation and verification reporting for Construction Phase

Necessary changes to the agreed implementation plan, arising during the course of the works, are to be agreed in writing with the local authority prior to being undertaken on site.

No contaminants have been reported in concentrations over the acceptable levels for future residential use. However, low levels of VOCs may remain within some soils. Maximum reported concentrations remaining in site soils are shown in Table 3.1 below. Data is taken from the FLI-QDS Verification Report.

Chemical of concern	Maximum concentration recorded	
Vinyl Chloride	mg/kg	0.0395
Dichloromethane	mg/kg	0.531
trans-1,2-Dichloroethene	mg/kg	1.32
cis-1,2-Dichloroethene	mg/kg	32.9
1,1,1-Trichloroethane	mg/kg	9.59
1,2-Dichloroethane	mg/kg	0.153
Trichloroethene	mg/kg	53.1
Toluene	mg/kg	0.145
1,1,2-Trichloroethane	mg/kg	0.153
Tetrachloroethene	mg/kg	702
Ethylbenzene	mg/kg	0.974
p/m-Xylene	mg/kg	3.41
o-Xylene	mg/kg	1.88

Table 3.1: Maximum contaminant concentrations remaining on site

The maximum concentrations were from samples collected from the saturated zone at 1.5 – 4.0 m below current site levels. Though the site has been thoroughly investigated, there always remains a possibility of previously undiscovered contamination or unknown subsurface infrastructure (tanks, drains etc) and a discovery strategy is included as Section 3.7.

3.1 Construction outline

The development comprises five detached houses with two detached garages and two open carports. The houses and garages will be standard brick and block construction. Foundations will comprise a 450mm ring beam on 220mm driven steel piles with beam and block floors. A VOC membrane will be laid over the block and beam floor to protect from potential VOC intrusion. The design also includes a vented void beneath the beam and block floor. A construction drawing of Plot 3 with additional detail is included as Figure 3.

Levels will be raised by 1 m across the whole site through the import of clean fill as required for flood protection. The land raise also forms a key part of the remediation design, enabling the placement of a continuous cover layer above the existing ground levels and for all foundation works (excepting piles) and services to be placed within clean imported fill.

The outline programme for groundworks and land raise will be as follows:

- 1) Grade whole site to 1m below final site level
- 2) Place 150mm hardcore layer (850 -1000 mm below final level) across whole site including building, patio and greenspace areas
- 3) Place the geotextile marker layer across the whole site
- 4) Install piles for houses and garages
- 5) Shutter and pour ring beam foundations over hardcore layer
- 6) Place subsoil / hardcore to raise levels as appropriate for driveways, subfloor voids, patios and greenspace. All services to be laid at surface during level raise.

This approach ensures the cover layer extends across the whole site, not just the landscaped areas.

3.2 Task C1: Appointment of an appropriate Construction Phase contractor

The Principal Contractor must manage the risks in accordance with the requirements outlined in this document and will need to prepare appropriate health and safety documentation prior to commencement. Method Statements should include reference to the potential for contamination and all groundworks contractors should be aware of the potential for encountering contaminated soils or asbestos.

Competent advice should be sought in the event of any unexpected contamination being identified to ensure an appropriate solution is put in place in line with the discovery strategy.

The appointed contractor is:

County Builders Ltd

3.3 Task C2: Placement of Clean Service Corridors

All new services will be placed within the top metre of clean imported fill at a depth of between 600 - 850mm. The one exception is a 2m by 1.2m wide section on the southern boundary which will be excavated an additional 600mm depth to enable the sewer connection. This will be replaced with clean fill to provide a clean service corridor. Soil arisings will be assessed in line with Table 3.2 and if unsuitable for re-use, disposed off-site as waste in line with duty of care requirements.

Though the services will be placed in clean fill, as a precaution, barrier water supply pipework should be compliant with *BS 8588: polyethylene pressure pipe with an aluminium barrier layer and associated fittings for potable water supply in contaminated land*.

The specified pipework is GPS Protecta-Line PE Pipe Systems or an equivalent of equal or higher specification. The specification is included in Appendix B.

The installation will be validated through:

- The barrier pipe will be laid on surface during the land raise and therefore placement and non-disturbance of hardcore layer will be evidenced by area photographs of installation
- Additional photographs of to demonstrate depth (by measuring staff) at the base of the cover layer at a minimum rate of one photograph per plot.
- Inspection by the environmental engineer (Sherwood Environmental) on at least one occasion
- Delivery notes referencing the supplied pipework

Anglian Water will be consulted on the water supply and drainage design and any additional validation requirements followed.

The verification steps undertaken will be recorded and included in the final verification report.

3.4 Task C3: Installation of Cover System in Landscaping Areas

In line with the Remedial Strategy and the Planning Conditions, all areas of soft landscaping should include a cover system of minimum 1 metre thickness to ensure future residents are protected from encountering potentially contaminated soils.

The cover system will consist of:

- a minimum of 850mm of clean, imported subsoil and topsoil over
- a geotextile marker layer; over
- 150mm of clean, compacted, crushed rock or concrete ("hard to dig" layer).

The design includes a raise of 1m in site levels via the import of clean fill which will be placed to meet the requirements of the cover layer. The site raise and therefore the cover layer will extend across the entire site including beneath houses, garages, roadways and green areas.

Consideration has been given to maintaining the cover layer where landscaping extends to the site boundaries. It is proposed to use the methods detailed below and as shown in Figure 4.

- Retaining walls at boundary: cover layer will be placed at full thickness up to retaining wall
- Graded boundary (landscaping areas): A wedge of existing ground will be excavated and replaced to maintain the 1 m cover layer thickness to the boundary

There will be a requirement to import hardcore, subsoils and topsoil for the cover layer. It is essential that the imported material is suitable for use. Imported soils for use in the cover layer will comply with the standards in Table 3.2 (replicated from criteria in Hydrock Remediation Strategy, 2017)

Chemical of concern	Target value mg/kg	Chemical of concern	Target value mg/kg
Arsenic	37	Acenaphthene	220
Beryllium	73	Acenaphthylene	180
Boron	300	Anthracene	2400
Cadmium	14	Benz(a)anthracene	4.2
Chromium(III)	890	Benzo(a)pyrene	1.5
Chromium(VI)	6.1	Benzo(b)fluoranthene	7.6
Copper	2500	Benzo(ghi)perylene	64
Lead	200	Benzo(k)fluoranthene	12
Mercury, inorganic	170	Chrysene	7.7
Nickel	130	Dibenz(a,h)anthracene	1.1
Selenium	360	Fluoranthene	290
Vanadium	410	Fluorene	170
Zinc	3900	Indeno(1,2,3,cd)pyrene	4.3
Cyanide(free)	790	Naphthalene	2.2
Phenol(total)	290	Phenanthrene	97
Total TPH	500	Pyrene	620
Asbestos	Nil	Total PAH	50

Table 3.2: Import criteria for cover system soils

Verification requires samples should be collected and analysed for the contaminants in Table 3.2

If the thresholds are exceeded the material shall be considered to be unsuitable for use in the cover layer without further assessment.

Testing will be in line with YALPAG Guidance as shown in Table 3.1 below. Sampling should be undertaken by an appropriately qualified environmental engineer.

Type	Number of Samples	Testing Schedule	Assessment Criteria
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)	Table 3.2
Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m ³	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Greenfield/ Manufactured Soils	Minimum 3 or 1 per 250m ³ (whichever is greater)	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Brownfield/ Screened Soils	Minimum 6 or 1 per 100m ³ (whichever is greater)	Standard metals/ metalloids (As above) PAH (16 USEPA speciation) TPH (CWG banded) Asbestos Any additional analysis dependent on the history of the donor site.	

Table 3.3: Testing criteria for cover system soils

Imported material should be placed in a segregated stockpile on site prior to use to ensure no cross contamination with existing soils. It should be characterised in advance of placement to confirm it is suitable for use.

Imported topsoil should be compliant with BS3882:2007. Re-used aggregates for the hard to dig layer should be certificated as WRAP compliant or an equivalent standard.

The contractor will evidence placement of the cover layer by photographically documenting the installation process including depth confirmation. Following installation, a minimum of five inspection pits will be excavated (one from each plot) and the exposed cover layer profile photographed, the photographs to include measuring staff and information board.

Additional guidance is available in the YALPAG document: Requirements for verification of cover systems: Technical guidance for developers, landowners and consultants.

Any changes to the Remediation Method Statement to be agreed in writing with SHDC.

3.5 Task C4: Installation of Vapour Membrane

The Remediation Strategy identified the risk rating due to VOCs and ground gas as Amber 2. All properties and garages require the installation of a vapour resistant gas proof membrane in accordance with CIRIA and NHBC guidance relating to gas and VOC protection. A drawing showing the locations of gas protection membrane is included as Figure 5. A construction section is included as Figure 3.

The membrane should be installed in compliance with *CIRIA C748: Guidance on the use of plastic membranes as VOC vapour barriers* and *BS 8485: 2019 Mandatory requirements for gas membrane testing and verification*.

The verification is considered as important as the installation and must be undertaken independently by a competent inspector under BS 8485:2019.

The specified membrane is Proctor Protech VOC flex or an alternative of equal or higher specification.

The qualified installer is:

Gas Membrane Installation Ltd (GMI Ltd)
Suite 15b Peartree Business Centre
Cobham Road
Ferndown Industrial Estate
Wimborne
BH21 7PT

GMI Ltd are an approved installer for Proctor membranes and installers will hold a minimum qualification of NVQ Level 2 Gas Protection Installation. GMI Ltd will provide a detailed method statement for review in advance of installation.

The independent verification programme will be undertaken and certified in accordance with BS 8485:2019. The independent verifier is:

Geoshield Ltd
Icon Business Park
4100 Park Approach
Leeds
LS15 8GB

The membrane will be installed in two phases with each phase being separately verified.

- Phase 1 is perimeter installation over the 450 mm ring beam foundation and first three courses of brick, with welded joints and including corner detailing using gas resistant self-adhesive membrane to fully seal the joints.

- Phase 2 is installation of the centre panels over the beam and block floor once the building shells are complete. The panels will be fully welded to the Phase 1 perimeter membrane. All pipe and service penetrations will be sealed using gas resistant self-adhesive membrane.

The two stage approach is considered more robust as it avoids the potential for damage to the membrane during construction. The block and beam design will also include passive venting (airbricks) of the 150 mm subfloor void to remove the potential of a build-up of gasses or vapours.

Verification and integrity testing will be undertaken in accordance with BS8545: 2019 and YALPAG guidance for Situation B: Low rise housing with ventilated void. The methodology follows NHBC and Wilson et al, 2007 with inspection of all five plots in line with guidance. The verification consultant (Geoshield Ltd) will provide a method statement for review, including detail of their qualifications and relevant experience.

Verifier to conduct thorough verification (visual) inspection of the 5 plots and after placement of reinforcement if no protection provided. All joints, pipe penetrations etc air lanced to ASTM D4437. Consideration given to need for/ scope of integrity testing (eg initially on 10 to 25 per cent of plots then falling to 0.5 per cent of plots if acceptable results obtained and no concerns raised by visual inspections).

The membrane verification report and associated data will be included in the overall remediation verification report. Any changes to the installation or verification methodology will be agreed in writing with SHDC.

3.6 Task C5: Verification and Reporting

A Verification Report confirming the works specified in this method statement will be issued following the completion of the Construction Phase remediation tasks. It will include:

- Verification report and certification for the vapour membrane in line with YALPAG guidance, BS 8485:2019 and verification requirements in Section 3.5.
- Details of any unexpected contamination identified during construction and the management actions taken
- Records of materials management of soil movements on site and final locations of soils
- Verification of the suitability of imported soils including sampling and analysis records
- Confirmation of the placement of cover system in areas of landscaping in line with YALPAG verification guidance and the verification requirements in Section 3.4
- Details of the disposal route for any contaminated soils removed from site

On completion of the verification works the verification documentation, detailing the works that have been completed in accordance with the Remediation Method Statement, will be submitted to SHDC.

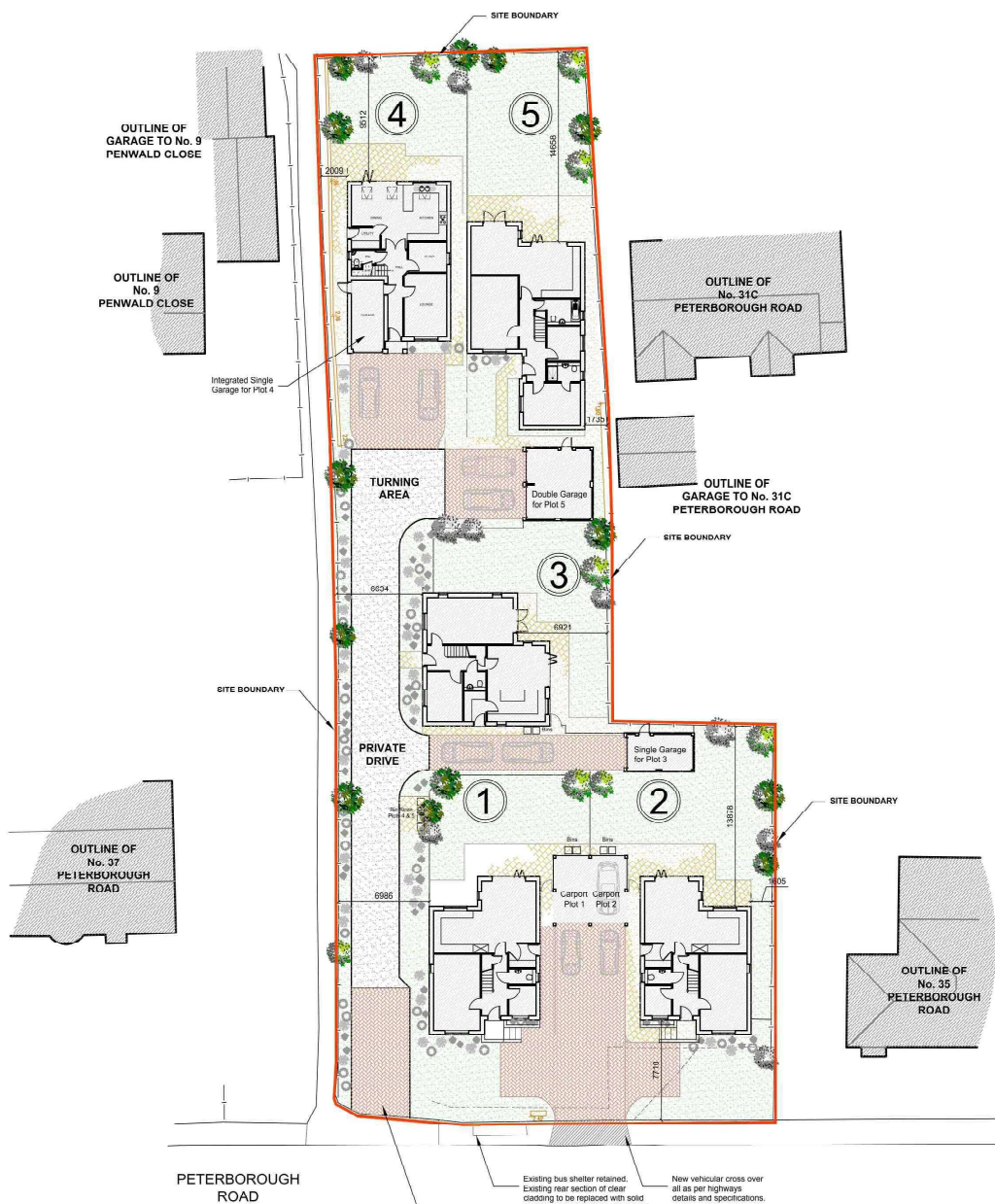
3.7 Discovery Strategy for unexpected contamination

Previous remediation works have addressed contamination where it had been identified. However, intrusive site investigations can never be certain of identifying all the contamination on a site and it is possible that additional contamination could be encountered during future work. If unexpected or suspected contamination is found the following procedures should be adhered to:

- Site works at the position of the suspected contamination should stop.
- Visual and olfactory observations made of the condition of the ground and the extent of contamination.
- An appropriate investigation undertaken from a suitably qualified geo-environmental engineer.
- Where further remediation is necessary, a remediation plan will be developed for approval by South Holland District Council.
- Following implementation of additional remediation works, a verification plan should be submitted to South Holland District Council.

APPENDIX A: FIGURES

Figure 1: Development Plan



NATIONAL SPACE STANDARDS

All new dwellings to comply with minimum space standards set out in Policy 30 (b) of the JCS.
Detailed layouts to include built in storage to meet the standards and technical standards for single and double occupancy bedrooms.

PROPOSED FFL LEVELS

Dwelling 1 -	3.350
Dwelling 2 -	3.350
Dwelling 3 -	3.350
Dwelling 4 -	3.300
Dwelling 5 -	3.300

Refer to Topographical Survey for existing site levels.

INTERNAL FLOOR AREAS

Dwelling 1 -	145 sqm	4 Bed
Dwelling 2 -	145 sqm	4 Bed
Dwelling 3 -	141 sqm	4 Bed
Dwelling 4 -	146 sqm	4 Bed
Dwelling 5 -	130 sqm	3 Bed

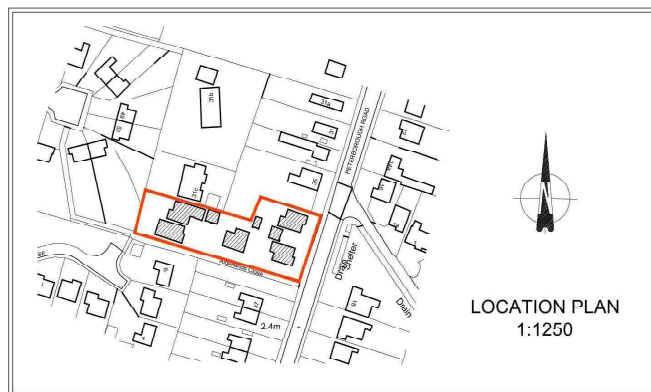
All areas exclude garages

SCHEDULE OF FINISHES

Walls
Facing brickwork to match existing neighboring dwellings / environment.
Windows & Doors
New double glazed windows and doors all to match existing neighboring dwellings / environment.
Roof
New roofing all similar to existing neighboring dwellings / environment. Roof pitch all similar to existing neighboring dwellings / environment.
Boundary Treatments
Existing perimeter boundary treatments replaced with new 1800mm close boarded fence. New 1800mm high close boarded fence between dwellings as shown.

SITE PLAN 1:200

BARBERS DROVE
NORTH



LOCATION PLAN 1:1250

Revision B - Amended following EA / Highways officers comments. 12/11/2018.
Revision A - Parking arrangements altered following highways comments. 19/10/2018.

SITE PLAN

Archi-tec

Architectural Design

0772 565 8850

www.Archi-tec.co.uk

Simon@Archi-tec.co.uk

8 Brabham Close, Silverstone, Northants, NN12 8UL

Telephone

Website

Email

Address

PROPOSED 5 No. NEW DWELLINGS ON LAND ADJACENT 35 PETERBOROUGH ROAD, CHOWLAND, PETERBOROUGH, PE6 0BB.

Client

Date June 2018

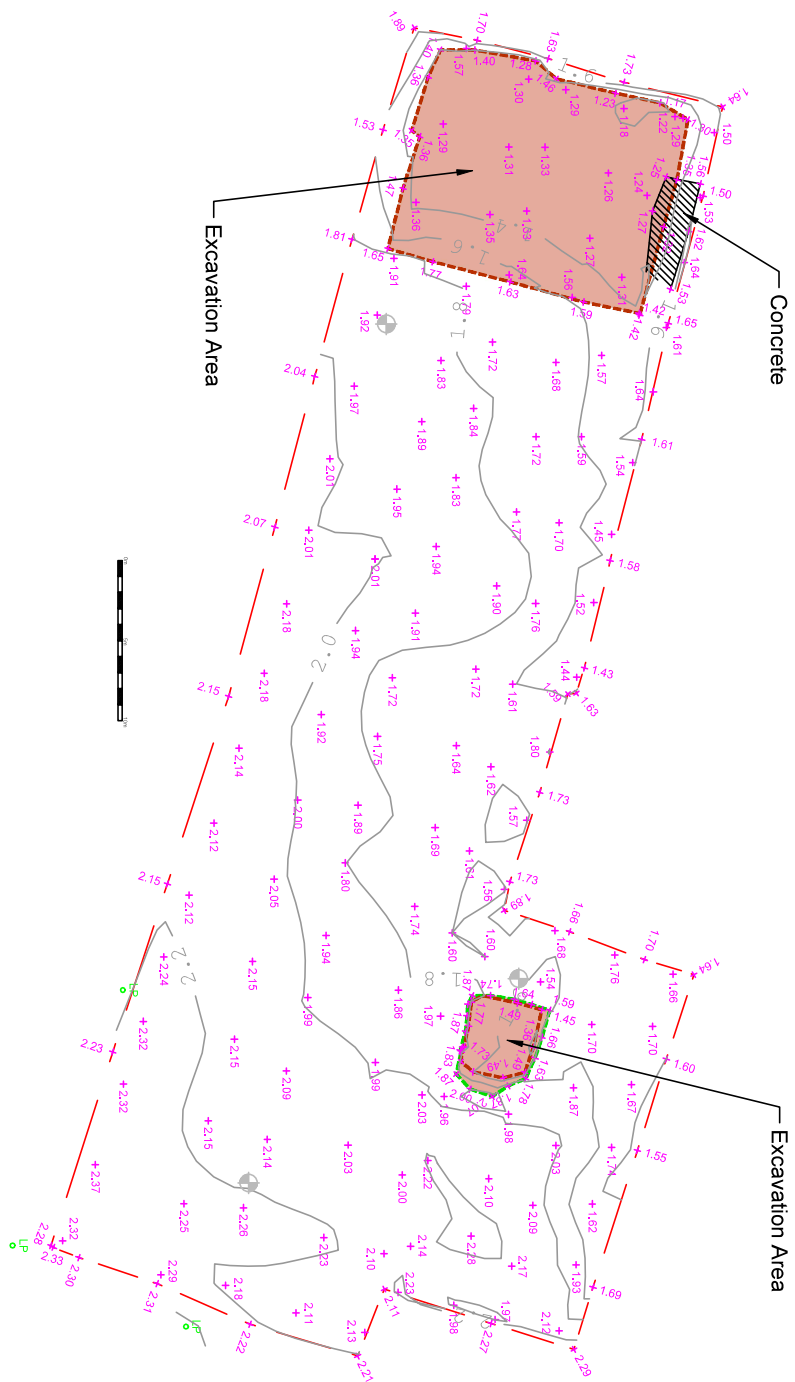
Scale As Noted @ A1

Drawing No C36 - 2008

ALL DIMENSIONS TO BE CHECKED ON SITE. ANY DISCREPANCIES TO BE DISCUSSED AND AGREED PRIOR TO PROCEEDING. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT BUILDING REGULATIONS AND RELEVANT CODES OF PRACTICE. THIS DRAWING IS THE PROPERTY OF ARCHI-TEC ARCHITECTURAL DESIGN AND MUST NOT BE COPIED OR REPRODUCED WITHOUT PRIOR WRITTEN CONSENT. STRUCTURAL INFORMATION SHOWN INDICATIVE ONLY. REFER TO STRUCTURAL ENGINEERS DRAWINGS AND SPECIFICATIONS FOR NECESSARY.

Figure 2: Enabling phase remediation areas

- Legend**
- Fence
 - Contours (0.2m)
 - Top of Bank
 - Bottom of Bank
 - Levels (mAOD)
 - Borehole



Rev	Description	Revised By	Date
1	FIRST ISSUE		24-01-19

FLI
qds

Soil & Groundwater
Remediation Solutions
email: info@fli-qds.co.uk
www.fli-qds.co.uk

■ Guildford Office: Tel: 01483 303070
□ Rotherham Office: Tel: 01709 300800

Site Address:
Peterborough Road
Crowland

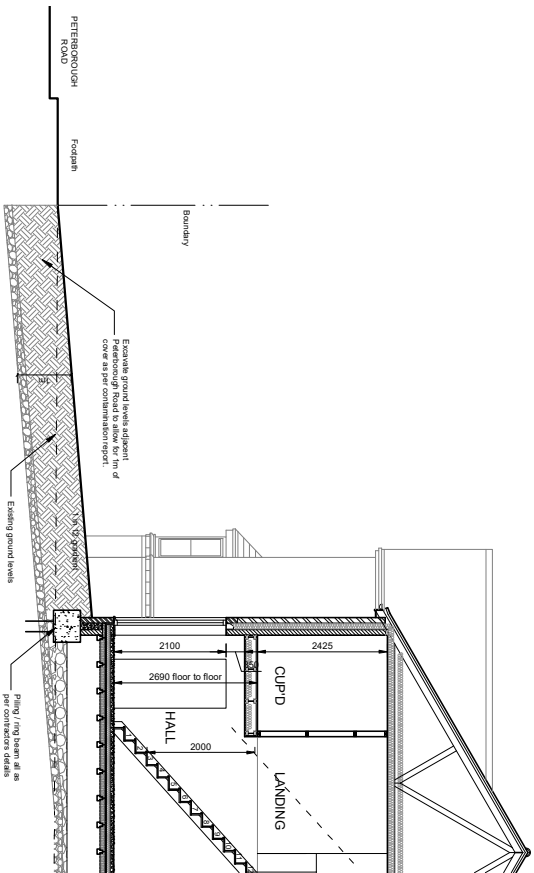
Title: Topographical Survey 24-01-19

Client: Caldic UK Ltd

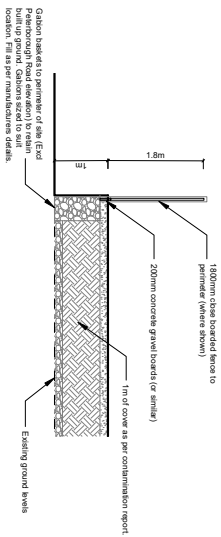
Drawn: MRG	Checked: RT	Approved: RT
Dwg: Q-05483-7	Contract: Q-05483	Scale: See Dwg

Figure 3: Construction drawing (Plot 3)

Figure 4: Cover layer boundary sections



SECTION THROUGH FRONT OF SITE



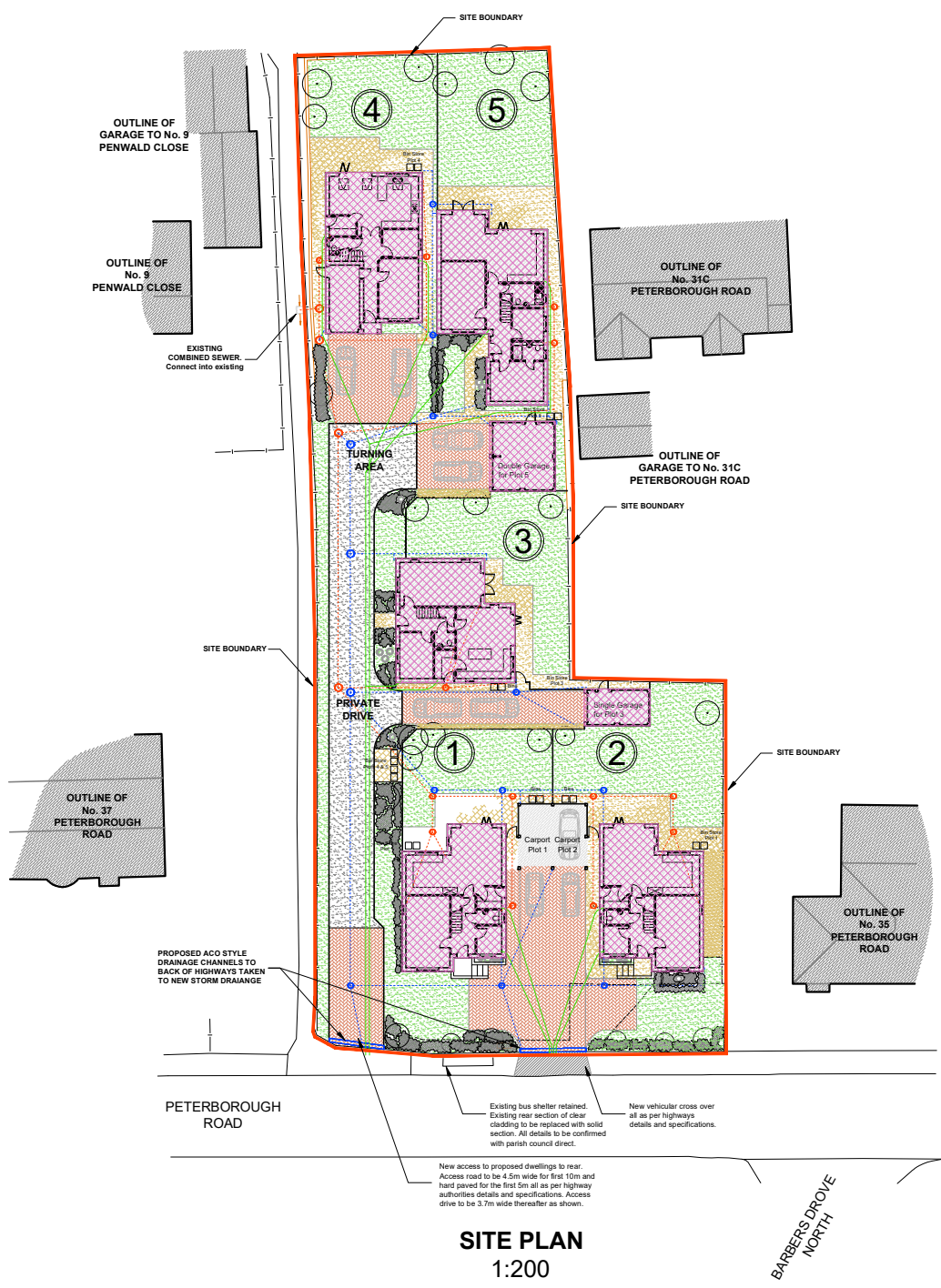
SECTION TO PERIMETER OF SITE

Perimeter Details
As Proposed



Architect Architectural Design	
0772 866 8880	Telephone
www.Architect.co.uk	Website
Simon@Architect.co.uk	Email
8 Bradham Close, Silverstone, Northants, NN12 8UL	Address
PROPOSED NEW NEW DWELLINGS ON LAND ADJACENT TO PETERBOROUGH ROAD, CROWLAND	
PETERBOROUGH, PE6 0BB.	
Client	June 2018
Date	1/9/2018
Scale	1/50 @ A2
Drawing No.	CM - 1008
THIS DRAWING IS A PART OF A PROJECT AND IS NOT TO BE USED FOR ANY OTHER PROJECT WITHOUT THE WRITTEN PERMISSION OF THE ARCHITECT. ANY REUSE OF THIS DRAWING FOR ANY OTHER PROJECT WITHOUT THE WRITTEN PERMISSION OF THE ARCHITECT IS A BREACH OF THE ARCHITECT'S PROFESSIONAL ETHICS AND MAY BE A CRIME UNDER THE ARCHITECTS ACT 1997.	

Figure 5: Locations for vapour membrane installation



SITE PLAN
1:200

BARBERS DROVE
NORTH

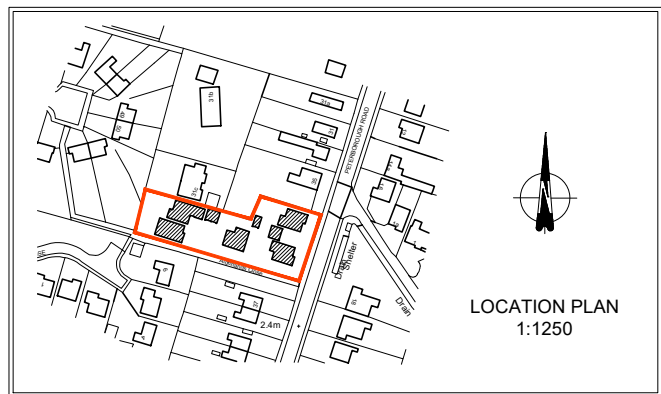
KEY

-  STORM DRAIN RUN / INSPECTION CHAMBER
-  FOUL DRAIN RUN / INSPECTION CHAMBER
-  PROPOSED SERVICES Gas / Water / Elec / BT
-  CONTAMINATION VAPOR MEMBRANE LOCATION

PROPOSED FFL LEVELS

Dwelling 1 -	3.100
Dwelling 2 -	3.100
Dwelling 3 -	3.000
Dwelling 4 -	3.000
Dwelling 5 -	2.900

Refer to Topographical Survey for existing site levels.



LOCATION PLAN
1:1250

Vapor Layer / Services Plan for
Contamination Report
As Proposed

Archi-tec
Architectural Design

0772 565 8850 Telephone
www.Archi-tec.co.uk Website
Simon@Archi-tec.co.uk Email
8 Brabham Close, Silverstone, Northants, NN12 8UL Address

**PROPOSED 5NO. NEW DWELLINGS ON
LAND ADJACENT 35 PETERBOROUGH
ROAD, CROWLAND,
PETERBOROUGH, PE6 0BB.**

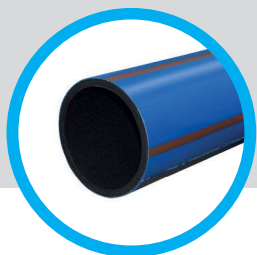
Client
Date June 2018
Scale As Noted @ A1
Drawing No C36 - 1007

ALL DIMENSIONS TO BE CHECKED ON SITE. ANY DISCREPANCIES TO BE DISCUSSED AND AGREED PRIOR TO PROCEEDING. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT BUILDING REGULATIONS AND RELEVANT CODES OF PRACTICE. THIS DRAWING IS THE PROPERTY OF ARCHI-TEC ARCHITECTURAL DESIGN AND MUST NOT BE COPIED OR REPRODUCED WITHOUT PRIOR WRITTEN CONSENT. STRUCTURAL INFORMATION (BROWN INDICATIVE ONLY) REFER TO STRUCTURAL ENGINEERS DRAWINGS AND CALCULATIONS AS NECESSARY.

APPENDIX B: Technical data for specified barrier pipe and vapour membrane

PROTECTA-LINE PIPE

PRODUCT DATA SHEET



Protecta-Line pipe is a multi-layered PE pipe with an embedded aluminium barrier layer. It is designed to safely transport drinking water in land which is contaminated or has the potential to be contaminated in the future.

RANGE / PRESSURE RATING

OD (mm)	SDR	Pressure rating	Material
25	11	12.5 bar	PE80
32			
63			
90 to 180	11	16 bar	PE100
	17	10 bar	PE100
225 to 630	11	16 bar	PE100
	17	10 bar	PE100

COLOURS

Material	Description	Colour
PE80	Black core and light blue outer with brown stripes	
PE100	Black core and dark blue outer with brown stripes	

Pipe diameter ≤ 180 mm pipe has four brown stripes; > 180 mm pipe has eight brown stripes.

STANDARDS / APPROVALS

The Water Supply Regulation 31/27/30	BS EN 12201-2
WRAS Approved	WIS 4-32-19

CERTIFICATION



1606501
1511343
1505514
1302025



BS EN 12201-2
KM 508224



WIS 4-32-19
KM 514626

LENGTHS

Pipes ≤ 180 mm in diameter are available in coiled lengths of 25m, 50m or 100m

Pipes 63mm – 630mm in diameter are also available in straight lengths of 6 or 12m.

Other lengths may be produced at customer's request

MARKINGS

As a minimum requirement, the following information is marked indelibly and linearly at intervals along the pipe:

■ Manufacturers identification:	GPS	■ Material designation:	PE100 or PE80
■ System:	Protecta-Line	■ Nominal size:	180mm (example)
■ Pipe composition:	PE Pipe with AL Barrier	■ SDR value:	SDR 17 (example)
■ Standard and pipe type:	WIS 4-32-19 TYPE A	■ Continuous pressure rating at 20°C	10 bar (example)

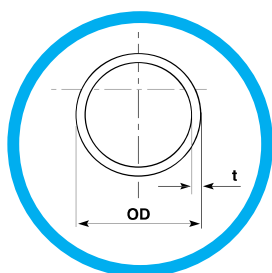
The pipes are marked with the following three times per metre:

■ Application: **Water**

BATCH NUMBER FORMAT

8 Digit Code	Extruder Number 1 & 2	Shift Number 3 & 4	Week Number 5 & 6	Year 7 & 8
	01-23	01 - 14	01 - 52	01-99

PIPE DIMENSIONS



* The size is the nominal core pipe outside diameter. Other diameters, SDRs and lengths can be made subject to a minimum order value.

Size* (mm)	SDR	Min OD (mm)	Max OD (mm)	Mean Bore (mm)	Min t (mm)	Max t (mm)	Approx Weight (kg/m)
25	11	26.2	27.4	20.0	3.0	3.7	0.3
32	11	33.3	34.5	26.0	3.7	4.4	0.4
63	11	64.3	65.6	50.9	6.5	7.6	1.3
90	11	92.2	93.5	72.9	9.3	10.7	2.6
	17	92.2	93.5	78.8	6.5	7.5	1.9
110	11	112.2	113.5	89.2	11.1	12.7	3.7
	17	112.2	113.5	96.3	7.7	8.8	2.7
125	11	127.2	128.5	101.2	12.5	14.2	4.7
	17	127.2	128.5	109.6	8.5	9.8	3.4
160	11	163.2	165.1	130.4	15.8	17.9	7.6
	17	163.2	165.1	141.1	10.7	12.4	5.4
180	11	183.3	185.4	146.8	17.6	20.0	9.5
	17	183.3	185.4	158.8	11.9	13.7	6.8
225	11	227.3	229.5	182.5	21.7	24.4	14.5
	17	227.3	229.5	197.4	14.6	16.6	10.3
250	11	252.3	254.9	203.0	23.9	26.8	17.7
	17	252.3	254.9	219.6	16.0	18.3	12.4
280	11	282.3	285.1	227.4	26.6	29.8	22.0
	17	282.3	285.1	245.9	17.8	20.1	15.4
315	11	317.3	320.2	255.7	29.8	33.3	27.6
	17	317.3	320.2	276.6	19.9	22.4	19.3
355	11	357.3	360.6	288.3	33.4	37.3	34.8
	17	357.3	360.6	311.6	22.3	25.1	24.3
400	11	402.3	405.8	324.8	37.5	41.8	43.9
	17	402.3	405.8	351.3	24.9	27.9	30.4
450	11	452.3	456.1	365.4	42.1	46.8	55.3
	17	452.3	456.1	395.2	27.9	31.2	38.2
500	11	502.3	506.4	406.0	46.6	51.8	67.9
	17	502.3	506.4	439.0	30.9	34.5	46.9
560	11	562.3	566.8	454.9	52.0	57.7	84.7
	17	562.3	566.8	491.8	34.4	38.4	58.4
630	11	632.3	637.2	511.6	58.4	64.8	106.9
	17	632.3	637.2	553.2	38.6	43.0	73.6

Protech VOC Flex

GAS PROTECTION

DESCRIPTION

Protech VOC Flex complies with CIRIA C748 and BS8485:2015. It is a high performance 6 layer flexible proprietary reinforced VOC gas barrier and is suitable for use on brownfield sites that require protection from dangerous contaminants such as hydrocarbons. The Protech VOC Flex has been developed to ease installation on site due to the flexibility of the membrane. It is also suitable as a high performance damp proof membrane.



INSTALLATION

Protech VOC Flex can be sealed either by welding or using Protech GM Tape. It is considered prudent that tape joints should not be used where there will be no long term compression of the membrane or where there is a likelihood where the membrane will come into direct contact with the VOCs in a liquid state.

In areas where the membrane crosses cavity walls or internal single skin walls, Protech VOC Flex Starter Band should be used in conjunction with Protech VOC Flex Internal and External preformed corner units. Pipe penetrations should be sealed with Protech VOC Top Hats or Protech GM Flashing Strips. Stanchions and columns should be sealing with Protech GM Primer and Protech GM Flashing strips (Photos, isometric and standard details are available on our website).

KEY FEATURES

- Exceptional chemical resistance
- Gas resistant
- Additional damp proofing protection
- Flexible membrane to ease installation on site
- Robust & durable multi-layer membrane
- High resistance to puncturing

ACCESSORIES

- Protech VOC Flex Starter Band
- Protech VOC Tophats
- Protech GM Flashing
- Protech VOC Corner Units
- Protech GM Primer
- Protech GM 3mm Protection Board
- Protech GM Protection Fleece
- Protech GM Tape
- Protech Liquid Applied Gas Membrane (LAGM)



PROPERTIES

PROPERTY	UNIT	MEAN	METHOD
Roll size	m	2 x 50	
Thickness	mm	0.55	
Weight	g/m ²	564	DIN EN ISO 536
Tensile strength MD CD	N/50mm	700 640	EN 12311-1 +Mods EN 13859-1
Elongation MD CD	%	30 25	EN 12311-1 +Mods EN 13859-1
Nail tear resistance MD CD	N	500 540	EN 12311-1

Protech VOC Flex

CHARACTERISTICS	TEST METHOD		
Methane Permeability	ISO 15105-1	✓	
Diesel Permeability	ISO 6179:2010	✓	
Petrol Permeability	ISO 6179:2010	✓	
Xylene Permeability	ISO 6179:2010	✓	
Toulene Permeability	ISO 6179:2010	✓	
Vinyl Chloride	ISO 15105-2	✓	
Ethyl Benzene	ISO 15105-2 EN 14414 Method C	✓	
Trichlorethene	ISO 15105-2	✓	
Xylene (O, M, P)	ISO 15105-2 EN 14414 Method C	✓	
Naphthalene	ISO 15105-2 EN 14414 Method C	✓	
Benzene	ISO 15105-2 EN 14414 Method C	✓	
Toluene	ISO 15105-2 EN 14414 Method C	✓	
Hexane	ISO 15105-2 EN 14414 Method C	✓	
Tetrachlorethene	ISO 15105-2	✓	
Bromoform	ISO 15105-2	✓	
Carbon Tetrachloride	ISO 15105-2	✓	
Chloroform	ISO 15105-2	✓	
Ethylene Dichloride	ISO 15105-2	✓	
Methyl Teriary Butyl Ether	ISO 15105-2	✓	
Trichloroethylene (TCE)	EN 14414 Method C	✓	
Perchloroethylene (PCE)	EN 14414 Method C	✓	
Determination of Chemical Resistance	Test Method	Properties	
Hydrolysis under Acid Conditions	BS EN 14414 Method A	Tensile Strength Mpa MD	Pass
		Tensile Strength Mpa CD	Pass
		Tensile Elongation % MD	Pass
		Tensile Elongation % CD	Pass
	NO VISUAL DEGRADATION		
Hydrolysis under Basic Conditions	BS EN 14414 Method B	Tensile Strength Mpa MD	Pass
		Tensile Strength Mpa CD	Pass
		Tensile Elongation % MD	Pass
		Tensile Elongation % CD	Pass
	NO VISUAL DEGRADATION		
Solvation & Swelling (Diesel/Parafin/Lubrication Oil)	BS EN 14414 Method C	Tensile Strength Mpa MD	Pass
		Tensile Strength Mpa CD	Pass
		Tensile Elongation % MD	Pass
		Tensile Elongation % CD	Pass
	NO VISUAL DEGRADATION		
Synthetic Leachate	BS EN 14414 Method D	Tensile Strength Mpa MD	Pass
		Tensile Strength Mpa CD	Pass
		Tensile Elongation % MD	Pass
		Tensile Elongation % CD	Pass
	NO VISUAL DEGRADATION		