GeoDyne

Geotechnical &
Environmental
Consultants

Balmoral Way
Holbeach

Supplementary Ground Gas Assessment
For
Ashwood Homes

GeoDyne Limited
Clarendon House, Clarendon Park,
Clumber Avenue, Nottingham NG5 1AH
Tel: 0115 962 0001 email: info@geodyne.co.uk

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Project No: D35051		**Date: 24th February 2021**	
Issue/revision	Prepared by	Checked By	Approved By
	Jason Hollands BSc (Hons) MSc MIEnvSc CGeol FGS Director	**Daniel Brunt BSc (Hons) MSc CGeol FGS** Associate	**Paul Kershaw BSc (Hons) PGDip CGeol FGS** Director
Comments			

1.0 INTRODUCTION

1.1 Introduction

GeoDyne Limited has been appointed by the Client, Ashley King (Developments) Ltd (now trading as Ashwood Homes) to undertake a supplementary ground gas assessment for a parcel of land at Balmoral Way, Holbeach.

We understand that the site has been redeveloped with 36 No. residential dwellings, which have incorporated ground gas precautions. However, we understand that South Holland District Council has queried the ground gas precautions adopted at the site, and requested further comment from the Consultant (GeoDyne Ltd) with respect to the ground gas precautions adopted.

1.2 Scope of Works

The scope of the works included the following:

- Review the sites setting and previous intrusive investigation works.
- Assess the potential provenance of the ground gases at the site.
- Undertake an initial risk assessment of ground gases at the site.
- Comment on the suitability of the installed ground gas protection measures.

The scope of works has been specifically designed to undertake the foregoing. All other matters are specifically excluded from our remit.

1.3 Limitations

The conclusions and recommendations made in this report are limited to those that can be made based on the findings of the investigation. Where comments are made based on information obtained from third parties, GeoDyne Limited assumes that all third party information is true and correct. No independent action has been undertaken to validate the findings of third parties, unless specifically stated.

This report has been prepared in accordance with our understanding of current good practice. However changes to good practice, guidance or legislation may necessitate revision of this report after the date of issue.

GeoDyne Limited has prepared this report for the sole use and reliance of the Client, Ashwood Homes, in accordance with our Standard Conditions and Limitations (included in Appendix VI).

This report may not be used or relied upon by any unauthorised third party without the explicit written agreement of GeoDyne Limited.

1.4 Confidentiality

The risk assessment herein remains the intellectual property and trade secret of GeoDyne Limited. The information contained within this report must not be disclosed or divulged to any commercial Consultant or other third party without the prior written agreement of GeoDyne Limited.

2.0 SITE SUMMARY

2.1 Project Setting and Previous Works

The site comprises an approximately rectangular shaped parcel of land located to the east of Balmoral Way, Holbeach, Lincolnshire. The site may be located centred around approximate Ordnance Survey National Grid Reference 537160E 325310N, and covers an area of approximately 1.73 hectares.

GeoDyne Ltd previously prepared the following report for the site:

- GeoDyne Ltd Report *'Balmoral Way, Holbeach – Combined Phase I Desk Study & Phase II Exploratory Investigation For Ashley King (Developments) Ltd',* dated 31st July 2015, Ref: D35051.

The site was originally proposed to be redeveloped with 48 No. residential dwellings (as indicated on the proposed layout plan contained within the above report). Planning permission for 36 No. dwellings at the site was obtained on 21st November 2019, Ref: H09-0706-19. We understand that dwellings at the site have been constructed and occupied.

A site location plan is included in Appendix I, with a plan showing the proposed layout of the site included in Appendix II.

2.1.1 Ground Conditions

With respect to ground gases, the report identified the presence of Terrington Beds (Tidal Flat Deposits) at the site, which were described as follows:

'Tidal Flat Deposits comprise marine alluvium, salt marsh, tidal creek and river deposits, typically consisting of Silt, Sand and Clay. They can include older marine alluvium or salt marsh deposits (Barroway Drove Beds), typically consisting of silty Clay. Tidal Flat Deposits may contain Peat either as a defined band (i.e. Nordelph or Lower Peat) or as impersistent horizons.'

Furthermore, with respect to the potential for Made Ground, our report noted the following:

'No man-made deposits (i.e. Made Ground, Worked Ground or Infilled Ground) are indicated on the reviewed geological map publications on the site.

We would note that the historical publications revealed the presence of a former drainage ditch and part of a pond that ran within the sites southeastern boundary, which appears to have been infilled during expansion of former on-site commercial activities.

In addition, Made Ground deposits should be anticipated associated with previous commercial activities on the site, together with the demolition of various buildings/structures.

It should also be noted that the central-southern part of the site forms an elevated plateau, approximately 1m-1.5m above the typical ground levels on the site. This may be indicative of former re-profiling/earthworks activities on the site, and may comprise entirely of Made Ground soils. Other bunds/soil mounds were also noted during the course of our site walkover.'

The following ground conditions were detailed in Section 8.4 of our report:

'Topsoil (typically Made Ground topsoil) was encountered to depths of between 0.10m and 0.45m begl in a majority of the exploratory holes.

Made Ground was proven to depths ranging between 0.40m and 2.50m (absent in the northern extent), with the greatest thicknesses revealed in the elevated plateau in the central-southern part of the site. The Made Ground typically comprised clayey/silty sand or sandy clay, with inclusions of brick, plastic sheeting, concrete, granite, flint and quartzite prevalent throughout. Locally, demolition type rubble was encountered, which incorporated metal, glass, ash and concrete blocks.

The elevated plateau forming the central-southern part of the site was found to comprise loose to medium dense slightly clayey silty gravelly sand, progressing into soft very sandy gravelly silt. The gravel component included various anthropogenic materials, such as whole bricks, brick fragments, timber, masonry, plastic, coal, polystyrene, rubber, tile, glass and metal. Within TP10 at approximately 1.10m begl a Princes mackerel can was identified – the can had a copyright date of 2005 and a best before end date of July 2009. The underlying Made Ground Silt also included anthropogenic materials, and locally exhibited an organic (stale) odour. Within TP9 the silt exhibited dark grey discolouration (between approximately 1.70m and 2.20m) and a slight diesel odour.

The underlying Natural Strata typically comprised firm very sandy SILT (locally CLAY/SILT), becoming soft or soft to firm with depth. Loose to medium dense very silty SAND was encountered between 2.80m and 6.40m, which was encountered until termination of the holes at depths of up to 15.95m begl.'

We have been informed that the Made Ground within the elevated plateau has previously been removed from the site by others prior to development works.

2.1.2 Ground Gas Monitoring

Taking account of the findings of the desk study and intrusive works undertaken at the site, a programme of ground gas monitoring was recommended and subsequently undertaken by GeoDyne. Monitoring comprised 6 No. ground gas visits overtaken at approximately a weekly basis.

The findings of the ground gas monitoring programme were detailed in Table 4 of our report and is included below.

TABLE 4 – SUMMARY OF GROUND GAS MONITORING DATA

Parameter	Minimum % by volume (v/v)	Maximum % by volume (v/v)
Methane	0.0	0.0
Carbon Dioxide	0.8	6.0
Oxygen	8.3	18.3
Flow (l/h)	0.0	0.0

The programme of ground gas monitoring did not reveal measurable concentrations of methane and similarly did not reveal measurable ground gas flow.

A maximum concentration of carbon dioxide of 6.0% by volume (v/v) was revealed.

2.1.3 Ground Gas Assessment & Recommendations

The ground gas monitoring results were assessed against the following guidance, which was current at the time of report production:

- British Standard BS 8485 *'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*' (2015).
- CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' (2007).
- NHBC & RSK Group publication '*Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present*' (March 2007).

The ground gas data was assessed against both BS8485:2015 and NHBC Guidance. In both sets of guidance a Typical Maximum Concentration of Carbon Dioxide of 5% provides a boundary been Green (NHBC) or CS1 (BS8485:2015) where no ground gas protection measures are required and NHBC Amber 1 or BS8484:2015 CS2, where ground gas protection measures become required.

We would note that both sets of guidance allow an element of Engineer judgement with respect to the requirement of ground gas protection measures, where the level of carbon dioxide exceeds 5% v/v, with BS8485 noting with respect to CS1 in Table 2 *'Typically <1% methane concentration and 5% carbon dioxide concentration (otherwise consider an increase to CS2.'* In Table 14.2 of the NHBC guidance, note 3 states *'The Typical Maximum Concentrations can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so.'*

With respect to ground gas protection measures, Section 8.6 of our Conclusions recommended the following:

'Based on the programme of ground gas monitoring undertaken the site may be classified as Characteristic Situation 'CS2' in accordance with BS8485:2015 and Amber 1 in accordance with NHBC guidance. On the basis of the foregoing, and the development proposals for the site, the following ground gas precautions may be adopted within proposed dwellings.

- *Suspended floors with a clear ventilated void (i.e. beam and block).*
- *Provision of periscopic air-brick ventilation on two sides of each dwelling. The recommended minimum area of ventilation for a sub-floor void is 1500mm^2 per metre run of wall or 500mm^2 per square metre of floor area, whichever gives the greater area of opening.*
- *Low-permeability well installed proprietary gas membrane. The membrane should be suitably lapped and taped and should be extended across wall cavities and lapped with cavity trays to effectively exclude ground gases from the footprint of the proposed buildings. Service penetrations through the membrane should be kept to a minimum and should be suitably sealed to the membrane. The membrane should be inspected by third party in accordance with the requirements of CIRIA C735 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gas' (2014). The membrane must be suitably robust to withstand the construction process and should be suitably protected following installation and inspection to minimise damage during construction.*

The foregoing precautions would score 4.5 points in accordance with BS 8485:2015 and are therefore considered appropriate for the site, based on the requirements for a minimum of protection level of 3.5 points. Alternative floor slab and ground gas protection measures (for example cast in-situ reinforced suspended slab on a granular/ventilation layer) that give a minimum protection score of 3.5 may be adopted at the site, to suit the requirements of the Client.

Where the proposed dwellings are to benefit from a buildmark warranty (i.e. NHBC, or similar) we would recommend that the Structural Engineer liaises with the warranty provider with respect to the floor slab design and ground gas protection measures to ensure that the proposals fully satisfy their requirements.'

2.2 Installed Ground Gas Protection Measures

We understand that since production of our report and securing planning permission for the site, the Client has developed the site with 36 No. residential dwellings with associated gardens etc.

We have been informed (in an email of 18th February 2021) that ground gas protection measures have been incorporated into the dwellings, which may be detailed accordingly:

- Suspended beam and block floor (minimum 150mm clear void) with air bricks and telescopic air bricks.
- Utilisation of a 2000g DPM (Lignofol 500) lapped and taped.

Ashwood Homes employed the services of Harlor to undertake ground gas membrane inspection works which appear to have taken place between 24th January 2020 and 3rd August 2020. Harlor's visual inspection of gas protection measures records are included in Appendix III.

In all instances Harlor identified the site as having a CS2 characteristic situation and concluded that the gas protection measures were acceptable and comply with the specification. GeoDyne Ltd was not involved in the verification process.

2.3 Regulatory Comment

We understand that Mr A Jagger from Ashwood Homes Ltd is liaising with Susan Armour at South Hollands District Council with respect to discharge of planning conditions as they relate to ground gas protection measures (Planning Condition 4). A copy of Planning Permission for the site is included in Appendix II.

In an email dated 17th February 2021, Ms Armour stated the following:

'NHBC amber 1 and CS2 from the British standard are not the same, and are not interchangeable. CS2 from the British Standard and CIRIA C659 are not the same. Your environmental consultants recommended CS2 from the British Standard, and what you have installed does not meet that. You will need to go back to your consultant and get them to sign off on what you have installed and why, or ask them to recommend remedial measures.'

3.0 GUIDANCE AND DATA REVIEW & RISK ASSESSMENT

3.1 Ground Gas Guidance

Guidance with respect to the assessment of ground gas data and provision of ground gas protection measures is a relatively rapidly evolving subject area.

At the time of writing our report for the site (July 2015), BS8485 *'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings',* had only recently been revised (June 2015). Consequently, our report made reference to both the new BS8485 guidance together with NHBC guidance.

In view of the fact that levels of carbon dioxide locally exceeded 5% v/v, ground gas protection measures were recommended by GeoDyne Ltd. Section 8.6 of our Conclusions recommended the following:

'Based on the programme of ground gas monitoring undertaken the site may be classified as Characteristic Situation 'CS2' in accordance with BS8485:2015 and Amber 1 in accordance with NHBC guidance. On the basis of the foregoing, and the development proposals for the site, the following ground gas precautions may be adopted within proposed dwellings.

- *Suspended floors with a clear ventilated void (i.e. beam and block).*
- *Provision of periscopic air-brick ventilation on two sides of each dwelling. The recommended minimum area of ventilation for a sub-floor void is 1500mm^2 per metre run of wall or 500mm^2 per square metre of floor area, whichever gives the greater area of opening.*
- *Low-permeability well installed proprietary gas membrane. The membrane should be suitably lapped and taped and should be extended across wall cavities and lapped with cavity trays to effectively exclude ground gases from the footprint of the proposed buildings. Service penetrations through the membrane should be kept to a minimum and should be suitably sealed to the membrane. The membrane should be inspected by third party in accordance with the requirements of CIRIA C735 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gas' (2014). The membrane must be suitably robust to withstand the construction process and should be suitably protected following installation and inspection to minimise damage during construction.*

The foregoing precautions would score 4.5 points in accordance with BS 8485:2015 and are therefore considered appropriate for the site, based on the requirements for a minimum of protection level of 3.5 points. Alternative floor slab and ground gas protection measures (for example cast in-situ reinforced suspended slab on a granular/ventilation layer) that give a minimum protection score of 3.5 may be adopted at the site, to suit the requirements of the Client.

Where the proposed dwellings are to benefit from a buildmark warranty (i.e. NHBC, or similar) we would recommend that the Structural Engineer liaises with the warranty provider with respect to the floor slab design and ground gas protection measures to ensure that the proposals fully satisfy their requirements.'

We would acknowledge that levels of carbon dioxide were only locally in excess of 5% v/v, with no methane or flow detectable. However, ground gas protection measures to comply with CS2 were recommended by GeoDyne Ltd.

Since production of our report in June 2015, guidance with respect to review of ground gas data and provision of ground gas protection measures has continued to evolve, as detailed below:

- CL:AIRE Technical Bulletin TB16 '*Complete Continuous Monitoring in Underfloor Voids',* dated December 2017.
- Ambisense and EPG Ltd Information Sheet No. 1 *'Using ternary plots for interpretation of ground gas monitoring data',* dated 30/07/2018.
- British Standards Publication BS8485:2015+A1:2019 *'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.*
- Ground Engineering Technical Paper *'Risk and reliability in gas protection design – 20 years on: Part 1',* dated August/September 2019.
- Ground Engineering Technical Paper *'Risk and reliability in gas protection design – 20 years on: Part 2',* dated October 2019.

3.2 Provenance Assessment (Ternary Plot)

To investigate the potential provenance (source) of ground gas at the site, we have undertaken a Ternary Plot for the ground gas dataset in accordance with the Ground Gas Information Sheet (No. 1) *'Using ternary plots for interpretation of ground gas monitoring results',* Wilson S, Collins F and Lavery R (2018).

Page 1 of the ternary plot guidance states the following:

'BS8485:2015 and previous assessment methods (Wilson and Card, 1999, Boyle and Witherington, 2007 and Wilson et al, 2007) require that where the carbon dioxide concentration exceeds 5% consideration is given to increasing a site classification from Characteristic Situation 1 up to Characteristic Situation 2. Carbon dioxide is widely present in natural ground at concentrations up to 21% and this often leads to uncertainty about whether to increase the classification. A ternary plot can help assess gas monitoring data to identify if there is an elevated risk and whether the classification should be increased.'

On page 6 of the same paper the following is stated:

'Carbon dioxide is widespread in the sub surface environment and is generated by microbial and geochemical purposes. If there is any organic, carbonate or pyrite content to the sites or rocks then carbon dioxide could potentially be present at concentrations up to 21% v/v. Soils in the UK where carbon dioxide is commonly encountered at elevated concentrations include Glacial Till, Chalk, Terrace Gravel, Thanet Sand, Lambeth Group and Made Ground.

When monitoring wells are installed in these materials, the small volumes of organic material are exposed to oxygen. This can result in biological respiration or oxidation of the material resulting in the production of carbon dioxide. Weathering of pyrites and the resultant reactions of acidic pore water with carbonate material can also cause increased concentrations of carbon dioxide in the monitoring well headspace.

Low volumes of organic material in Made Ground can also degrade aerobically to produce carbon dioxide, or may locally be degrading anaerobically with the process being so slow that the methane completely oxidises to carbon dioxide before reaching the well headspace. In all these cases the carbon dioxide is generated so slowly that it will not be emitted from the ground surface in quantities or at a rate that is sufficient to pose a risk to overlying development.

However, there are situations where carbon dioxide could pose a risk and elevated concentrations require careful consideration:

- *Landfill gas migration through open fractured rock or other highly permeable pathway;*
- *Old open coal mine workings that have a free connection to the ground surface.*
- *High flow of acidic mine water in open working or fractured rock with an open pathway to the surface;*
- *Volcanic activity causing emission of gas from the ground.*

For this reason, all of the commonly used screening approaches used in the UK (BS8485:2015, Wilson and Card, 1999, CIRIA Report C665 – Wilson et al and NHBC – Boyle and Witherington, 2007) have a requirement to consider increasing the characteristic situation of a site identified as Characteristic Situation 1 or Green based on the Gas Screening Value, if carbon dioxide concentrations exceeding 5% have been recorded.

This increase in characteristic situation is not a mandatory requirement in any of the guidance documents. The distribution of elevated concentrations and the source of the gas should be considered before deciding whether the increase is appropriate. In most cases there will not be any need to increase the classification if the carbon dioxide is caused by biological respiration of small quantities of organic material. Increasing the characteristic situation is only likely to be a requirement if the gas source is one of the four high risk sources identified above…'

We would note that the site is not identified as one of the four high risk categories listed on page 6 of Ground Gas Information Sheet No. 1. Consequently it is considered appropriate to utilise ternary plots to examine the relative concentrations of methane, carbon dioxide, oxygen and nitrogen encountered at the site.

The ternary plots have been prepared using bespoke ternary plot spreadsheets prepared by Land Quality Management (LQM – published in 2019) and purchased under licence by GeoDyne Ltd.

The data, comprising all 18 No. individual borehole datasets (methane, carbon dioxide and oxygen) has been entered into the ternary plot spreadsheet and the results plotted on Chart A with Carbon Dioxide and Methane plotted on two axes with the third comprising Oxygen+Nitrogen.

With respect to Chart A the results plot within an area indicative of ambient air whilst also generally plotting in an area indicative of microbial respiration of organic materials in soil (zero methane and low flow). We note that no methane or flow was recorded on the site.

The Ternary Plot for Chart A is included in Appendix IV.

3.3 Ground Gas Risk Assessment

The result of the Ternary Plot indicates that the levels of carbon dioxide encountered, when taking account of the absence of methane (and measurable flow), are suggestive of ambient air whilst also predominantly plotting in an area of the chart suggesting microbial respiration of organic materials in soil.

As a secondary check to the foregoing, it is possible to undertake steady state subfloor modelling, to attempt to model likely levels of carbon dioxide in the subfloor void.

3.3.1 Steady State Sub-Floor Modelling

The NHBC published report *'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present'* (Report Edition No. 4, 2007), provides a basis for the design of Gas Screening Values and the design of ground gas protection measures through from Green < Amber 1 < Amber 2 < Red.

The Criteria for Green conditions are based on 'limiting equilibrium' ground gas concentrations in the subfloor void of dwellings.

Appendix F of the guidance states the following:

'The model low-rise housing development is based upon a model low-rise house as shown in Figure 1. The property has a floor plan of 8.00m x 8.00m, giving a floor area of 64m^2. Continuing the assumption that an individual 50mm internal diameter borehole relates to an approximate area of 10m^2 (proposed by Pecksen (1985) and further expanded by Ove Arup & Partners (1996)), this therefore, represents 6.4 boreholes for the floor plan of the house.

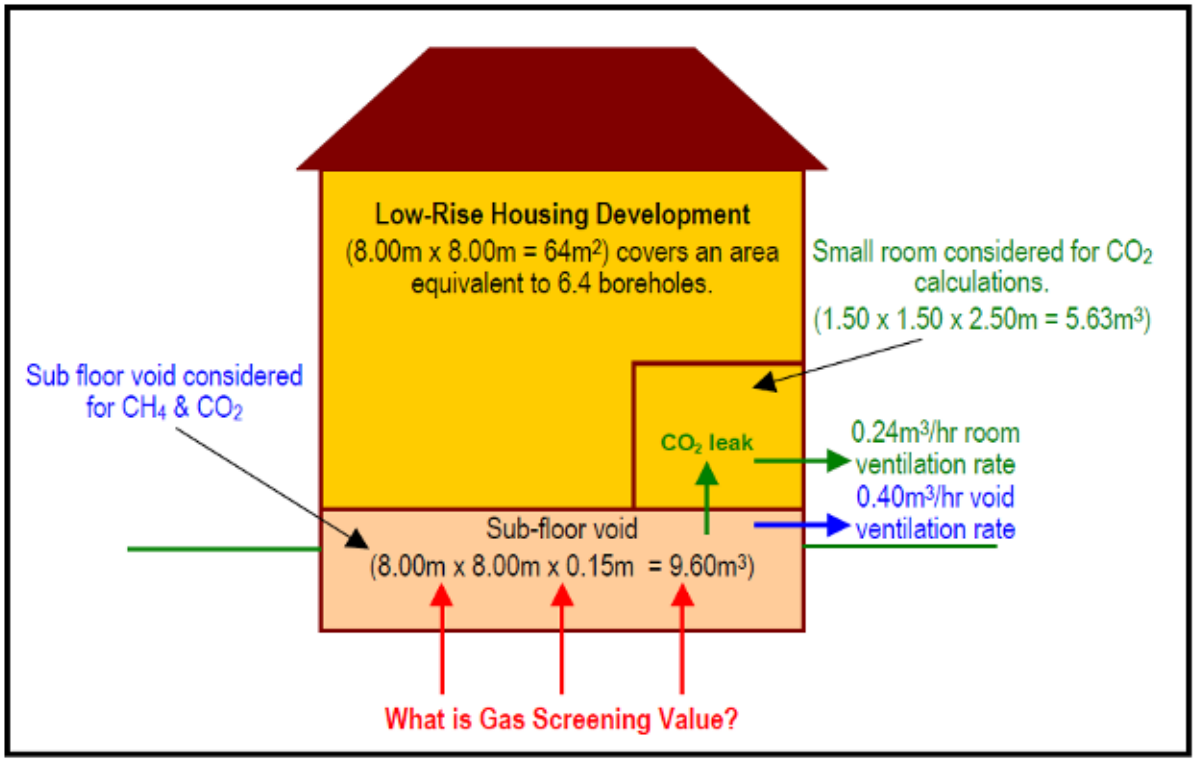


Figure F1: Model Residential Property Developed for Calculating Maximum Permitted Equilibrium Gas Concentrations within the Sub-Floor Void

The model low-rise house was given the minimum recommended sub-floor height of 0.15m as specified in the Building Regulations *'Approved Document C'* (Department of the Environment and the Welsh Office, 2004 edition), which produces a sub-floor void space of 9.60m^3. As a worst-case scenario, it was considered that the ventilation rate which the sub-floor void was subject to a complete volume change every 24 hours, which is considered to be highly conservative. The ventilation rate, therefore, is 9.60/24 = 0.40m^3/hr.

With respect to carbon dioxide the NHBC states the following:

'For carbon dioxide, however, it is not considered to be a problem how much gas is contained within the sub-floor void, as humans will not be entering into it. What is of concern is if the membrane and/or floor above the sub-floor void are accidentally or otherwise penetrated, which would allow for a release of carbon dioxide into the house. Therefore, for carbon dioxide a leak of gas from the sub-floor void into a small room (e.g. downstairs toilet with soil pipe potentially passing into sub-floor void) of dimensions 1.50m x 1.50m x 2.50m with a total room volume of 5.63m3 was considered. Again, as a worst-case scenario, it was considered that the ventilation rate of the room was subject to a complete volume change every 24 hours, which is again considered to be highly conservative. The ventilation rate within the room is, therefore, 5.63 / 24 = 0.24m^3/hr. The leak from the sub-floor void was assumed to account for ten percent (0.024m^3/hr) of the small room ventilation rate, which is considered to represent a significant leak. Therefore, this is considered to be highly conservative in its approach.'

With respect to the boundary between a Green and Amber 1 site, the NHBC note the following:

'*If a sub-floor void were to be present, which would allow CO_2 to leak into a small room, the maximum equilibrium concentrations of carbon dioxide considered allowable within the small room would be 25% of the Amber 2/Red concentration, which is 0.125%v/v. Thus, from the Amber 2/Red calculations, the maximum concentration of carbon dioxide entering the small room equates to 1.25%v/v of 0.40m^3/hr = 0.005m^3/hr = 5l/hr.*

Assuming that the house occupies an area equivalent to 6.4 boreholes, the GSV for Green to Amber 1 Traffic Lights is:

- *5 / 6.4 = 0.78l/hr.*

The Typical Maximum Concentration for Green to Amber 1 Traffic Lights is 5.0%v/v. If the GSV is not exceeded, no gas protection measures are considered necessary for carbon dioxide. However, if the GSV of carbon dioxide is above this value it would cause an Amber 1 Traffic Light and development should include protection measures as prescribed in Amber 1. The Typical Maximum Concentration may be exceeded if the GSV indicates it is safe to do so or a site-specific GSV can be derived.'

3.3.1.1 NHBC Green Sites

The modelled maximum limiting equilibrium concentration for carbon dioxide in a subfloor void of a property at a Green site may be calculated as 1.25% v/v (see foregoing commentary from the NHBC, this compares to the maximum permissible concentration of carbon dioxide in a monitoring point of 5% v/v).

The selection of a value of carbon dioxide in the subfloor void is supported by CL:AIRE Technical Bulletin 16, page 4 which states *'…a threshold concentration for carbon dioxide is not provided by NHBC but the value of 1.25% is appropriate in an unoccupied subfloor void.'*

3.3.1.2 Steady State Modelling

GeoDyne Ltd has prepared a spreadsheet allowing steady state modelling of predicted levels of carbon dioxide for subfloor voids at a site, taking account of factors such as concentration of the gas being modelled, flow rate of the gas being modelled, dimensions of the property being considered, height of the subfloor void and an assumed rate of air change within the subfloor void of 1 per day.

The following details were provided by the Client in an email dated 18th February 2021:

- A suspended beam and block floor has been used at the site and that this is ventilated with air bricks in accordance with the standards.
- Height of subfloor void – 0.15m.
- Approximate length of standard dwelling – 9m.
- Approximate width of standard dwelling – 5.5m

Modelling was undertaken using the maximum concentration of carbon dioxide revealed by GeoDyne Ltd of 6.0% v/v.

No measurable flow of ground gas was encountered during any monitoring visit. In accordance with good practice, the limit of detection (LOD) of the measurement device (GA2000) equating to 0.1l/hr, should be used in calculations.

3.3.1.3 Carbon Dioxide

Adopting the highest concentration of carbon dioxide reported by GeoDyne of 6.0% v/v and adopting the LOD flow rate of 0.1l/h, and allowing for one air change in the subfloor void per day, a calculated maximum carbon dioxide concentration of 0.0096% v/v is derived based on the monitoring data obtained. This is below the NHBC Limiting Equilibration Concentration (LEC) of Carbon Dioxide of 1.25% for a Green Site.

Where the rate of air change in the subfloor void is reduced to one per month, the maximum modelled concentration of carbon dioxide in the subfloor void of 0.288% is calculated and this is also below the NHBC Limiting Equilibration Concentration (LEC) of Carbon Dioxide of 1.25% for a Green Site.

A copy of our Steady State assessment is included in Appendix V.

4.0 CONCLUSIONS

The following conclusions relate to a reassessment of the sites ground gas regime and installed ground gas protection measures. All other matters are beyond the remit of this report.

4.1 Summary

GeoDyne Ltd undertook a programme of ground gas monitoring at the site in 2015. The monitoring programme revealed a maximum concentration of carbon dioxide of 6% v/v. No methane or measurable flow was encountered at the site.

Based on the ground gas regime encountered, interpreted in accordance with the guidance published at the time of reporting, GeoDyne recommended the provision of ground gas protection measures at the site. The measures included adoption of a suspended ventilated subfloor void and low-permeability well installed proprietary gas membrane with third party verification.

We have been informed that a suitably suspended and ventilated beam and block floor was adopted at the site, together with suitable air bricks and telescopic vents. However, a 2000g DPM (Lingofol 500) was used at the site rather than a proprietary gas membrane.

Ashwood Homes utilised Harlor to undertake the inspection and validation of the installed membranes. Harlor identified the site as CS2 on their inspection sheets and concluded on a plot specific basis that installed protection measures complied with the specification.

We would note that the use of 2000g DPM as a gas protection membrane, whilst historically acceptable, is no longer generally accepted. Normally a proprietary ground gas resistant membrane is required on sites requiring ground gas protection measures. Whilst not a proprietary ground gas resistant membrane, the 2000g DPM, where well installed and validated, should reduce the potential migration of ground gases from the subfloor void.

In view of the relatively low concentrations of carbon dioxide, and absence of measurable methane and flow, GeoDyne Ltd has undertaken a provenance assessment of the ground gas encountered at the site, taking into account new guidance published after production of our previous report. The individual ground gas monitoring results plot within an area indicative of ambient air whilst also generally plotting in an area indicative of microbial respiration of organic materials in soil (zero methane and low flow). The carbon dioxide is not indicative of geogenic or landfill gas.

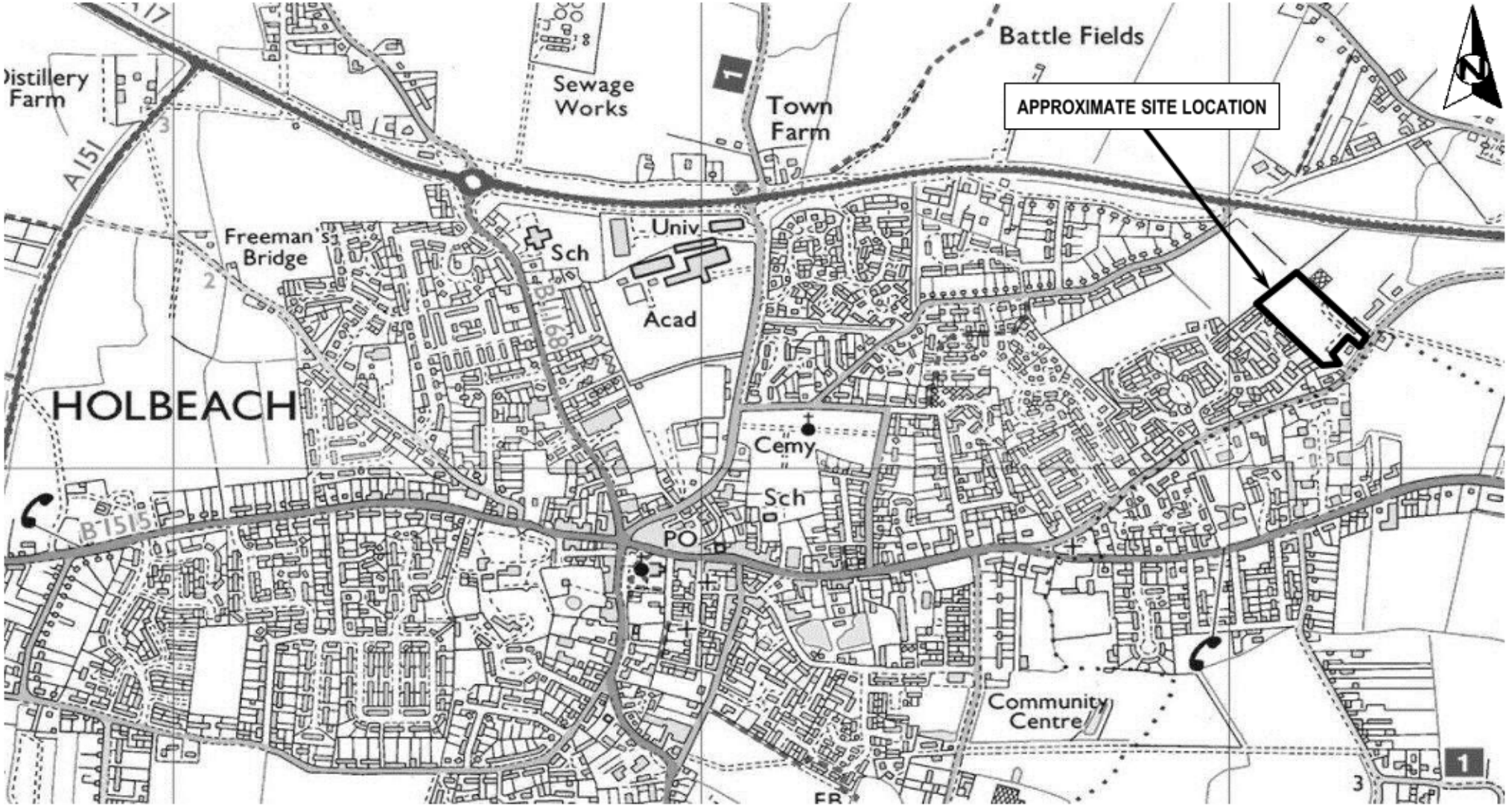
We have also undertaken a steady state ground gas assessment of the subfloor voids at the site adopting typical values provided by the Client. Taking account of the low levels of carbon dioxide (maximum 6% v/v) and the absence of measurable flow (0.1l/hr adopted in the model), the model identifies a maximum steady state level of carbon dioxide in the subfloor void of 0.0096% v/v (based on 1 subfloor air change per day), which is significantly below the NHBC Limiting Equilibration Concentration (LEC) of Carbon Dioxide of 1.25% for a Green Site.

Taking account of the foregoing, we would conclude that the ground gas protection measures installed by Ashwood Homes and verified by Harlor (both confirmed in an email from the Client dated 18th February 2021), are suitable for the proposed development, when considering the ground gas regime, ground gas provenance and in consideration of steady state modelling (suggesting NHBC Green subfloor conditions). No further works or mitigation are therefore considered to be necessary at the site.

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APPENDIX I

Site Location Plan



REPRODUCED FROM THE ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. CROWN COPYRIGHT RESERVED.
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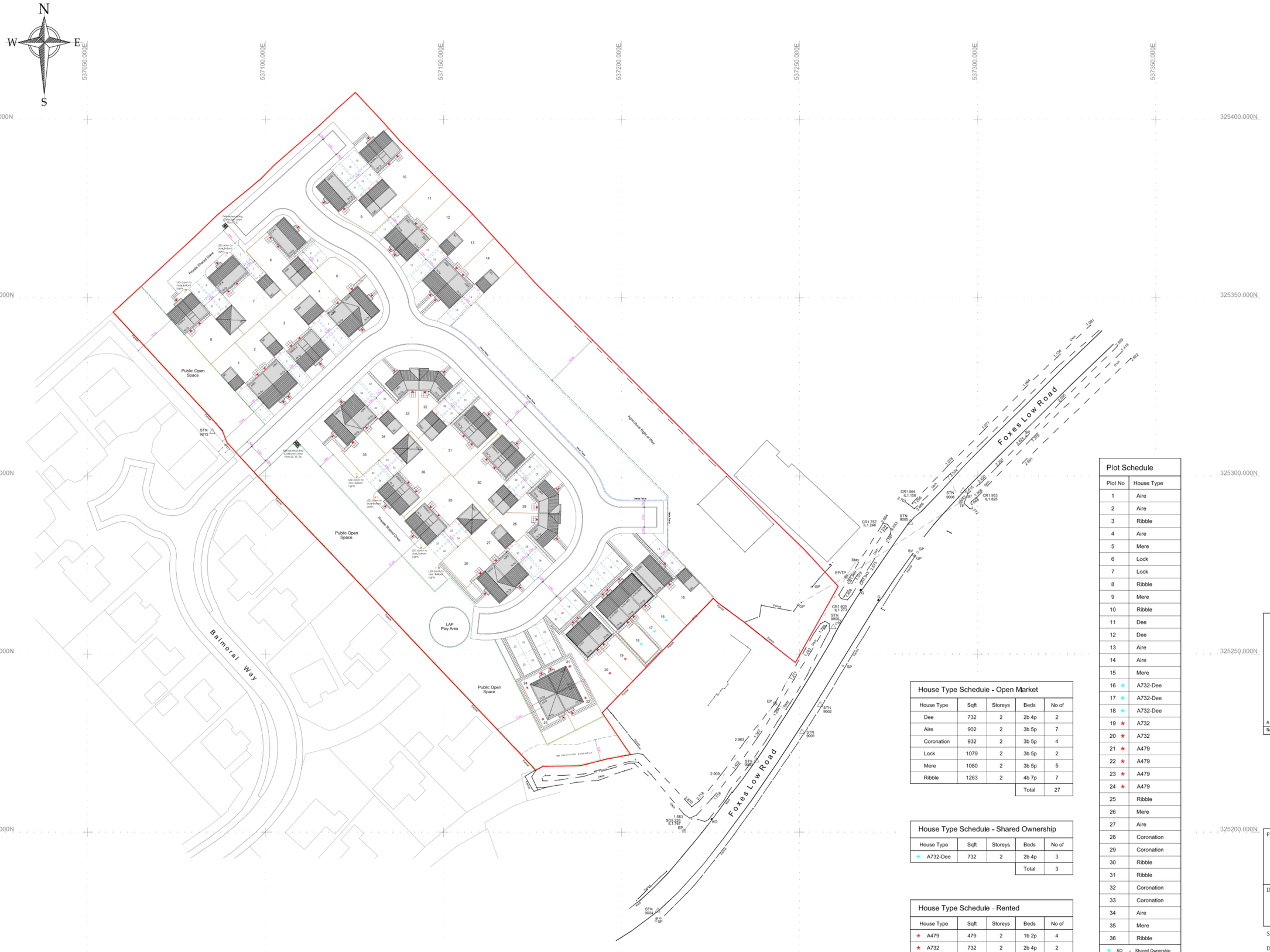
Project No.	D35051	Title	Site Location Plan	Drawn	DJH
Client	Ashley King (Developments) Ltd			Checked	RS
Project	Balmoral Way Holbeach	Date Drawn	23/07/2015	Approved	RS
		Scale	NTS	Figure No. D35051/01	
		Revision			

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APPENDIX II

Proposed Site Layout & Planning Permission



Plot Schedule	
Plot No	House Type
1	Aire
2	Aire
3	Ribble
4	Aire
5	Mere
6	Lock
7	Lock
8	Ribble
9	Mere
10	Ribble
11	Dee
12	Dee
13	Aire
14	Aire
15	Mere
16 ☆	A732-Dee
17 ☆	A732-Dee
18 ☆	A732-Dee
19 ★	A732
20 ★	A732
21 ★	A479
22 ★	A479
23 ★	A479
24 ★	A479
25	Ribble
26	Mere
27	Aire
28	Coronation
29	Coronation
30	Ribble
31	Ribble
32	Coronation
33	Coronation
34	Aire
35	Mere
36	Ribble
☆ SO - Shared Ownership	
★ R - Rented	

House Type Schedule - Open Market

House Type	Sqft	Storeys	Beds	No of
Dee	732	2	2b 4p	2
Aire	902	2	3b 5p	7
Coronation	932	2	3b 5p	4
Lock	1079	2	3b 5p	2
Mere	1080	2	3b 5p	5
Ribble	1283	2	4b 7p	7
			Total	27

House Type Schedule - Shared Ownership

House Type	Sqft	Storeys	Beds	No of
☆ A732-Dee	732	2	2b 4p	3
			Total	3

House Type Schedule - Rented

House Type	Sqft	Storeys	Beds	No of
★ A479	479	2	1b 2p	4
★ A732	732	2	2b 4p	2
			Total	6

Rev.	Date	Description
A	03.07.2019	Single garage added to plots 1, 2, 13, 14, 27 and 34.

ASHWOOD HOMES
1 Goodison Road, Lincs Gateway Business Park,
Spalding, Lincs, PE12 6FY **T: 01406 490590**

PROJECT:
Proposed Residential Development at Balmoral Way, Holbeach

DRAWING:
Site Layout

SCALE: 1:500@A1 DRAWN: MII

DATE: JUNE.2019 REVISION: A

DRAWING No: 72-SL-01

Council Offices
Priory Road
Spalding
Lincolnshire
PE11 2XE
Admin 01775 764723
DC Officers 01775 764703
facsimile 01775 762937
planningadvice@sholland.gov.uk
www.sholland.gov.uk

Ashley King Developments
1 Goodison Road
Lincs Gateway Business Park
Spalding
PE12 6FY

TOWN AND COUNTRY PLANNING ACT 1990

SECTION 73 MODIFICATION

Reference: H09-0706-19 **Date of Decision:** 21st November 2019

Applicant: Ashley King Developments
1 Goodison Road
Lincs Gateway Business Park
Spalding
Lincs
PE12 6FY

Location: Land Off Balmoral Way Holbeach Spalding

Description: Proposed residential development comprising 36 dwellings - approved under H09-0288-15. Modification of Condition 2 to allow amendments to previously approved plans.

South Holland District Council hereby give notice that this application has been GRANTED (or equivalent) subject to the following condition(s):

1 The development must be begun no later than 20 February 2021.

Reason: As required by Section 91 of the Town and Country Planning Act 1990 as amended by the Planning and Compulsory Purchase Act 2004.

2 The development hereby permitted shall be carried out in accordance with the following approved plans:

Under the present application

72-SL-01A
RIBB-V-DS-01

Under H09-0288-15

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203.Aff-1B2P-02R.P.01
203.Aff-2B4P-01.P.01
203.Aff-3B5P-01.P.01
203.DDG.P.01
203.K2S2B01-B.P.01
203.K2S3B01-B.P.01
203.K2S3B02-B.P.01
203.K2S3B04-B.P.01
203.LP.01
Approved Flood Risk Assessment (prepared by Geoff Beel Consultancy, dated January 2015)

Reason: For the avoidance of doubt and in the interests of proper planning

3 Before the commencement of the development hereby permitted beyond oversite a schedule of external materials of construction of buildings and hard surfaced areas shall be submitted to and approved in writing by the Local Planning Authority. The development shall be constructed in accordance with the materials so approved.

Reason: To ensure that the Local Planning Authority retains control over the external materials of construction of the development in the interests of the character and appearance of the development and the visual amenity of the area in which it is set.
This Condition is imposed in accordance with Policies 2 and 3 of the South East Lincolnshire Local Plan, 2019.

4 The development hereby permitted shall not be commenced until a scheme to deal with any contamination of land or pollution of controlled waters has been submitted to and approved in writing by the Local Planning Authority (LPA) and until the measures approved in that scheme have been implemented. The scheme shall include all of the following measures:

i) a desk-top study carried out to identify and evaluate all potential sources of contamination and the impacts on land and/or controlled waters, relevant to the site. The desk-top study shall establish a 'conceptual site model' and identify all plausible pollutant linkages. Furthermore, the assessment shall set objectives for intrusive site investigation works/Quantitative Risk Assessment (or state if none required). Two full copies of the desk- top study and a non-technical summary shall be submitted to the LPA without delay upon completion.
ii) if identified as being required following the completion of the desk-top study, a site investigation shall be carried out to fully and effectively characterise the nature and extent of any land contamination and/or pollution of controlled waters. It shall specifically include a risk assessment that adopts the Source-Pathway-Receptor principle, in order that any potential risks are adequately assessed taking into account the sites existing status and proposed new use. Two full copies of the site investigation and findings shall be forwarded to the LPA without delay upon completion.
iii) thereafter, a written method statement detailing the remediation requirements for land contamination and/or pollution of controlled waters affecting the site shall be submitted to and approved in writing by the LPA, and all requirements shall be implemented and completed to the satisfaction of the LPA. No deviation shall be made from this scheme. If during redevelopment contamination not previously considered is identified, then the LPA

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shall be notified immediately and no further work shall be carried out until a method statement detailing a scheme for dealing with the suspect contamination has been submitted to and agreed in writing by the LPA.
iv) two full copies of a full closure report shall be submitted to and approved in writing by the LPA. The report shall provide verification that the required works regarding contamination have been carried out in accordance with the approved Method Statement(s). Post-remediation sampling and monitoring results shall be included in the closure report to demonstrate that the required remediation has been fully met.

Note
The applicant is advised that the phased risk assessment required by the Contaminated Land Scheme Condition should be carried out in accordance with the procedural guidance of the Environmental Protection Act 1990 Part 11A.
The applicant's attention is also drawn to the document entitled "Developing Land Within Lincolnshire - A guide to submitting planning applications to develop land that may be contaminated", which can be obtained through the Local Environmental Health Department.

Reason: To assess whether the site is polluted and to address any pollution to ensure a satisfactory development. This issue is integral to the development and therefore full details need to be finalised prior to the commencement of works.
This Condition is imposed in accordance with Policy 30 of the South East Lincolnshire Local Plan, 2019.

5 The development hereby permitted shall be carried out in accordance with the measures set out in the approved Flood Risk Assessment (prepared by Geoff Beel Consultancy, dated January 2015) forming part of planning application ref. H09-0288-15, and in particular the following mitigation measures:

- Finished floor levels shall be set no lower than 3.6m AOD;
- All dwellings shall be a minimum of two storeys;
- Flood resilient construction shall be incorporated throughout the development.

The mitigation measures shall be fully implemented prior to occupation and subsequently in accordance with the timing/phasing arrangements embodied within the scheme, or within any other period as may be agreed in writing by the local planning authority.

Reason: To ensure that the development does not increase the risk of flooding or be at risk of flooding.
This Condition is imposed in accordance with Policies 3 and 4 of the South East Lincolnshire Local Plan, 2019 and national guidance contained in Section 14 of the National Planning Policy Framework, 2019.

6 Before the commencement of the development hereby permitted, full details of the existing and proposed site levels and proposed floor levels of the buildings and hard surfaced areas shall be submitted to and approved in writing by the Local Planning Authority. The development shall be constructed in accordance with the details so approved.

Reason: To reduce the risk of flooding of the development. This issue is integral to the

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development and therefore full details need to be finalised prior to the commencement of works.
This Condition is imposed in accordance with Policy 4 of the South East Lincolnshire Local Plan, 2019 and national guidance contained in Section 14 of the National Planning Policy Framework, 2019.

7 Before the commencement of the development hereby granted beyond oversite, full details of the proposed means of foul and surface water disposal to separate systems shall be submitted to and approved in writing by the Local Planning Authority and the details so approved shall be implemented in full before there are any flows into the receiving systems.

Reason: To ensure that the site is adequately drained, to avoid pollution, and to prevent increased risk of flooding.
This Condition is imposed in accordance with Policies 2, 3 and 30 of the South East Lincolnshire Local Plan, 2019 and national guidance contained in Section 14 of the National Planning Policy Framework, 2019.

8 Before the development is commenced beyond oversite, full details of the proposed soakaway system for the disposal of surface water from the development hereby permitted, including percolation test results, shall be submitted to and approved in writing by the Local Planning Authority. Should the percolation test results be considered unacceptable by the Local Planning Authority details of an alternative means of providing for surface water drainage shall be submitted for consideration. The approved means of surface water drainage shall be implemented in full before the development hereby permitted is first brought into use.

Reason: To ensure that the site is adequately drained, to avoid pollution, and to prevent increased risk of flooding.
This Condition is imposed in accordance with Policies 2, 3 and 30 of the South East Lincolnshire Local Plan, 2019 and national guidance contained in Section 14 of the National Planning Policy Framework, 2019.

9 Before the commencement of the development hereby permitted beyond oversite, the approval of the Local Planning Authority is required to a scheme of landscaping and tree planting for the site indicating, inter alia, the number, species, heights on planting and positions of all the trees, together with details of post-planting maintenance. Such scheme as is approved by the Local Planning Authority shall be carried out and completed in its entirety during the first planting season following practical completion of the development. All trees, shrubs and bushes shall be maintained by the owner or owners of the land on which they are situated for the period of five years beginning with the date of completion of the scheme and during that period all losses shall be made good as and when necessary.

Note: The applicant is recommended to employ a qualified and experienced landscape designer to produce a landscaping scheme for the development.

Reason: To ensure that the development is adequately landscaped, in the interests of its visual amenity and that of the area in which it is set.
This Condition is imposed in accordance with Policies 2 and 3 of the South East

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Lincolnshire Local Plan, 2019.

10 Prior to its installation, details of the proposed boundary treatment, including a schedule of materials, and details of the size and species of any hedging, shall be submitted to and approved in writing by the Local Planning Authority, and the details so approved shall be implemented in full before the development is first brought into use.

Reason: In the interests of the character and appearance of the development and the visual amenity of the area in which it is set.
This Condition is imposed in accordance with Policies 2 and 3 of the South East Lincolnshire Local Plan, 2019.

11 An equipped children's play area shall be provided within the site. The timing of the implementation, location, detailed design, layout, specification of the equipment, and the management and maintenance regime of the play area shall be submitted to and approved in writing by the Local Planning Authority. The play area shall be provided in accordance with the details so approved, and thereafter so maintained.

Reason: To ensure that adequate play provision is made for the occupiers of the development hereby permitted and that the facility is adequately managed and maintained.
This Condition is imposed in accordance with Policy 32 of the South East Lincolnshire Local Plan, 2019.

12 All areas of publicly accessible open space shown on the approved plans shall be laid out and made available for use prior to the occupation of the 18th dwelling, and shall thereafter be so maintained.

Reason: To ensure that adequate open space provision is made available for the occupiers of the development hereby permitted and that provision is made for the management and maintenance of the open space.
This Condition is imposed in accordance with Policy 32 of the South East Lincolnshire Local Plan, 2019.

13 A management plan for the areas of publicly accessible open space and any outdoor play areas, including management responsibilities and maintenance schedules, shall be submitted to and approved in writing by the Local Planning Authority prior to the commencement of the development hereby permitted beyond oversite. The management of these areas shall be carried out in accordance with the details so approved.

Reason: To ensure that adequate open space provision is made available for the occupiers of the development hereby permitted and that provision is made for the management and maintenance of the open space.
This Condition is imposed in accordance with Policy 32 of the South East Lincolnshire Local Plan, 2019.

14 Before each dwelling is occupied, the roads and footways providing access to that dwelling, for the whole of its frontage, from the existing public highway, shall be constructed to a specification to enable them to be adopted as highways maintainable at the public expense, less the carriageway and footway surface courses. The carriageway and footway surface courses shall be completed within three months from the date upon

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which the erection is commenced of the penultimate dwelling.

Reason: To ensure safe and adequate access to the site and to each dwelling.
This Condition is imposed in accordance with Policies 2 and 3 of the South East Lincolnshire Local Plan, 2019.

15 Prior to commencement of development on site details of construction management shall be submitted to and approved in writing by the Local Planning Authority, the details to include:

- parking for all vehicles associated with construction including employees cars;
- access for all construction traffic (to be via Foxes Low Road);
- hours of working;
- measures to control dust, noise, vibration and smoke;
- measures to prevent mud and debris entering the public highways by construction traffic including wheel washing facilities.

Construction shall be carried out only in strict accordance with the approved details and access for construction related vehicles shall only be via Foxes Low Road.

Reason: In the interests of the amenity of local residents during the construction process.
This Condition is imposed in accordance with Policies 2 and 3 of the South East Lincolnshire Local Plan, 2019.

16 Details of the design and positions of all external boxes for gas and electricity supplies and of any gas flues and soil vent pipes shall be submitted to and approved in writing by the Local Planning Authority prior to their installation and there shall be no variation from the details so approved.

Reason: To ensure that the Local Planning Authority retains control over these details of the development in the interests of the character and appearance of the development and the visual amenity of the area in which it is set.
This Condition is imposed in accordance with Policies 2 and 3 of the South East Lincolnshire Local Plan, 2019.

Notes:

The Local Planning Authority has acted positively and proactively in determining this application by assessing it against all material considerations, including national guidance, planning policies and representations that have been received during the public consultation exercise, and subsequently determining to grant planning permission.

This decision notice, the relevant accompanying report and the determined plans can be viewed online at http://planning.sholland.gov.uk/OcellaWeb/planningSearch

The permitted development requires the formation of a new/amended vehicular access. Applicants should note the provisions of Section 184 of the Highways Act 1980. The works should be constructed to the satisfaction of the Highway Authority in accordance with the Authority's specification that is current at the time of construction. For further

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information, please telephone 01522 782070 or e-mail developmentmanagement@lincolnshire.gov.uk.

This planning permission is subject to an Agreement under Section 106 of the Town & Country Planning Act 1990 dated 19 February 2018 and Deed of Variation dated 18 November 2019 and can only be implemented as a consequence of meeting the provisions of that Agreement

Future occupants are strongly advised to register with the Environment Agency's free Floodline Warnings Direct Service



Phil Norman
Planning and Building Control Manager
South Holland District Council

BUILDING REGULATIONS:
This decision refers only to planning permission as granted under the Town and Country Planning Act 1990. The works that you are proposing may also require Building Regulations and this planning permission does not give authority under Building Regulations to commence work. Please contact the Building Control section for further information on 01775 764557 or bcadmin@sholland.gov.uk

RIGHTS OF APPEAL

Appeals to the Secretary of State

If you are aggrieved by the decision of your Local Planning Authority to refuse permission for the proposed development or grant consent subject to conditions, then you can appeal to the Secretary of State under Section 78 of the Town and Country Planning Act 1990 or Section 20 of the Planning (Listed Building and Conservation Areas) Act 1990.

Timescales for appealing

The deadlines for appeals are calculated from the **date of decision** and are as follows for the types of applications below:

12 Weeks	6 Months	8 Weeks
Householder Applications	Planning Permission	Consent to Display Adverts
Minor Commercial Development	Listed Building Consent	
Agricultural Determinations	Other Prior Approval Applications	
Householder Prior Approval Applications		

If you intend to submit an appeal that you would like examined by inquiry then you must notify the Local Planning Authority and Planning Inspectorate (inquiryappeals@planning inspectorate.gov.uk) at least 10 days before submitting the appeal. Further details are on GOV.UK.

Enforcement Notices

If an enforcement notice was served prior to the planning application being determined then the deadline for appealing is 28 days from the date of the **planning refusal**.

If an enforcement notice is served after the planning application is determined then the deadline for appealing is 28 days from the date of the **enforcement notice** OR **the timescales stated above for each application type** from the date of the planning refusal - whichever is sooner.

Appeals can be made online at: https://www.gov.uk/planning-inspectorate. If you are unable to access the online appeal form, please contact the Planning Inspectorate to obtain a paper copy of the appeal form on tel: 0303 444 5000.

The Secretary of State can allow a longer period for giving notice of an appeal but will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.

The Secretary of State need not consider an appeal if it seems to the Secretary of State that the

Local Planning Authority could not have granted planning permission for the proposed development or could not have granted it without the conditions they imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under the order.

Purchase Notices

If either the Local Planning Authority or the Secretary of State refuses permission to develop land or grant it subject to conditions the owner may claim that he can neither put the land to a reasonably beneficial use in its existing state nor can he render the land capable of a reasonably beneficial use by the carrying out of any development which has been or would be permitted.

In these circumstances the owner may serve a purchase notice on the Council in whose area the land is situated. This notice will require the Council to purchase his interest in the land in accordance with the provisions of the Part VI of the Town and Country Planning Act 1990 or Section 32 of the Planning (Listed Building and Conservation Areas) Act 1990.

Compensation

In certain circumstances compensation may be claimed from the Local Planning Authority if permission is refused or granted subject to conditions by the Secretary of State on appeal or on reference of the application to him.

These circumstances are set out in Section 114 and related provisions of the Town and Country Planning Act 1990 and Section 27 of the Planning (Listed Building and Conservation Areas) Act 1990.

GeoDyne

APPENDIX III

Harlor Inspection Certificates

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: [illegible] Wam	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/commercial/other) RESI
Date: 26/11/2020	Building description: 3 BED SEMI (1&2)
Visit by:	Foundation type: (suspended floor/[illegible]) SUSPENDED
Weather at time of inspection: FOG	Gas protection type: passive/~~active~~ PASSIVE.

No.	Item	Comments (see notes)
1	**Gas membrane**	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	VAPORFOIL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CLOSER DOUBLE SIDED JOINTING TAPE
1.5	Lapping design	MIN 150 OVERLAP, JOINTING TAPE & 300 MM GIRTH TAPE
1.6	Laps, welds and joints seals	AS ABOVE
1.7	Service entries seals	TOPMATS WITH TAPE
2	**Passive venting**	
2.1	Sub-floor void	MIN 150 CLEAR VOID.
2.2	External wall airbricks	REFER TO DRAWINGS.
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICK & TELESCOPIC VENTS.
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

The gas protection measures inspected:	a Are acceptable and comply with the specification ✓
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. CROWSON Signature: Date: 21/11/2020

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: FAGMORAL WAY	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked (residential/commercial/other) RESIDENTIAL
Date: 25/01/2020	Building description: PLOT 3.
Visit by:	Foundation type: (suspended floor/~~slab-on-floor~~
Weather at time of inspection: FOG	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	MEMBRANE 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE
1.5	Lapping design	150 OVERLAP, JOINTING TAPE & 100MM CLOTH TAPE.
1.6	Laps, welds and joints seals	JOINTING TAPE AS ABOVE
1.7	Service entries seals	VISQUEEN TOP HAT UNITS
2	***Passive venting***	
2.1	Sub-floor void	MIN 150 MM CLEAR VENTILATED VOID
2.2	External wall airbricks	AS DRAWING.
2.3	Internal sleeper walls	" "
2.4	External vent trenches/ducts	MANTHORPE AIRBRICK AND TELESCOPIC VENTS.
3	***Active venting***	
3.1	System details	/

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 mised 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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. CROWSON **Signature:**  **Date:** 25/11/20

Harlor

Harlor Civils Ltd
Groundworks & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL MAIN	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/ commercial/other) RESI
Date: 6/2/2020	Building description: PLOTS 4&5.
Visit by:	Foundation type: (suspended floor/~~ground bearing~~)
Weather at time of inspection: CLEAR	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LINOFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE
1.5	Lapping design	150 OVERLAP, JOINTING TAPE & 100MM GIRTH TAPE.
1.6	Laps, welds and joints seals	JOINTING TAPE AS ABOVE.
1.7	Service entries seals	TOP HAT UNITS
2	***Passive venting***	
2.1	Sub-floor void	MIN 150 VOID AS PER DESIGN.
2.2	External wall airbricks	AS PER DRAWING
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	AIR BRICK AND TELESCOPIC VENTS
3	***Active venting***	
3.1	System details	/

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

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. CROWSON Signature: Date: 6/12/20

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL WAY	**Gas characteristic situation:** CS2
Job number:	**Type of development and building/block checked (residential/ commercial/other)** RESI
Date: 2/3/2020	**Building description:** Plot 6
Visit by:	**Foundation type: (suspended floor/** ~~slab-on-ground~~
Weather at time of inspection: Clear.	**Gas protection type: passive/** ~~active~~

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	Good
1.2	Gas membrane type	LIGNOFOL 500
1.3	Gas membrane condition	Good
1.4	Joining tape product	CORDEK.
1.5	Lapping design	150 MM OVERLAP, JOINTING TAPED FROM WITH TAPE
1.6	Laps, welds and joints seals	JOINTING TAPE AS ABOVE.
1.7	Service entries seals	TOPHAT UNITS
2	***Passive venting***	
2.1	Sub-floor void	MIN 150MM CLEAR & VENTILATED VOID
2.2	External wall airbricks	AS DRAWING
2.3	Internal sleeper walls	" "
2.4	External vent trenches/ducts	AIR BRICKS & TELESCOPIC VENTS MANTICRÉ
3	***Active venting***	
3.1	System details	/
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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. Clewson **Signature:** [signature] **Date:** 2/3/2020

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: Balmoral Wood	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/ commercial/other) RESI
Date: 2/3/2020	Building description: PLOT 7
Visit by:	Foundation type: (suspended floor/~~slab/basement~~)
Weather at time of inspection: CLOUDY.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	~~150MM OVERLAP~~ CORTEK
1.5	Lapping design	150MM OVERLAP AS DATA SHEET.
1.6	Laps, welds and joints seals	DOUBLE SIDED TAPE & 100 MM CURTH TAPE.
1.7	Service entries seals	TOP HATS
2 Passive venting		
2.1	Sub-floor void	MIN 150 MM VENTILATED VOID REFER TO DESIGN DWG'S
2.2	External wall airbricks	TO DRAWING
2.3	Internal sleeper walls	" "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICKS & TELESCOPIC VENTS.
3 Active venting		
3.1	System details	/

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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Adam Wilkinson **Signature:** A Wilkinson **Date:** 2/3/2020

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BASINGHALL WALK	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/ commercial/other) RES1
Date: 2/3/2020	Building description: PLOT 8
Visit by:	Foundation type: (suspended floor/~~slab/basement~~)
Weather at time of inspection: CLOUDY.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOPOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED.
1.5	Lapping design	150 OVERLAP W/ JOINTING TAPE & 100 MM WIDTH TAPE.
1.6	Laps, welds and joints seals	SEE ABOVE.
1.7	Service entries seals	VISQUEEN TOP MAT UNITS
2	***Passive venting***	
2.1	Sub-floor void	MINIMUM 150 MM CLEAR VOID.
2.2	External wall airbricks	AS INDICATED ON DRAWINGS.
2.3	Internal sleeper walls	" " " "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICK & TELESCOPIC VENTS.
3	***Active venting***	
3.1	System details	/
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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: ADAM WILKINSON **Signature:** A Wilkinson **Date:** 2/3/2020.

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL, WARM	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/ commercial/other) RESI
Date: 9/3/2020	Building description: PLOT 9
Visit by:	Foundation type: (suspended floor/~~slab/other~~)
Weather at time of inspection: OVERCAST.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIQUIFOIL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED TAPE
1.5	Lapping design	150 MM OVERLAP, JOINTING TAPE, 100MM GIRTH TAPE, AS MANUF. DETAILS
1.6	Laps, welds and joints seals	AS ABOVE, JOINTING TAPE & GIRTH TAPE.
1.7	Service entries seals	VISQUEEN TOP HAT UNITS
2 Passive venting		
2.1	Sub-floor void	MIN 150 SUBFLOOR VOID.
2.2	External wall airbricks	TO DRAWINGS.
2.3	Internal sleeper walls	" "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICKS & TELESCOPIC VENTILATORS.
3 Active venting		
3.1	System details	/
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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Adam Wilkinson **Signature:** A Wilkinson **Date:** 9/3/2020

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Consultancy, Design & Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site **name:** BALMORAL WAY	Gas **characteristic** situation: CS2
Job **number:**	Type of **development and** building/block checked: (residential/ **commercial/other)** RESI
Date: 24/4/2020.	Building description: PLOT 10
Visit by:	Foundation **type:** (suspended floor/~~slab/other~~)
Weather at time of inspection: SUNNY.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIQUIFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	DOUBLE SIDED JOINTING TAPE (CORDEK)
1.5	Lapping design	150 LAP, DOUBLE SIDED JOINTING TAPE & 100 MM CAPPING TAPE.
1.6	Laps, welds and joints seals	AS ABOVE & DATA SHEET
1.7	Service entries seals	VISQUEEN TOP HAT UNITS
2	***Passive venting***	
2.1	Sub-floor void	150mm MINIMUM SUBFLOOR VOID. CLEAR & VENTED.
2.2	External wall airbricks	AS DESIGN DRAWINGS.
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICK & TELESCOPIC VENTS.
3	***Active venting***	
3.1	System details	/
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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. CRAWSON Signature: Date: 24.9.2020

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BRIMCRAL WAY	Gas characteristic situation: CS2
Job number:	Type of development **and** building/block checked: (residential/ **commercial/other)** RESI
Date: 22/4/2026.	Building description: Plot 11 & 12.
Visit by:	Foundation **type:** (suspended floor/~~oversite~~)
Weather at time of inspection: SUNNY.	Gas protection **type:** passive/~~active~~

No.	Item	Comments (see notes)
1	**Gas membrane**	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE
1.5	Lapping design	150 LAP, JOINTING TAPE, & 100mm CIRITH TAPE.
1.6	Laps, welds and joints seals	AS ABOVE.
1.7	Service entries seals	TOP HAT UNITS WITH TAPE
2	**Passive venting**	
2.1	Sub-floor void	VENTILATED VOID, MIN 150 MM & CLEAR OF OBSTRUCTION.
2.2	External wall airbricks	REFER TO DRAWINGS.
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	AIRBRICK & TELESCOPIC VENT BY MANTHORPE.
3	**Active venting**	
3.1	System details	/
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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. Crewson Signature: [redacted] Date: 22.4.2020

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL WAY	**Gas characteristic situation:** CS2
Job number:	**Type of development and** building/block **checked (residential/ commercial/other)** RESI.
Date: 7/4/2020.	**Building description:** PLOT 13 & 14
Visit by:	**Foundation type:** (suspended floor/~~slab/other~~)
Weather at time of inspection: SUNNY.	**Gas protection type: passive/~~active~~**

No.	Item	Comments (see notes)
1	*Gas membrane*	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE.
1.5	Lapping design	150 MM OVERLAP, JOINTING TAPE & 100MM GIRTH TAPE.
1.6	Laps, welds and joints seals	JOINTING TAPE, DOUBLE SIDED & GIRTH TAPE.
1.7	Service entries seals	TOP HAT UNITS WITH TAPE
2	*Passive venting*	
2.1	Sub-floor void	MIN 150 MM VENTILATED VOID.
2.2	External wall airbricks	AS DRAWINGS.
2.3	Internal sleeper walls	N/A
2.4	External vent trenches/ducts	AIR BRICK & TELESCOPIC VENTS MANTHORPE
3	*Active venting*	
3.1	System details	/

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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. Crawson **Signature:** [signature] **Date:** 7/9/20

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL WALK	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/ commercial/other) RESI
Date: 15/7/2020	Building description: PLOT 15
Visit by:	Foundation type: (suspended floor/raft/other)
Weather at time of inspection: CLOUDY.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE
1.5	Lapping design	150MM OVERLAP, JOINTING TAPE & 100MM AIRTIGHT TAPE.
1.6	Laps, welds and joints seals	AS ABOVE.
1.7	Service entries seals	TOP HAT UNITS BY VISQUEEN.
2 Passive venting		
2.1	Sub-floor void	MIN 150 MM CLEAR & VENTILATED VOID.
2.2	External wall airbricks	INSTALLED AS SHOWN ON DRAWING.
2.3	Internal sleeper walls	" " " " "
2.4	External vent trenches/ducts	AIR BRICKS & TELESCOPIC VENTS BY MANTHORPE.
3 Active venting		
3.1	System details	—
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

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Adam Wilkinson **Signature:** A.Wilkinson **Date:** 15/7/20

Harlor

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Geoenvironmental & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BARNHAM WORKS	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/commercial/other) RES 1
Date: 15/7/2020.	Building description: PLOT 16 - 18
Visit by:	Foundation type: (suspended floor/raft/other)
Weather at time of inspection: CLOUDY.	Gas protection type: passive/active

No.	Item	Comments (see notes)
1	**Gas membrane**	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	MEMBRANE 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE
1.5	Lapping design	150 MM LAP, W/ DOUBLE SIDED TAPE & 100 MM CLOTH TAPE.
1.6	Laps, welds and joints seals	AS ABOVE & MANUFACTURERS SPEC.
1.7	Service entries seals	TOP HATS BY VISQUEEN
2	**Passive venting**	
2.1	Sub-floor void	MIN. 150 MM VOID, CLEAR & VENTILATED AS DRAWINGS.
2.2	External wall airbricks	AS PER DESIGN.
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	AIR BRICKS & TELESCOPIC VENTS BY MANTHORPE.
3	**Active venting**	
3.1	System details	/

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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Adam Wilkinson **Signature:** AWilkinson **Date:** 15/7/20

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL WAY	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked (residential/ commercial/other) RESI
Date: 22/7/2020	Building description: PLOT 19 & 20
Visit by:	Foundation type: (suspended floor/~~raft/other~~)
Weather at time of inspection: SUNNY.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1	**Gas membrane**	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE
1.5	Lapping design	ISO LAP, JOINTING TAPE & 100 MM GIRTH TAPE
1.6	Laps, welds and joints seals	AS MANUF. DETAILS.
1.7	Service entries seals	TOP HAT UNITS.
2	**Passive venting**	
2.1	Sub-floor void	MINIMUM 150MM VOID, CLEAR & VENTILATED.
2.2	External wall airbricks	REFER TO DRAWINGS.
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	AIRBRICK & TELESCOPIC VENTS BY MANTHORPE.
3	**Active venting**	
3.1	System details	/
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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T Crowson Signature: Date: 22/7/20

Harlor

Harlor Consulting Ltd
Contaminated Land & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL WAY	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/ commercial/other) RESI
Date: 3/8/2020.	Building description: PLOT 21-24
Visit by:	Foundation type: (suspended floor/~~ground bearing~~)
Weather at time of inspection: CLOUDY.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	DOUBLE SIDED TAPE FROM CORDEK
1.5	Lapping design	150 OVERLAP / DBL SIDED JOINTING TAPE & 100mm GIRTH STRIP.
1.6	Laps, welds and joints seals	AS ABOVE & MANUF. DETAILS
1.7	Service entries seals	TOP HAT UNITS
2 Passive venting		
2.1	Sub-floor void	MIN. 150 CLEAR & VENTILATED VOID.
2.2	External wall airbricks	INSTALLED TO DRAWING.
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	AIR BRICK & TELESCOPIC VENTS MANTHORPE.
3 Active venting		
3.1	System details	/

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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. CRUMSON **Signature:** [signature] **Date:** 3/8/20

Harlor

Harlor Civils Ltd
Groundworks & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: Bowmead Way	**Gas characteristic situation:** CS2
Job number:	Type of development and building/block **checked: (residential/** commercial/other) RESI
Date: 18/3/2020.	**Building description:** PLOT 25
Visit by:	**Foundation type:** (suspended floor/~~raft/other~~)
Weather at time of inspection: DRIZZLE.	**Gas protection type: passive/~~active~~**

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	GAS
1.3	Gas membrane condition	LIGNOFOL 500
1.4	Joining tape product	DOUBLE SIDED JOINTING TAPE CORDEK
1.5	Lapping design	150 LAP/ JOINTING TAPE & 100MM WIDTH TAPE
1.6	Laps, welds and joints seals	AS PER MANUF DETAILS.
1.7	Service entries seals	VISQUEEN TOP HATS.
2	***Passive venting***	
2.1	Sub-floor void	MIN. 150MM VENTILATED VOID CLEAR OF OBSTRUCTIONS.
2.2	External wall airbricks	REFER TO DRAWING!
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICKS W/ TELESCOPIC VENT.
3	***Active venting***	
3.1	System details	/
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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Adam Wilkinson Signature: Date: 18/3/2020

Harlor

Harlor Limited
Geoenvironmental & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BATHGATE WORKS	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked (residential/ commercial/other) RESI
Date: 25/7/2020.	Building description: PLOT 26&27
Visit by:	Foundation type: (suspended floor/~~wall/raft~~)
Weather at time of inspection: BROKEN CLOUD.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1	**Gas membrane**	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500.
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINING TAPE
1.5	Lapping design	150MM LAP, JOINTING TAPE / 100MM CIRTH TAPE.
1.6	Laps, welds and joints seals	DOUBLE SIDED JOINTING TAPE & 100MM CIRTH TAPE AS DATA SHEET.
1.7	Service entries seals	VISQUEEN TOP HAT UNITT.
2	**Passive venting**	
2.1	Sub-floor void	MINIMUM 150 CLEAR & VENTILATED VOID AS PER DRAWINGS.
2.2	External wall airbricks	INSTALLED AS PER DRAWING!
2.3	Internal sleeper walls	" " " "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICK & TELESCOPIC VENTILATORS.
3	**Active venting**	
3.1	System details	/

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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Adam Wickerson **Signature:** **Date:** 25/7/2020

Harlor

Harlor Civils Ltd
Ground works & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BRIMHAM WAY	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/commercial/other) RES
Date: 25/6/2020.	Building description: PLOT 28 & 29.
Visit by:	Foundation type: (suspended floor/~~solid slab~~)
Weather at time of inspection: SUNNY.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1	**Gas membrane**	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	MEMBRANE 500.
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE.
1.5	Lapping design	150 MM LAP JOINTING TAPE & 100 MM LAP TAPE.
1.6	Laps, welds and joints seals	AS ABOVE -
1.7	Service entries seals	VISQUEEN TOP HAT UNITS.
2	**Passive venting**	
2.1	Sub-floor void	150MM MINIMUM VOID, CLEAR & VENTILATED.
2.2	External wall airbricks	AS SHOWN ON DRAWINGS.
2.3	Internal sleeper walls	" " " "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICK WITH TELESCOPIC VENTILATORS.
3	**Active venting**	
3.1	System details	/
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

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. Crowson **Signature:** **Date:** 25/6/2020

Harlor

Harlor Courts Ltd
Geoenvironmental & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL WAY.	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/commercial/other) RES
Date: 25/6/2020.	Building description: PLOT 30
Visit by:	Foundation type: (suspended floor/[illegible]
Weather at time of inspection: SUNNY.	Gas protection type: passive/[illegible]

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK. DOUBLE SIDED.
1.5	Lapping design	150 OVERLAP MIN. WITH DOUBLE SIDED JOINTING TAPE & 100MM GIRTH TAPE.
1.6	Laps, welds and joints seals	AS MANUF. DETAILS.
1.7	Service entries seals	VISQUEEN TOP HAT UNITS.
2 Passive venting		
2.1	Sub-floor void	MIN. 150 MM VOID, VENTILATED & CLEAR OF OBSTRUCTION/DEBRIS
2.2	External wall airbricks	REFER TO DRAWINGS
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICK AND TELESCOPIC VENTILLATORS.
3 Active venting		
3.1	System details	/
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/ain 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

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. CRONSON. **Signature:** [signature] **Date:** 25/6/2020

Harlor

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: PAKURANGA WAY	Gas characteristic situation: CS2
Job number:	Type of development and building/block checked: (residential/commercial/other) RESI
Date: 23/6/2020.	Building description: PLOT 31
Visit by:	Foundation type: (suspended floor/~~slab/other~~)
Weather at time of inspection: SUNNY.	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIQUIFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED TAPE
1.5	Lapping design	150MM OVERLAP, JOINTING TAPE & 100MM GIRTH TAPE
1.6	Laps, welds and joints seals	DOUBLE SIDED TAPE AS ABOVE & MANUFACTURERS DETAILS.
1.7	Service entries seals	TOP HATS VISQUEEN.
2 Passive venting		
2.1	Sub-floor void	MIN 150 MM VENTILATED VOID.
2.2	External wall airbricks	AS DRAWING.
2.3	Internal sleeper walls	" "
2.4	External vent trenches/ducts	MANTHORPE AIR BRICKS AND TELESCOPIC VENTILATORS
3 Active venting		
3.1	System details	/
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

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: ADAM WILKINSON Signature: A.Wilkinson Date: 23/6/2020

Harlor

Harlor Civils Ltd
Groundworks & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BRAMLEA WAY.	**Gas characteristic situation:** CS2.
Job number:	**Type of development** and building/**block checked: (residential/ commercial/other)** RESI
Date: 3/13/2020.	**Building description:** PLOT 32 & 33
Visit by:	**Foundation type:** (suspended floor/raft/other) BEAM & BLOCK.
Weather at time of **inspection:** CLOUDS	**Gas protection type: passive**/~~active~~

No.	Item	Comments (see notes)
1	***Gas membrane***	
1.1	**Condition of sub-grade and underside of gas membrane**	GOOD
1.2	**Gas membrane type**	LIGNOFOL 500.
1.3	**Gas membrane condition**	GOOD
1.4	**Joining tape product**	CLADEK DOUBLE SIDED TAPE.
1.5	**Lapping design**	150 OVERLAP, JOINT TAPE & GIRTH TAPE.
1.6	**Laps, welds and joints seals**	SEE ABOVE.
1.7	**Service entries seals**	TOP HAT SEALS.
2	***Passive venting***	
2.1	**Sub-floor void**	150MM MINIMUM VOID, VENTILATED CLEAR OF DEBRIS.
2.2	**External wall airbricks**	AS DRAWING.
2.3	**Internal sleeper walls**	" "
2.4	**External vent trenches/ducts**	MANTHORPE AIR BRICKS & TELESCOPIC VENTILATORS.
3	***Active venting***	
3.1	**System details**	/
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

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: ADAM WILKINSON. **Signature:** A.Wilkinson **Date:** 31/3/20

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Harlor Civils Ltd
Consultancy & Civil Engineering

VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BALMORAL WAY.	**Gas characteristic situation:** CS2.
Job number:	**Type of** development and building/block checked: (residential/ **commercial/other)** RESI
Date: 12/2/2020	Building description: PLOT 34 & 35.
Visit by: CLOUGH.	Foundation **type: (suspended** floor/~~slab~~/~~piled~~)
Weather at time of inspection:	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1	**Gas membrane**	
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIGNOFOL 500.
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	CORDEK DOUBLE SIDED JOINTING TAPE.
1.5	Lapping design	MIN. 150 OVERLAP, JOINTING TAPE & 100mm GIRTH TAPE.
1.6	Laps, welds and joints seals	AS MANUF DETAILS.
1.7	Service entries seals	TOP HATS.
2	**Passive venting**	
2.1	Sub-floor void	MIN 150mm VOID, CLEAR OF DEBRIS & WELL VENTILATED TO DESIGN.
2.2	External wall airbricks	REFER TO DESIGN DRAWINGS.
2.3	Internal sleeper walls	" " " "
2.4	External vent trenches/ducts	MONITOR AIRBRICK & TERRESCOPE VENTILATORS.
3	**Active venting**	
3.1	System details	/
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

The gas protection measures inspected:	(a) Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: T. CROWSON. Signature: [signature] Date: 12/2/2020.

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VISUAL INSPECTION OF GAS PROTECTION MEASURES

Site name: BRAMBRAE WAY	Gas characteristic situation: CS2
Job number: —	Type of development and building/block checked: (residential/commercial/other) RESI
Date: 18/3/2020	Building description: PLOT 36
Visit by:	Foundation type: (suspended ~~beam/raft/other~~)
Weather at time of inspection: DRIZZLE	Gas protection type: passive/~~active~~

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition of sub-grade and underside of gas membrane	GOOD
1.2	Gas membrane type	LIQUAFOL 500
1.3	Gas membrane condition	GOOD
1.4	Joining tape product	DOUBLE SIDED JOINTING TAPE, CORDEK
1.5	Lapping design	150 LAP, JOINTING TAPE & 100MM GIRTH TAPE
1.6	Laps, welds and joints seals	AS PER MANUF. DETAILS.
1.7	Service entries seals	VISQUEEN TOP MATS
2 Passive venting		
2.1	Sub-floor void	MIN. 150MM VENTILATED VOID CLEAR OF OBSTRUCTIONS.
2.2	External wall airbricks	REFER TO DRAWINGS.
2.3	Internal sleeper walls	" " "
2.4	External vent trenches/ducts	MANTHORPE 112 BRICK W/ TELESCOPIC VENT.
3 Active venting		
3.1	System details	—

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 assured? 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

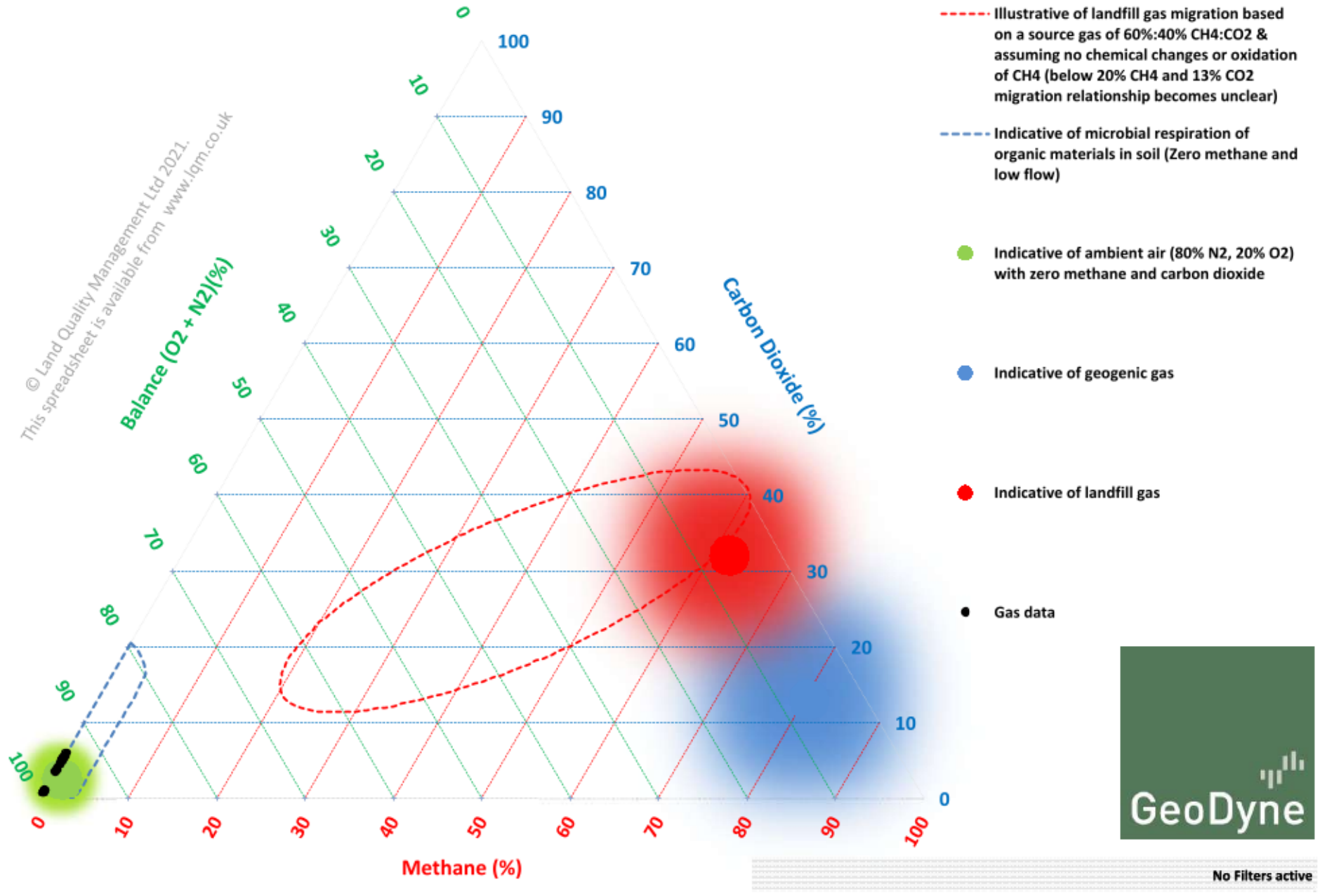
The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no. xxx
	c Are not acceptable due to the issues related to item no. xxx

Name: Adam Wilkinson **Signature:** **Date:** 18/3/2020

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APPENDIX IV

Ground Gas Ternary Plot



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This spreadsheet is available from www.lqm.co.uk

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APPENDIX V

Site Modelling

Client	Ashwood Homes/Ashley King (Developments) Ltd
Site	Balmoral Way, Holbeach
Our Ref	D35051
Date	18/02/2021
Gas Assessed	Carbon Dioxide

GeoDyne
Clarendon House
Clarendon Avenue
Clumber Park
Nottingham
NG5 1AH

Tel: 0115 9620001
Email: info@geodyne.co.uk

Landfill Gas Quantitative Risk Assessment

Maximum Carbon Dioxide Conc (C_{hg})	6	% v/v	Maximum concentration revealed by GeoDyne
Maximum Flow Rate (**q**)	0.1	l/hr	Maximum flow revealed by 0.0l/h (assume LOD 0.1)
Width of Building	5.5	m	Client Confirmed (email 18-02-2021)
Length of Building	9	m	Client Confirmed (email 18-02-2021)
Base Area	49.5	m^2	By Calculation
Height of Sub Floor Void (Max)	0.15	m	Client Confirmed (email 18-02-2021)
Volume of Void (**M**)	7.425	m^3	By Calculation
Carbon Dioxide Design Target Concentration in Building (C_T) (i.e. sub-floor void)	1.25	%	NHBC calculated limiting equilibrium for Green site
Gas Screening Value	**0.006**	l/hr	

Equation 1 - Calculate Hazardous Gas Emission Rate (Q_{hg}) Using $Q_{hg} = C_{hg}/100 \times (q/A_l)$

Q_{hg}	0.0006	$l/m^2/hr$	after Pecksen assumed area of monitoring point influence $10m^2$
Q_{hg}	0.0000006	$m^3/m^2/hr$	Convert l to m^3

Scenario 1 - Build Up of Gas to Carbon Dioxide Design Target Concentration (C_t)

Equation 2: $t = (MC_T)/(VC_{hg})$

Where

M = Room Volume (sub-floor void)	7.425	m^3
C_T = Design Target Conc	1.25	%
V = Flow Rate	0.000495	m^3/h
C_{hg} = Carbon Dioxide Concentration	6	%
Time **t**	3125.00	Hours
Time **t**	**130.21**	**Days**

This calculation is highly conservative as it assumes the building is sealed. In reality the carbon dioxide could not migrate into the building without existing atmosphere being displaced

Scenario 2 - Build Up of Gas Given Rate of Building Ventilation (V_q) of 1 Air Change/Month (via air bricks)

Equation 3: $V_q = C_{hg}V/C_{max}$

Ventilation Rate $V_{q\,(month)}$	7.43	m^3/month
Ventilation Rate $V_{q\,(day)}$	0.248	m^3/day
Ventilation Rate $V_{q\,(hour)}$	0.010	m^3/hour

Equation 4: $C_{max} = ((C_{hg} \times V)/V_q)$ [Rearrange to find C_{max}]

C_{max} = Maximum Attained Conc. in sub-floor void	0.288	%	SAFE

Scenario 3 - Build Up of Gas Given Rate of Building Ventilation (V_q) of 1 Air Change/Day (via air bricks)

Equation 3: $V_q = C_{hg}V/C_{max}$

Ventilation Rate $V_{q\,(day)}$	0.309	m^3/hour

Equation 4: $C_{max} = ((C_{hg} \times V)/V_q)$ [Rearrange to find C_{max}]

C_{max} = Maximum Attained Conc. in sub-floor void	0.00960	%	SAFE

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APPENDIX VI

Conditions and Limitations

Conditions & Limitations

Phase I Desk Studies

1. Works undertaken to provide the basis of the Phase I Desk Study report comprise a review of information available from a number of sources/parties (potentially also including the Client) together with a walk over of the site (where applicable and included within the quotation). The opinions given in the Phase I Desk Study are based on the information available from third parties/sources that has been obtained within the available timeframe. GeoDyne Limited assumes all third party information to be true and correct and therefore cannot accept liability for the accuracy of such information supplied.

2. Should additional information become available that may affect the comments and opinions made within the Phase I Desk Study, GeoDyne Limited reserves the right to review such information and make modifications to comments/opinions as appropriate.

3. It should be borne in mind that a Phase I Desk Study collates available information to generate a conceptual model of the site. The actual geotechnical and environmental considerations can only be fully quantified by intrusive investigation works to confirm the accuracy of the conceptual site model.

Phase II Intrusive Investigations

1. Our quotation assumes that access to the site will be arranged by others at no cost to ourselves.

2. We have assumed that free access is available throughout to the entire site and that works can be undertaken during a single mobilisation. Where restricted access is encountered, or where additional unscheduled mobilisations are required, additional costs may be incurred to the client.

3. We have assumed that all available information relating to buried services will be supplied by the Client at no cost to ourselves. No responsibility will be accepted for damage to underground services that have not been brought to our prior attention by the Client.

4. All excavations/boreholes will be backfilled with compacted arisings upon completion, with any excess arisings left proud of ground levels. Excess arisings will not be removed from the site unless specifically requested by the Client. Where we are requested to remove excess arisings, all associated costs will be passed to the Client.

5. We will attempt to leave the site in a clean and tidy state, however, it must be understood that some disturbance of the site is unavoidable during intrusive works.

6. Exploratory holes are positioned approximately on site by GeoDyne Limited. Should the client require precise locations of all exploratory points, additional fees will be incurred. It must be borne in mind that backfilled trial pits can create 'soft spots', therefore, should the Client wish to designate 'no dig' zones, for example under the footprint of proposed structures, these must be brought to our attention prior to commencement of works.

7. Groundwater observations relate to conditions encountered at the time of investigation. It must be understood that groundwater levels may vary as a result of recent climatic conditions or seasonal variation.

8. Trial pits and boreholes examine only a small proportion of the total site area. No liability can be accepted for conditions not revealed in exploratory holes, particularly between positions. All extrapolations of available data are given in good faith.

Payment

1 Payment terms are strictly 28 days from the invoice date.

2 Prior to commencement of works, we require receipt of formal written instruction from the party accepting full financial responsibility for the work. In the absence of such an instruction, we would expect the instructing Consulting Engineers/Architects to accept full financial responsibility for the works.

3 Receipt of instruction to commence work shall be taken as acceptance and compliance of the foregoing conditions.

Liability

1. GeoDyne Limited offer £5,000,000.00 Professional Indemnity Insurance (in aggregate over the year). This shall be the limit of our liability for works undertaken. No individual liability shall be implied to, or accepted by, any employee for works undertaken for and on the behalf of GeoDyne Limited.