G.R. MERCHANT LTD
Architectural & Planning Consultants

4 Wrights Mews • 12A Park Road • Holbeach
Spalding • Lincolnshire • PE12 7EE
Telephone: 01406 490800
e-mail: gr.merchant@btconnect.com
www.grmerchantltd.co.uk

2775-15

RESIDENTIAL DEVELOPMENT
24 GREEN LANE
SPALDING
LINCS
PE11 2YD

15 NO – DWELLINGS

FOR

D & R PROPERTY SERVICES LTD



PLANNING, DESIGN & ACCESS STATEMENT

VAT No. 552 6200 69
Registered in England No: 5667107
Registered Address: Bank House, Broad Street, Spalding, PE11 1TB

RESIDENTIAL DEVELOPMENT
24 GREEN LANE
SPALDING
LINCS
PE11 2YD

This application is to demolish an existing house, 24 Green Lane, Spalding, and develop the whole site with 15 No. two and three bedroom houses with car parking spaces for the benefit of D & R Property Services Ltd.

Pre-application discussions have been taking place with Planning Officers since October 2013 (we are currently working with scheme 15)
:- PE-00671-2013
Originally the proposal was for 18 No. dwellings, the proposed application is for 15 No. dwellings all with car parking spaces off an adopted carriageway.

USE

The site to the South/West of Spalding town centre amounts to 0.3 hectares (0.75 acres) and is bounded to the West by the Great Northern Great Eastern Railway (Network Rail). The general area is surrounded by Victorian and post war semi-detached and terraced housing.
Green Lane
St Thomas' Road
Havelock Street
Cross Street
Knipe Avenue
Only Knipe Avenue has car parking facilities (see photographs).
24 Green Lane is a single dwelling built in the 1960's.

The development proposal for 15 No. houses is similar in density to surrounding properties and conveniently situated close to facilities and within walking distance of Spalding town centre.

LAYOUT

The layout concept has been designed to provide amenity space, 2 No. car parking spaces per property and all properties orientated to avoid over-looking.

SCALE

All dwellings will be two storey, either two or three bedrooms and accessed off an adapted highway with all the latest disabled access requirements.

LANDSCAPING & BOUNDARY TREATMENTS

A modicum of tree and shrub planting is proposed. The boundary treatment will be a 2.5 metre high close boarded fence alongside the railway to the South/West a 2 metre high wall will be erected (a requirement of the neighbouring bungalow – 26 Green Lane) and the existing wall on the North/East boundary will be retained and a 0.6 metre high trellis will be introduced to the top and complemented with climbing shrubs.

ACCESS

Access to the site will be via an adapted highway installed to the requirements and specification of the Lincolnshire County Council Highways Department.

EXTERNAL MATERIALS

Walls - Red Multi Hand Made - All About Bricks
Roofs - Sandtoft Calderdale Slate - Grey
Joinery - Cream UPVC windows

FLOOD RISK

A Flood Risk Assessment (FRA) has been produced by Geoff Beel Consultancy to satisfy the Environment Agency as the site is in Flood Zone 3. The conclusions and recommendations are that floor levels of the properties are to be raised 300mm above the existing Green Lane carriageway level (DPC's at 3.50 O.D Newlym)
Flood resistant/resilient techniques to be incorporated into the design and construction of all the proposed dwellings.

FOUNDATIONS

A soil investigation report has been produced by Geoff Holyoake Associates Ltd, due to the presence of peat and clay and there is evidence that the existing dwelling (24 Green Lane) has possible subsidence movement. It is proposed to construct all the properties off piled foundations with ring beams.

NOISE

Due to the close proximity of the railway to the West of the site an Environmental Noise and Vibration Assessment report has been produced by Acoustic Associates (Peterborough). The recommendations suggested are as follows :-

3.2 The following noise mitigation measures are required for this development:-

- *A 1.8m close-boarded timber fence should be erected between the gardens and the railway, as indicated with a blue line in figure 6. Figure 7 shows a specification for the fence .*
- *Double glazing fitted with compression seals should be built into all bedrooms.*
- *Windows behind façades marked red in Figure 6 (plots 11-13) should be equipped with mechanical ventilation or attenuated passive ventilation, unless they have an openable window on a façade not marked in red. A passive vent should achieve minimum sound insulation value of D = 30dB. The ventilation must comply with the Noise Insulation Regulations (Reference 7). Alternatively, a 'whole house' ventilation system could be used. The are several suppliers of acoustic ventilators, e.g. BDP supply Passivent Acoustic Ventilation products and 'whole house' systems and offer a free design service (see website: www.buildingproductdesign.com)*

FOUL & SURFACE WATER

Foul water disposal will be via the Anglian Water public foul sewer in Green Lane. Surface water from the dwellings will be to on-site soakaways. Negotiations are taking place with the Lincolnshire County Council Highway Design Team regarding surface water from the adopted highway.

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The site falls inside the development area of Spalding and conforms to current National Planning Policies. The National Planning Policy Framework sets out the Governments planning policies for England and how these are expected to be applied. It sets out the Government requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so it provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Delivering sustainable, development – paragraph 18 onwards requiring good design paragraph 56 onwards.

These guidelines recommend:-

- Increase in supply of housing in sustainable locations
- Deliver a wide range of choice for high quality homes that people want and need.
- Create sustainable communities

APPLICATION PLANS

2775-15-01B	Block Plan
2775-15-02A	3D Views
2775-15-03	2 Bedroom Semi Detached Houses. Floor Plans & Elevations – Proposed
2775-15-04B	3 Bedroom Semi Detached Houses. Floor Plans & Elevations – Proposed
2775-15-05B	3 Bedroom Semi Detached House, Floor Plan & Elevations – Proposed
2775-15-06A	Location & Site Layout Plans
13514/01	Topographical Survey by SRC Ltd

G R Merchant
May 2015

APPENDIX

LOCATION PLANS 1/2500

'GOOGLE' SITE & LOCATION PLANS

ANGLIAN WATER SEWER RECORDS

FLOOD RISK ASSESSMENT BY GEOFF BEEL CONSULTANCY

SOIL INVESTIGATION REPORT BY GEOFF HOLYOAKE ASSOCIATES LTD

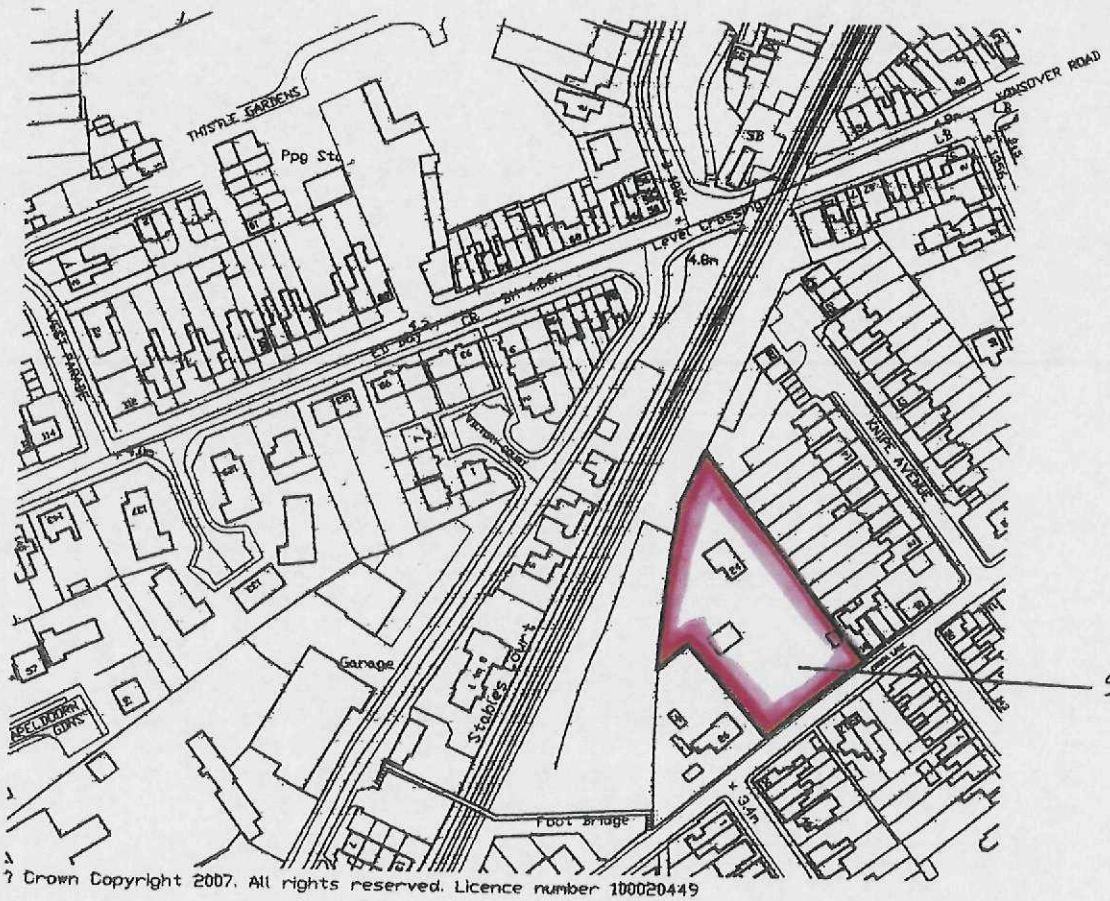
ENVIRONMENTAL NOISE & VIBRATION REPORT BY ACOUSTIC ASSOCIATES (PETERBOROUGH)

PHOTOGRAPHS OF SURROUNDING ROADS. HIGHLIGHTING ON-STREET VEHICLE PARKING

2775-15

LOCATION PLAN 1/2500

'GOOGLE' SITE & LOCATION PLANS



NORTH

LOCATION PLAN.
1/2500


Fulney
Spalding
Spalding
Clay Lake
© 2015 Google
Image © 2015 Getmapping plc
Google earth
Google earth
miles
km
2
3



Google earth

feet 1000

meters 400



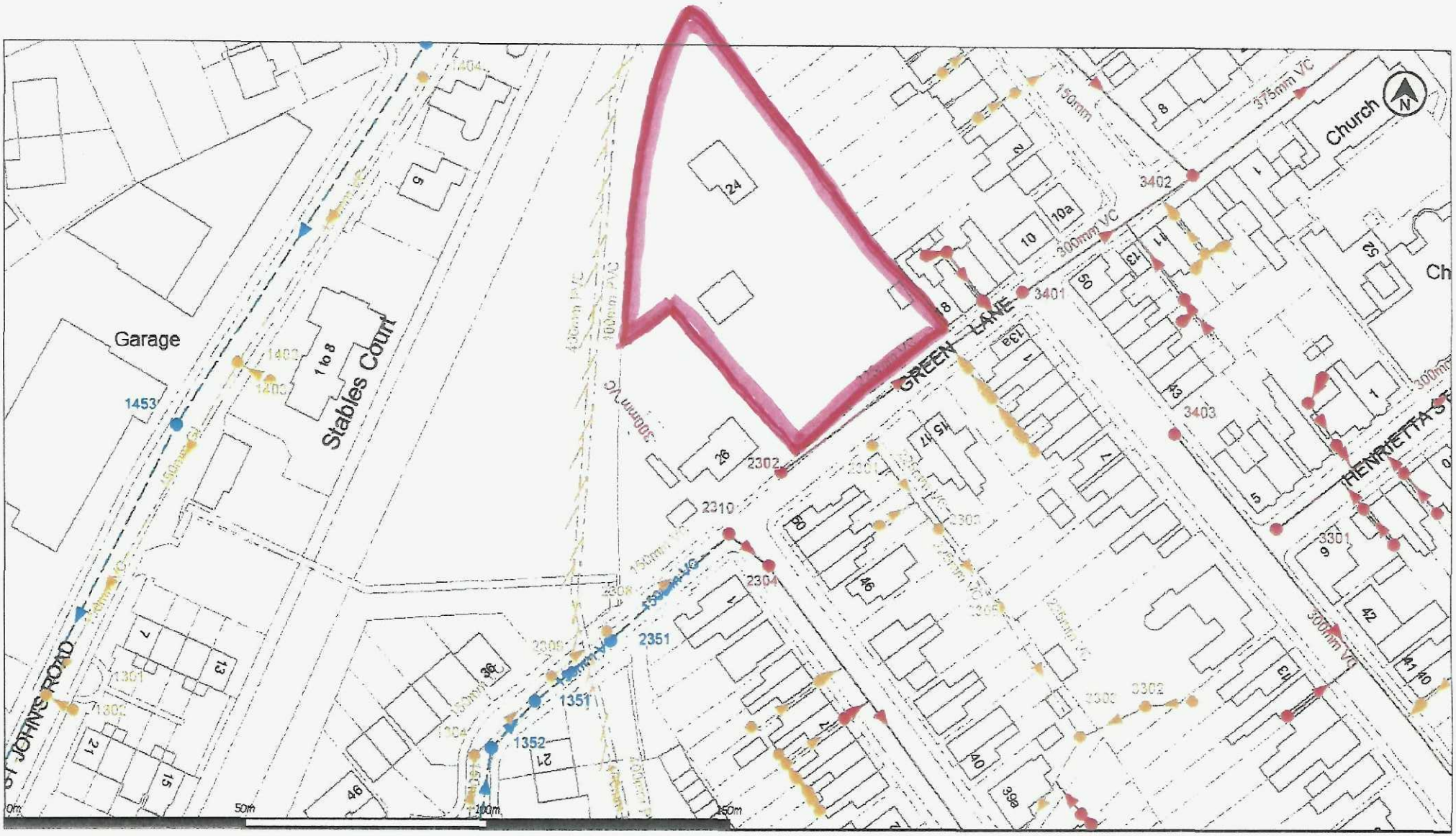
Google earth

feet 800

meters 200

ANGLIAN WATER

SEWER RECORDS MAP



(c) Crown Copyright and database rights 2011 Ordnance Survey 100018507 | Date: 18/03/14 | Scale: 1:1080 | Map Centre: 524240,322402 | Data updated: 24/01/14 | Wastewater Plan A4

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. The plan is produced by Anglian Water Services Limited from Ordnance Survey © Crown Copyright. 100018507. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main (Colour denotes effluent type)
- Private Sewer (Colour denotes effluent type)
- Decommissioned Sewer (Colour denotes effluent type)
- Outfall (Colour denotes effluent type)
- Inlet (Colour denotes effluent type)
- Manhole (Colour denotes effluent type)
- Sewage Treatment Works
- Pumping Station

ccannon@sholland.gov.uk

B16-0283-14

love every drop anglianwater

2775-15

FLOOD RISK ASSESSMENT

BY

GEOFF BEEL CONSULTANCY

FLOOD RISK ASSESSMENT FOR PROPOSED RESIDENTIAL DEVELOPMENT AT 24 GREEN LANE, SPALDING, LINCS.

FINAL REPORT

GEOFF BEEL CONSULTANCY

NOVEMBER 2014

GCB/MERCHANT

DISCLAIMER

This document has been prepared solely as a Flood Risk Assessment in support of a planning application for proposed Residential Development at 24 Green Lane, Spalding, Lincs. "Geoff Beel Consultancy" accepts no responsibility or liability whatsoever for any use made of this document other than by the client "D & R Property Services Ltd Mrs" for the purposes it was originally commissioned and prepared. All comments and opinions made are based upon information available to "Geoff Beel Consultancy" during the necessary investigative process, and the conclusions and recommendations could therefore, differ in the event of material subsequently being found erroneous, incomplete or misleading. "Geoff Beel Consultancy" therefore, accepts no liability should this prove to be the case.

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Fig 1 - Location Plan & Site Plan –
G R Merchant Ltd drg. no. 2482-13-15

Fig 2 - Plans & Elevations –
G R Merchant Ltd drg. no. 2482-13-20

Fig 3 - Plans & Elevations –
G R Merchant Ltd drg. no. 2482-13-21

Fig 4 - Topographical Survey –
Sidebottom, Richardson, Cherry Ltd drg. no. 13514/01

Fig 5 - Environment Agency Flood Zone Map

Fig 6 - South Holland District Council Strategic Flood Risk Assessment Map

Fig 7 - Welland & Deepings IDB district site plan

1.0 INTRODUCTION

1.1 A full planning application is to be submitted by G R Merchant Ltd on behalf of D & R Property Services Ltd for proposed residential development at 24 Green Lane, Spalding, Lincs.

1.2 Planning approval requires a Flood Risk Assessment to accompany the application to meet the requirements and general principles contained in paragraph 9 of the Technical Guidance to the National Planning Policy Framework (NPPF) and for approval by the Environment Agency.

The site is shown within Flood Zone 3 of the Environment Agency's Flood Zone Map. The latest Flood Zone Maps have been created as a tool to raise awareness of flood risk with the public and partner organisations, such as Local Authorities, Emergency Services and Drainage Authorities. The Maps do not take into account any flood defences.

The site is also shown within a defended Flood Zone 1 of the South Holland District Council's Strategic Flood Risk Assessment Map and located in the Welland and Deepings Internal Drainage Board district.

1.3 Geoff Beel Consultancy was appointed on 17th November 2014 to undertake a Flood Risk Assessment.

2.0 LOCATION

2.1 The development site is at 24 Green Lane, Spalding. The National Grid Reference of the central point of the site is TF 24152225.

2.2 The position and extent of the site are shown on Fig 1 – Location Plan & Site Plan at the end of the document.

2.3 The site, located within the Welland and Deepings Internal Drainage Board district is shown within Flood Zone 3 as detailed on the Environment Agency Flood Zone Maps and in a defended Flood Zone 1 of the Council's Strategic Flood Risk Assessment Map.

3.0 THE SITE AND SEQUENTIAL TEST

3.1 The site is currently an existing property with large garden.

3.2 The area of development is approximately 0.314 hectare.

3.3 The proposed site layout consists of 15 two-storey dwellings off cul-de-sac from Green Lane after demolition of existing property.

3.4 The Sequential Test and Exception Test will require to be applied by the Local Planning Authority but the development may be permitted as the site is protected against the 1 in 100 year fluvial event by a combination of defences, pumping stations and sluice gates meeting the requirements of NPPF as located in Flood Zone 1 of the Councils' Strategic Flood Risk Assessment.

4.0 EXISTING FLOOD ALLEVIATION MEASURES

4.1 The site is within a defended floodplain, as defined in Appendix 1 of the Environment Agency's 'Policy and Practice for the Protection of Floodplains' and is considered to be passive until such time as a flood greater than that for which the defences were designed occurs. The likelihood of flooding due to overtopping or failure of a flood defence embankment is considered to be small.

4.2 The site is located within the Welland and Deepings Internal Drainage Board protected by the River Welland defences to the 1 in 100 year return period flood event. The nearest 'main drain' open watercourse, the Town Drain (Spalding) is some 300 metres south of the site. Existing property floor level is at 3.35m aOD whilst Green Lane carriageway level is at 3.14m aOD.

4.3 The existing standard of drainage for the Welland and Deepings Internal Drainage Board is 1 in 50 years return period, compatible with the Department of the Environment, Food and Rural Affairs target level of service for rural drainage and flood defence works. Freeboard of 1.00 metre is provided to the lowest land levels.

4.4 The site and surrounding development drains by Anglian Water Services Ltd sewerage to the Board's Town Drain (Spalding) and hence to Pode Hole Pumping Station. The Pode Hole Pumping Station discharges into the Vernatts Drain which ultimately flows into the tidal River Welland.

4.5 The Vernatts Drain is an embanked high level carrier conveying the surface water run-off from some 16165 hectares of land into the tidal River Welland at Surfleet Seas End.

The Welland and Deepings IDB have recently completed a three year programme to raise and strengthen the Vernatts Drain embankments to accommodate with 450mm freeboard, the design flood level of 3.96m aOD, estimated to be a 1 in 100 year return period event.

4.6 Current maintenance standards within the Welland and Deepings Internal Drainage Board are generally very good.

During the operation and maintenance of its pumping stations, associated structures and channel systems, particularly those that could affect property, the Board seeks to maintain a general standard capable of providing flood protection to its district. A routine maintenance programme is in place to ensure that the Boards assets are commensurate with the standard of protection that is sought. However, bank slips, blocked culverts etc may occur from time to time and these matters are usually dealt with promptly.

4.7 The fluvial River Welland is located approximately 600 metres to the east of the site with a standard of protection of 1 in 100 years return period. The Crowland and Cowbit Washes are situated upstream of the town on the opposite bank of the River Welland offering integrated protection to Spalding and the surrounding district.

4.8 Fluvial flood levels of the River Welland on the site frontage upstream of Spalding Town Bridge are as follows:

	Present	Present + Climate Change
1%	4.43m	4.68m
0.1%	4.45m	4.68m

The present day 1% annual probability fluvial flood level and the 1% plus climate change is estimated at 80mm above the highest part of the site.

4.9 Maintenance standards of the Environment Agency's main rivers and defences are well maintained and regularly inspected for their asset condition.

5.0 POTENTIAL SOURCES OF FLOODING

5.1 Five potential sources of flooding have been identified as a result of this assessment:

a) local blockages to AWS Ltd sewerage
b) local blockages to existing IDB main drain system.
c) storm return period of 1 in 50 years being exceeded
d) failure of Pode Hole Pumping Station
e) overtopping and breaching of the fluvial River Welland defences

5.2 The probability of flooding from source a) is low due to the standards of sewerage already achieved by Anglian Water Services Ltd. Telemetry systems monitor the performance of the sewerage for any blockage. Existing connections to the sewerage will be maintained with no increase in the total impermeable area.

5.3 The probability of flooding from source a) is low due to the maintenance standards already achieved and managed by the IDB.

The probability of flooding from b) is also low due to the Welland and Deepings IDB main drain design standard incorporating a minimum 900mm freeboard to the lowest land level which provides adequate storage in events greater than 1 in 50 years.

5.4 Failure of Pode Hole Pumping Station may occur due to long term mechanical breakdown or power supply being disrupted. However, in these circumstances, if conditions were such to put properties and land at risk of flooding, the Internal Drainage Board would take emergency action to maintain the drainage level of service by utilising temporary pumping equipment. The probability of such an occurrence is also considered to be low.

Previous historic rainfall events of 1968 and 1978, estimated to be greater than 1 in 100 year events, caused no flooding to any residential properties at the time and the Boards policy is to provide a standard of drainage which satisfies NPPF requirements of a 1 in 100 year return period for fluvial protection inclusive of the effects of climate change and development. The Boards policy regarding the connection of future developments to the arterial system enables a flexible approach to be adopted and meet the criteria for "sustainable urban drainage".

The probability of the site flooding from this potential source is also considered to be low.

5.5 The possible overtopping and breaching of the fluvial River Welland flood defences which may affect the site under extreme conditions is also considered to be very low. The standard of defence of 1 in 100 years would have to be exceeded to create such conditions. However, the defences to the site river frontage consist of steel sheet piling and hard defences with no risk of a breach occurring.

5.6 It is therefore recommended that proposed floor levels of the development should be 300mm above existing road level of Green Lane to safeguard against the remote possibility of overtopping of the River Welland defences. Flood resistant/resilient measures will also be incorporated into the design and construction of the dwellings.

6.0 EXTENT OF KNOWN FLOODING

6.1 During the preparation of this assessment, no evidence was discovered of the site being flooded or of any adjoining properties.

7.0 PROBABILITIES AND TRENDS OF FLOODING

7.1 The probability of this development flooding from localised drainage systems is very low. It is also intended to construct floor levels 300mm above Green Lane carriageway level with flood resistant/resilient measures incorporated.

7.2 The probability of the site flooding with water from any AWS Ltd sewerage system Welland and Deepings river system is less than 1% because of the standards of the existing flood defence systems, storage within existing drainage channels and the location of the site. Similarly the same standard is provided by the Environment Agency's main river and defences.

7.3 If under very extreme events, levels of floodwater from any Environment Agency or Welland and Deepings river or arterial systems rose to such an extent that the site was affected, the situation would not be sudden. It is very probable that sufficient time would be available to take precautionary actions to limit the extent and potential impact of flooding.

7.4 The water levels in the drainage channels will tend to rise as a result of the impacts of climate change. However the existing systems and defences together with the raising of floor levels above existing Green Lane carriageway level will be appropriate for the design life of the development (i.e. 100 years).

7.5 Proposed floor levels are above the 1 in 1000 year return period flood event plus climate change offering safe refuge for the occupants. Safe access and egress to and from the site would be available in a south westerly direction towards Deeping St. Nicholas where land is in Flood Zone 1.

8.0 IMPACTS OF FLOODING

No significant impacts of flooding are anticipated.

8.2 Floor levels of the development will be raised 300mm above existing Green Lane carriageway level offering additional protection against impacts arising from any extreme short duration, localised events. Surface water drainage will be discharged to existing AWS Ltd public sewerage.

8.3 The general location of the site within the catchment is such that if flooding occurred from any of the Environment Agency or Welland and Deepings river systems, then probably 2 to 3 days warning time would be available.

8.4 The developer should ensure that the eventual occupiers of the properties are sufficiently aware of the risk of flooding, and the standard of the existing defences. The Environment Agency provides a Flood Warning Service which includes Flood Warning Codes and uses direct warning methods where the risks and impacts of flooding are high. Indirect warnings are provided to all flood risk areas, even those at low risk of flooding. The main method is media broadcasts via local radio and also by television including teletext.

In addition to direct and indirect flood warnings, the Environment Agency operates a 24 hour a day Floodline Service providing advice and information on flooding contact: tel 0845 988 1188.

8.5 No displacement of water from the site will affect any adjoining properties and agricultural land.

9.0 RESIDUAL RISK – EXTREME EVENTS

9.1 The residual risk from extreme events is very low on this site, because of its location, within a pumped sub-catchment of the Welland and Deepings IDB area and its location 600 metres from the River Welland fluvial defences consisting of vertical steel sheet piling and concrete capping beam and hard defences.

9.2 The site is within Flood Zone 1 according to NPPF classification the site with a very low risk of flooding due to the current standards of drainage and flood defence and land levels. The site is not located within a Functional Flood Plain of any 'main river' or 'main drain'. The Environment Agency Flood Zone Maps have been produced irrespective of existing flood defences and standards of protection.

9.3 South Holland District Council in conjunction with the Environment Agency and the local IDB's within the Council area have carried out a Strategic Flood Risk Assessment of the whole District by appointed Consulting Engineers.

The Strategic Flood Risk Assessment has produced more definitive Flood Risk Maps than those published by the Environment Agency and at the same time has analysed flood return periods of all tidal and fluvial defences for years 2002 and 2052 to account for the effects of climate change.

Breach scenarios of embankments failing and/or being overtopped have also been carried out to establish Flood Risk Zones.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 As a result of the assessment, the following conclusions have been reached:-

- The proposed development is not in a Functional Floodplain. It is located in the Passive Floodplain protected by River Welland and Welland & Deepings IDB defences to a 1 in 100 year return period.

- The site is in Flood Zone 1 with the actual risk of the site flooding from any Environment Agency river system being very low.

- Although the site is located within an Internal Drainage District with a minimum standard of drainage of 1 in 50 years, this accords with Defra guidelines for rural development. Freeboard to design water level of 900mm to lowest land level is available for events greater than 1 in 50 years providing further storage within the drainage channels.

- Floor levels will be raised 300mm above existing Green Lane carriageway level and flood resistant/resilient techniques incorporated into the design and construction of the proposed dwellings.

- On site surface water drainage will be discharged to existing AWS Ltd public sewerage.



SITE LAYOUT PLAN.
1/250.

SITE LEVELS & FINISHED FLOOR LEVELS -

PROPOSED SITE LEVELS WILL BE SIMILAR TO THE EXISTING SITE LEVELS SHOWN ON SRC LTD DRAWING NO 13514/01

PROPOSED FINISHED FLOOR LEVELS OF DWELLINGS TO BE 3.50 O.D.N

INDICATIVE SCHEDULE -

PLOTS 1 to 4 - 3 BEDROOM SEMI-DETACHED HOUSES
PLOTS 5 to 10 - 2 BEDROOM SEMI-DETACHED HOUSES
PLOT 11 - 3 BEDROOM DETACHED HOUSE
PLOTS 12 to 15 - 3 BEDROOM SEMI-DETACHED HOUSES

Note -
All properties provided with at least two car parking spaces

LANDSCAPING & BOUNDARY TREATMENT SCHEME -

A PROPOSED 2m HIGH WALL - REDUCING DOWN TO 1m AT ROADSIDE
B PROPOSED 2.5m HIGH CLOSE BOARDED FENCE - ACOUSTIC FENCE
C EXISTING 1.5m HIGH WALL WITH 0.6m HIGH TRELLIS ON TOP
D PROPOSED 1.8m HIGH BOARDED FENCE
E SILVER BIRCH - Feathered
F HAWTHORN - Feathered
G MAGNOLIA - Whip
H CHERRY TREE - Whip
J GRAVEL DRIVES

All planting to be in accordance with BS 4428:1989 Code of practice for general landscape operations.
All trees to be planted with minimum 0.5m planting width and staked, tied and fed at time of planting.
Min 5 to 8 bags of peat free top soil and shrub planting compost to be incorporated into backfill for each shrub hole.

ADOPTED ROADWAY & FOOTPATH:
TO LCC HIGHWAYS REQUIREMENTS AND SPECIFICATIONS

NORTH



LOCATION PLAN.
1/2500

A	PLANTING AMENDED	MAY '19

G. R. MERCHANT LTD.
I.ENG AMICE FIWO
ARCHITECTURAL, STRUCTURAL AND LAND DRAINAGE CONSULTANTS
4 Wrights Mews
12A Park Road, Holbeach,
Spalding, Lincs. PE12 7EE
Tel: 01406 480600
Fax: 01406 425744
E-Mail: gr.merchant@btconnect.com

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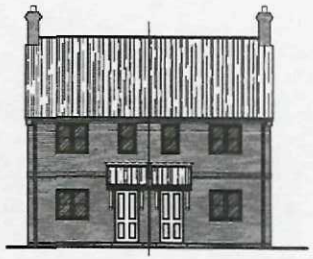
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LOCATION & SITE LAYOUT PLANS

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Date	Drawn
APRIL 2019	K.D

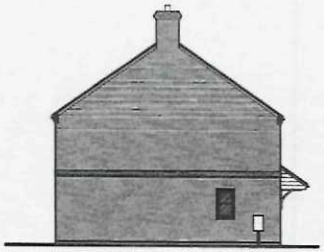
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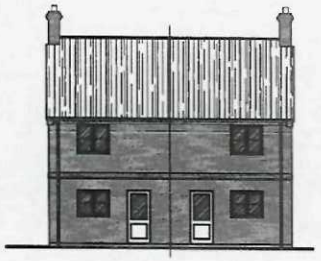
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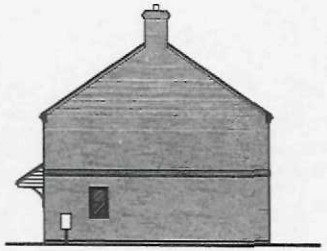
FRONT ELEVATION



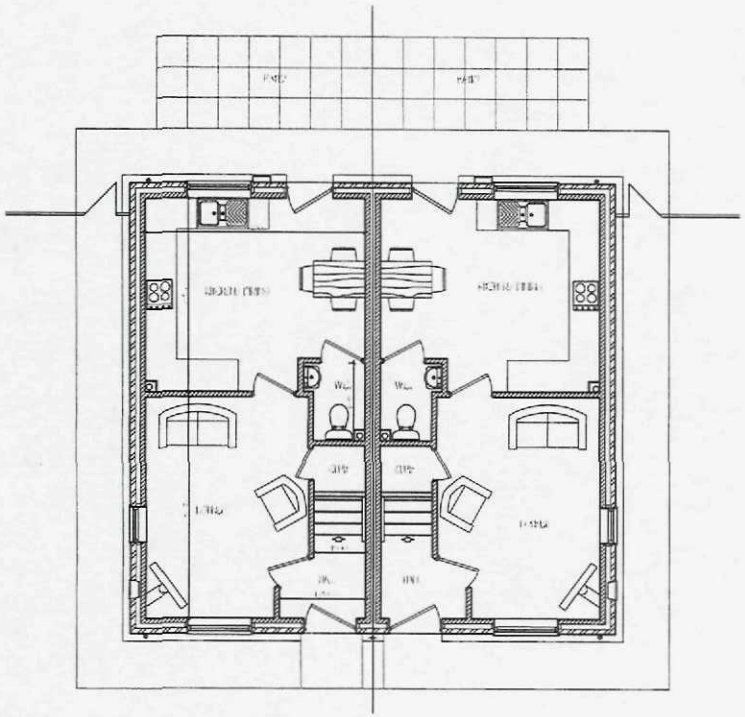
SIDE ELEVATION



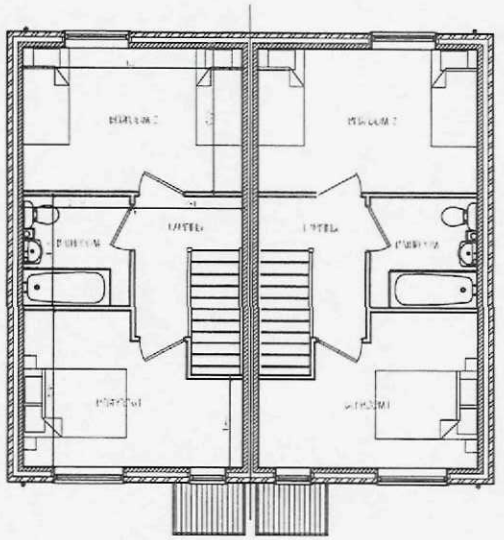
REAR ELEVATION



SIDE ELEVATION



GROUND FLOOR PLAN



FIRST FLOOR PLAN

G. R. MERCHANT LTD.
I.ENG AMICE FIWO

ARCHITECTURAL, STRUCTURAL AND LAND DRAINAGE CONSULTANTS

4 Wrights Mews
122a Park Road, Holbeach,
Spalding, Lincs. PE12 7EE
Tel: 01406 490500
Fax: 01406 422744
E-Mail: gr.merchant@btconnect.com

Project

Client

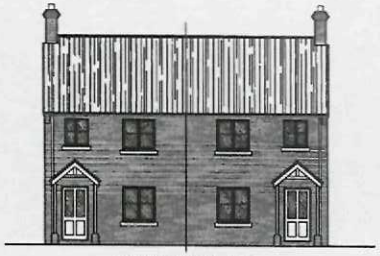
Drawing

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Date	Drawn
NOV '14	

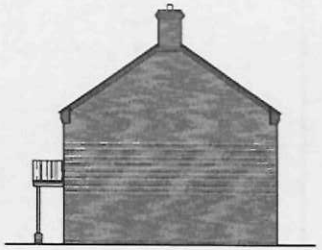
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1:50 & 1:100

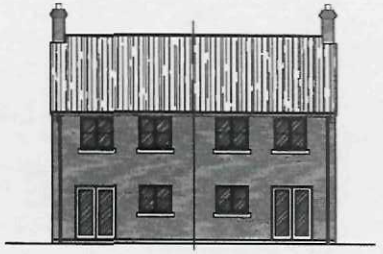
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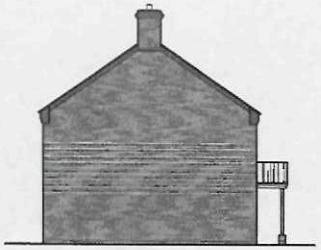
FRONT ELEVATION



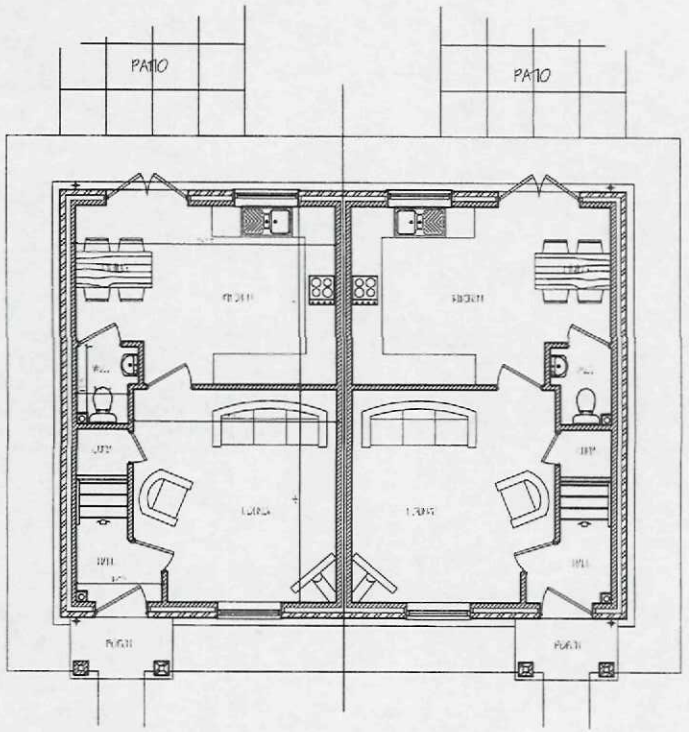
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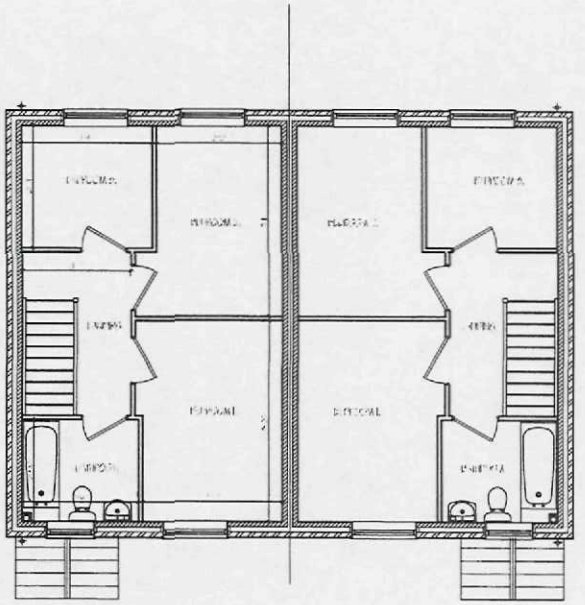
REAR ELEVATION



SIDE ELEVATION



GROUND FLOOR PLAN



FIRST FLOOR PLAN

G. R. MERCHANT LTD.
I.ENG AMICE FIWO
ARCHITECTURAL, STRUCTURAL AND LAND DRAINAGE CONSULTANTS
4 Wrights Mews
12A Park Road, Holbeach,
Spalding, Lincs. PE12 7EE
Tel: 01406 490800
Fax: 01406 425744
E-Mail: gr.merchant@btconnect.com

Project
RESIDENTIAL DEVELOPMENT,
24 GREEN LANE,
FALKIRK,
FK2 9PL

Client
[illegible]

Drawing
BATHROOM AND DOOR ELEVATIONS,
FLOOR PLANS & SECTIONS
PROPOSED & EXISTING

Job Ref.
[illegible]

Drawing No.
[illegible]

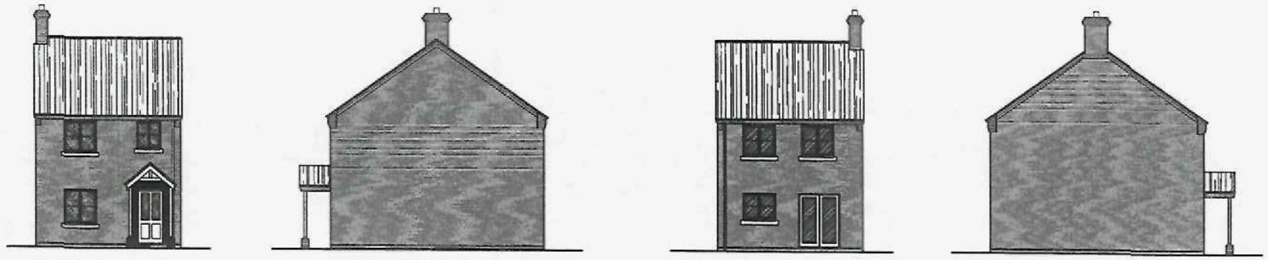
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NOV 2015

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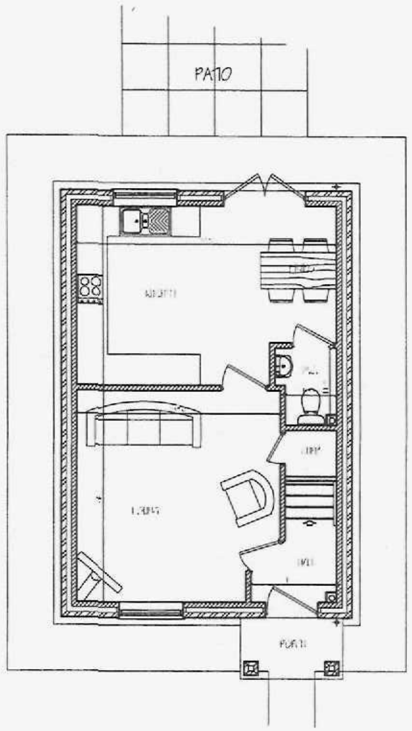
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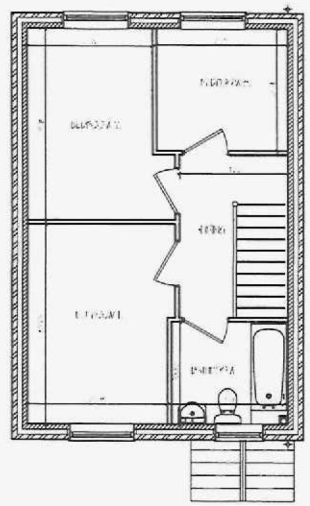
This drawing is the property of G. R. Merchant and may not be reproduced or used in any manner without the written consent of G. R. Merchant. Any discrepancies must be reported to G. R. Merchant before any work is commenced. Dimensions must be checked on site before any work is commenced. Any variations from the drawing must be approved by G. R. Merchant before any work is commenced. G. R. Merchant will not be responsible for any errors or omissions in the drawing or for any work carried out from the drawing. The contractor is responsible for all dimensions and for the correct fitting of all components. The contractor is responsible for all health and safety matters on site. The contractor is responsible for all insurance matters on site. The contractor is responsible for all statutory matters on site. The contractor is responsible for all environmental matters on site. The contractor is responsible for all waste matters on site. The contractor is responsible for all noise matters on site. The contractor is responsible for all dust matters on site. The contractor is responsible for all vibration matters on site. The contractor is responsible for all traffic matters on site. The contractor is responsible for all security matters on site. The contractor is responsible for all fire matters on site. The contractor is responsible for all first aid matters on site. The contractor is responsible for all welfare matters on site. The contractor is responsible for all training matters on site. The contractor is responsible for all supervision matters on site. The contractor is responsible for all quality matters on site. The contractor is responsible for all programme matters on site. The contractor is responsible for all cost matters on site. The contractor is responsible for all claims matters on site. The contractor is responsible for all disputes matters on site. The contractor is responsible for all termination matters on site. The contractor is responsible for all handover matters on site. The contractor is responsible for all defects matters on site. The contractor is responsible for all maintenance matters on site. The contractor is responsible for all guarantee matters on site. The contractor is responsible for all warranty matters on site. The contractor is responsible for all insurance matters on site. The contractor is responsible for all statutory matters on site. The contractor is responsible for all environmental matters on site. The contractor is responsible for all waste matters on site. The contractor is responsible for all noise matters on site. The contractor is responsible for all dust matters on site. The contractor is responsible for all vibration matters on site. The contractor is responsible for all traffic matters on site. The contractor is responsible for all security matters on site. The contractor is responsible for all fire matters on site. The contractor is responsible for all first aid matters on site. The contractor is responsible for all welfare matters on site. The contractor is responsible for all training matters on site. The contractor is responsible for all supervision matters on site. The contractor is responsible for all quality matters on site. The contractor is responsible for all programme matters on site. The contractor is responsible for all cost matters on site. The contractor is responsible for all claims matters on site. The contractor is responsible for all disputes matters on site. The contractor is responsible for all termination matters on site. The contractor is responsible for all handover matters on site. The contractor is responsible for all defects matters on site. The contractor is responsible for all maintenance matters on site. The contractor is responsible for all guarantee matters on site. The contractor is responsible for all warranty matters on site.



FRONT ELEVATION SIDE ELEVATION REAR ELEVATION SIDE ELEVATION



GROUND FLOOR PLAN



FIRST FLOOR PLAN

ref	revision	date
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

G. R. MERCHANT LTD.
I.ENG AMICE FIWO

ARCHITECTURAL, STRUCTURAL AND LAND DRAINAGE CONSULTANTS

4 Wrights Mews
12A Park Road, Holbeach,
Spalding, Lincs. PE12 7EE
Tel: 01406 490600
Fax: 01406 425744
E-Mail: gr.merchant@btconnect.com

Project
RESIDENTIAL DEVELOPMENT, [illegible]

Client
[illegible]

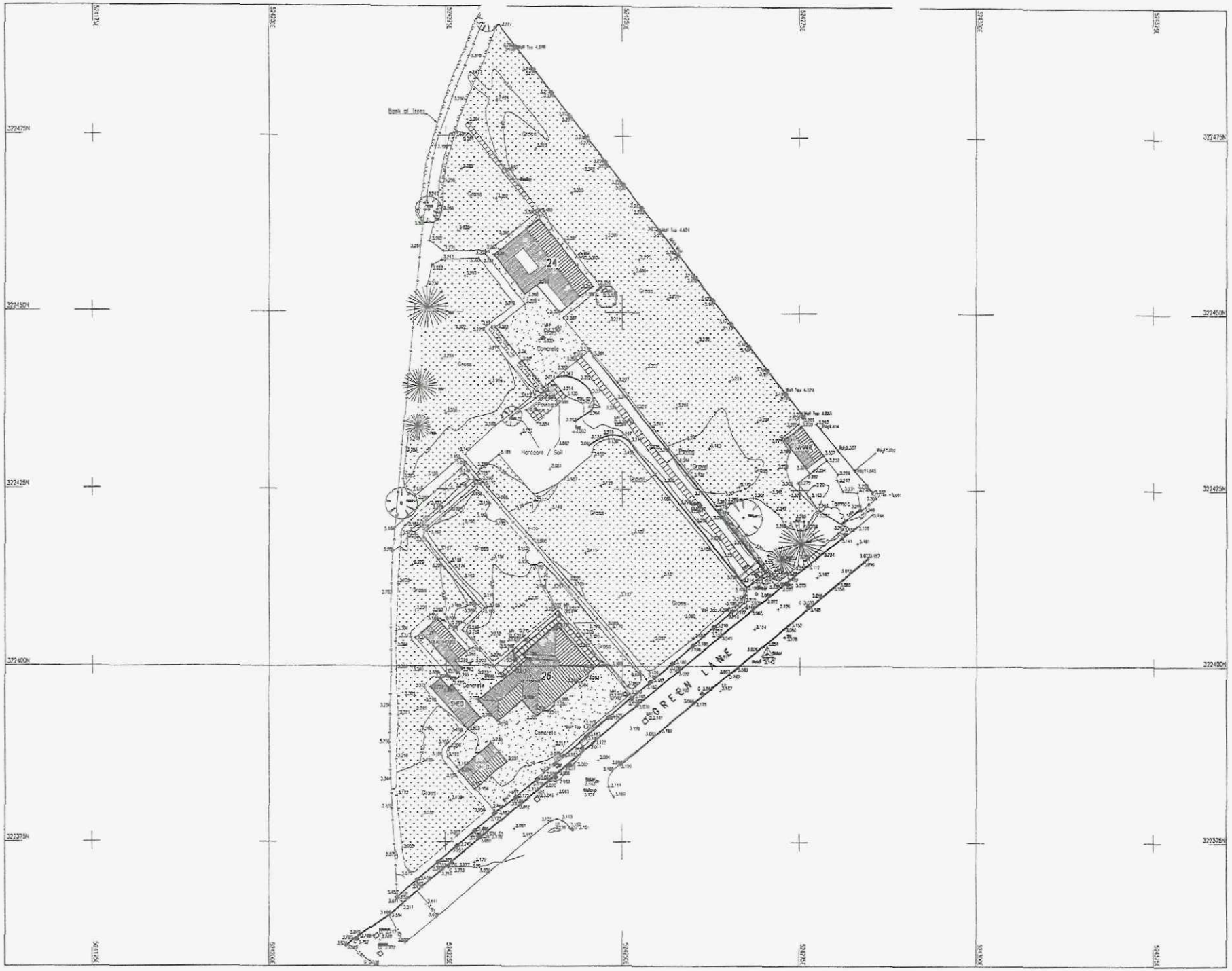
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Job Ref.	Drawing No.
[illegible]	[illegible]

Date	Drawn
[illegible]	[illegible]

Scales
[illegible]

DO NOT SCALE FROM THIS DRAWING



SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
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S2	324745.853	322436.994	3.292	P-K Nail
S3	324730.394	322376.950	3.178	P-K Nail

Coordinates & Levels to OSGB36

N

File	Date	Remarks
Status	FOR INFORMATION	

SIDEBOTTOM RICHARDSON CHENG LTD
CONSULTING STRUCTURAL AND CIVIL ENGINEERS

Project
Site Survey
24 Green Lane,
Spalding, Lincs.
For G R Merchant

Title
Topographical Survey

Date	Feb '14	Scale	1:250 @A1
Drawn	MP	Checked	SRC
Design	-	File Name	13514-01

DRG No. 13514/01 — File -

Environment Agency

Enter a postcode or place name:

Spalding, Lincolnshire

Go

Other topics for this area...

Flood Map for Planning (Rivers and Sea)

Flood Map for Planning (Rivers and Sea)

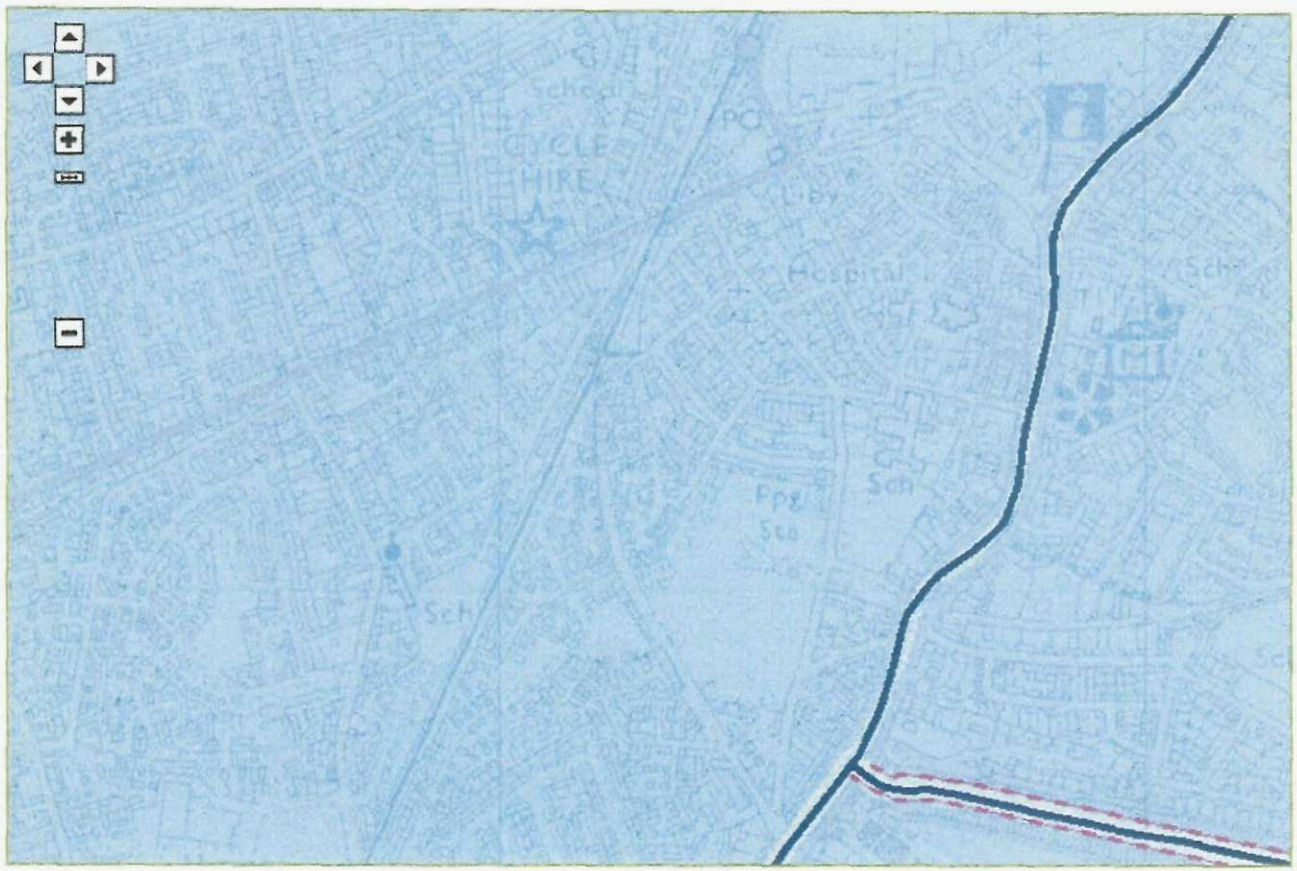
Map legend

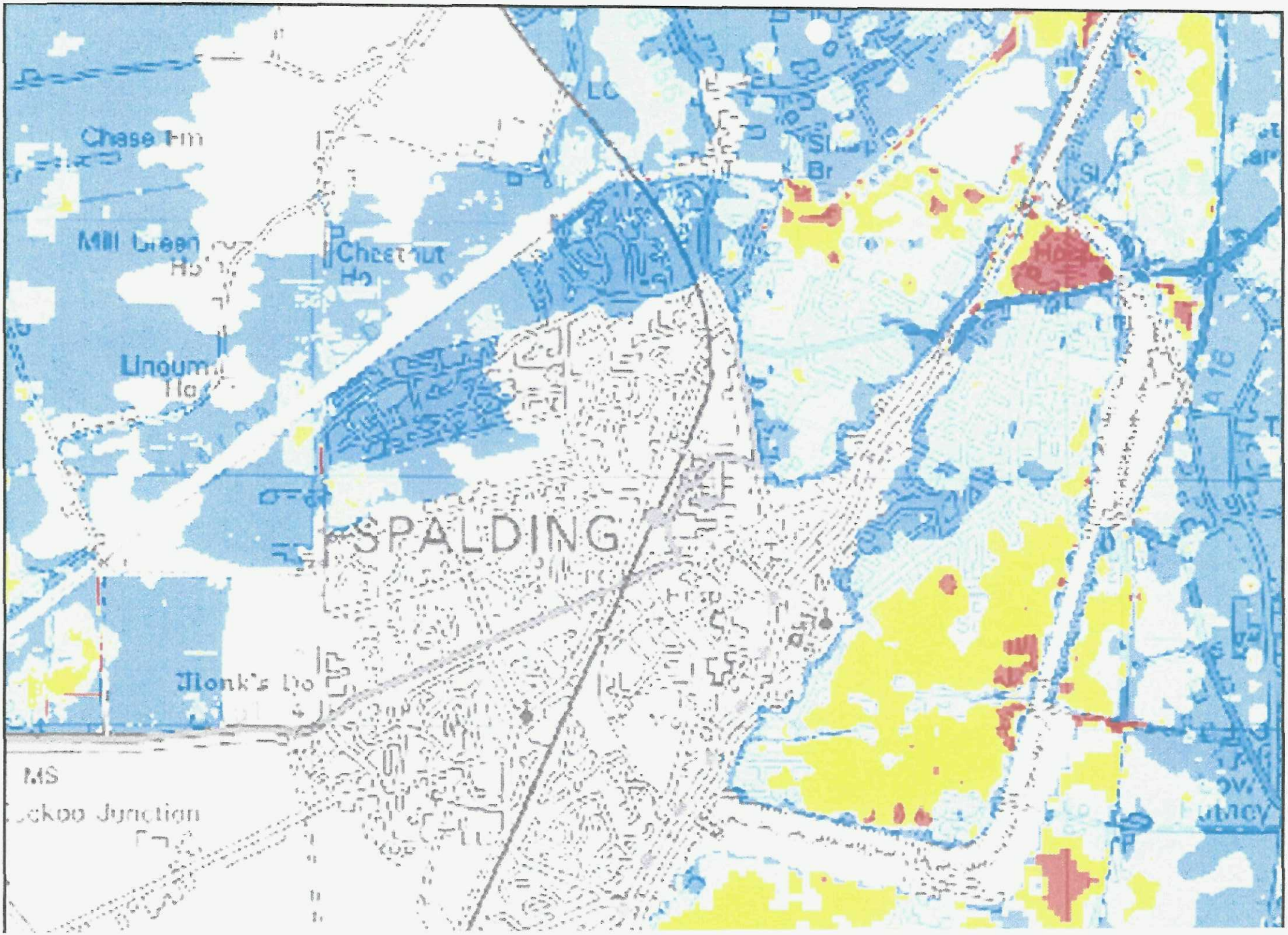
Click on the map to see what Flood Zone (National Planning Policy Guidance definitions) the proposed development is in.

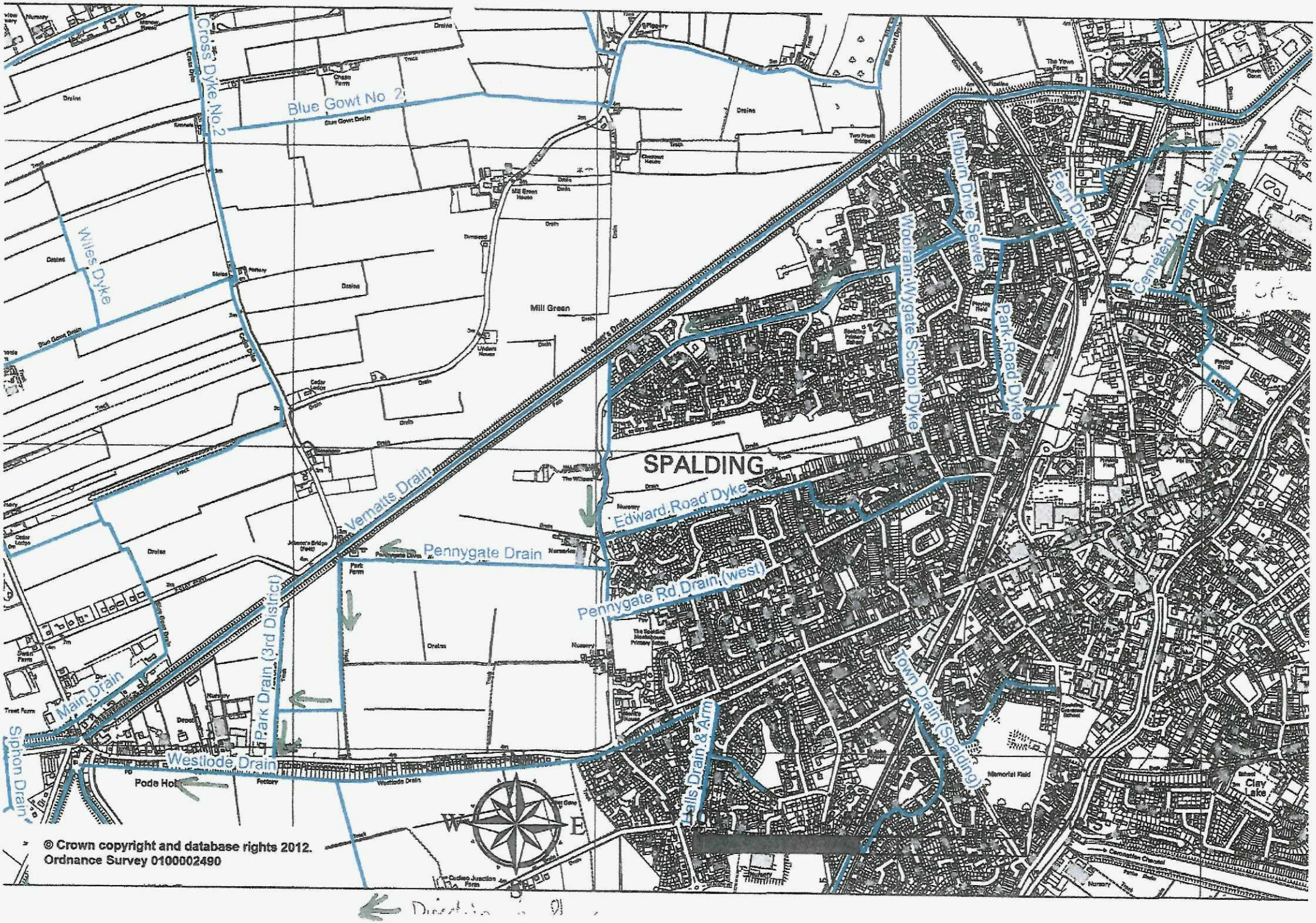
- Flood Map for Planning (Rivers and Sea)
- Flood Zone 3
- Flood Zone 2
- Flood defences (Not all may be shown*)
- Areas benefiting from flood defences (Not all may be shown*)
- Main rivers

Spalding, Lincolnshire at scale 1:10,000

Other maps | Data search | Text only version




Chase Fm
Mill Green Ho
Chestnut Ho
Lincum Ho
SPALDING
Monk's Ho
MS
Eckoo Junction


Cross Dyke No.2
Blue Gowt No 2
Wiles Dyke
Mill Green
Vernatts Drain
Pennygate Drain
Park Drain (3rd District)
Main Drain
Siphon Drain
Westlode Drain
Pode Hole
SPALDING
Edward Road Dyke
Pennygate Rd Drain (west)
Lilburn Drive Sewer
Woolram Wygate School Dyke
Fern Drive
Park Road Dyke
Cemetery Drain (Spalding)
Town Drain (Spalding)
Falls Drain & Arm
Memorial Field
Clay Lake
W
E
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Ordnance Survey 0100002490

2775-15

SOIL INVESTIGATION REPORT

BY

GEOFF HOLYOAKE ASSOCIATES LTD

Geoff Holyoake Associates Ltd.

Structural & Civil Engineering Consultants

27 Exeter Gardens
Stamford
Lincolnshire PE9 2RN
Tel: 01780 765971
Fax: 01780 765847
e-mail: info@holyoake-associates.co.uk

SOIL INVESTIGATION REPORT

AT 24 GREEN LANE,

SPALDING.

S.I.1122/14/GCH
DECEMBER 2014

1. **Client:**

R K Wilson Builders
Sandpit Farm
Wisbech Road
Long Sutton
Wisbech

2. **Brief.**

2.1. Provide a soil investigation report of the titled plot using trial holes and sample analysis and comment on the foundation types for the proposed domestic development.

2.2. All as per the client's instruction confirmed, on site, dated 4 December 2014.

2.3. In accordance with our standard practice, this report is for the sole use of the parties to whom it is addressed and no responsibility is accepted to any third party for the whole or any parts of its contents.

2.4. The following recommendations are based on the findings of the site investigation. We highlight that, other conditions may occur elsewhere on the site of which we have no knowledge and therefore cannot accept any responsibility.

2.5. Please note that, this site has not been tested for contamination.

3. **Site Location.**

3.1. See location plan.

3.2. The site, at present, is the large garden area to No 24 Green Lane near to the centre of the Lincolnshire town of Spalding. This area is covered by the South Holland District Council.

3.3. The main railway line passes beyond the rear boundary.

3.4. The existing two storey house is situated to the rear of the plot. It was noted that, there are a number of significant diagonal cracks to the external brickwork elevations, particularly to the western element.

3.5. The large rectangular garden is mainly lawn.

3.6. There are a number of ornamental, conical, fir trees within the site to the rear western boundary and along part of the eastern boundary.

3.7 There are also low, 2-3m tall, leylandi hedges that form some of the perpendicular boundaries to the adjacent eastern properties.

3.8. Similar trees have been planted around the cess pit area adjacent to the existing house.

3.9. There is also a line of approximately 20m high Poplars to the rear northern boundary.

Trial Hole Investigations.

4.1. See trial hole logs 01 - 14 and laboratory test results.

4.2. A large number of trial holes were excavated in order to try and rationalise the varying ground conditions around the site.

4.3. The sub soil conditions may be considered in three general areas.

Firm natural very silty clays	:	Trial holes 02, 06, 07, 08, 09, 11 & 12.
Silty clay with a thick band of peat	:	Trial holes 05 & 10
Thick Fill	:	Trial holes 01, 03, 04, 13 & 14

4.4. The influential band of peat was 400 – 600mm thick commencing at 1.2m to 1.4m below ground level.

4.5. A sample of the upper very silty clay from trial hole 07 was sent for analysis. The test results show that the clay has a plastic index of 16 % and therefore can be defined as a low shrinkable soil in accordance with the guidelines of the National House Building Council Standard 4.2.

4.6. It was not possible to establish the parameters of the large fill areas.

4.7. Standing water level in trial holes 01 and 05 at the end of the investigation was 1.35m and 1.6m respectively below ground level. No sulphate tests were undertaken.

5. Foundation Types.

5.1. The proposed new houses will generate foundation line loads in the order of 30 – 40kn/m when considering a suspended ground floor system. For traditional mass concrete foundations, 600mm wide, a bearing capacity in the order of 67kn/m^2 is required. This is acceptable for the upper regions of the natural firm silty clay, which is considered to have a safe allowable bearing capacity of 75kn/m^2.

5.2. However, apart from Plots 1 and 2 and possibly 12 and 13 the extent of the fill areas and the band of peat prevent the use of traditional mass concrete footings for this site.

5.3. In addition, it is highlighted that there is evidence of possible subsidence movement within the existing house.

5.4. The thickness and commencement depth of the peat and the thickness of the fill encountered also prevent the economic use of reinforced concrete raft foundations.

5.5. Consequently, it is recommended that piled foundations are used for the remaining 11 plots. It is therefore rational to provide piled foundations for all plots in order negate the risk of encountering varying conditions within plots 1, 2, 12 and 13 as works progress.

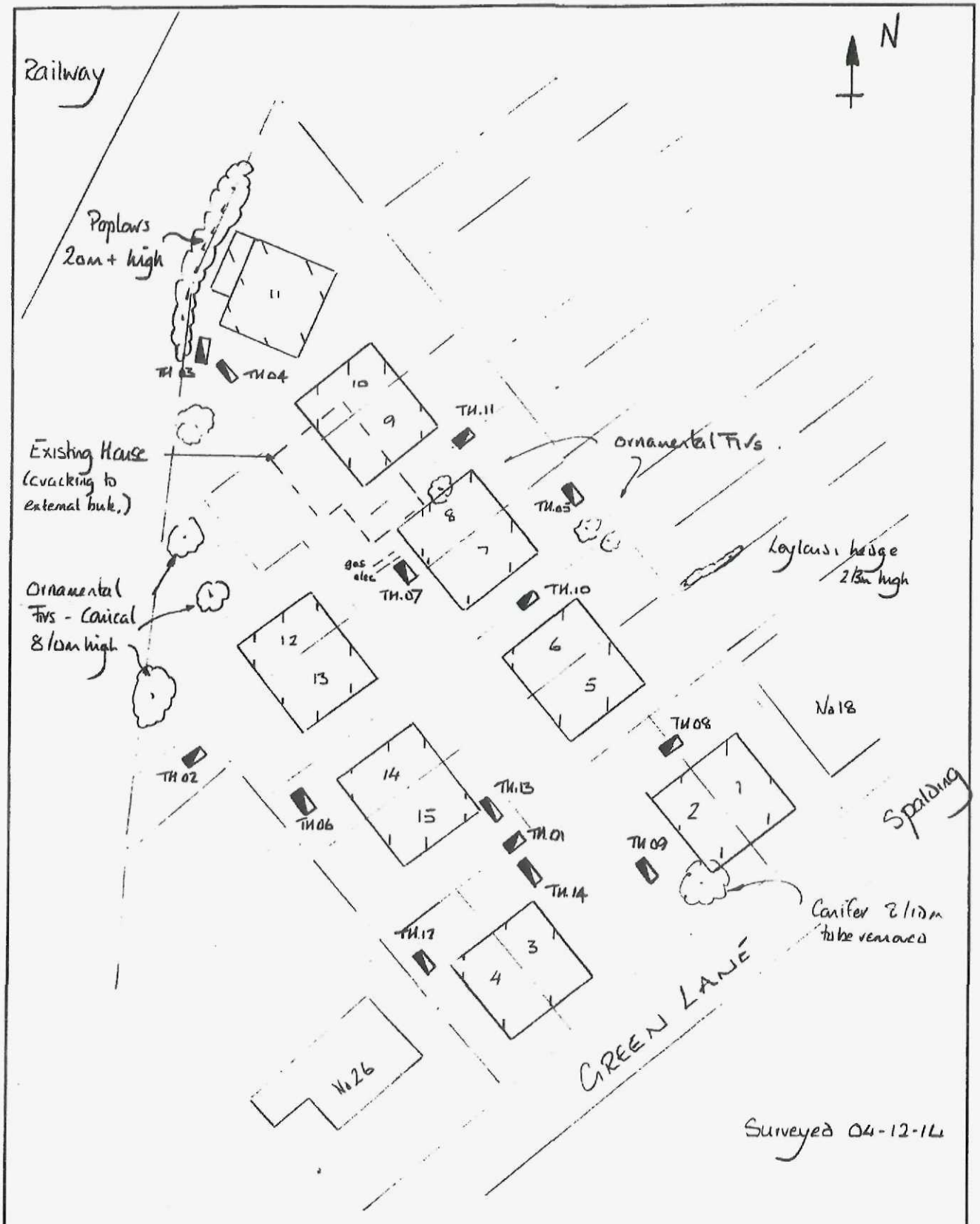
5.6. The repetitive house type and simple footprint should allow the piled reinforced concrete ground beams to be designed and detailed cost effectively.

5.7. The piled foundations will cater for all the sub soil conditions encountered but heave precaution detailing will be required to Plot 11 adjacent to the boundary Poplars.

5.9. The minimum grade for buried reinforced concrete is RC 35.



Eur. Ing. G. C. Holyoake, B.Sc. C.Eng. M.I.C.E.



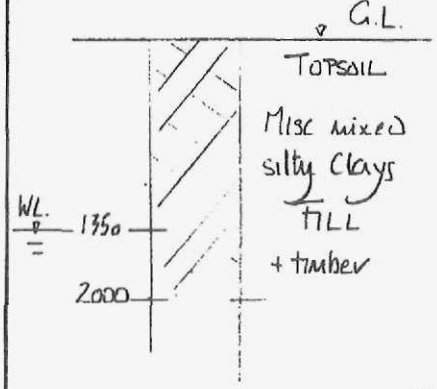
Geoff Holyoake Associates Ltd.
Structural & Civil Engineering Consultants

27 Exeter Gardens
Stamford
Lincolnshire PE9 2RN
Tel: 01780 765971

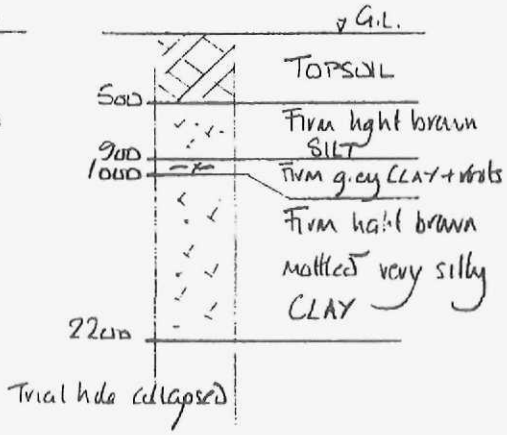
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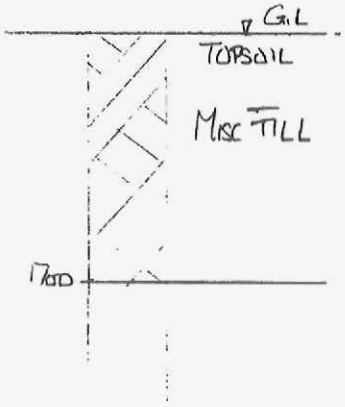
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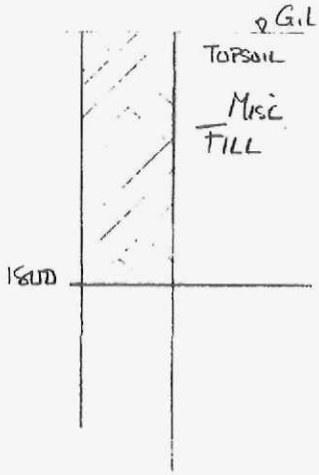
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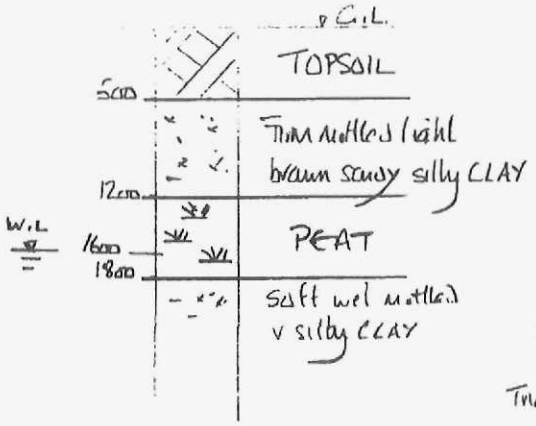
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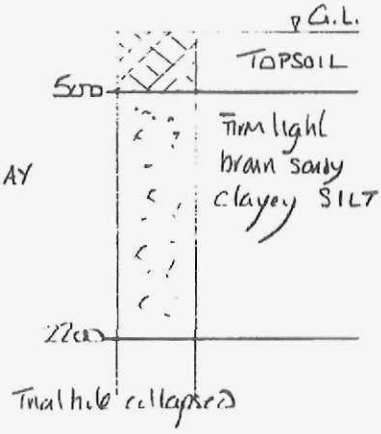
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TH.06



Geoff Holyoake Associates Ltd.
Structural & Civil Engineering Consultants

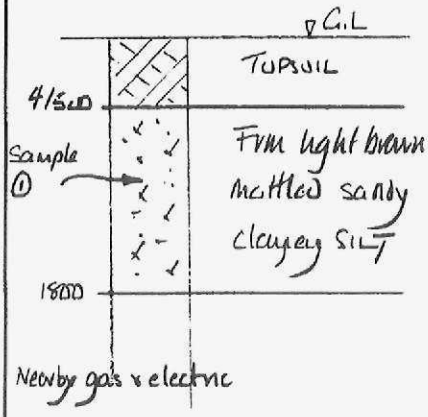
27 Exeter Gardens
Stamford
Lincolnshire PE9 2RN
Tel: 01780 765971

Drawing Title

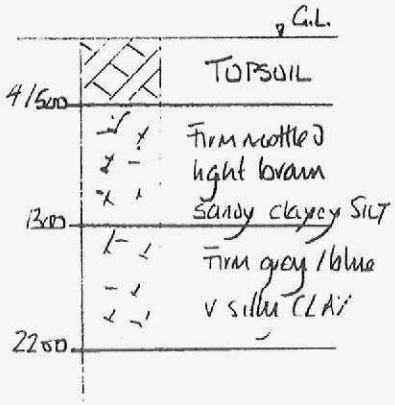
TRIAL HOLE LOGS 01~06

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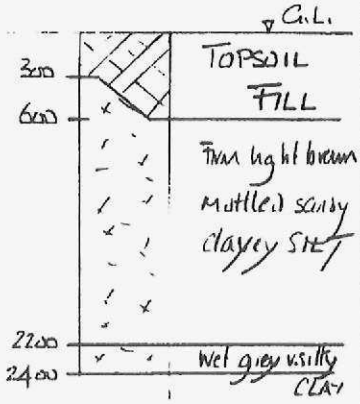
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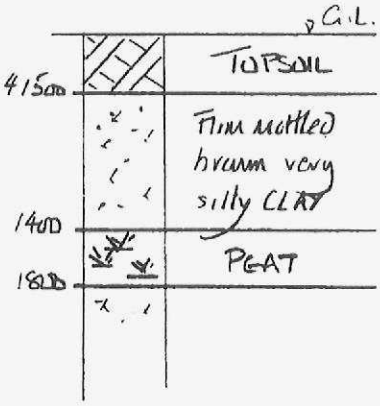
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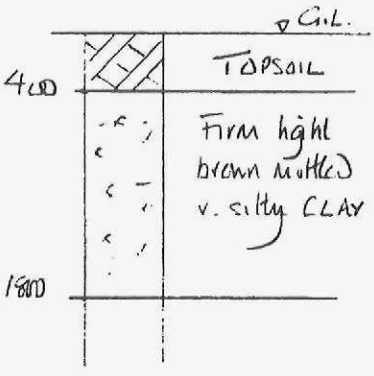
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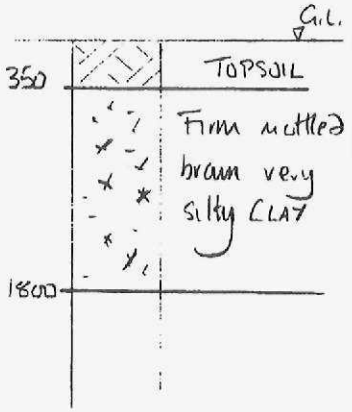
TH.10



TH.11



TH.12



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Structural & Civil Engineering Consultants

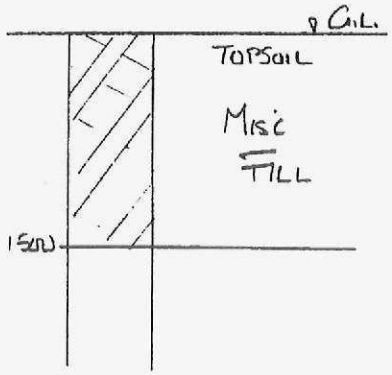
27 Exeter Gardens
Stamford
Lincolnshire PE9 2RN
Tel: 01780 765971

Drawing Title

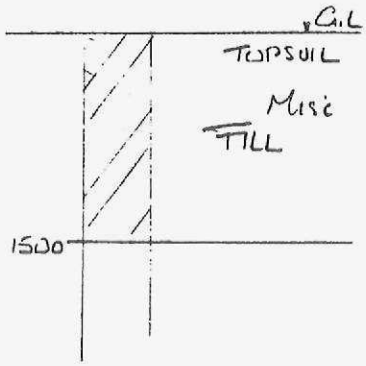
TRIAL HOLE LOGS 07-12

Drawn	Date	Scale	Dwg.No
CCH	Dec '14	1	SZ 1122 14103

TH.13



TH.14



Geoff Holyoake Associates Ltd.
Structural & Civil Engineering Consultants

27 Exeter Gardens
Stamford
Lincolnshire PE9 2RN
Tel: 01780 765971

Drawing Title: TRIAL HOLE LOGS 13 & 14

Drawn	Date	Scale	Dwg.No
GCH	DEC '14	—	SZ.1122 14104

8180

GROUND ENGINEERING

Newark Road Peterborough

t: 01733 566566 f: 01733 315280

e: admin@groundengineering.co.uk

TEST CERTIFICATE

Determination of Liquid & Plastic Limits

Tested in accordance with BS 1377-2:1990: Clause 4.4 & 5: One Point Method

Client:	Geoff Holyoake Associates Ltd	Certificate Number:	PL4849-1/1/704
Client Address:	27 Exeter Gardens Stamford Lincs PE9 2RN	Client Reference:	Not Given
		Job Number:	PL4849-1
		Date Sampled:	Unknown
Contact:	Geoff Holyoake	Date Received:	05.12.2014
		Date Tested:	12.12.2014
Site Name:	24 Green Lane	Certificate of Sampling:	N/A
Site Address:	Spalding	Sampling Certificate No.:	N/A
		Sampled By:	Client

Test Results:

Laboratory Reference: PL4849-1/1

Sample Reference: Sample 01 (Disturbed)

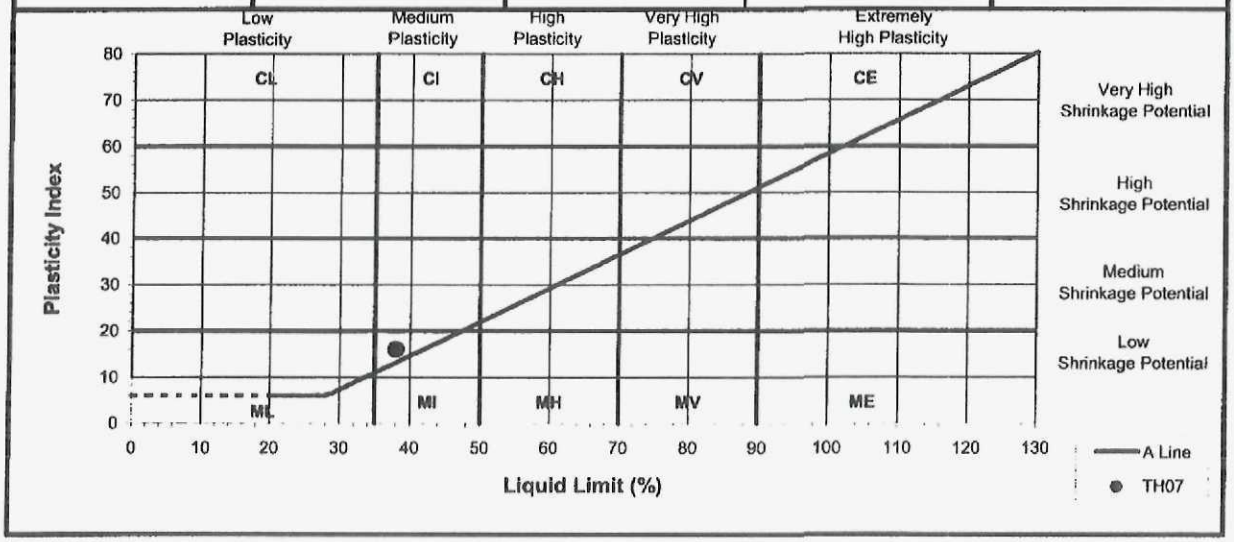
Sample Description: Soft brown grey very sandy CLAY

Location: TH07 **Depth:** 1.20m

Sample Preparation: As Received

Estimated % Passing 425µm BS Test Sieve

Moisture Content (%)	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index	% Passing 425µm BS Test Sieve
35	38	22	16	100



Comments:

Approved Signatory: M. Hartnup - Laboratory Manager Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 15.12.2014 Page 1 of 1

Form Number: GELab/C/704 Version 33

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Registration Number: 6929574
Reg Office: Ground Engineering Ltd
Newark Rd, Peterbrough PE1 5UA

8180

GROUND ENGINEERING

TEST CERTIFICATE

Determination of Moisture Content

Newark Road Peterborough
t: 01733 566566 f: 01733 315280
e: admin@groundengineering.co.uk

Tested in Accordance with BS 1377-2: 1990: Clause 3.2

Client:	Geoff Holyoake Associates Ltd	Certificate Number:	PL4849-1/1/705
Client Address:	27 Exeter Gardens Stamford Lincs. PE9 2RN	Client Reference:	Not Given
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		Date Received:	05.12.2014
Contact:	Geoff Holyoake	Date Tested:	12.12.2014
		Certificate of Sampling:	N/A
Site Name:	24 Green Lane	Sampling Certificate No.:	N/A
Site Address:	Spalding	Sampled By:	Client

TEST RESULTS

Laboratory Reference	Sample Reference	Location	Depth Top	Depth Base	Description	Moisture Content [%]
PL4849-1/1	Sample 01 (Disturbed)	TH07	1.20m	N/A	Soft brown grey very sandy CLAY	35

Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 15.12.2014 Page 1 of 1
Form Number: GELab/C/705 Version 17

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Reg Office: Ground Engineering Ltd
Newark Rd, Peterbrough PE1 5UA

2775-15

ENVIRONMENTAL NOISE & VIBRATION ASSESSMENT

BY

ACOUSTIC ASSOCIATES (PETERBOROUGH)

Acoustic Associates

PETERBOROUGH

Environmental Noise and Vibration Assessment of Proposed Residential Development on Green Lane, Spalding

CLIENT:	D & R Property Services Ltd
AGENT:	G R Merchant Ltd
REPORTED BY:	Jaroslaw Gil MSc, MIOA, MIDiagE
CHECKED BY:	Sean Sullivan MIOA, MIDiagE
REPORT No.:	JG/J2894/15329
DATE:	December 2014

ACOUSTIC ASSOCIATES (PETERBOROUGH)

32 South Street, Stanground, Peterborough, PE2 8ET.
Tel: 01733 896346, Fax: 01733 567779
e-mail: info@aapb.co.uk **Website:** www.aapb.co.uk

SUMMARY

An assessment has been carried out associated with environmental noise and vibration for a proposed residential development at a site on Green Lane, Spalding. The assessment was carried out in accordance with the National Planning Policy Guidance and Noise Policy Statement for England.

The noise climate is dominated by the adjacent railway line and distant road traffic.

Using the noise impact criteria from the Noise Policy Statement for England the noise situation on site is likely to be at the "*No Observed Effect Level*" or "*Lowest Observed Effect Level*", provided noise mitigation measures listed in this report are implemented.

The assessment showed that vibration will not be an issue at the site.

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1 OBJECTIVES

1.1 To carry out a *noise and vibration assessment of a proposed residential development on Green Lane, Spalding in accordance with the National Policy Planning Framework (NPPF - Reference 1) and the Noise Policy Statement for England (NPSE) – (Reference 2).

1.2 To recommend solutions to any problems identified by the assessment.

2 CONCLUSIONS

2.1 Provided noise mitigation measures as listed in Section 3 of this report are implemented, the noise levels across the site and inside the dwellings are likely to be below the guidance limits for the daytime and night time periods given in World Health Organisation (WHO) guidance (Reference 3) and British Standard BS8233:2014 (Reference 4).

2.2 The vibration levels associated with trains passing by are unlikely to cause cosmetic damage to the buildings, according to guidance criteria given in British Standard BS 7385-2 (Reference 5).

2.3 The vibration monitoring carried out in accordance with British Standard 6472:1992 (Reference 6) shows that the vibration levels are in the *'low probability of adverse comment'* range for the 8-hour night-time period and beneath the threshold of that range for the 16-hour daytime period.

2.4 Using the noise and vibration impact criteria from the Noise Policy Statement for England the noise and vibration impact from the noise situation at the proposed site is likely to be at the "*No Observed Effect Level*" or "*Lowest Observed Effect Level*".

2.5 The noise and vibration levels documented within this report are based on current rail traffic as well as future rail traffic assumptions. It is assumed in this report that as a result of the Great Northern Great Eastern rail network renovation the rail traffic may double in future, which would result in a 3 dB noise impact increase both for daytime and night time periods.

3 RECOMMENDATIONS

3.1 This report should be used in support of the Planning Application for the Proposed Residential Development on Green Lane, Spalding.

3.2 The following noise mitigation measures are required for this development:

- A 1.8 m close-boarded timber fence should be erected between the gardens and the railway, as indicated with a **blue** line in Figure 6. Figure 7 shows a specification for the fence.
- Double glazing fitted with compression seals should be built into all bedrooms.
- Windows behind facades marked **red** in Figure 6 (plots 11-13) should be equipped with mechanical ventilation or attenuated passive ventilation, unless they have an openable window on a façade not marked in red. A passive vent should achieve a minimum sound insulation value of $D_{n,e,w}$ = 30 dB. The ventilation must comply with the Noise Insulation Regulations (Reference 7). Alternatively, a 'whole house' ventilation system could be used. There are several suppliers of acoustic ventilators, e.g. BPD supply Passivent Acoustic Ventilation products and 'whole house' systems and offer a free design service (see website: www.buildingproductdesign.com).

*** see Appendix 1 for a Glossary of Terms**

4 BACKGROUND

D & R Property Services Ltd propose to develop a site off Green Lane, Spalding into a residential area (See Figure 1). The proposal includes one detached house and ten semi-detached dwellings. The site is located close to a railway line, and the noise climate on site is dominated by railway noise and distant road traffic. The proposed dwelling layout is shown in Figures 2-6.

There are currently approximately two passenger train passes every hour between 7 am and 10 pm every day. The frequency of freight train passes by are unknown. The proposed site is not far from the Spalding train station, therefore the trains pass by at low speeds. 86 miles of The Great Northern Great Eastern (GNGE) rail network is being renovated which will result in increased traffic. It is not possible to estimate the future timetable, however, it was stated in a meeting between Peakirk residents and a Network Rail representative that the upgraded railway will provide 2 additional train paths per hour each way and that in a worst case rail traffic would be 4 freight trains per hour on top of the 2 passenger services, i.e. 6 in total. (Reference 10). It is therefore assumed in this report that the rail traffic could double as a result of the GNGE renovation works.

Acoustic Associates (Peterborough) were asked to undertake a noise assessment of the proposed development and this report documents the results of that assessment.

5 POLICY, GUIDANCE AND STANDARDS

5.1 National Policy Planning Framework

The National Policy Planning Framework (NPPF – Reference1) states the following with respect to noise (para 123). 1

"Planning policies and decisions should aim to:

> *avoid noise from giving rise to significant adverse impacts (27) on health and quality of life as a result of new development;*
>
> *mitigate and reduce to a minimum other adverse impacts (27) on health and quality of life arising from noise from new development, including through the use of conditions;*
>
> *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established and*
>
> *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The footnote 27 in the first two bullet points refers to the Noise Policy Statement for England (NPSE) in order to explain what it means by "adverse impact".

5.2 Noise Policy Statement for England and National Policy Planning Guidance

The Noise Policy Statement for England (Reference 2) has stated that the impact of noise be classified according to an "effect level" (shown in column 3 below). The National Planning Policy Guidance has clarified what this effect level below means in terms of its perception by people at receptors and what action should be taken (columns 1 and 4 below).

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 - National Policy Planning Guidance noise exposure hierarchy

5.3 World Health Organisation Guidance

5.3.1 The World Health Organisation (WHO) has published guidelines for community noise, as shown in Table 2 (see Reference 3). This WHO document gives guidance for the levels of noise both inside and outside of dwellings.

Specific Environment	Critical Health Effect(s)	L_{Aeq} (dB)	Time Base (hours)	L_{Amax}, fast (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

Note: The 'daytime' and 'night-time' periods are generally referred to as 0700 to 2300 and 2300 to 0700 hours respectively.

Table 2. World Health Organisation Noise Guidance Levels (Reference 3)

5.3.2 In addition to the above the WHO in 2009 published guidelines for night-time noise outside dwellings. These state:

".....an $L_{night,outside}$ of 40 dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55 dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach..... $L_{night,outside}$ of 40 dB is equivalent to the LOAEL for night noise."

5.4 British Standard BS 8233

British Standard BS8233:2014 (Reference 4) also gives guidance on indoor ambient noise levels, as shown in Table 3.

Activity	Location	Noise criteria	
		07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 3 – BS 8233: 2014 guidance indoor ambient noise levels for dwellings.

5.5 Vibration Standards

A guide to cosmetic damage for transient vibration is given in British Standard BS 7385: Part 2: 1993 (Reference 5) which is shown in Table 4.

Type of Building	Peak Particle Velocity (mms^{-1}) in Frequency Range of Predominant Pulse	
Unreinforced or light framed structures. Residential or light commercial type buildings.	4 Hz to 15 Hz	15 Hz and above
	Transient Vibration	
	15 mms^{-1} @ 4 Hz increasing to 20 mms^{-1} @ 15 Hz	20 mms^{-1} @ 15 Hz increasing to 50 mms^{-1} @ 40 Hz
	Continuous Vibration	
	7.5 mms^{-1} @ 4 Hz increasing to 10 mms^{-1} @ 15 Hz	10 mms^{-1} @ 15 Hz increasing to 25 mms^{-1} @ 40 Hz

Table 4 - Guidance on Transient Vibration Values below which Cosmetic Damage to Buildings is unlikely to occur – derived from BS 7385

British Standard 6472-1 (Reference 6) details the likely comments associated with Vibration Dose Values in residential buildings during the daytime and night time periods, as shown in Table 5.

Place and Time	Low Probability of Adverse Comment $m/s^{1.75}$	Adverse Comment Possible $m/s^{1.75}$	Adverse Comment Probable $m/s^{1.75}$
Residential Buildings (16 hour day)	0.2 to 0.4 [1]	0.4 to 0.8	0.8 to 1.6 [2]
Residential Buildings (8 hour night)	0.1 to 0.2 [1]	0.2 to 0.4	0.4 to 0.8 [2]

Notes: [1] Below these ranges adverse comment is not expected.
[2] Above these ranges adverse comment is very likely
[3] For offices and workshops, multiplying factors of 2 and 4 respectively should be applied to the above vibration dose value ranges for a 16 hour day.

Table 5 – Vibration Dose Value (VDV) Ranges (British Standard 6472-1)

5.6 Noise Measurements

Noise monitoring equipment was set up at Location A (see Figure 1) close to the position of the façade of the northernmost proposed dwelling and approximately 18 m away from the railway line. Noise was continuously monitored throughout the period from 15:13 hours on Thursday 20th November 2014 to 03:32 hours on Friday 21st November 2014. The noise monitoring location was in free-field conditions at a height of 1.5 metres above ground level. The weather was cool, 4-11°C, dry, calm, overcast and foggy. Appendix 2 gives details of the noise instrumentation used and Figure 1 shows the monitoring location.

5.7 Vibration Measurements

Vibration measurements were conducted at Location B (see Figure 1), adjacent to the façade of an existing house and approximately 33 m away from the railway line. Vibration Dose Values (VDV) where continuously monitored in the three orthogonal directions throughout the period, from 14:46 hours on Thursday 20th November 2014 to 15:41 hours on Friday 21st November 2014. The monitoring instrumentation records all vibration events and calculates the hourly and period VDV values. For 'daytime' vibration the 16-hour (07:00 to 23:00) VDV level is used whilst for 'night-time' the 8-hour (23:00 to 07:00) VDV value is taken. Additionally, Peak Particle Velocity (PPV) values were measured in the vertical direction. Appendix 2 gives details of the vibration instrumentation used.

5.8 Computer Noise Model Of The Site And Surrounding Area

A computer noise model of the site and surrounding area was generated using Wolfel IMMI Computer Noise Modelling Software (Reference 9) which uses the methods given in ISO 9613 – 2 (Reference 8) to calculate noise levels given a topographical model of the site. The model was calibrated with the noise measurements taken on site.

6 RESULTS

6.1 Measured Noise Levels

The results from the ambient noise monitoring are shown in Appendix 3 in graphical form. The graphs show the 'energy average' noise level ($L_{Aeq,T}$) during 1-hour long periods. From this data the 16-hour daytime and 8-hour night time noise levels ($L_{Aeq,T}$), were determined and these are documented in Table 6.

Noise level ($L_{Aeq,T}$) – dB(A)	
16-hour Day[1]	**8-hour Night[2]**
49.4	40.1
[1] Monitoring from 14:46 to 23:00 [2] Monitoring from 23:00 to 3:00	

Table 6 - Measured Noise Levels at Location A (See Figure 1)

It can be seen in Appendix 3 that the L_{Amax} levels were generally below 60 dB(A) in the night time period, with the exception of two events: 62.9 dB(A) at 23:56 and 71 dB(A) at 01:13 hour.

6.2 Calculated Noise Levels over Site

The noise incident on the proposed new dwellings is required to enable noise mitigation measures to be designed. This was determined using the computer noise model. The railway noise source was calibrated based on the noise levels measured at Location A. The prediction numerical output for that location is shown in Appendix 4.

Having created and calibrated the model, noise predictions were carried out at assessment locations in the middle of the proposed gardens, at 1.5 m and in front of dwelling façades, at 1.5 m (ground floor level) and 4.5 m (first floor level) above the ground.

The following table shows the computer prediction of noise levels at these assessment locations for daytime and night-time. The figures in brackets are to a possible future doubling of railway traffic (a noise level increase of 3 dB). Figures 2 and 3 show the dwelling locations and the noise contours for daytime and night time, respectively. Figures 4 and 5 show noise contours for daytime and night time periods, following an increase in rail traffic.

Location	Predicted Noise Level dB(A) Values in brackets are for future increased rail traffic	
	Daytime $L_{Aeq,16hour}$	Night time $L_{Aeq,8hour}$
Plot 1 garden	39.5 (42.5)	-
Plot 2 garden	38.8 (41.8)	-
Plot 3 garden	41.7 (44.7)	-
Plot 4 garden	41.9 (44.9)	-
Plot 5 garden	40.2 (43.2)	-
Plot 6 garden	39.0 (42.0)	-
Plot 7 garden	41.4 (44.4)	-
Plot 8 garden	41.3 (44.3)	-
Plot 9 garden	43.3 (46.3)	-
Plot 10 garden	42.8 (45.8)	-
Plot 11 garden	48.5 (51.5)	-
Plot 12 garden	48.9 (51.9)	-
Plot 13 garden	45.5 (48.5)	-
Plot 14 garden	43.0 (46.0)	-
Plot 15 garden	44.1 (47.1)	-
Plot 11, outside ground floor window	48.4 (51.4)	-
Plot 11, outside first floor window	-	43.0 (46.0)
Plot 12-13, outside ground floor window	47.3 (50.3)	-
Plot 12-13, outside first floor window	-	40.5 (43.5)
Plot 14-5, outside ground floor window	46.3 (49.3)	-
Plot 14-15, outside first floor window	-	37.3 (40.3)

Table 7 - Predicted noise levels across the proposed site

Only in the northernmost gardens (plots 11 and 12) do noise levels marginally exceed the WHO threshold of 'moderate annoyance' (50 dB(A)), however, it is below the 'serious annoyance' threshold (55 dB(A)).

6.3 Measured Vibration Levels

Vibration measurements were made in accordance with BS6472 (Reference 6). The measurement location was about 33 m from the nearest rail track. The Vibration Dose Values (VDV's) were measured in three orthogonal directions during the monitoring period. The monitoring instrumentation records all vibration events and calculates the hourly and period VDV values. For daytime vibration the 16-hour (07:00 to 23:00) VDV level is given whilst for night time the 8-hour (23:00 to 07:00) VDV value is stated. The following table summarises the measured vibration levels and shows the predicted level at the façade of the nearest proposed house, which is 18 metres from the nearest rail track.

Day / Night	Vibration Dose Value (VDV) – $m/s^{1.75}$	
	16-hour Day	8-hour Night
Thursday / Friday	[1]0.040	0.029
Friday / Saturday	[1]0.042	-
Adjusted to position of façade of proposed dwelling which is closest to the railway line (approx. 18 m from track).	[2]0.057	[2]0.039

[1] projected 16-hour value based on part of a day

[2] The decay of vibration with distance can be estimated from the following formula:

$$V_x = V_{ref} \times \sqrt{(d_{ref}/d_x)}$$

Where; V_x = Amplitude of vibration at location x
V_{ref} = Amplitude of vibration at reference location
d_{ref} = Distance from source at reference location
d_x = Distance from source at location x

Table 8 – Measured and Predicted Vibration Levels (VDV)

Comparison of the results with the values in Table 5 shows that the daytime and night time vibration levels indicate that there is a low probability of adverse comment.

Table 9 shows the highest recorded PPV value. When comparing the measured PPV levels with the guidance limits in tables 4 and 7 it can be seen that there is very low probability of cosmetic damage.

Time	Maximum Peak Particle Velocity (PPV) – mm/s
15:01	0.4

Table 9 – Measured vibration levels (PPV)

7 NOISE MITIGATION

7.1 Calculation

The WHO gives guidance on indoor noise levels above which critical health effects occur: 35 dB(A) – speech intelligibility disturbance and 30 dB(A) – sleep disturbance.

Noise can enter a building through many paths, e.g., windows, walls, roof, etc. However, in most cases windows provide the main path and it is important to ensure that their insulation is specified correctly. Planning Policy Guidance PPG 24 (now obsolete) gives guidance on the noise reduction through windows (see Table 10).

Noise Source	Difference Between dB(A) Levels Outside and Inside			
	Partially Open Window	Single Glazing	Thermal Double Glazing	Secondary Glazing
Diesel Train	13	28	32	35
Electric Train	13	30	36	41
Road Traffic	13	28	33	34

Table 10 - Reduction of Noise for Different Window Specifications

To estimate the internal noise levels, noise reception points were created at 1 m away from the northern façade of each dwelling. The reception points were at ground floor level (1.5 m above the ground) and first floor level (4.5 m above the ground). The noise levels inside particular rooms were calculated in line with formulas shown in British Standard BS 8233:1999 section 6.7.2 (Reference 3). A number of assumptions were made for the calculations:

- The double glazing, including compression seals, was used as standard.
- Where windows had to be closed, a passive attenuated vent was assumed with a minimum sound insulation of $D_{n,e,w}$ = 30 dB.
- The roof construction was roof tiles with insulation in the loft space and a 12.5mm plasterboard layer for the ceiling.
- Room volume was assumed to be at least 25 m^3.

Using the above specification as a starting point internal ambient noise levels have been predicted. Table 13 shows the estimated indoor noise level only the most exposed dwellings: plots 11-15. The noise levels in all other dwellings will be lower. The values calculated in Table 11 include noise mitigation measures, as listed in section 7.2.

Room	reception point	Noise level outside the façade dB(A)		Conditions	Internal noise level dB(A)		Compliance with WHO / BS 8233 Guidance
		Daytime	Night time		Daytime	Night time	
Plot 11 Lounge	Plot 11, Ground Floor	51.4	-	Windows closed (attenuated ventilation required)	30.0	-	YES
Plot 11 Bedroom	Plot 11, First Floor	-	46.0	Windows closed (attenuated ventilation required)	-	27.9	YES
Plot 12-13 Lounge	Plot 12-13, Ground Floor	52.5	-	Windows closed (attenuated ventilation required)	31.1	-	YES
Plot 12-13 Bedroom	Plot 12-13, First Floor	-	43.5	Windows closed (attenuated ventilation required)	-	25.4	YES
Plot 14-15 Lounge	Plot 14-15, Ground Floor	49.3	-	Natural ventilation (partially open window)	33.5	-	YES
Plot 14-15 Bedroom	Plot 14-15, First Floor	-	40.3	Natural ventilation (partially open window)	-	27.6	YES

Table 11 – Ambient noise levels in representative plots.

7.2 Noise mitigation measures

7.2.1 A 1.8 m close-boarded timber fence should be erected between the gardens and the railway. Figure 7 shows a specification for the fence and Figure 6 shows its footprint.

7.2.2 All windows should be double glazed with compression seals.

7.2.3 Windows behind facades marked red in Figure 6 (plots 11-13) should be equipped with mechanical ventilation or attenuated passive ventilation unless there is an openable window on a façade not marked in red. See section 3 for more details.

REFERENCES

1 National Policy Planning Framework (NPPF)
Published July, 2012 by Department for Communities and Local Government
ISBN: 978-1-4098-3408-3

2 Noise Policy Statement for England - Published March 2010 by DEFRA

3 World Health Organisation (WHO) – Guidelines for Community Noise.
Published 1999

4 British Standard BS8233 :2014 , (BS 8233)
Sound Insulation and Noise Reduction for Buildings –A Design Guide

5 BS 7385-2:1993
Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration

6 BS 6472-1:2008
Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting

7 Noise Insulation Regulations, 1975: SI 1975: 1763

8 ISO 9613 – 2:
Acoustics – Attenuation of sound during propagation outdoors.

9 Wolfel IMMI Computer Noise Modelling Software.

10 Minutes of a meeting of Peakirk Parish Council held on Monday, 15th July 2013 in the village hall at 7:30.

APPENDIX 1 – Glossary of Terms

Sound Pressure	The variation of ambient pressure that is detected by the ear as sound.
Noise	Unwanted sound
deciBel (dB)	Ten times the logarithm of the square of the ratio of the Sound Pressure to a reference pressure (20 micro-Pascal's).
Sound Pressure Level (Lp)	The decibel version of the Sound Pressure.
A-Weighting	A frequency weighting which simulates the response of the ear. An A-Weighted Sound Pressure Level is denoted by L_{pA} and has units of dB(A)
$L_{Aeq,T}$	The value of the A-weighted sound pressure level, in decibels [dB(A)], of a continuous steady sound that within a specified time interval (T), for example 16 hours, has the same mean-square sound pressure as a sound that varies with time. Therefore, the average over a 16 hour period would be denoted as $L_{Aeq,16h}$
$L_{Amax,T}$	The maximum A-Weighted sound pressure level that was encountered during the measurement period.
$L_{A90,T}$	The A-Weighted sound pressure level that is exceeded for 90% of the time (T). This is usually used a measure of background noise.
Free Field	Where noise can propagate freely without any reflections from buildings etc.
Octave Band	A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000
NPSE Critera	
NOEL	No Observed Effect Level
LOAEL	Lowest Observed Adverse Effect Level
SOAEL	Significant Observed Adverse Effect Level

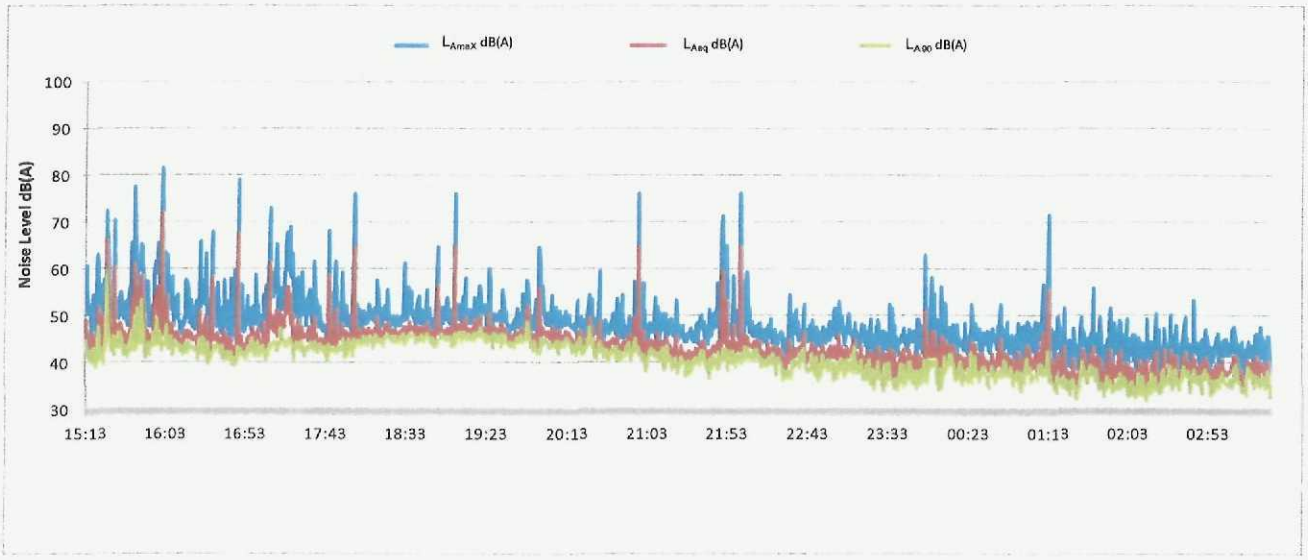
APPENDIX 2 - Noise Instrumentation

Type	Manufacturer	Description	Serial number	Last Calibration Date	Calibration Certificate No.
Svan 957	Svantek	Sound Level Meter	27591	10/06/2014	148881
GA 607	Castle	Sound Level Calibrator	032942	08/07/2013	143599
V901	Vibrock	Vibration Meter	1486	28/07/2014	149591

The calibration of the instrumentaiton was checked at the start and end of the tests and there was no significant drift.

APPENDIX 3 - Results of Noise Monitoring at Location A

Weather: cool, 4-11°C, dry, calm, overcast and foggy



APPENDIX 4 – Computer model numerical output

A4.1 Legend

Long list - legend			
Shared fields			
1	No.	-	Consecutive numbering of data rows (without titles etc.)
2	IPkt	-	Receiver name automatically generated from type and element number
3	IPkt: Label	-	Receiver point name attributed by the user
4	IPkt: RP_x	/m	x-coordinate of the receiver point
5	IPkt: RP_y	/m	y-coordinate of the receiver point
6	IPkt: RP_z	/m	z-coordinate of the receiver point
7	source	-	Source name automatically generated from type and element number
8	Label	-	Source name attributed by the user
9	Dep.	-	Number of the element section (line section or triangle)
10	Spli	-	Number of the section/triangle resulting from the application of either distance criterion or projection
11	SP_x	/m	x-coordinate of the (virtual) sound source
12	SP_y	/m	y-coordinate of the (virtual) sound source
13	SP_z	/m	z-coordinate of the (virtual) sound source
14	Length	/m	Length of the ound source section
15	Surface	/m,	Surface of the sound source section
16	RO	-	Order of reflection: 0= sirect sound, 1= 1st reflection, 2= 2nd and higher order
17	Rde	-	Number of the element section of the reflector
18	Reflector	-	Name of the reflecting element automatically generated from element type and number
19	Distance	/m	Distance between receiver point and (virtual) point source
20	Frq	/Hz	Emission frequency
21	s_perpend.	/m	perpendicular distance between receiver and line source on the xy-plane
22	Lw,i	/dB(A)	A-weighted emission value for the partial source in dB
22			Für Iso 9613-2: Bei Beurteilung nach TA Lärm ist hier gg. ein Ruhezeitzuschlag enthalten.
23	L_corr	/dB	Correction for the section length or partial surface
201	,i	/dB(A)	Rated A-weighted level of partial source
202	(dep)	/dB(A)	Rated A-weighted level of the section of the source
203	(SS)	/dB(A)	Rated A-weighted level of the source
204	(EC)	/dB(A)	Rated A-weighted level of the sources of the element class
205	(RP)	/dB(A)	Rated A-weighted level at the receiver

ISO 9613-2, Oct.1999. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation			
LfT = Lw + Dc - Adiv - Aatm - Agr - Afol - Ahous - Abar - Cmet			
101	AM	/dB	Total propagation attenuation = difference between emitter and receiver
102	DC	/dB	Solid angle measure+Directivity+Ground effect (frequency-independent)
			Dc = D0 + DI + Domega
103	DI	/dB	Directivity
104	Adiv	/dB	Attenuation due to geometrical divergence
105	Aatm	/dB	Attenuation due to atmospheric absorption
106	Agr	/dB	Attenuation due to ground effect in dB
107	Afol	/dB	Attenuation due to vegetation
108	Ahous	/dB	Attenuation due to housing
109	Ddg	/dB	Sum total of the attenuation by vegetation and housing
110	Abar	/dB	Attenuation due to a barrier
111	Cmet	/dB	Meteorological correction

A4.2 Numerical output for Location A (model calibration point)

Long list - full detail	**Point calculation**
Noise prediction	
Current	**Setting: Last direct entry**
	Day

	IPkt	IPkt: Label	IPkt: RP_x	IPkt: RP_y	IPkt: RP_z	(RP)
-	-	-	/m	/m	/m	/dB(A)
1	IPkt001	Location A	213.20	115.20	1.500	49.83

No.	IPkt: Label	Source Label	Dep.	Spli	RO	Distance	Frq	Lw,i	Lw,i	AM	DC	Adiv	Aatm	Agr	Afol	Ahou	Ddg	Abar	Cmet	(RP)
-	-	-	-	-	-	/m	/Hz	/dB(A)	/dB(A)	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB(A)
1	Location A	Railway	1	1	0	362.19	500	71.39	71.39	-64.53	3.01	62.17	0.70	4.68	0.00	0.00	0.00	0.00	0.00	
2	Location A	Railway	1	2	0	301.35	500	90.81	90.81	-62.79	3.01	60.57	0.58	4.65	0.00	0.00	0.00	0.00	0.00	
3	Location A	Railway	1	3	0	201.21	500	89.07	89.07	-59.01	3.01	57.07	0.39	4.57	0.00	0.00	0.00	0.00	0.00	
4	Location A	Railway	1	4	0	134.61	500	87.33	87.33	-55.27	3.01	53.57	0.26	4.44	0.00	0.00	0.00	0.00	0.00	
5	Location A	Railway	1	5	0	90.45	500	85.63	85.63	-51.52	3.01	50.12	0.17	4.24	0.00	0.00	0.00	0.00	0.00	
6	Location A	Railway	1	6	0	61.37	500	83.99	83.99	-47.77	3.01	46.75	0.12	3.91	0.00	0.00	0.00	0.00	0.00	
7	Location A	Railway	1	7	0	42.57	500	82.51	82.51	-44.04	3.00	43.58	0.08	3.39	0.00	0.00	0.00	0.00	0.00	
8	Location A	Railway	1	8	0	31.04	500	81.36	81.36	-40.54	3.00	40.83	0.06	2.65	0.00	0.00	0.00	0.00	0.00	
9	Location A	Railway	1	9	0	25.23	500	80.88	80.88	-38.03	2.99	39.03	0.05	1.94	0.00	0.00	0.00	0.00	0.00	
10	Location A	Railway	1	10	0	25.23	500	80.88	80.88	-38.03	2.99	39.03	0.05	1.94	0.00	0.00	0.00	0.00	0.00	
11	Location A	Railway	1	11	0	31.04	500	81.36	81.36	-40.54	3.00	40.83	0.06	2.65	0.00	0.00	0.00	0.00	0.00	
12	Location A	Railway	1	12	0	42.57	500	82.51	82.51	-44.04	3.00	43.58	0.08	3.39	0.00	0.00	0.00	0.00	0.00	
13	Location A	Railway	1	13	0	61.37	500	83.99	83.99	-47.77	3.01	46.75	0.12	3.91	0.00	0.00	0.00	0.00	0.00	
14	Location A	Railway	1	14	0	90.45	500	85.63	85.63	-51.52	3.01	50.12	0.17	4.24	0.00	0.00	0.00	0.00	0.00	
15	Location A	Railway	1	15	0	134.61	500	87.33	87.33	-55.27	3.01	53.57	0.26	4.44	0.00	0.00	0.00	0.00	0.00	
16	Location A	Railway	1	16	0	201.21	500	89.07	89.07	-59.01	3.01	57.07	0.39	4.57	0.00	0.00	0.00	0.00	0.00	
17	Location A	Railway	1	17	0	243.88	500	77.19	77.19	-60.81	3.01	58.74	0.47	4.61	0.00	0.00	0.00	0.00	0.00	49.83

Long list - full detail	**Point calculation**
Noise prediction	
Current	**Setting: Last direct entry**
	Night

	IPkt	IPkt: Label	IPkt: RP_x	IPkt: RP_y	IPkt: RP_z	(RP)
-	-	-	/m	/m	/m	/dB(A)
1	IPkt001	Location A	213.20	115.20	1.500	40.83

No.	IPkt: Label	Source Label	Dep.	Spli	RO	Distance	Frq	Lw,i	Lw,i	AM	DC	Adiv	Aatm	Agr	Afol	Ahou	Ddg	Abar	Cmet	(RP)
-	-	-	-	-	-	/m	/Hz	/dB(A)	/dB(A)	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB	/dB(A)
1	Location A	Railway	1	1	0	362.19	500	62.39	62.39	-64.53	3.01	62.17	0.70	4.68	0.00	0.00	0.00	0.00	0.00	
2	Location A	Railway	1	2	0	301.35	500	81.81	81.81	-62.79	3.01	60.57	0.58	4.65	0.00	0.00	0.00	0.00	0.00	
3	Location A	Railway	1	3	0	201.21	500	80.07	80.07	-59.01	3.01	57.07	0.39	4.57	0.00	0.00	0.00	0.00	0.00	
4	Location A	Railway	1	4	0	134.61	500	78.33	78.33	-55.27	3.01	53.57	0.26	4.44	0.00	0.00	0.00	0.00	0.00	
5	Location A	Railway	1	5	0	90.45	500	76.63	76.63	-51.52	3.01	50.12	0.17	4.24	0.00	0.00	0.00	0.00	0.00	
6	Location A	Railway	1	6	0	61.37	500	74.99	74.99	-47.77	3.01	46.75	0.12	3.91	0.00	0.00	0.00	0.00	0.00	
7	Location A	Railway	1	7	0	42.57	500	73.51	73.51	-44.04	3.00	43.58	0.08	3.39	0.00	0.00	0.00	0.00	0.00	
8	Location A	Railway	1	8	0	31.04	500	72.36	72.36	-40.54	3.00	40.83	0.06	2.65	0.00	0.00	0.00	0.00	0.00	
9	Location A	Railway	1	9	0	25.23	500	71.88	71.88	-38.03	2.99	39.03	0.05	1.94	0.00	0.00	0.00	0.00	0.00	
10	Location A	Railway	1	10	0	25.23	500	71.88	71.88	-38.03	2.99	39.03	0.05	1.94	0.00	0.00	0.00	0.00	0.00	
11	Location A	Railway	1	11	0	31.04	500	72.36	72.36	-40.54	3.00	40.83	0.06	2.65	0.00	0.00	0.00	0.00	0.00	
12	Location A	Railway	1	12	0	42.57	500	73.51	73.51	-44.04	3.00	43.58	0.08	3.39	0.00	0.00	0.00	0.00	0.00	
13	Location A	Railway	1	13	0	61.37	500	74.99	74.99	-47.77	3.01	46.75	0.12	3.91	0.00	0.00	0.00	0.00	0.00	
14	Location A	Railway	1	14	0	90.45	500	76.63	76.63	-51.52	3.01	50.12	0.17	4.24	0.00	0.00	0.00	0.00	0.00	
15	Location A	Railway	1	15	0	134.61	500	78.33	78.33	-55.27	3.01	53.57	0.26	4.44	0.00	0.00	0.00	0.00	0.00	
16	Location A	Railway	1	16	0	201.21	500	80.07	80.07	-59.01	3.01	57.07	0.39	4.57	0.00	0.00	0.00	0.00	0.00	
17	Location A	Railway	1	17	0	243.88	500	68.19	68.19	-60.81	3.01	58.74	0.47	4.61	0.00	0.00	0.00	0.00	0.00	40.83

FIGURE 1 – Location Plan

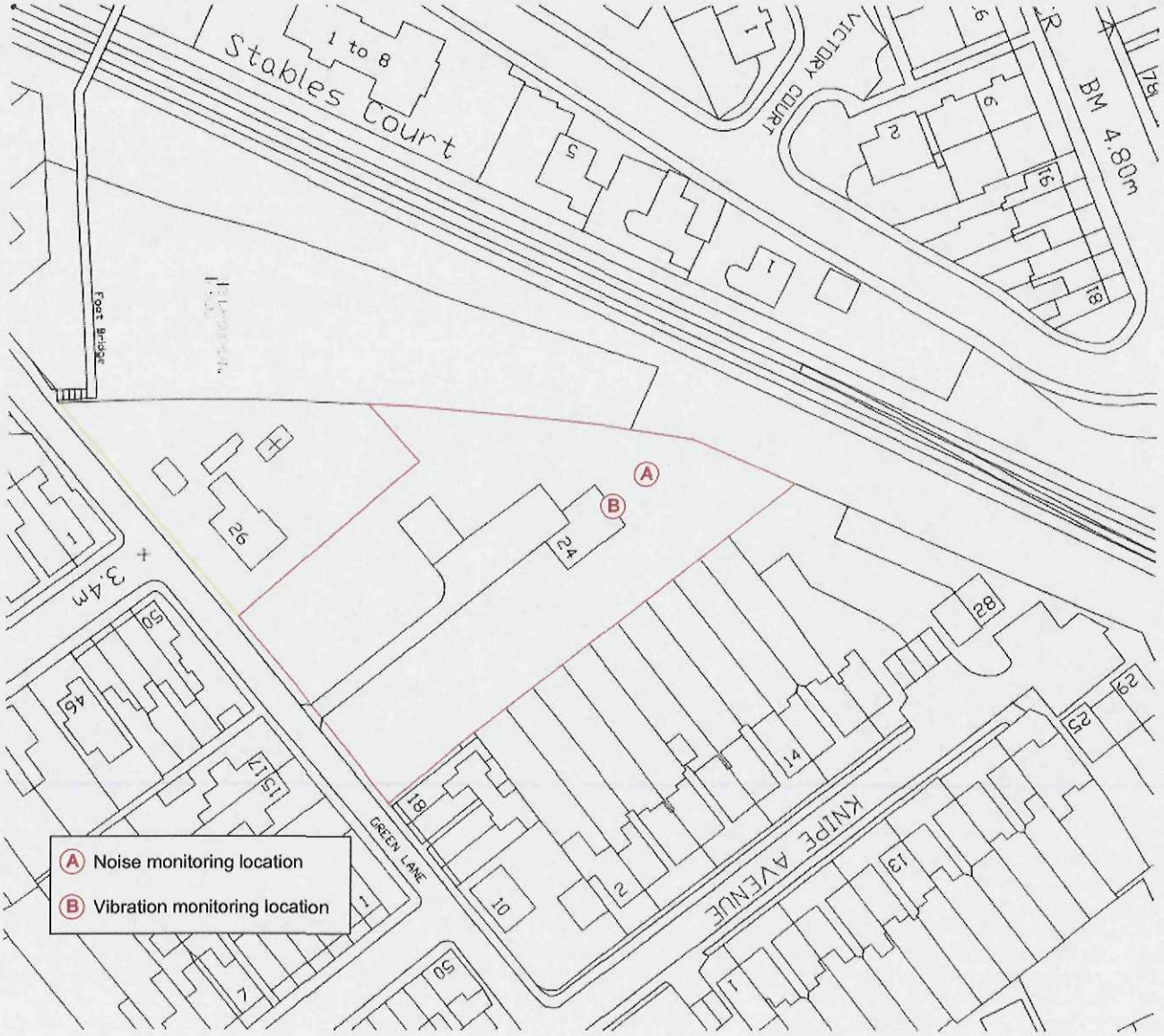


FIGURE 2 – Daytime noise contours (current rail traffic)

Ground floor level (1.5 m above the ground)

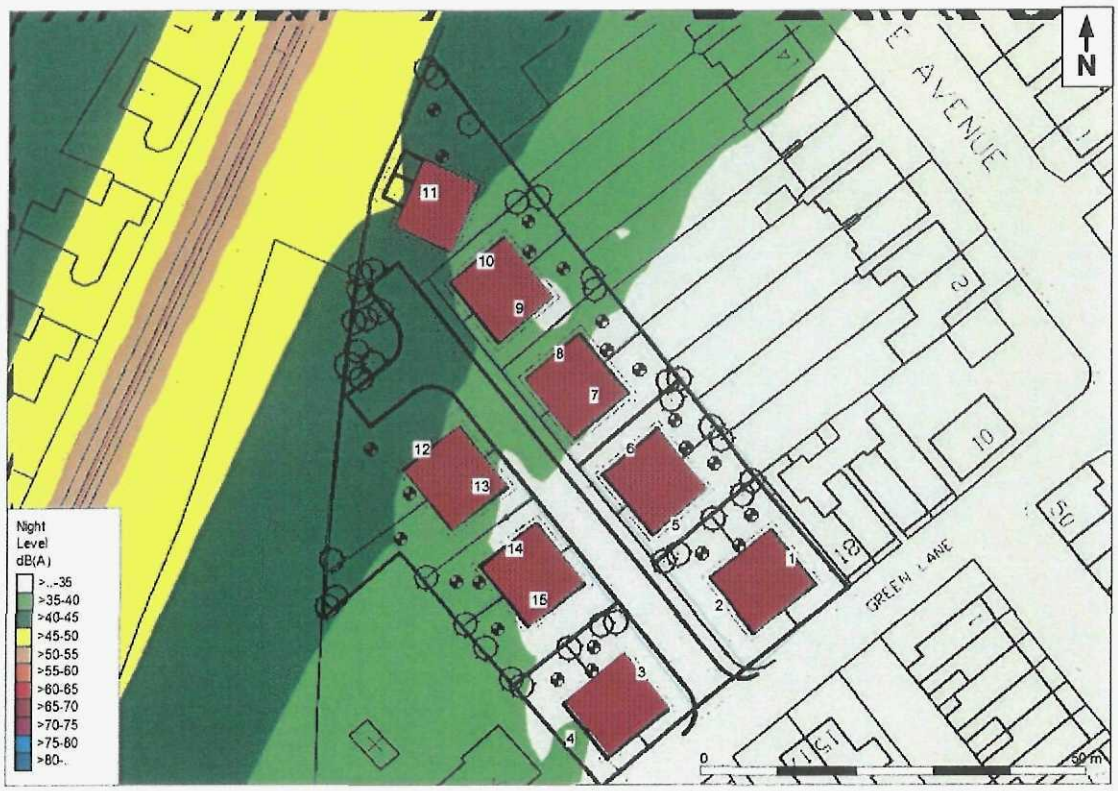


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Project:	Green Lane, Spalding

FIGURE 3 – Night time noise contours (current rail traffic)

First floor level (4.5 m above the ground)



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Handled by:	Jaroslaw Gil
Project:	Green Lane, Spalding

FIGURE 4 – Daytime noise contours (future rail traffic)

Ground floor level (1.5 m above the ground)



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Company:	Acoustic Associates
Handled by:	Jaroslaw Gil
Project:	Green Lane, Spalding

FIGURE 5 – Night time noise contours (future rail traffic)

First floor level (4.5 m above the ground)



Acoustic Associates
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Company:	Acoustic Associates
Handled by:	Jaroslaw Gil
Project:	Green Lane, Spalding

FIGURE 6 – Noise Mitigation Measures

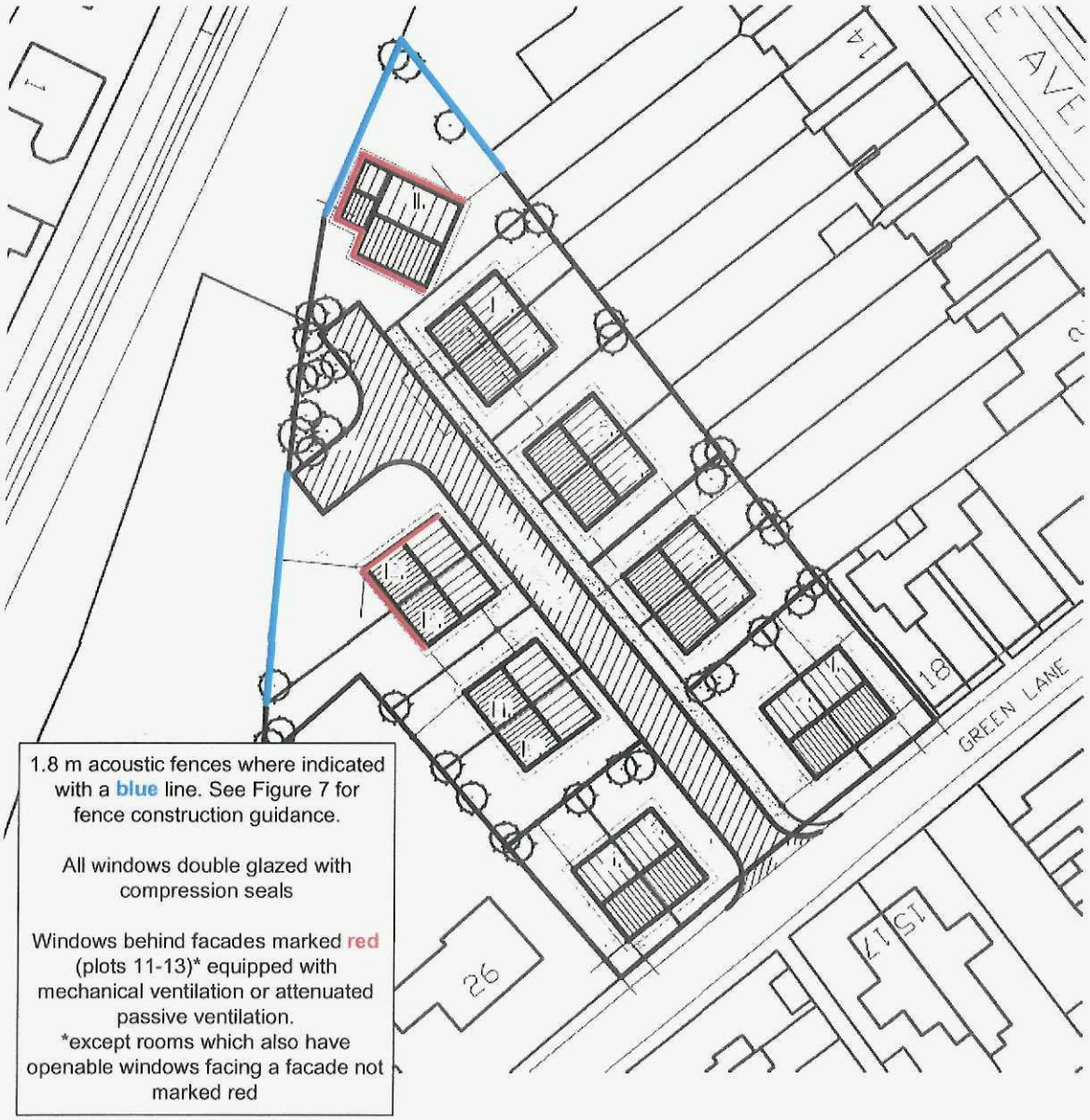


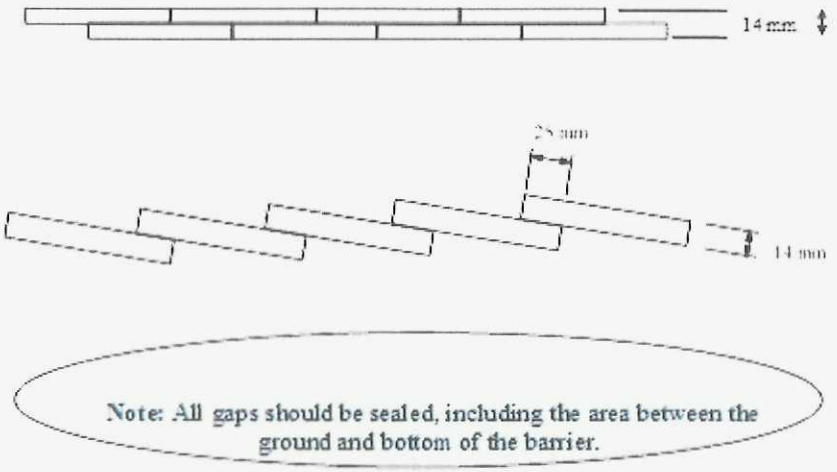
FIGURE 7 – Acoustic Fence advice

Any acoustic barrier should comprise of an impervious material. e.g. close-boarded timber and have a mass per unit area of at least 7 kg/m^2.Any material can be used to construct the acoustic barrier. with a minimum surface density of 7 kg/m^2.

It is advised that the minimum thickness of a wooden fence is at least 14mm and is overlapped as shown below.

Suitable Wooden Fence Configurations:

Plan Views



PHOTOGRAPHS OF SURROUNDING ROADS

HIGHLIGHTING ON-STREET VEHICLE PARKING



HAVELOCK STREET



GREEN LANE



KNIPE AVENUE



CROSS STREET