

21LPL083/JS/L1

6th April 2022

Richard Sedden
Lovell Partnership
(via email: Richard.Sedden@Lovell.co.uk)

Dear Richard

PILING IMPACT ON GROUNDWATER – EDGE LANE, OPENSHAW

1. Introduction

This letter report has been issued to satisfy a query from the Environment Agency for the development at the above mentioned site. The query is as follows:

"21/LPL/083/MJF/GS/FP01 (condition 8) – Under previous EA correspondence (see letter SO/2020/120226/02) for the original parent permission, we have raised concern regarding the coverage /extent of protective clay covering for the underlying aquifer. The letter provided details BGS record extract and references the fact that additional boreholes to determine the suitability of pile lengths have been undertaken. We would advise that reference to the BGS extract alone is not sufficient evidence (as this is site-specific characterisation) and would request that the further borehole / piling investigation detailed within the letter are submitted in full for review by the EA. Preferentially this information/data should be submitted in the form of a piling risk assessment which details how the results of the investigations (additional boreholes) have informed the piling methodology selected for use."

The following reports should be read in conjunction with this letter:

- Betts Geo Letter Report – 15th February 2022 – Discharge of Condition 4 (Local Benefit Proposal), 5 (Drainage), 8 (piling) and 9 (Construction Management Plan) – 21/LPL/083/MJF/GS/FP01
- Pre-Cast Piling Methodology Rev # May 2021 - Edge Lane. Land at Edge Land, Manchester, M11 1DG. Application Number: 126674/FO/2020. Prepared by Lovell. Date: May 2021

Betts Geo have been involved with the site with Your Housing Group prior to sale to Lovells – as such we have undertaken extensive ground investigation along with supervision of demolition and remedial works at the site. The following reports were produced for the works for Your Housing Group:

- Betts Geo - Ground Investigation Report for Edge Lane, Openshaw – March 2020 - Report No. 19YHG001/GI Rev 2
- Betts Geo – Remediation Strategy for Edge Lane, Openshaw – May 2020 - Report No. 19YHG001/RS Rev D

2. Cable Percussive Holes for Piling Depth

Four (4 No) cable percussive holes were undertaken on the site in November/December 2020 (post demolition of the warehouse buildings) to 15.00mbgl to confirm ground conditions for pile design. The location of these can be seen in the Exploratory Hole Location Plan at the end of this report.

Ground conditions comprised of MADE GROUND to a maximum depth of 3.50mbgl overlying a stiff to very stiff CLAY which was found to a maximum depth of 9.80mbgl. Below the stiff CLAY was a dense to very dense reddish brown fine

to coarse SAND – the base of which was not reached in three of the boreholes (terminated at 15.00mbgl). BH04 did however, encounter the base of the SAND at 14.00mbgl with further stiff CLAY underlying the SAND. A summary of each borehole can be seen below:

- BH01 – MADE GROUND to 1.60mbgl. Stiff to very stiff CLAY between 1.60mbgl – 9.00mbgl. Dense to very dense SAND between 9.00mbgl – 15.00mbgl (BNE).
- BH02 – MADE GROUND to 3.50mbgl. Stiff to very stiff CLAY between 3.50mbgl – 9.80mbgl. Dense to very dense SAND between 9.80mbgl – 15.00mbgl (BNE).
- BH03 – MADE GROUND to 1.60mbgl. Stiff to very stiff CLAY between 1.60mbgl – 7.50mbgl. Dense to very dense SAND between 7.50mbgl – 15.00mbgl (BNE).
- BH04 – MADE GROUND to 1.30mbgl. Stiff to very stiff CLAY between 1.30mbgl – 7.90mbgl. Dense to very dense SAND between 7.90mbgl – 14.00mbgl. Stiff to very stiff CLAY between 14.00mbgl – 15.00mbgl (BNE).

Bedrock was not encountered in any of the boreholes.

The ground conditions encountered during the cable percussive holes are generally consistent with those encountered at shallow depth during the main site investigation detailed in Betts Geo report 19YHG001/GI Rev 2 & those encountered at shallow depth within the nearest former abstraction point – extract below (off site immediately S of site – formerly part of the former works).

An extract of the British Geological Survey log for nearby former water extraction point is shown below (available at: http://scans.bgs.ac.uk/sobi_scans/boreholes/936531).

Quality (attach copy of analysis if available)					
Sunk by <u>Messrs. Thos. Matthews</u> for <u>Messrs. Ferguson Padin Ltd</u> Date of well <u>1938</u>					
Information from <u>Messrs. Thomas Matthews, Pendleton, Manchester.</u>					
(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA (and any additional remarks).	THICKNESS		DEPTH	
		Feet.	Inches.	Feet.	Inches.
	<i>85/1045 E 87</i>				
	Clay	<u>Metres.</u> 6	40	21	-
	Clay and stones			26	-
	Sand	7	93	54	-
	Marly loam	16	46	72	-
	Clay and stones	21	95	84	6
	Sand	25	76	128	-
<i>Dft</i>	Clay and gravel	39	01	133	-
	Dark clay	40	54	148	-
<i>EMM</i>	Marl	45	11	168	-
	Loamy sandstone	51	21	177	-
<i>C.S.</i>	Red sandstone	53	95	330	-
		100	58		

Groundwater was encountered in BH01 at 9.00mbgl (CLAY/SAND interface). The remaining three boreholes (BH02 – BH04) were noted as dry.

5. Potential Impacts on Groundwater from Piling

The construction of piles can increase the risk of near-surface pollutants migrating to underlying aquifers if the new piles breach previously competent low-permeability strata.

Impact on Groundwater

As stated in Section 3 above, it is proposed that driven piles will be used on site. The piles are proposed to be between 5m to 7m long (with >1m upstanding at surface). Based on the maximum 7m depth with 1m upstanding, it can be concluded that the piles will remain in the low-permeability clay strata and not extend into the underlying SAND (shown to be at depths of >7.50mbgl in the cable percussive boreholes). As the piling depth doesn't breach the CLAY on site, the risk to groundwater from piling is deemed low.

Based on the nearby BGS abstraction point borehole log (extract above) & the Betts Geo BH04, it is also anticipated that further stiff CLAY underlies the SAND strata encountered to 15.00mbgl on site. The nearby BGS abstraction point borehole log also demonstrates that the major aquifer is noted to be at >50m depth.

The Betts Geo Site Investigation and Remediation Strategy identified contamination exceedances in the MADE GROUND on site, however no exceedances were noted in the underlying natural strata proving that the contamination is relatively immobile and insoluble, and the clay is stopping any downward migration into the underlying bedrock aquifer. Furthermore the areas impacted by hydrocarbons (highest risk to aquifer) have been remediated – these areas were removed off site and the resultant voids tested for residual contamination prior to backfill. Please see the Remediation Strategy reference in section 1 above for full details.

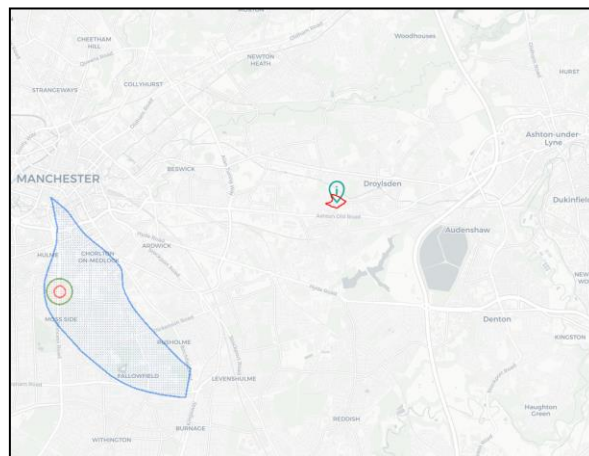
Impact on Groundwater in Continuity with Surface Water Features

The nearest surface water feature is documented as the Ashton Canal located 80m – 100m N of the site.

Due to the infrastructure present between the canal and the site (residential properties and commercial properties), the cohesive superficial geology identified across the site, and the fact the canal is probably clay lined, there is a negligible risk of any contamination migration pathway to surface waters from the contamination on site through groundwater.

Additional details

It is also documented that the site sits outside of a Source Projection Zone (SPZ) according to the Environment Agency (see extract below). The site is shown by the 'i' symbol with the nearest SPZ being located circa 3.5km to the south west.



Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 288179
www.betts-associates.co.uk

5.1 Conclusion

Following the results of the cable percussive boreholes undertaken for pile design, the risk to groundwater has been demonstrated to be low due to the extensive clay cover protecting the underlying aquifer, the low solubility/migration potential of contamination identified in the made ground, and the remedial actions that have been undertaken on site in regard to the hydrocarbon impacted areas.

At this stage, the piling contractor details are not available, however subject to an appropriate regime of quality control to ensure good workman ship, piling techniques represent an applicable methodology to protect the environment.

We trust that this information is satisfactory, however if you have any queries then please get in touch.

Yours sincerely

Jenny Skues
Senior Geo-Environmental Engineer
BETTS GEO

Inc –
Cable Percussive Borehole Logs
Exploratory Hole Location Plan
Preliminary Foundation Zoning Plan



BOREHOLE LOG

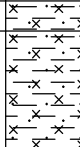
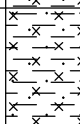
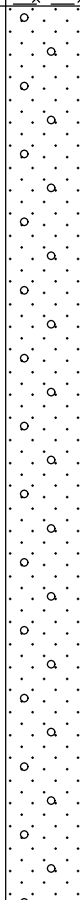
Project Edge Lane, Openshaw				BOREHOLE No BH01	
Job No 19YHG001	Date 24-11-20 25-11-20	Ground Level (m)	Co-Ordinates ()		
Contractor BETTS GEO Ltd				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
						(0.80)		
						0.80		
1.20		N7				(0.80)		
						1.60		
2.00		N17						
3.00		N13						
4.00		N14						
5.50		N13				(6.60)		
7.00		N14						

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
All dimensions in metres Scale 1:50			Client Your Housing Group			Method/ Plant Used Dando 2000			Logged By KR		

BOREHOLE LOG

Project Edge Lane, Openshaw				BOREHOLE No BH01	
Job No 19YHG001	Date 24-11-20 25-11-20	Ground Level (m)	Co-Ordinates ()		
Contractor BETTS GEO Ltd				Sheet 2 of 2	

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick- ness)		
8.50 8.50	D	N38				8.20		
						(0.80)	Very stiff stiff brown sandy silty CLAY with rare narrow sand banks / pockets.	
10.00 10.00	D	N50				15.00	Dense to very dense reddish brown fine to coarse SAND with rare fine to medium subangular to subrounded gravel of mixed lithology. Strata is damp.	
11.50		N50						
13.00		N30						
14.50		N22						

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
All dimensions in metres Scale 1:50			Client Your Housing Group			Method/ Plant Used Dando 2000			Logged By KR		

BOREHOLE LOG

Project Edge Lane, Openshaw				BOREHOLE No BH02	
Job No 19YHG001	Date 25-11-20 26-11-20	Ground Level (m)	Co-Ordinates ()		
Contractor BETTS GEO Ltd				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
1.20		N20				(3.50)		
2.00		N14						
3.00		N10				3.50		
3.50	D							
4.00		N16						
5.50		N14				(6.30)		
7.00		N16						

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:50	Client Your Housing Group	Method/ Plant Used Dando 2000	Logged By KR
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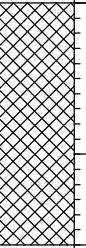
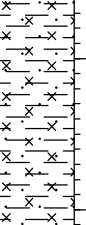
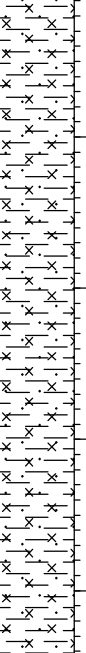
BOREHOLE LOG

Project Edge Lane, Openshaw				BOREHOLE No BH02
Job No 19YHG001	Date 25-11-20 26-11-20	Ground Level (m)	Co-Ordinates ()	
Contractor BETTS GEO Ltd				Sheet 2 of 2

[illegible][illegible]

BOREHOLE LOG

Project Edge Lane, Openshaw				BOREHOLE No BH03	
Job No 19YHG001	Date 26-11-20 27-11-20	Ground Level (m)	Co-Ordinates ()		
Contractor BETTS GEO Ltd				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
1.20	D	N11				(1.60)		
1.70						1.60		
2.00		N18						
3.00		N17						
4.00		N20						
5.50		N19				(5.90)		
7.00		N22				7.50		
								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:50	Client Your Housing Group	Method/ Plant Used Dando 2000	Logged By KR
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BOREHOLE LOG

Project Edge Lane, Openshaw				BOREHOLE No BH03	
Job No 19YHG001	Date 26-11-20 27-11-20	Ground Level (m)	Co-Ordinates ()		
Contractor BETTS GEO Ltd				Sheet 2 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
8.50 8.50	D	N50						
10.00		N50						
11.50		N50				(7.50)		
13.00		N50						
14.50		N42				15.00		

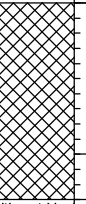
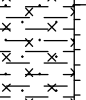
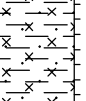
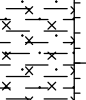
Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:50	Client Your Housing Group	Method/ Plant Used Dando 2000	Logged By KR
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AGS3 UK BH 19YHG001 - EDGE LANE CP NOV 20 GPJ GINT STD AGS 3.1 GDT 22/12/20

BOREHOLE LOG

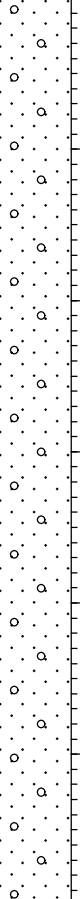
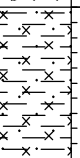
Project Edge Lane, Openshaw				BOREHOLE No BH04	
Job No 19YHG001	Date 30-11-20 01-12-20	Ground Level (m)	Co-Ordinates ()		
Contractor BETTS GEO Ltd				Sheet 1 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
1.20	D	N15				(1.30) 1.30		
1.70								
2.00		N16						
3.00		N18						
4.00		N17						
5.50		N18				(6.60)		
7.00		N19				7.90		

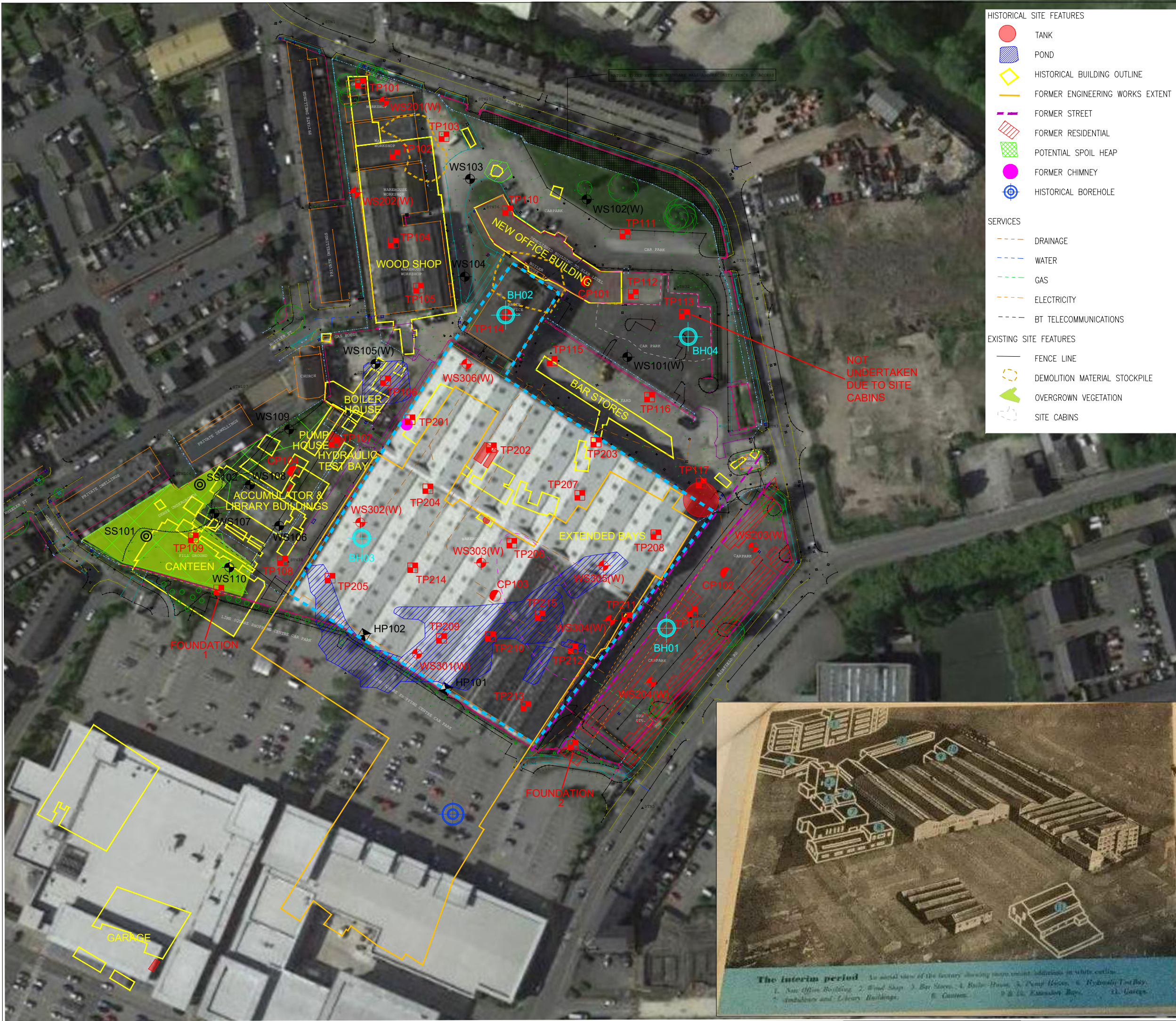
Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
All dimensions in metres Scale 1:50			Client Your Housing Group			Method/ Plant Used Dando 2000			Logged By KR		

BOREHOLE LOG

Project Edge Lane, Openshaw				BOREHOLE No BH04	
Job No 19YHG001	Date 30-11-20 01-12-20	Ground Level (m)	Co-Ordinates ()		
Contractor BETTS GEO Ltd				Sheet 2 of 2	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
8.50 8.50	D	N50						
10.00		N35						
11.50		N38				(6.10)		
13.00		N50				14.00		
14.50		N30				(1.00) 15.00		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
All dimensions in metres Scale 1:50			Client Your Housing Group			Method/ Plant Used Dando 2000			Logged By KR		



- HISTORICAL SITE FEATURES**
- TANK
 - POND
 - HISTORICAL BUILDING OUTLINE
 - FORMER ENGINEERING WORKS EXTENT
 - FORMER STREET
 - FORMER RESIDENTIAL
 - POTENTIAL SPOIL HEAP
 - FORMER CHIMNEY
 - HISTORICAL BOREHOLE
- SERVICES**
- DRAINAGE
 - WATER
 - GAS
 - ELECTRICITY
 - BT TELECOMMUNICATIONS
- EXISTING SITE FEATURES**
- FENCE LINE
 - DEMOLITION MATERIAL STOCKPILE
 - OVERGROWN VEGETATION
 - SITE CABINS

DO NOT SCALE

NOTES

THIS SKETCH SHOWS THE INDICATIVE LOCATIONS OF EXPLORATORY HOLES OVERLAIN SELECTED DIGITISED HISTORICAL FEATURES OVERLAIN THE TOPOGRAPHICAL SURVEY (Dwg; Proposed Development at Edge Lane, Openshaw, No.; 030919/TOP, Dated; Sept 2019, By; G J Brookes Ltd, For; Chilton Estates Ltd) OVERLAIN AN AERIAL IMAGE TAKEN FROM GOOGLE MAPS (IMAGERY ©2020 Google, MAP DATA ©2020 Google, www.google.co.uk/maps).

EXPLORATORY HOLES PREVIOUSLY UNDERTAKEN BY WARDELL ARMSTRONG ARE ALSO SHOWN (Dwg, Site Investigation Location Plan, No.; SH12240-002, Dated; 18/12/18, By; Wardell Armstrong, For; Chilton Estates Limited).

- KEY**
- POST DEMOLITION INVESTIGATION PHASE
 - AREA OF DELINEATION POST DEMOLITION
 - EXPLORATORY HOLES – WARDELL ARMSTRONG – 2018
 - HP101 HAND PIT
 - SS102 SOIL SAMPLE
 - WS103 WINDOW SAMPLE
 - WS101(W) WINDOW SAMPLE WITH WELL INSTALL
 - EXPLORATORY HOLES – BETTS GEO – 2020
 - WS201(W) WINDOW SAMPLE BOREHOLE WITH WELL INSTALL
 - WS206 WINDOW SAMPLE BOREHOLE
 - CP101 CABLE PERCUSSIVE BOREHOLE TO 15mbgl
 - TP101 TRIAL PIT
 - BH01 POST DEMO CABLE PERCUSSIVE BOREHOLE

E	15/01/21	RD	POST DEMO CP HOLES ADDED	MJF
D	27/07/20	RD	UPDATED POST 2ND PHASE SI	MJF
C	09/07/20	RD	BUILDINGS LABELED	MJF
B	05/03/20	RD	UPDATED POST SI	JS
A	12/02/20	RD	IDS RENUMBERED & SERVICES ADDED	JS
REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: **DRAFT**

BETTS GEO
CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sedland, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

Your
HOUSING GROUP

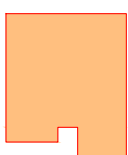
PROJECT: **EDGE LANE OPENSRAW**

TITLE: **PROPOSED EXPLORATORY HOLE LOCATION PLAN**

DATE: 27/01/20	SCALE @ SIZE: NTS	DRAWN: RD	CHECKED: MJF
PROJECT No: 19YHG001	DRAWING No: PROP EXP 001	REV: E	

Foundation Key, Section Details and Notes

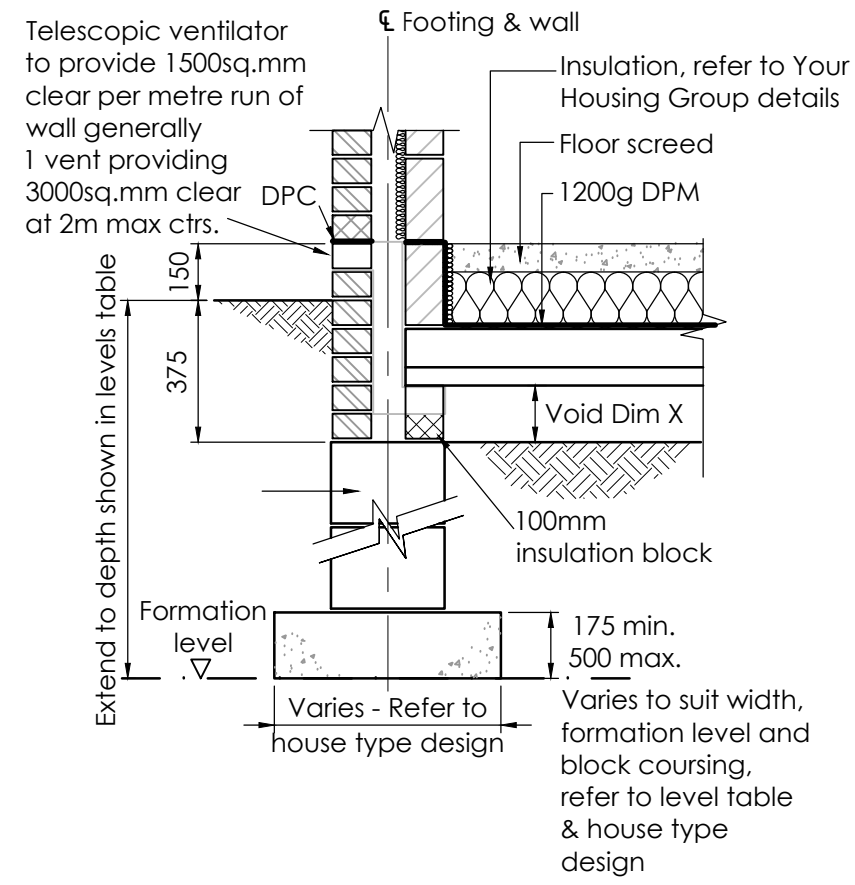
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Traditional Strip Foundations

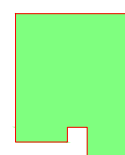
Formation depth circa. 0.90-1.325m BPGCL

- Bearing strata generally stiff clays
- Allowable ground bearing pressure 125kN/m²
- Minimum depth 0.90m below existing or proposed ground level (whichever is lower) where strata is suitable with no tree influence
- Refer to Foundation Level Table ref: 19YHG001/2000 for plot specific anticipated foundation depths and formation levels taking account of strata and tree influence
- Precast suspended beam & block floors, see 'void dim X' detail for sub-floor void requirements
- Refer to Tree Heave Protection Requirements Key



Traditional Strip Foundation

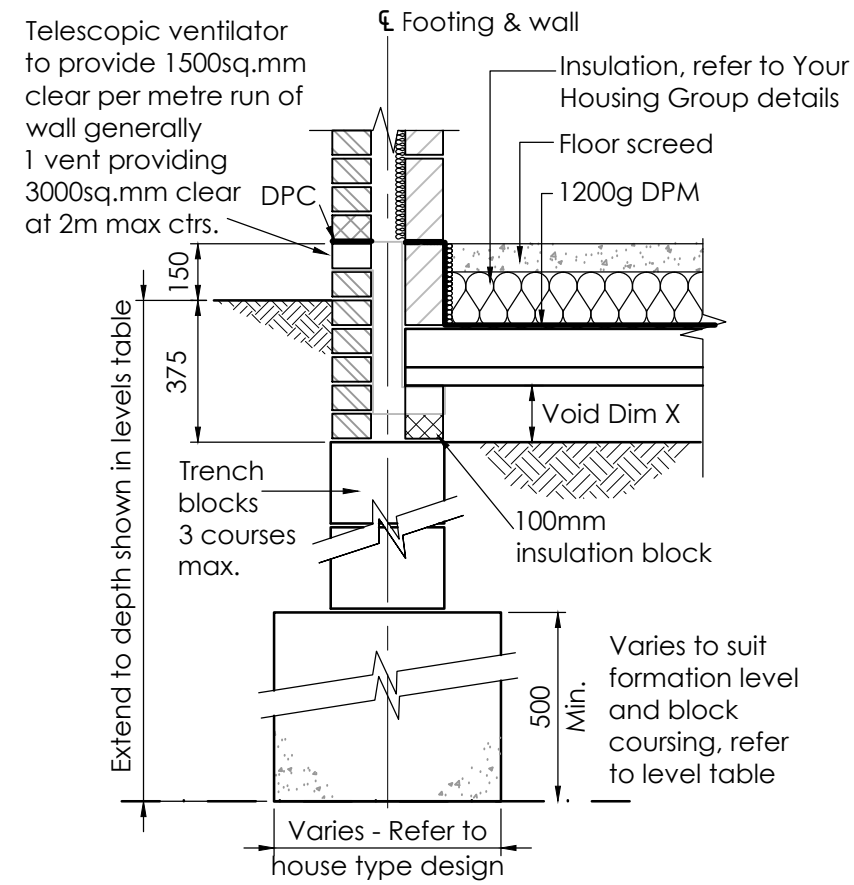
Typical section through external wall



Trench Fill Foundations

Formation depth circa. 1.325-2.00m BPGCL

- Bearing strata generally stiff clays
- Allowable ground bearing pressure 125kN/m²
- Minimum depth 0.90m below existing or proposed ground level (whichever is lower) where strata is suitable with no tree influence
- Refer to Foundation Level Table ref: 19YHG001/2000 for plot specific anticipated foundation depths and formation levels taking account of strata and tree influence
- Precast suspended beam & block floors, see 'void dim X' detail for sub-floor void requirements
- Refer to Tree Heave Protection Requirements Key



Trench Fill Foundation

Typical section through external wall

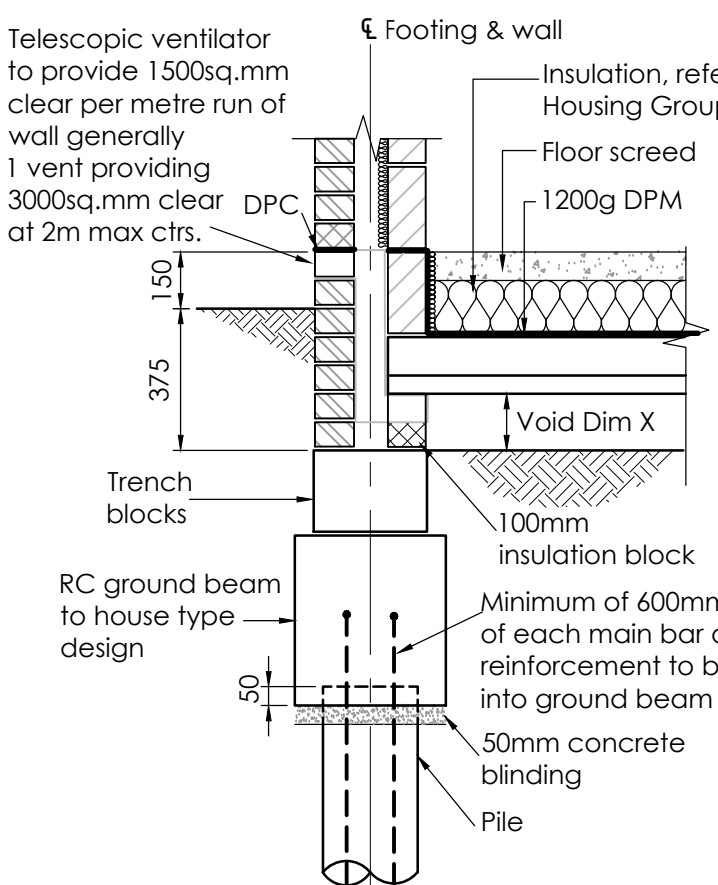


Pile & Ground Beam Foundations

Where anticipated depths to suitable strata are >4m

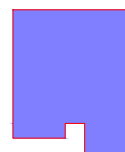
- Pile type & design by specialist
- Piling contractor to be fully appraised of site conditions
- Reinforced concrete ground beams to be designed in accordance with the Design Sulphate Class for the site
- Refer to Foundation Level Table ref: 19YHG001/2000 for plot specific information
- Precast suspended beam & block floors, see 'void dim X' for sub-floor void requirements
- Refer to Tree Heave Protection Requirements Key

Piling Contractor to have full knowledge of site ground conditions



Pile & Ground Beam Foundation

Typical section through external wall

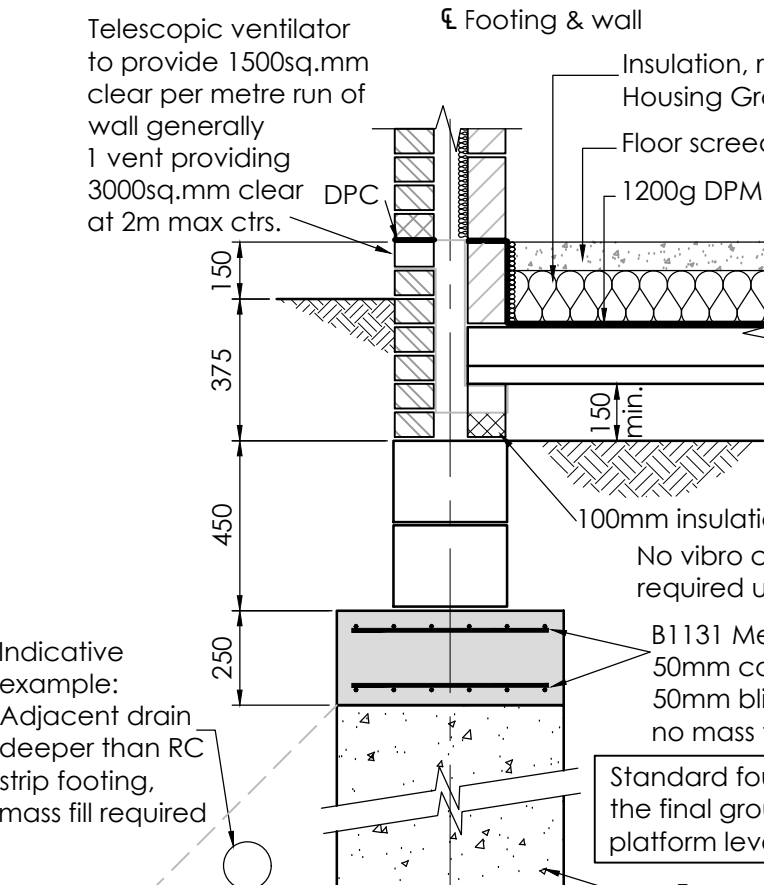


RC Strip Foundations over Vibro Improved Ground

Where anticipated depths to suitable strata are >2m

- Treatment type, design and depth by specialist
- Vibro contractor to be fully appraised of site conditions
- Refer to Foundation Level Table ref: 19YHG001/2000 for plot specific information
- Precast suspended beam & block floors, 150mm sub-floor void
- Maximum spacing of compaction points must not exceed 2m centres
- Minimum improvement after treatment shall be capable of providing a safe ground bearing capacity of at least 125kN/m² at the footing formation level
- Where the foundation formation depths need to be extended, due to adjacent drainage runs, the foundation shall be constructed in two parts i.e. Upper section: 250mm RC strip footing. Lower section: Mass fill taken down to an approved depth and finished at the underside of the 250mm reinforced strip footing.

Subject to confirmation of Specialist Vibro Ground Improvement Contractor Vibro Contractor to have full knowledge of site ground conditions

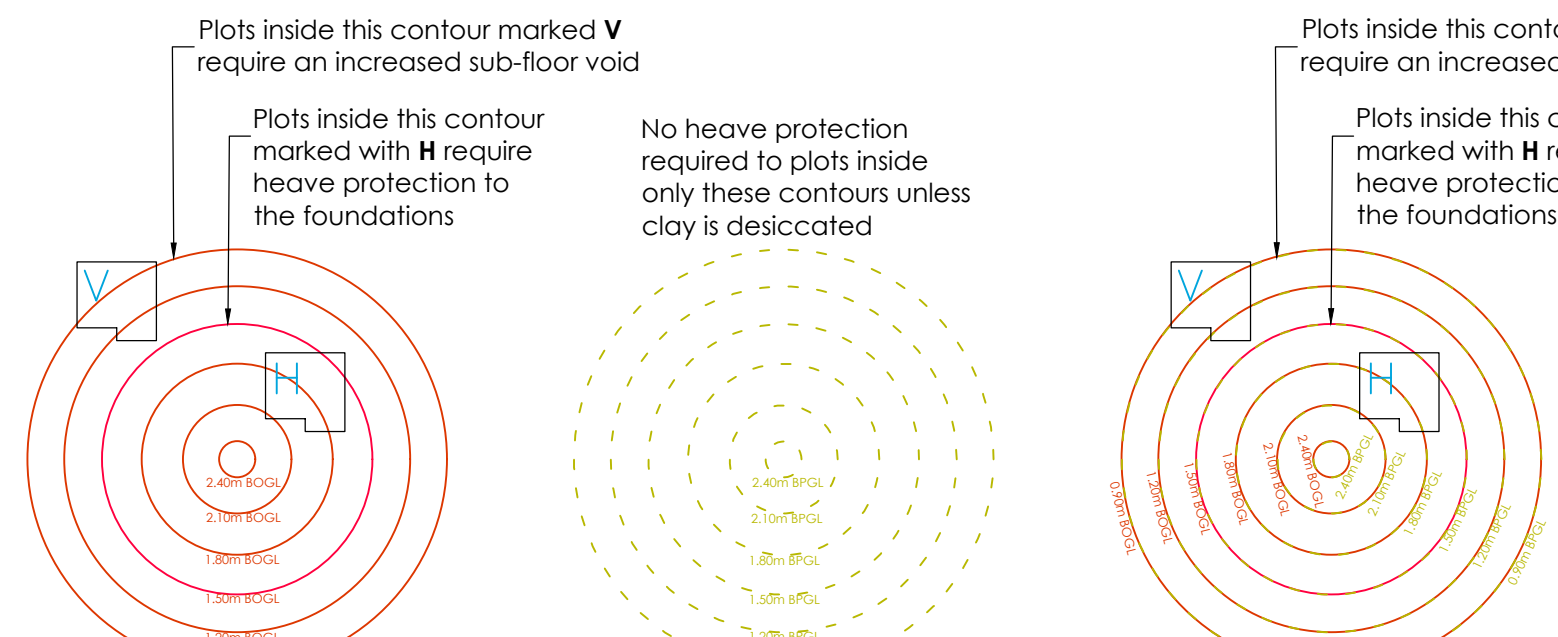


RC Strip Foundations over Vibro Improved Ground

Typical section through external wall

Heave Precaution Requirements Key

Heave protection to be provided in accordance with the tree heave protection requirements table and NHBC Standards Chapter 4.2



Tree depth contours to be read from Original Ground Level (OGL)

based on topo survey levels

Tree depth contours to be read from Proposed Ground Level (PGL)

based on topo survey levels

Tree depth contours to be read from either Original or Proposed Ground Level

whichever gives the deepest level based on topo survey levels

Tree contours are drawn using the appropriate height in accordance with NHBC Ch4.2 at the time of removal or assessment.

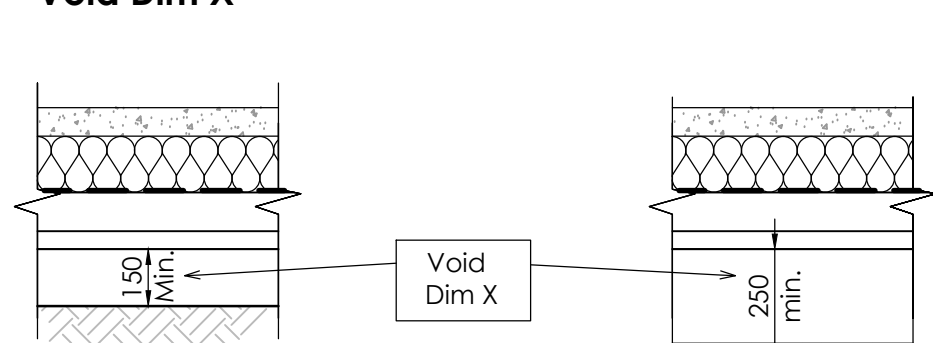
Should tree heights be greater at the time of construction than those shown in the survey foundation depths may need recalculation.

Refer to the site foundation levels table for plot specific foundation depths and heave protection requirements which consider site conditions, level adjustments and are derived using the rules within Ch4.2

Plot specific drawings for plots requiring deeper foundations and heave protection due to the effects of trees can be provided at clients request.

Sub-floor Void Requirements

Void Dim X



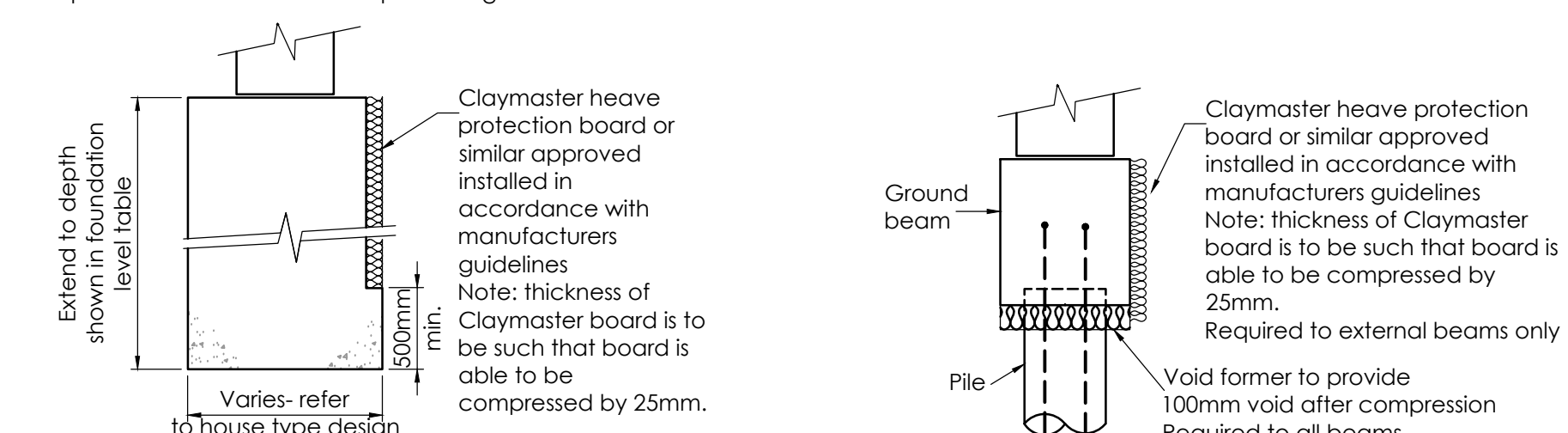
Typical Sub-floor Void No Tree Influence

Typical Sub-floor Void With Tree Influence

- Plots marked V on plan require an increased sub-floor void only
- Plots marked H on plan require heave protection to foundations and an increased sub-floor void

Foundation Heave Protection Requirements

Where the plot has calculated free influence to depths greater than 1.5m BOGL (based on the appropriate tree height in accordance with NHBC Standards Ch4.2) compressible material should be placed against the inside face of external wall foundations thus.



Trench Fill Foundation with Heave Protection

scale 1:20

Pile & Ground Beam Foundation with Heave Protection

scale 1:20

General

G1

This drawing is to be read in conjunction with the following information:

Ground Investigation: Betts Geo-Environmental ref. YHG001/GI dated March 2020

Planning Layout: ref. 0723-EA-A-P002 Rev. C dated 29 June 2020

Topographical survey - AS Built Survey ref. 10012_005_01_001-07 dated 04 Sep 2020 & Bose of Dig Survey ref. 10012_004_01-07 04 Sep 2020

External Works Drawing: ELLUC ref. ELL-19045-YH-B-140-144 dated Jan 2020 (Note levels are not to the current planning layout)

Arboricultural Report: Amenity Tree Care ref: 8382-Tree Consultants Report - Edge Lane dated 29 Oct 2019

G2

The foundation types indicated are based upon observations & field tests during the site investigation. Third party information, accepted in good faith, may also have been used in this assessment.

It should be recognised that strata may vary considerably between sampling points and that groundwater regime may be influenced by seasonal or other factors. The foundation types, and depths where applicable, are therefore 'For Guidance Purposes Only', and should be continually reviewed in light of actual site conditions encountered during construction work and/or ongoing investigations.

G3

With reference to Landscape proposals, it has been assumed that any new planting will be of a species, and so stated, as to not affect the proposed substructure construction.

G4

Foundation depths and precautions to foundations and floor slabs have been assessed in accordance with NHBC Standards Chapter 4.2 'Building Near Trees'.

These have been assessed using known existing and proposed ground levels. If proposed ground levels are amended after issue of this drawing refer to Betts Associates for further advice.

G5

All construction work in close proximity to trees is to be in accordance with BS 5837: 2005 'Trees in relation to Construction'

G6

Where necessary foundations may be stepped in accordance with NHBC standards and Part A of the Building Regulations.

G7

All foundation design is based on shallow plot drainage - circa 1m deep BPGCL. Any drainage by others that poses a risk of undermining should immediately be brought to the attention of Betts Associates and the affected plot foundation not continued.

G8

Any deviation from schedule formation depth to be reported to Your Housing Group and Betts Associates.



Foundation Assessment Plan

Not to scale



The following summarises the main issues highlighted by the Site Investigation report, but must not be considered exhaustive.

Summary of ground conditions at shallow depth	Made ground encountered in almost all locations across site to varying depths, overlying stiff clay with occasional bands of sand.
Tree Influence?	Yes - Refer to Assessment Plan
Clay Plasticity	N/A in Sands - Medium in Clays
Groundwater and Shallow excavation instability?	Shallow groundwater was encountered within made ground and sand bands as slight to moderate seepages during site investigation. Ground water within sands likely to become running sands. Care should be taken to avoid excessive excavation into ground water within sands. Shuttering & pumping should be allowed for within tender. This may vary with seasonal / abnormal weather conditions.
Contamination	A number of contaminants discovered, to be remediated in accordance with the remediation strategy report ref: 19YHG001/RS May 2020
Obstructions	Former buried structures ie foundations and air raid shelters may remain on site and must be removed before commencement a vibro and piling works.
Mining	The site lies within an area affected by historical coal mining however into suggests no workings beneath site.
Ground Gas Protection Measures	CS1 / Green for all plots except for plots 82-87 & 201-204 which requires CS2
Radon Protection Measures	Not required
Design Sulphate Class	DS-3
ACEC Class	AC-2s
Special Requirements for concrete?	Designed mix to C28/35 strength required for reinforced foundations
Special Requirements for sub-structure masonry?	Sub-structure masonry to be suitable for the Design Sulphate class
Special requirements for sub-structure mortar?	Sub-structure mortar to be suitable for the Design Sulphate class
Flood Risk	Unknown - Further advice to be sought from specialist
Environmental Constraints	Existing trees that are to remain, local housing development
Bearing Capacity	125kN/m² in stiff clay.
Further investigation needed	Further intensive investigation to be carried out as noted on plan Gas regime to be confirmed

Risk Items

- Potential for shallow ground water within made ground and within any sand bands
- Further ground investigation required
- Potential for ground gases local to area of contamination, which should be remediated
- Former air raid shelters (deep excavations)
- Buried structures including existing piles must be removed before commencement of vibro and piling works.
- Stockpile of Asbestos Containing Materials to be buried on site - refer to Remediation Strategy Report

Plot Specific Foundation Depths - Refer to 19YHG001/2000

The foundation solutions recommended on this drawing are based on the calculated foundation depths shown within Betts Associates Foundation Level Table Ref: 19YHG001/2000.

The levels table takes account of current site levels, proposed site levels, existing trees (retaining or removed), ground conditions.

The table must be read in order to determine plot specific foundation depths.

P4	22/09/21	Plot requiring gas protection classified on plan	RC
P3	07/07/21	Plots 82-87 & 201-204 require CS2 gas protection	WR
P2	04/04/21	Updated following receipt of revised P3's and	RC
P1	23/07/20	Geotechnical review	RC
Sheet 1	04/04/21	Preliminary Issue	RC
Sheet 1	04/04/21	Details	RC

Drawing originator:



Client:



Project title:

Edge Lane
Droydsden

Drawing title:

Foundation Assessment Plan

Scale: As Indicated for the original size of A0

Drawn by: RC Checked by: MJF Passed by: Date: Sep 2020

Drawing status: Preliminary

Job No: 19YHG001

Project: BET XX 00 | DR | S | 1000

Do not scale this drawing

67 Old Ashton from Betts, Main Road, Sedgley, Walsley, CH4 2LY

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