

Glyndwr Innovations Ltd, St Asaph Business Park, St Asaph, LL17 0JD

Tel: 01248 672666

Email: CezarySalwa@caulmert.com

Web: www.caulmert.com

Adra (Tai) Cyfyngedig
 Tŷ Coch,
 Llys y Dderwen,
 Parc Menai,
 Bangor,
 Gwynedd
 LL57 4BL

Our ref: 5456-CAU-XX-XX-XX-XX-XXXX.XX.XX

Date: Friday, 29 July 2022

By e-mail: richard@atticuslandanddevelopment.co.uk

F.A.O. Richard Ingram

Dear Richard,

Re: Proposed Residential Development at Land adjacent to Llanrwst Road, Gyffin, Conwy.

Summary

Caulmert Ltd were commissioned by Adra ("the Client") to undertake a pre-purchase ground investigation at land adjacent to Llanrwst Road, Gyffin, Conwy ("the Site"). A site location plan is provided as Figure 1, see over.

The Client is proposing a housing scheme comprising 80 dwellings with associated gardens, public open space, amenity space, access roads, detention basins, retaining walls and stone gabions. The proposed layout is shown on Figure 2.

This letter report comprises the findings from the following sources:

- British Geological Survey (BGS) website – <http://mapapps2.bgs.ac.uk/geoindex/home.html>;
- Grid Reference Finder website – <https://gridreferencefinder.com>;
- DEFRA maps website – <https://magic.defra.gov.uk>;
- Coal Authority - Interactive Map Viewer | Coal Authority (bgs.ac.uk);
- UK Radon - <https://www.ukradon.org/radonmaps>
- Zetica UXO Risk Maps – <https://zeticauxo.com/downloads-and-resources/risk-maps/>;
- Natural Resources Wales Flood Risk Map Viewer – <https://maps.cyfoethnaturiolcymru.gov.uk/>
- Side by side georeferenced maps viewer, historical maps - National Library of Scotland (nls.uk)



Certificate Number 9113
 ISO 9001, ISO 14001

Caulmert Limited
 Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG

Company Registered No. 06716319
 Company Registered in Cardiff

Site Setting

The proposed development site lies on the outskirts of Gyffin, Conwy, approximately 1 kilometre south of Conwy town centre. The site is roughly 400 metres long and 100-200 metres wide. It is roughly rectangular in plan area and measures approximately 7.5 hectares. To the north lies the residential area of Gyffin and to the east a band of mature woodland set on rising ground. To the south is agricultural land and to the west a small belt of woodland that separates the site from Llanrwst Road (B1506).

The site is steeply sloping rising from circa 25 m AOD at its lowest point in the north-west corner, to around 60 m AOD at its highest point in the south-east corner. The site has an average gradient of around 1 in 5 but becomes steeper as it rises in the east of the site.

The site is understood to be a greenfield site with no historical development recorded. The site is currently used for the grazing of sheep and set within the rural backdrop of the Conwy Valley.

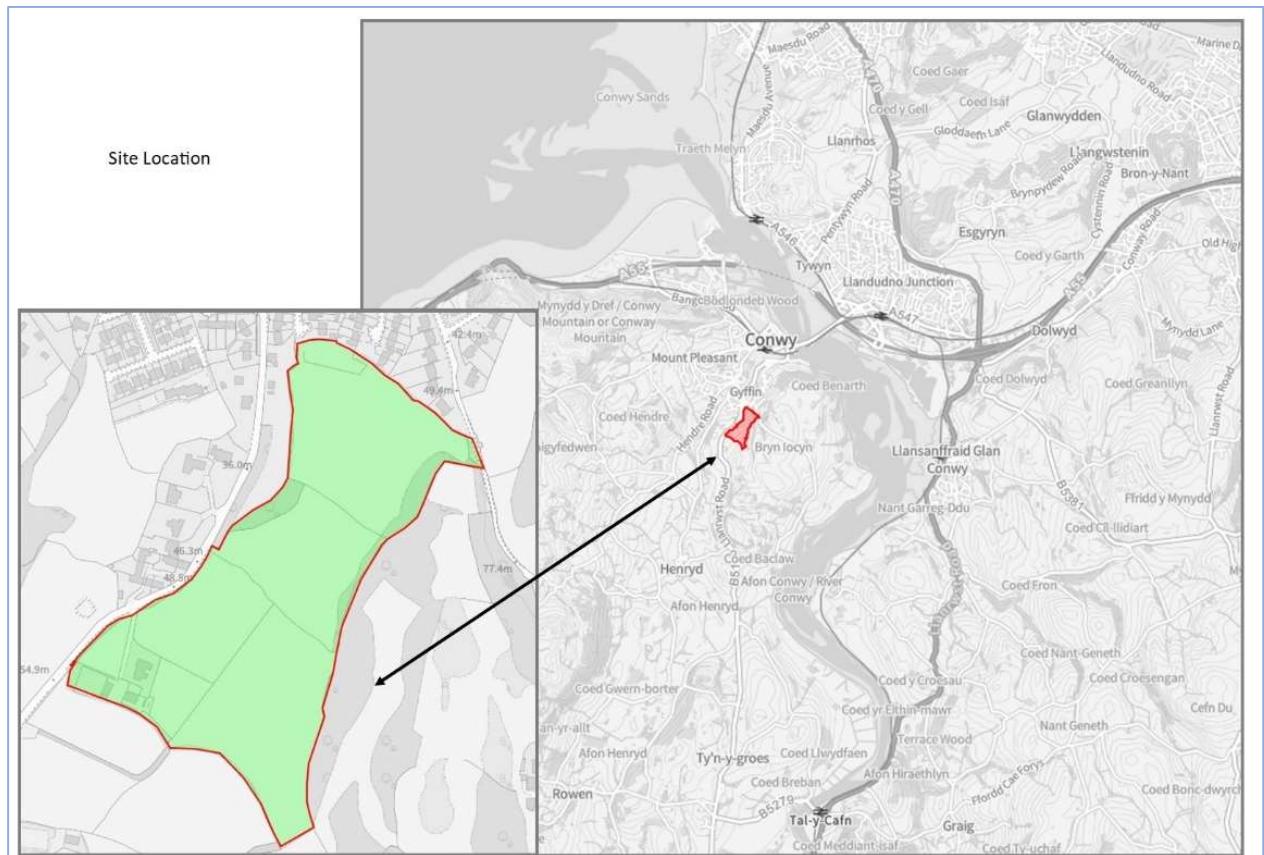


Figure 1: Site Location Plan



Figure 2: Indicative Site Layout.

Table 1. Site Details

Site Details	
Address	Land off Llanrwst Road, Gryffin, Conwy, LL32 8NB
National Grid Reference	277 774 Easting 376 517 Northing
Local Authority	Conwy County Council
Status	Pre-purchase
Site Area (approx..)	65,500 m ²
Current Nature of the Site	Open, grassed fields used for agricultural grazing purposes
Surrounding Area	North: Gryffin residential area
	East: Llanrwst Road
	South: open, grassed fields
	West: woodland and hills
Proposed Use	Housing scheme comprising 80 dwellings with amenity space.

Published Geology

According to the published geology for the area (British Geological Survey 3D Viewer, and 1:50,000 BGS GeoIndex Viewer) the site is shown to be directly underlain by Glacial Till, a superficial deposits formed in the Quaternary and typically comprising of firm to stiff clay with variable sand and gravel content, with localised bands of sand and gravel.

The BGS maps shows that the superficial deposits are underlain by the Bettws Mudstone Formation across the majority of the site , with the Denbigh Grits Formation outcropping in the east and far south of the site and the Llandovery Rocks possibly outcropping in the central western area of the site. All formations are sedimentary of the Silurian period.

There is an inferred fault crossing the centre of the site from the south-east to north-west and another fault follows approximately the western boundary of the site from the south-west to the north-east. There are another two faults of direction south-east to northwest in the western part of the site, extending offsite

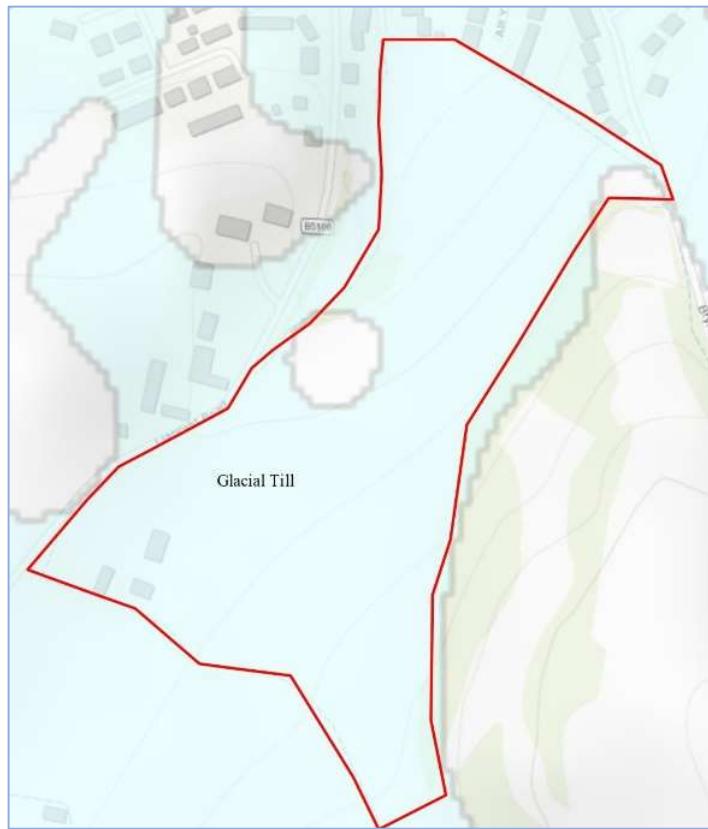


Figure 3a: Indicative Site Geology - Superficial

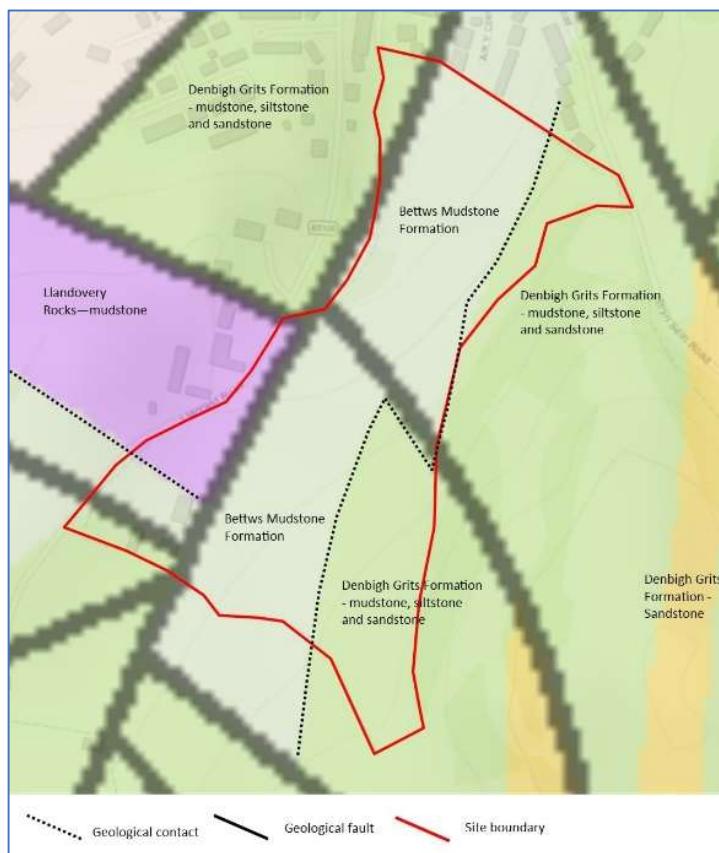


Figure 3b: Indicative Site Geology - Bedrock

Coal Mining

The site is not within a Coal Mining Reporting Area and the risk from historical coal mining activities are negligible. No other non-ferrous or ferrous metal mining has been identified in the vicinity of the site.

Radon

Some parts of this 1km grid square are in bands of elevated radon potential. The maximum radon potential is 5-10 % of dwellings above the action level. Basic Radon Protection measures are likely to be required. However, this should be confirmed through a site specific radon report.

Ground Gasses/Contamination

Site History

The 1885-1971 OS historical maps show the site to be agricultural land, bounded by Llanrwst Road with a number of buildings (possibly agricultural) to the west, wooded elevated area to the east, and agricultural land to the south and to the north. From 1888 the site is split up into 3 parcels of land. A quarry is mapped to the west of the site on map between 1888 and 1913.

The housing estate to the north of the site was built between 1971 and 1980 and is shown on pre 1980 historical map.

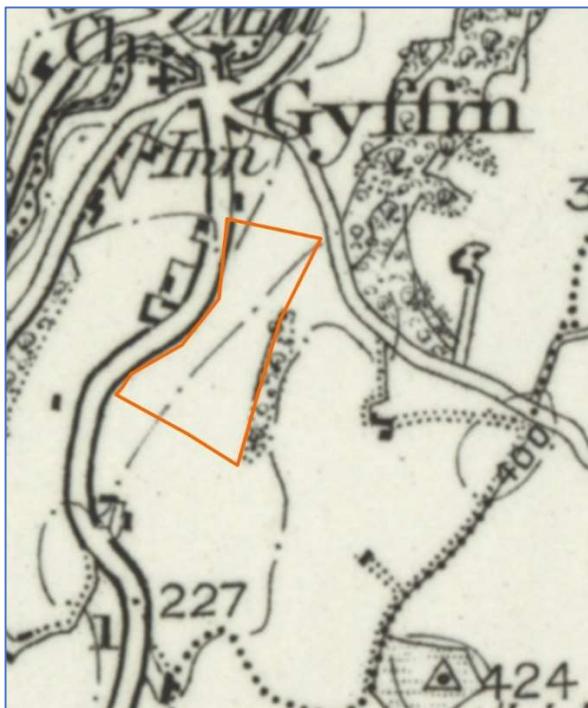


Figure 4a. 1885-1900

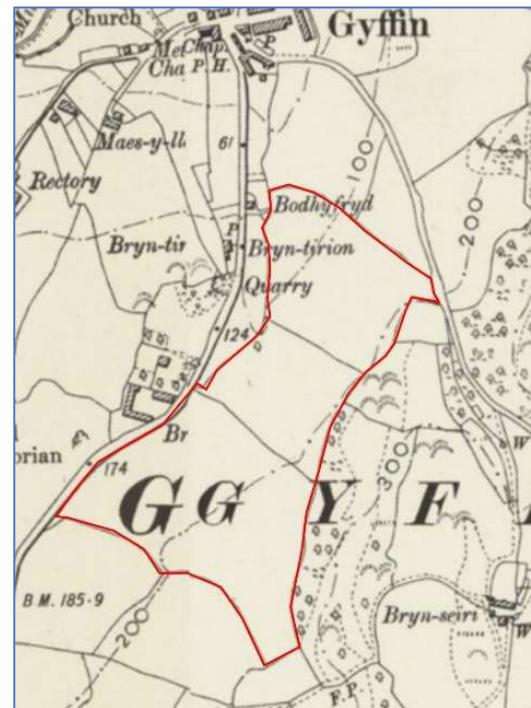


Figure 4b. 1888-1913

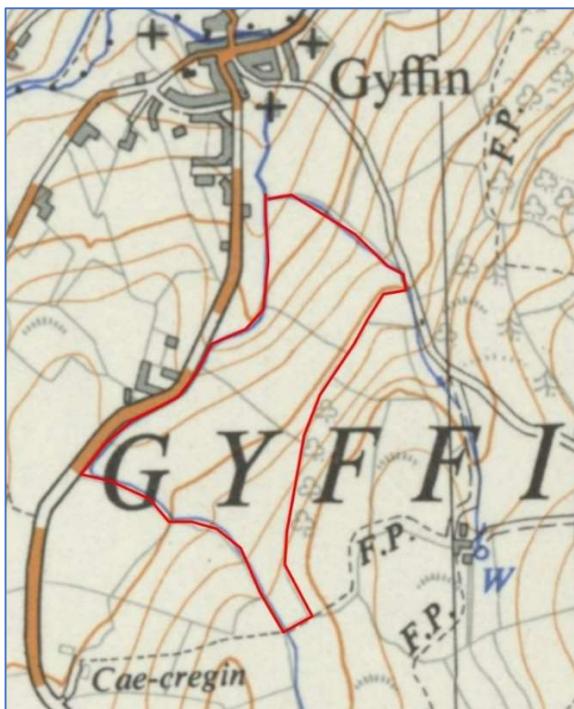


Figure 4c. 1937-1961

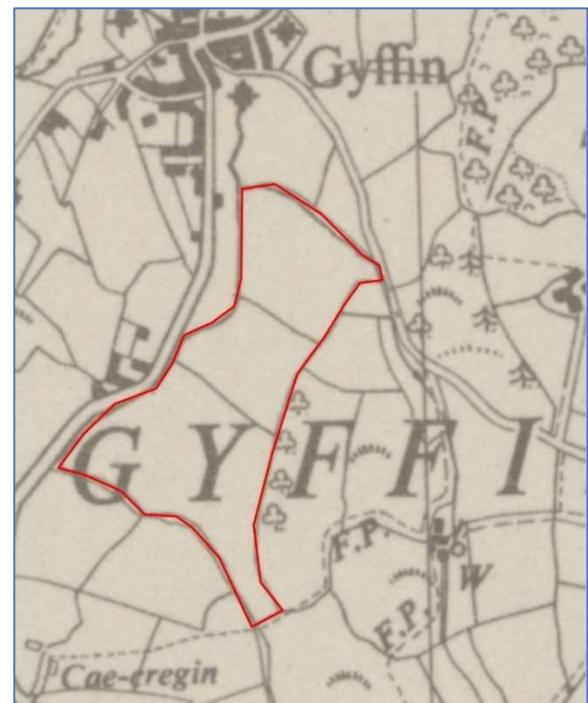


Figure 4d. 1945-1965



Figure 4e. 1949-1971

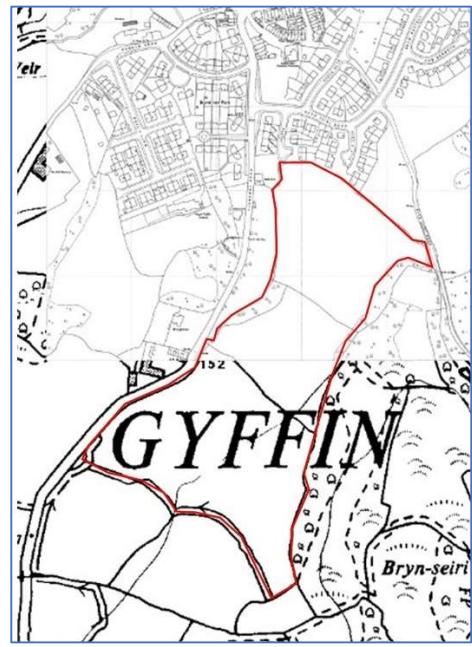


Figure 4f. 1971-1980

There are no significant changes noted onsite from 1980 up to present day.

Potential contamination sources

Contamination is unlikely given the majority of the site has been undeveloped from the earliest records and appears to have been in use as agricultural land up to present day.

No contaminating industries have been identified near to the site. The risk from contamination is therefore assessed to be negligible.

Flooding

The site is not in the area at risk from flooding from rivers, surface water and small watercourses. However, areas at risk from flooding are identified along the site's western, north-eastern and southern site boundaries.



Figure 5. Surface watercourses (OS map).

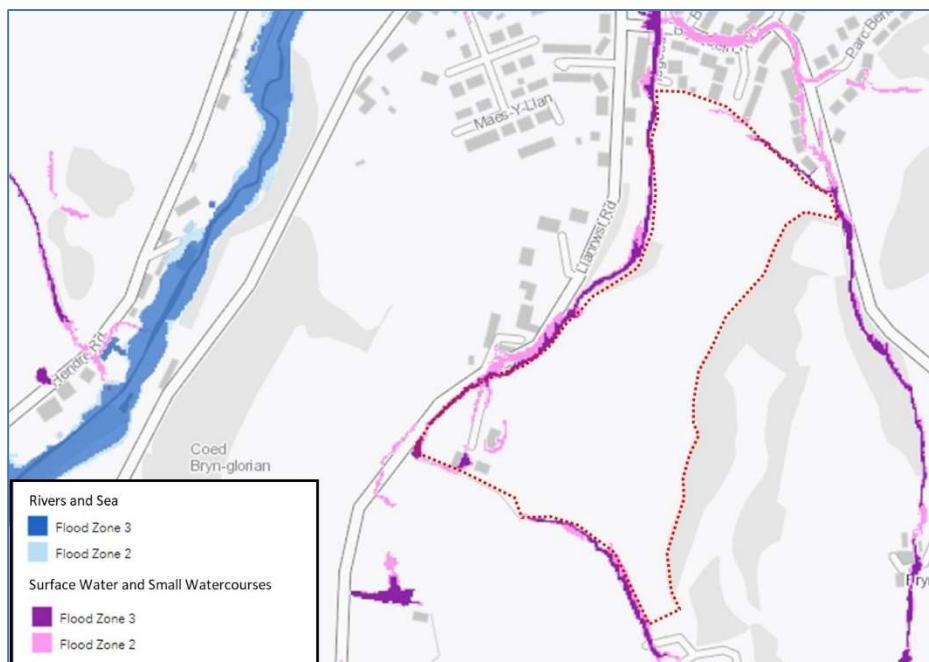


Figure 6. Flood risk from rivers, surface waters and small watercourses map (extracted from The Development Advice Map – Natural Resources Wales website).

Site Works

General

A total of 17no. machine excavated trial pits were formed at the site on 21 July 2022. The logs are provided in Appendix B.

The position of the exploratory holes were selected by Caulmert to provide a wide coverage of information on the site area. An exploratory hole location plan is presented in Appendix A.

Methodology

The trial pits TP01-TP17 were excavated with a JCB backhoe excavator to maximum depths of between 0.9mbgl (below ground level) and 3.1mbgl.

On completion, all trial pits were carefully backfilled with arisings in thin layers, ensuring that excavated material was replaced in the same order as it had been removed and compacted using the backhoe bucket.

Ground Conditions

In general, the bedrock ground conditions encountered during the ground investigation reflected those detailed within the published geology. However, the observed superficial deposits differed from the published geology, with the Glacial Till, not recorded across the majority of the site..

The site works revealed that the general succession of strata can be represented by a thin layer of Topsoil over Head Deposits locally Glacial Till underlain by highly to moderately weathered bedrock comprising mainly mudstone, locally siltstone and sandstone.

A summary of the ground conditions encountered during this site investigation is presented in Table 1.

A copy of the trial pit logs along with photographs from each of the trial pits is included in Appendix B.

Table 2. Summary of Ground Conditions

Hole ID	Topsoil	Glacial Till	Head Deposits (slightly gravelly clayey sand)	Moderately to Highly Weathered Bedrock (sandy gravel)		Notes
				Mudstone	Sandstone	
TP01	0-0.25		0.25-0.80	0.80- 1.10		
TP02	0-0.30	0.30-1.30		1.30- 1.40		
TP03	0-0.20	0.20-0.60		0.60- 1.30		
TP04	0-0.30		0.30-1.20		1.20- 1.30	
TP05	0-0.20		0.20- 1.10			
TP06	0-0.10		0.10-0.40	0.40- 1.00		
TP07	0-0.30	0.30-1.20		1.20- 1.30		
TP08	0-0.20	0.20-1.80		1.80- 1.90		
TP09	0-0.20	0.20-3.00		3.00- 3.10		Possible fault zone
TP10	0-0.20		0.20-2.10	2.10- 2.20		Possible fault zone
TP11	0-0.20		0.20-2.40	2.40- 2.50		Possible fault zone
TP12	0-0.20	0.20-2.30		2.30- 2.40		Possible fault zone
TP13	0-0.20		0.20-2.30	2.30- 2.40		Possible fault zone
TP14	0-0.15		0.15-0.80	0.80- 0.90		
TP15	0-0.20		0.20-1.20		1.20- 1.30	
TP16	0-0.15				0.15- 1.00	
TP17	0-0.15		0.15-0.70		0.70- 1.10	

2.10 - base of the exploratory hole in bold

Topsoil – encountered at each test location from ground level to depths of between 0.1m and 0.3m. Represented in general by brown slightly clayey slightly gravelly sandy topsoil with grass roots.

Glacial Till – encountered in six locations at lower elevation in central and western part of the site (TP02, TP03, TP07, TP08, TP09 and TP12) from depths of between 0.2m and 0.3m down to depths of between 0.6m and 3m bgl. Represented in general by firm to very stiff (soft to firm in TP02) reddish brown slightly gravelly slightly sandy to very sandy clay.

More granular layers of Glacial Till were observed on TP08 (02m – 0.4m), TP09 (0.2-1.2m) and TP12 (0.2m – 1.1m) and represented by brown slightly gravelly to gravelly clayey to very clayey sand.

Head Deposits – encountered at 10 of the 17 test locations from depths of between 0.15m and 0.3m bgl down to depths of between 0.4m and 2.4m bgl. Represented in general completely weathered bedrock locally residual soil observed as light brown to brown slightly clayey gravelly sand locally with partings of sandy clay and with cobbles and occasional boulders of sandstone. The gravel is fine to coarse subangular mudstone, locally surrounded sandstone.

Highly to Moderately Weathered Bedrock - encountered at each test location from between 0.15m and 3m bgl down to the base of trial pits at depths of between 0.9m and 3.1m bgl. Represented in general by highly to moderately weathered bedrock retrieved as brown to light grey/dark grey sandy angular to very angular gravel of grey/dark grey mudstone. The bedrock of sandstone was observed in TP04, TP15, TP16 and TP17.

Contamination Indicators

No visual or olfactory contamination indicators were observed and no Made Ground was encountered during the intrusive works. Along with the findings of the desk study this would indicate that the site poses a negligible risk to proposed end users and other environmental receptors with respect to site derived contamination.

Groundwater

Groundwater was not encountered in any of the trial pits during the fieldwork. However, the site works was undertaken following a prolonged dry spell and seasonal groundwater conditions may be possible.

Site Excavation

Conventional hydraulic plant should be capable of excavating foundation and service trenches within the Glacial Till, residual soil and highly weathered bedrock.

However, it would be prudent to make allowances for having a pneumatic breaker on site, to break out the moderately weathered bedrock, if encountered in deeper excavations.

In line with HSE guidelines all excavations requiring personnel access should be adequately supported to avoid the risk of collapse. Excavations within the cohesive materials are likely to remain stable in the short term, however excavations may be unstable within layers of granular soils (residual soils and highly weathered bedrock).

Drainage

The underlying bedrock influences the overlying superficial deposits and generally the higher ground away from Llanrwst Road is likely to be more suitable for the adoption of soakaways, with clayey material more common towards Llanrwst Road. Further Ground investigation work is required to better define areas of potential soakaway location and to also assess infiltration rates and confirm viability. However, locally within the north, east and far south of the site there may be potential areas where soakaways could be adopted.

Foundation Solutions

Shallow foundations are likely to be suitable for the proposed housing at depths of between 0.5 and 0.7mbgl, although locally the soils maybe classified as shrinkable and may need further deepening where they are in the influence of trees.

For costings purposes it is recommended that a minimum foundation depth of 0.9m below ground level is adopted, with allowable bearing pressures of between 100-125kN/m² likely to be achievable across the majority of the site, with up to 175kN/m² possible where shallow bedrock is present.

Earthworks

It is anticipated that the majority of the soils will be suitable for use within any cut and fill works. (No unsuitable materials were identified during the ground investigation).

Topsoil is relatively thin, however, it is anticipated that suitable volumes could be site won from hardstanding areas to ensure suitable depth of growing medium within garden areas.

Slope Stability

The following preliminary recommendations are made with respect to slopes and presented in Table 2.:

Table 3. Preliminary Recommendations to Slopes

Strata	Preliminary Safe Angle of Repose	Comments
Natural Superficial	1 in 2.5 to 1 in 3	
Bedrock	1 in 2 to 1 in 1	Dependant on degree of weathering and discontinuity mapping.
Reworked superficial/bedrock	1 in 3	

If you have any questions regarding the above, please do not hesitate to contact us.

Yours sincerely,

Cezary Salwa

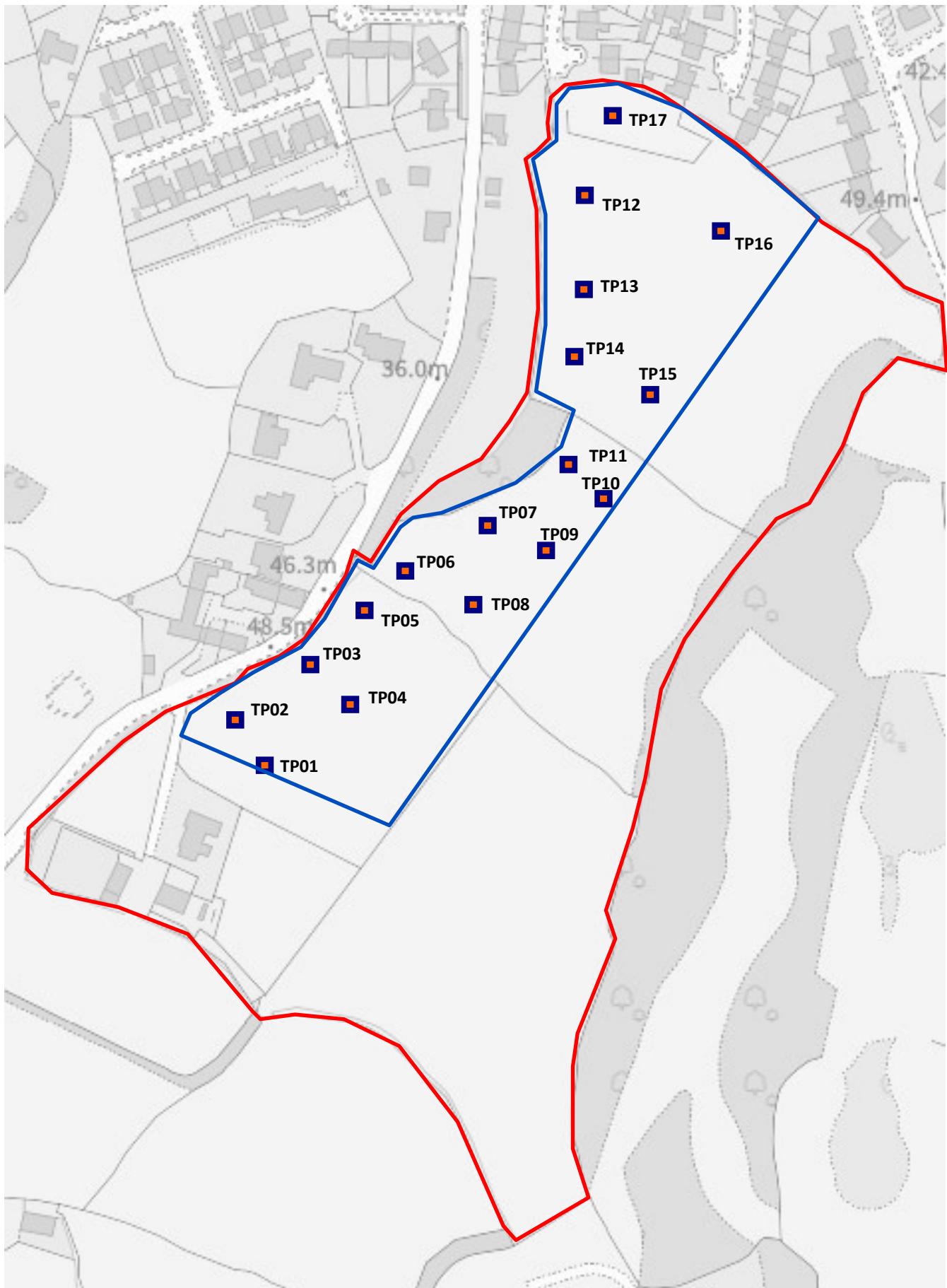
Cezary Salwa

Position: Geotechnical Engineer
On behalf of Caulmert Ltd

Encls.

Appendix A – Exploratory Holes Location Plan
Appendix B – Trial Pits Logs

Exploratory Holes Location Plan



- TP - Trial Pit
- Site Boundary
- Development Boundary

Job no: 5388
Land off Llanrwst Road
Gyffin
Conwy

Project:

Land off Llarwst Road, Gyffin,
Conwy

Location:

Conwy

Hole ID:

TP01

Job No.

5388

Date:

21.07.22

Sheet

1 of 1

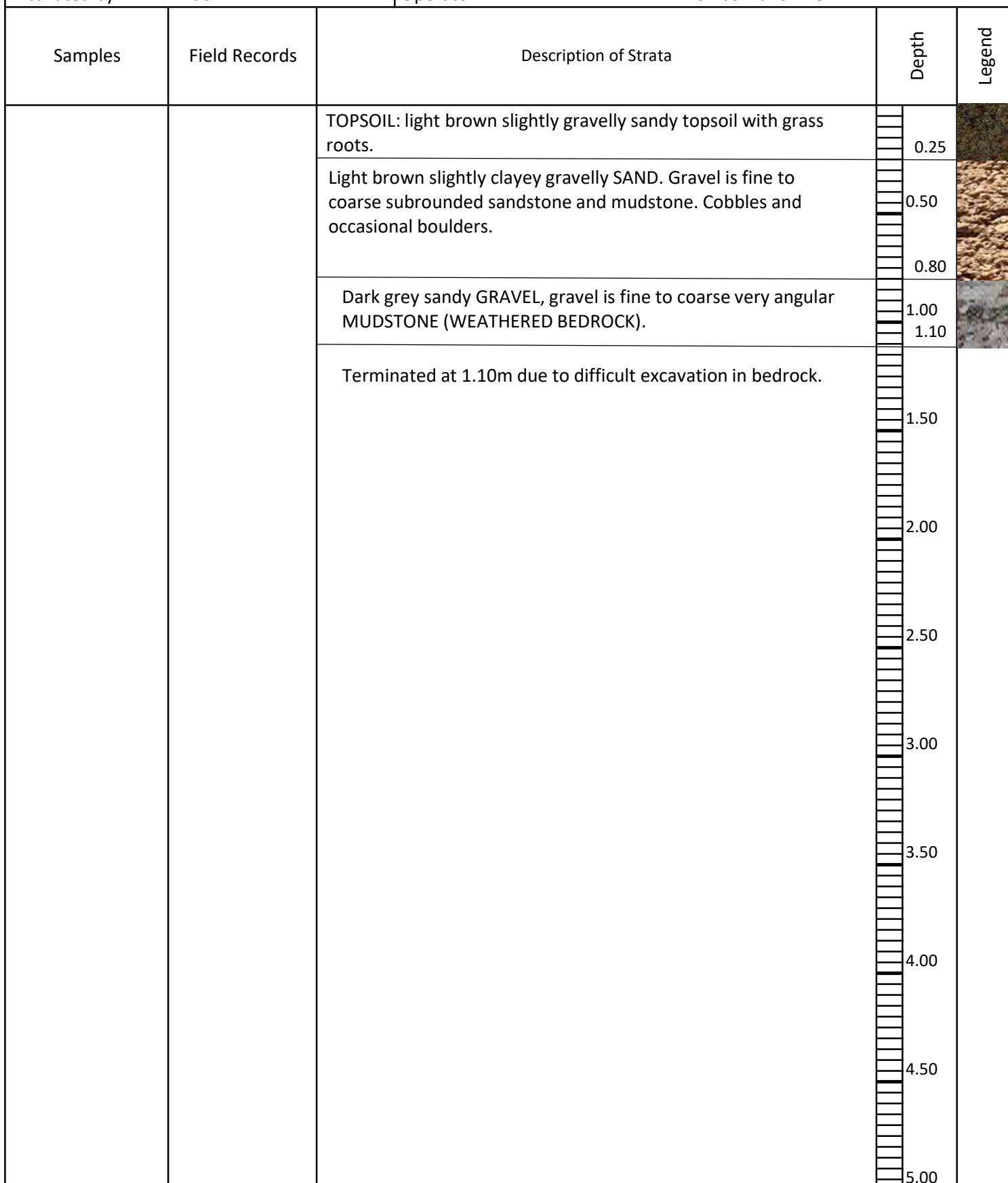
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire



Groundwater:

not observed

Remarks:



Hole ID:
TP01

Location



Sidewalls

Arisings



Project:
Land off Llarwst Road, Gyffin,
Conwy

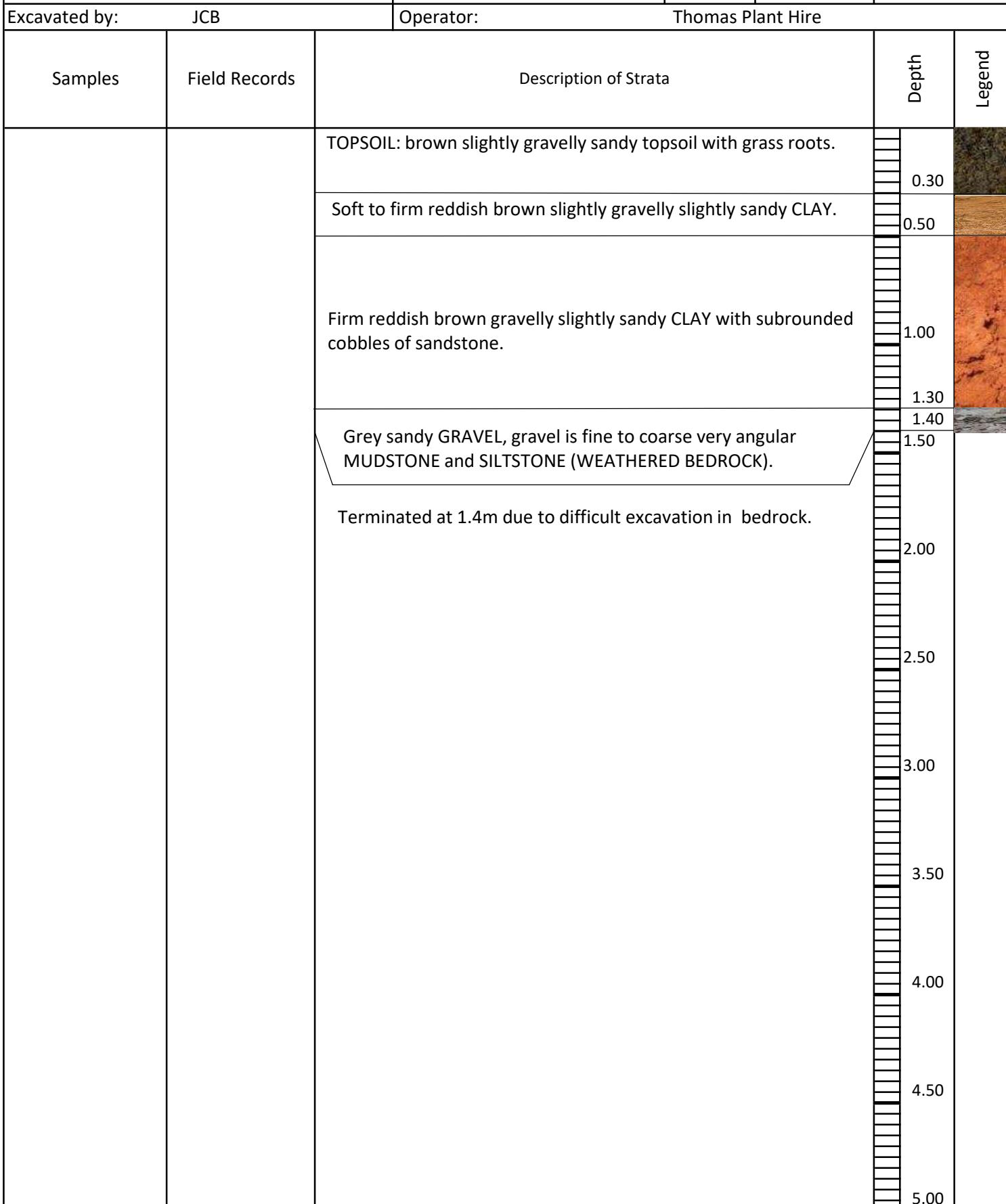
Location:
Conwy

Hole ID:
TP02

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

Client: Adra



Groundwater: not observed

Remarks:



Hole ID:

TP02



Location

Sidewalls

Arisings



Project:
Land off Llarwst Road, Gyffin,
Conwy

Location:
Conwy

Hole ID:
TP03

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

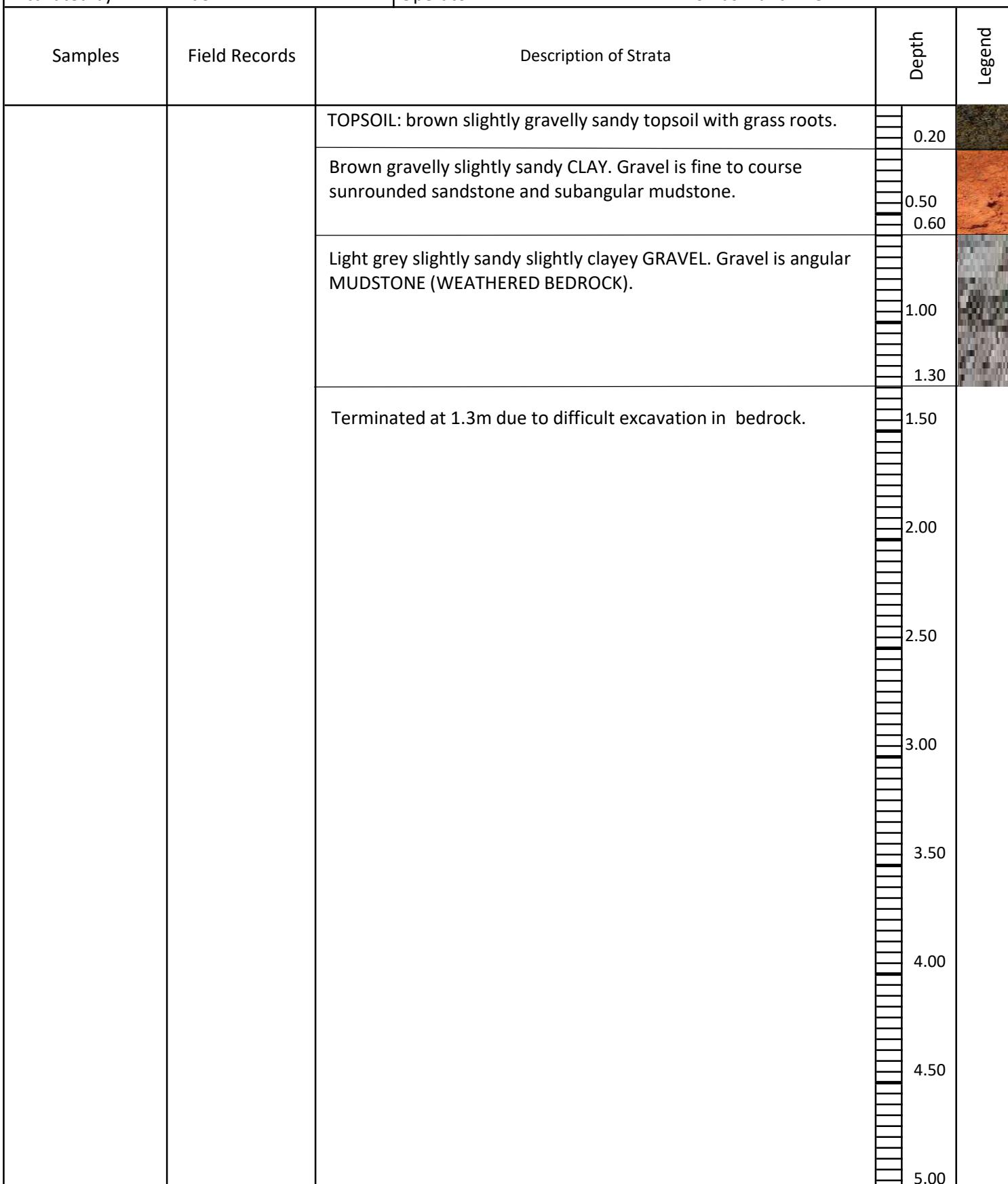
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire



Groundwater:

not observed

Remarks:



Hole ID:

TP03

Location



Sidewalls



Arisings

Gravel of mudstone



Project:
Land off Llarwst Road, Gyffin,
Conwy

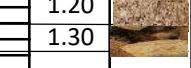
Location:
Conwy

Hole ID:
TP04

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

Client: Adra

Excavated by: JCB		Operator: Thomas Plant Hire	Depth	Legend
Samples	Field Records	Description of Strata		
		TOPSOIL: brown slightly gravelly sandy topsoil with grass roots.		
		Light brown slightly clayey gravelly SAND with partings of stiff clay. Gravel is fine to coarse subrounded sandstone and	0.30	
			0.50	
			1.00	
			1.20	
		Brown sandy GRAVEL. Gravel is angular dark grey SANDSTONE (WEATHERED BEDROCK).	1.30	
			1.50	
		Terminated at 1.3m due to difficult excavation in bedrock.	2.00	
			2.50	
			3.00	
			3.50	
			4.00	
			4.50	
			5.00	

Groundwater: not observed

Remarks:

Hole ID:

TP04



Sidewalls



Gravel of grey sandstone

Arisings



Project:

Land off Llarwst Road, Gyffin,
Conwy

Location:

Conwy

Hole ID:

TP05

Job No.

5388

Date:

21.07.22

Sheet

1 of 1

Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire

Samples	Field Records	Description of Strata	Depth	Legend
		TOPSOIL: light brown slightly gravelly sandy topsoil.	0.20	
		Light brown slightly clayey gravelly SAND with cobbles and occasional boulders of sandstone. Boulders between 0.2m and 0.6m in diameter.	0.50	
			1.00	
			1.10	
		Terminated at 1.10.m due to presence of boulder.	1.50	
			2.00	
			2.50	
			3.00	
			3.50	
			4.00	
			4.50	
			5.00	

Groundwater:

not observed

Remarks:



Hole ID:

TP05



Location

Sidewalls



Arisings

Project:
Land off Llarwst Road, Gyffin,
Conwy

Location:
Conwy

Hole ID:
TP06

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

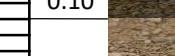
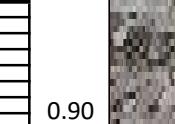
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire

Samples	Field Records	Description of Strata	Depth	Legend
		TOPSOIL: light brown slightly gravelly sandy topsoil.	0.10	
		Brown slightly clayey gravelly SAND. Gravel is fine to coarse angular mudstone.	0.40	
		Brown to dark grey sandy GRAVEL of angular dark grey MUDSTONE (WEATHERED BEDROCK).	0.50	
		Terminated at 0.90m due to presence of bedrock.	0.90	
			1.00	
			1.50	
			2.00	
			2.50	
			3.00	
			3.50	
			4.00	
			4.50	
			5.00	

Groundwater:

not observed

Remarks:

Hole ID:

TP06



Location



Sidewalls



Arisings



Gravel of mudstone

Project:

Land off Llarwst Road, Gyffin,
Conwy

Location:

Conwy

Hole ID:

TP07

Job No.

5388

Date:

21.07.22

Sheet

1 of 1

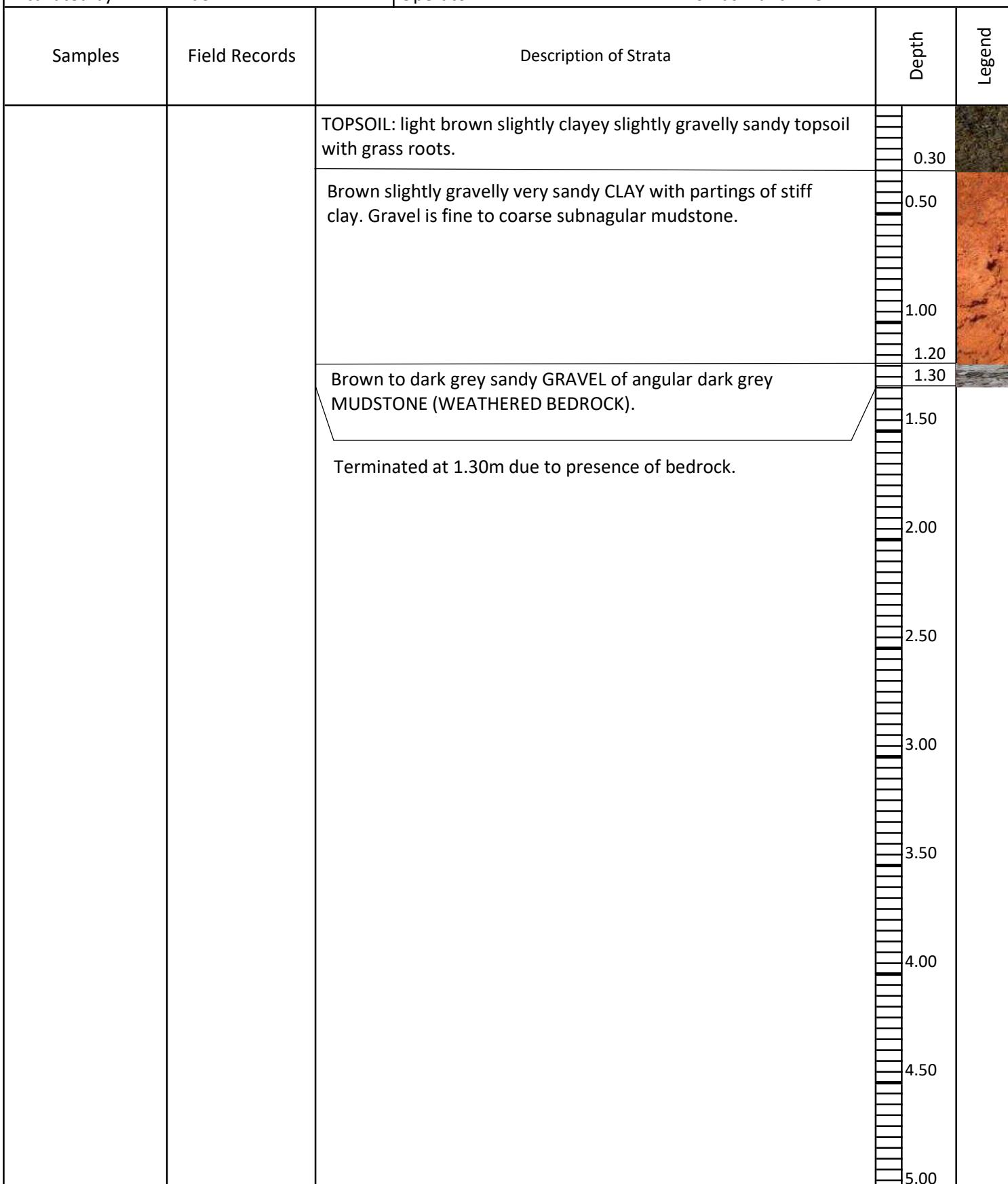
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire



Groundwater:

not observed

Remarks:



Hole ID:

TP07



Location

Sidewalls



Arisings

Project:

Land off Llarwst Road, Gyffin,
Conwy

Location:

Conwy

Hole ID:

TP08

Job No.

5388

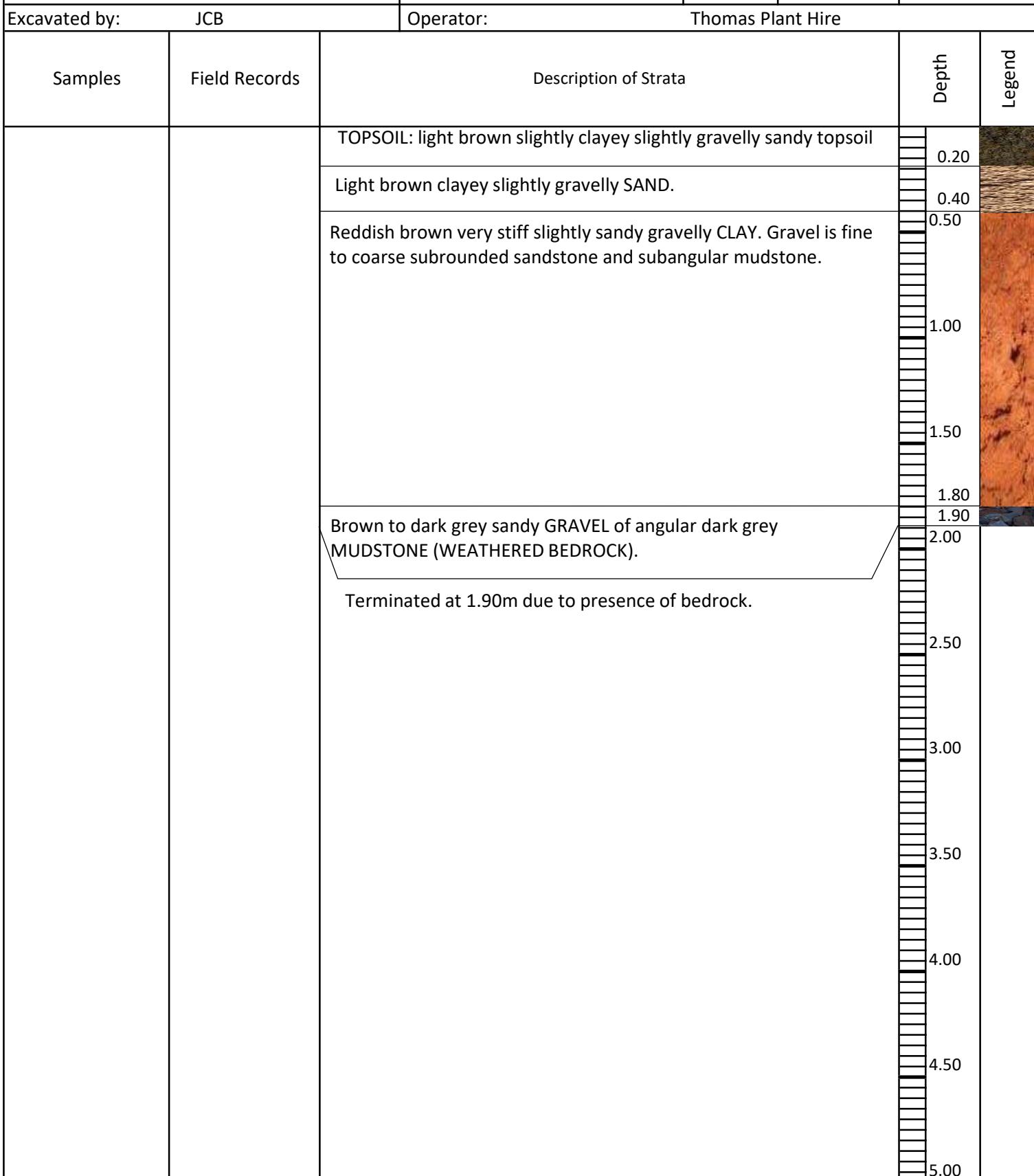
Date:

21.07.22

Sheet

1 of 1

Client: Adra



Groundwater:

not observed

Remarks:

Hole ID:
TP08



Location



Sidewalls



Arisings

Project:

Land off Llarwst Road, Gyffin,
Conwy

Location:

Conwy

Hole ID:

TP09

Job No.

5388

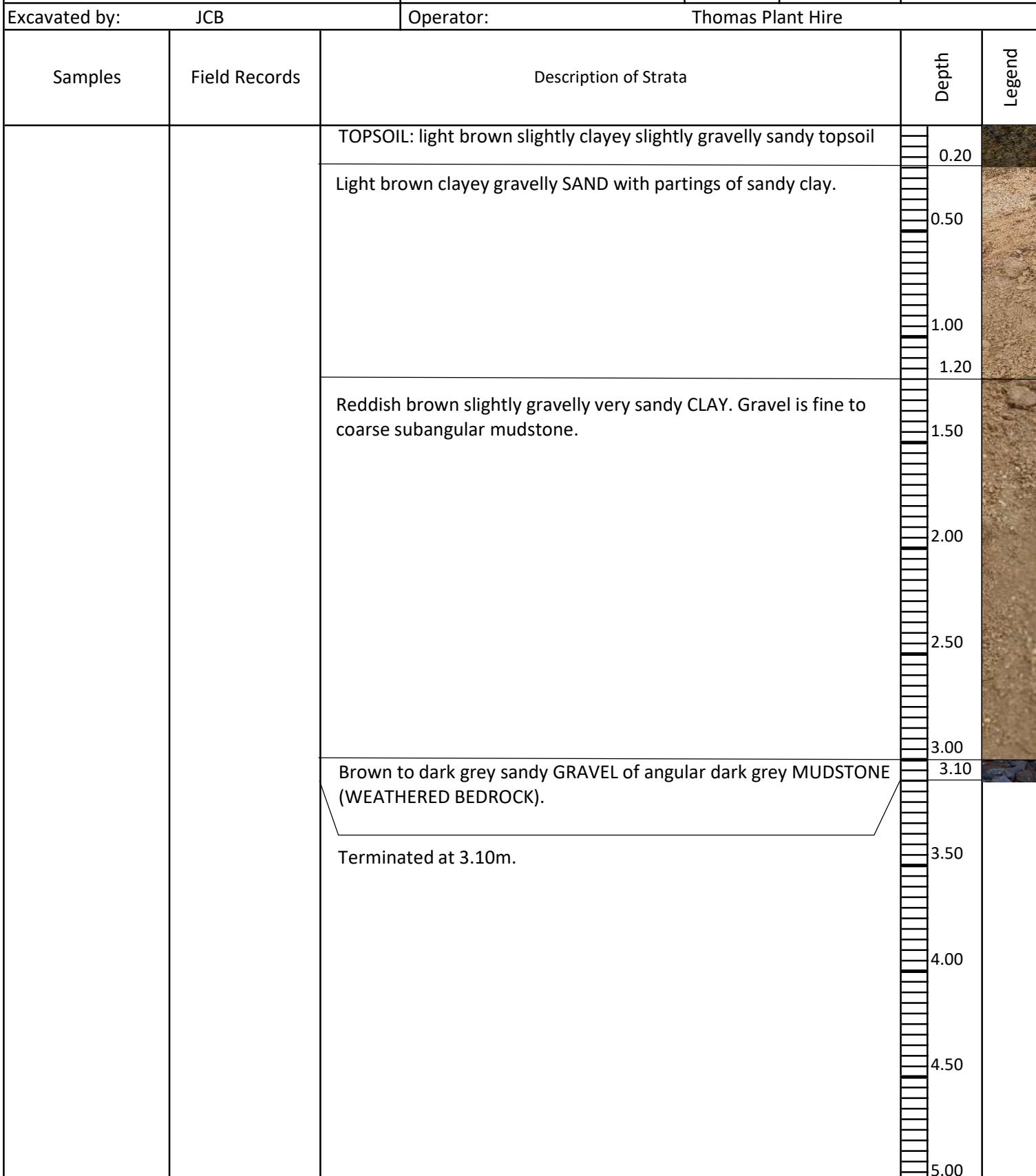
Date:

21.07.22

Sheet

1 of 1

Client: Adra



Groundwater:

not observed

Remarks:

Hole ID:
TP09



Location



Sidewalls



Arisings

Project:

Land off Llarwst Road, Gyffin,
Conwy

Location:

Conwy

Hole ID:

TP10

Job No.

5388

Date:

21.07.22

Sheet

1 of 1

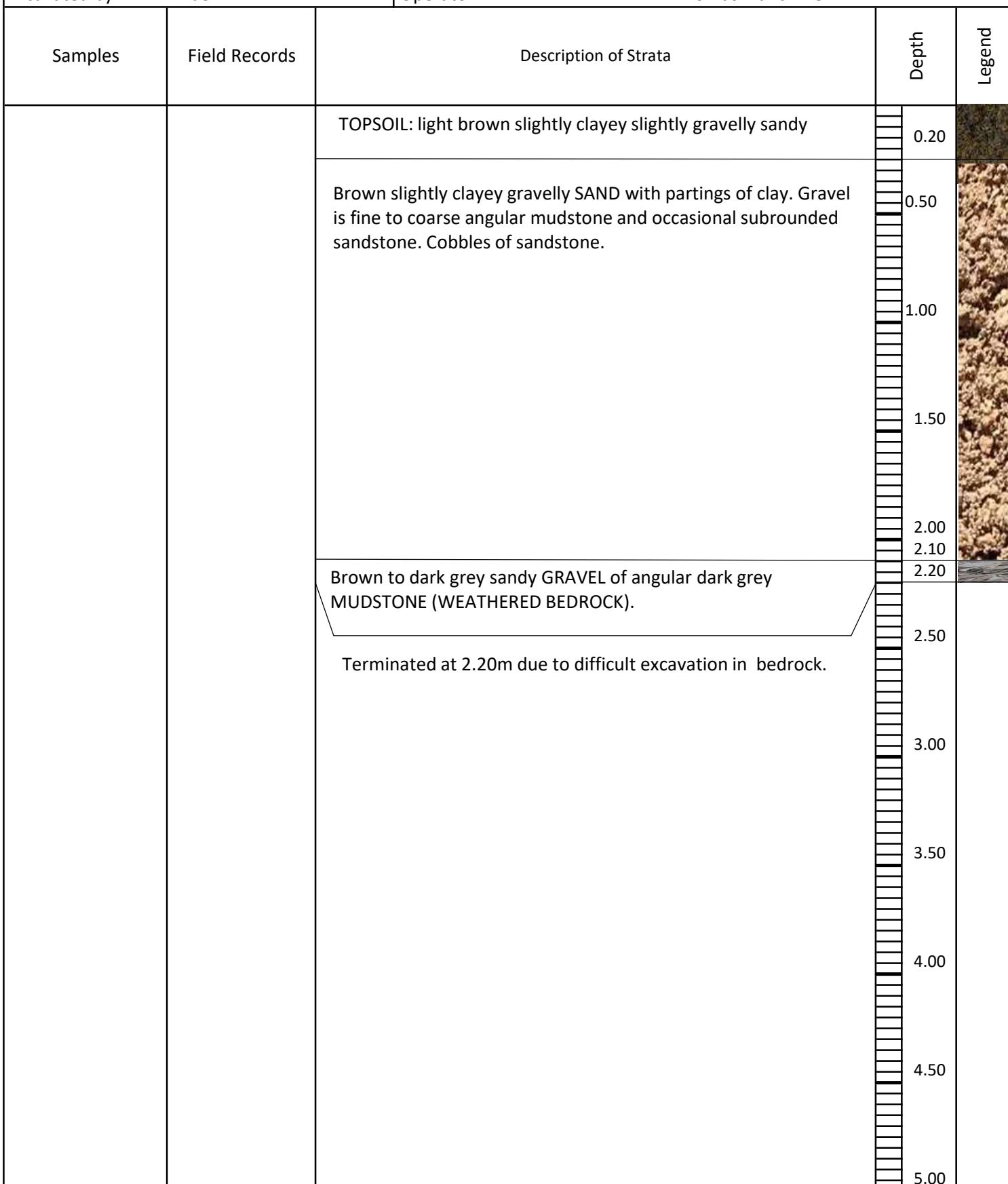
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire



Groundwater:

not observed

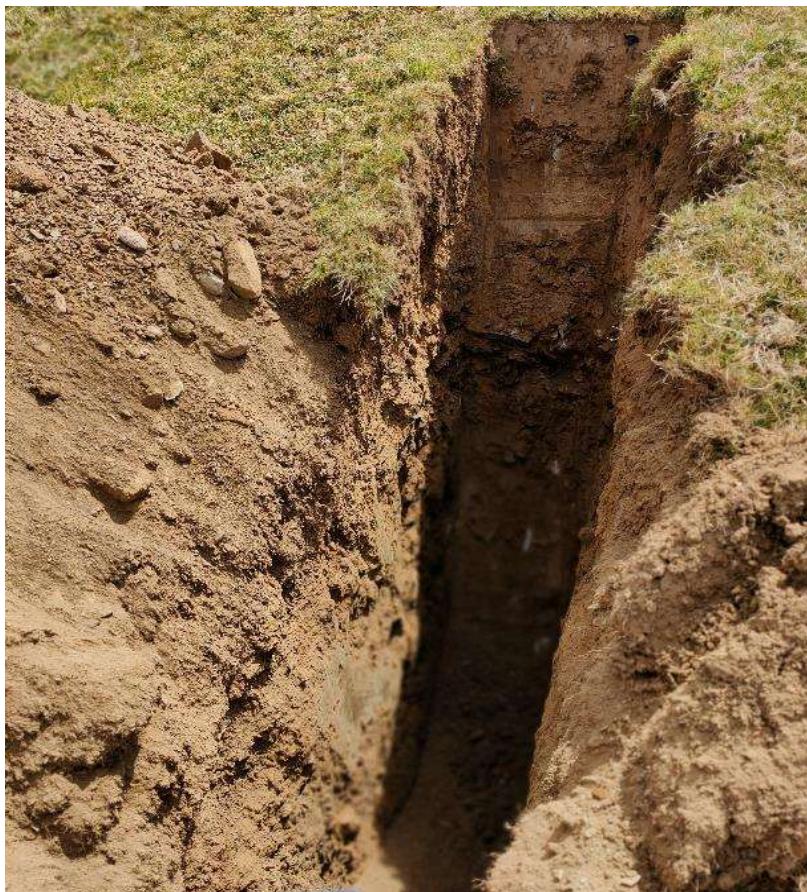
Remarks:

Hole ID:

TP10



Location



Sidewalls

Arisings



Project:
Land off Llarwst Road, Gyffin,
Conwy

Location:
Conwy

Hole ID:
TP11

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

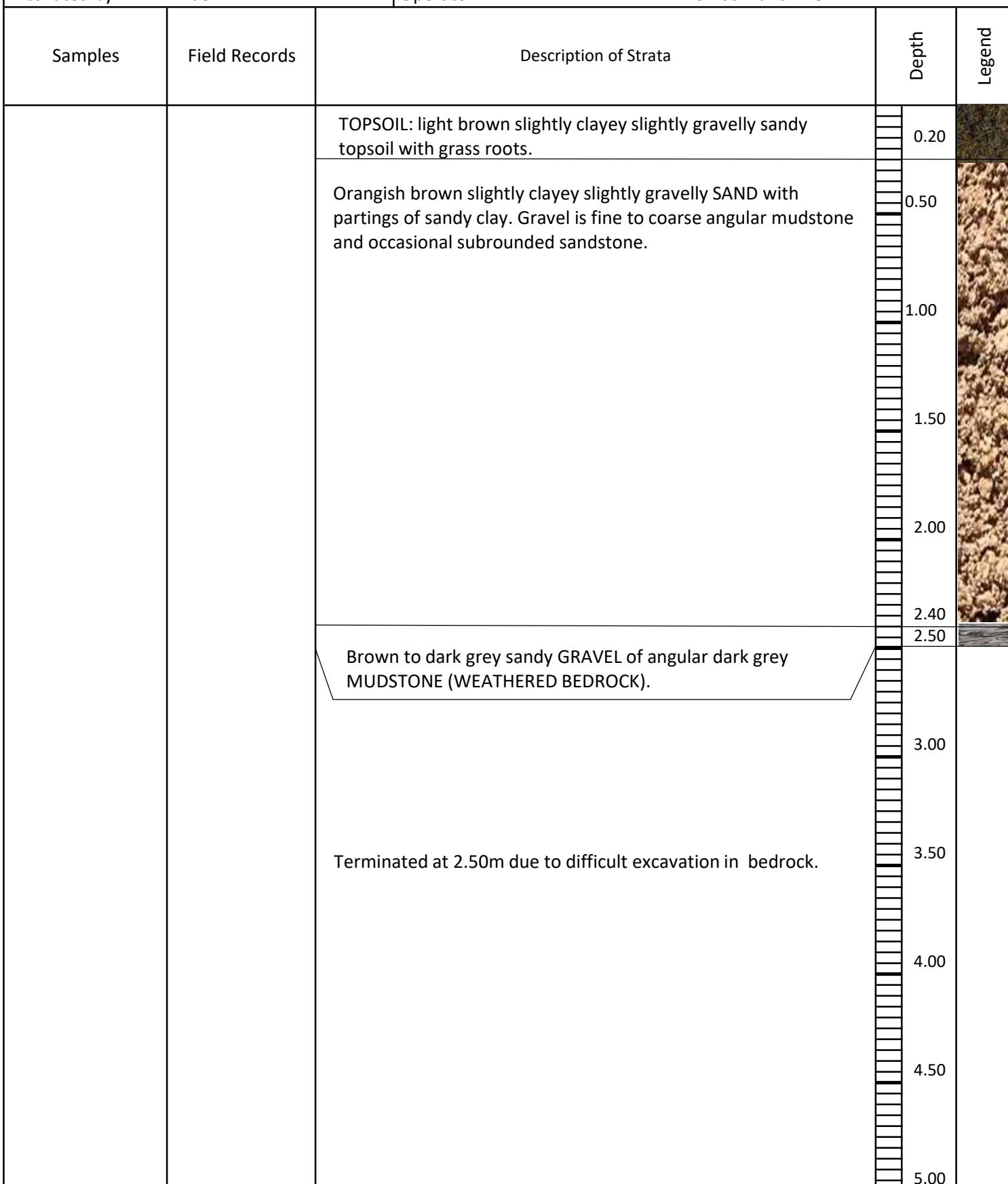
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire



Groundwater:

not observed

Remarks:

Hole ID:

TP11



Location



Sidewalls



Arisings

Project:
Land off Llarwst Road, Gyffin,
Conwy

Location:
Conwy

Hole ID:
TP12

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

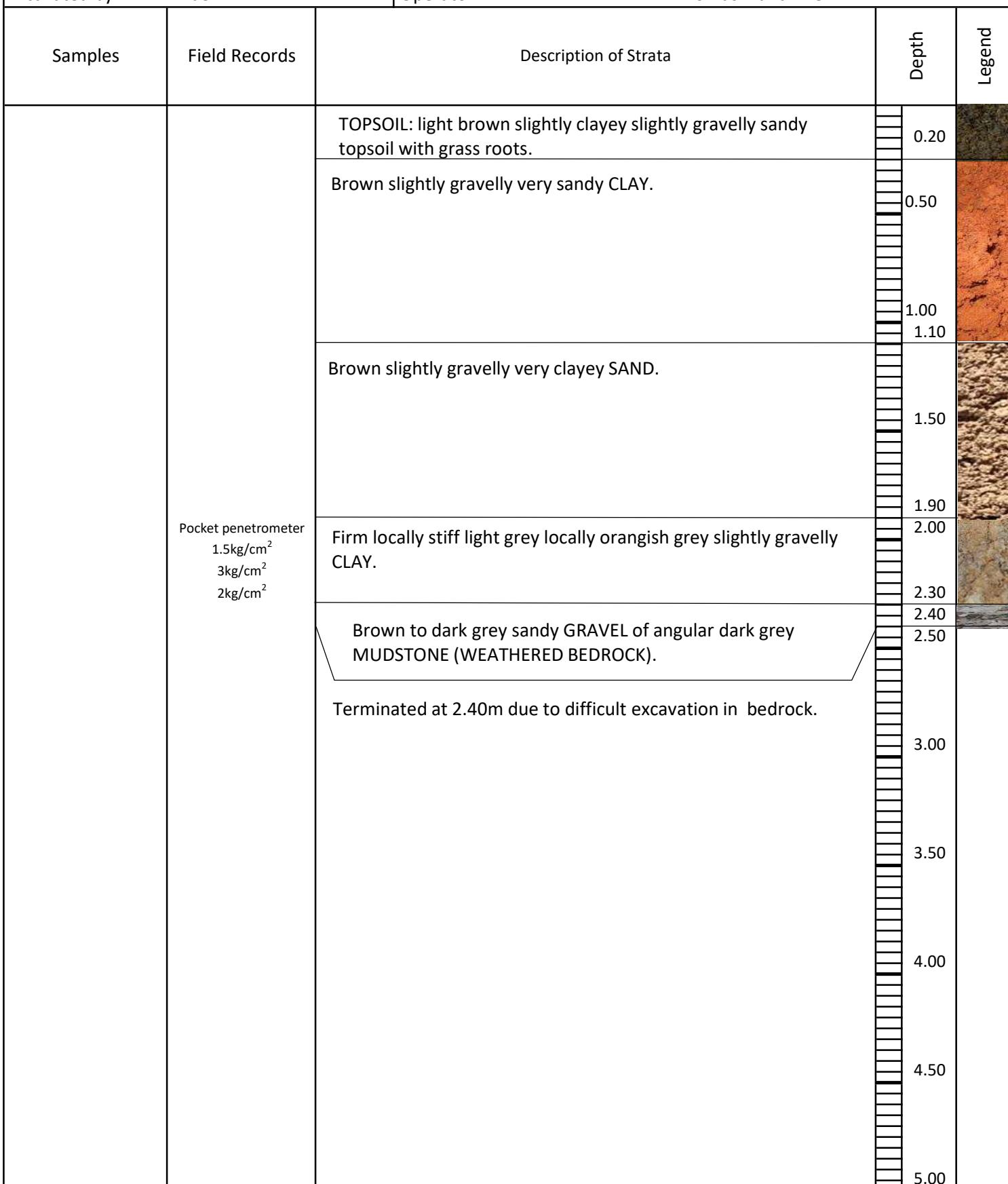
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire



Groundwater:

not observed

Remarks:



Hole ID:

TP12

Location



Sidewalls

Arisings



Project:
Land off Llarwst Road, Gyffin,
Conwy

Location:
Conwy

Hole ID:
TP13

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire

Samples	Field Records	Description of Strata	Depth	Legend
		TOPSOIL: light brown slightly clayey slightly gravelly sandy topsoil with grass roots.	0.20	
		Orangish brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse subrounded sandstone.	0.50	
		Brown clayey slightly gravelly SAND. Gravel is fine to coarse subrounded sandstone. Occasional cobbles of sandstone.	1.00	
		Brown to dark grey sandy slightly clayey GRAVEL of angular dark grey MUDSTONE (WEATHERED BEDROCK).	1.30	
		Terminated at 2.40m due to difficult excavation in bedrock.	2.00	
			2.30	
			2.40	
			3.00	
			3.50	
			4.00	
			4.50	
			5.00	

Groundwater:

not observed

Remarks:



Hole ID:

TP13



Location

Sidewalls



Arisings

Project:
Land off Llarwst Road, Gyffin,
Conwy

Location:
Conwy

Hole ID:
TP14

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

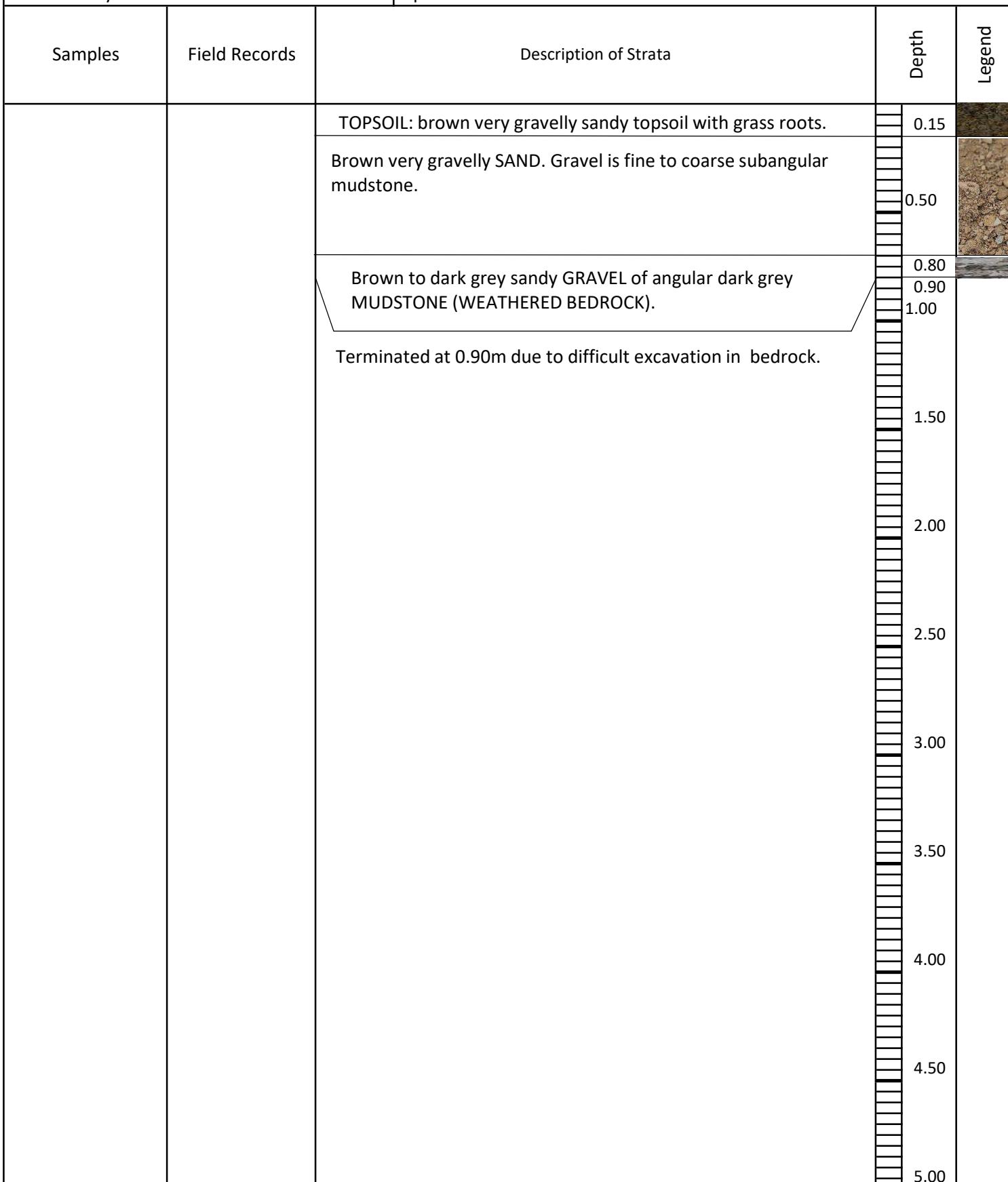
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire



Groundwater:

not observed

Remarks:



Hole ID:

TP14



Location

Sidewalls



Arisings

Project:
Land off Llarwst Road, Gyffin,
Conwy

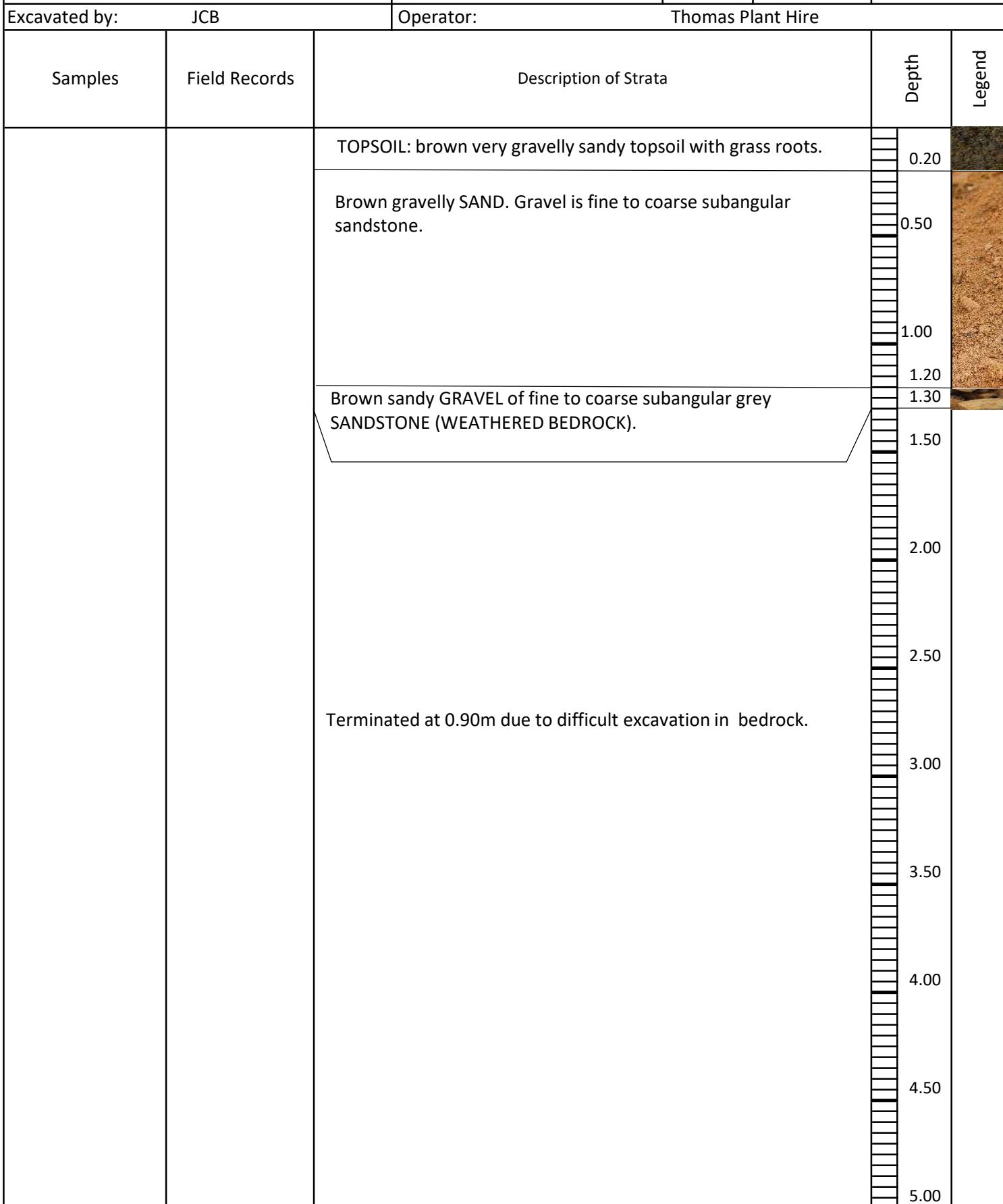
Location:
Conwy

Hole ID:
TP15

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

Client: Adra



Groundwater: not observed

Remarks:



Hole ID:

TP15

Location



Sidewalls

Arisings



Gravel of sandstone

Project:

Land off Llarwst Road, Gyffin,
Conwy

Location:

Conwy

Hole ID:

TP16

Job No.

5388

Date:

21.07.22

Sheet

1 of 1

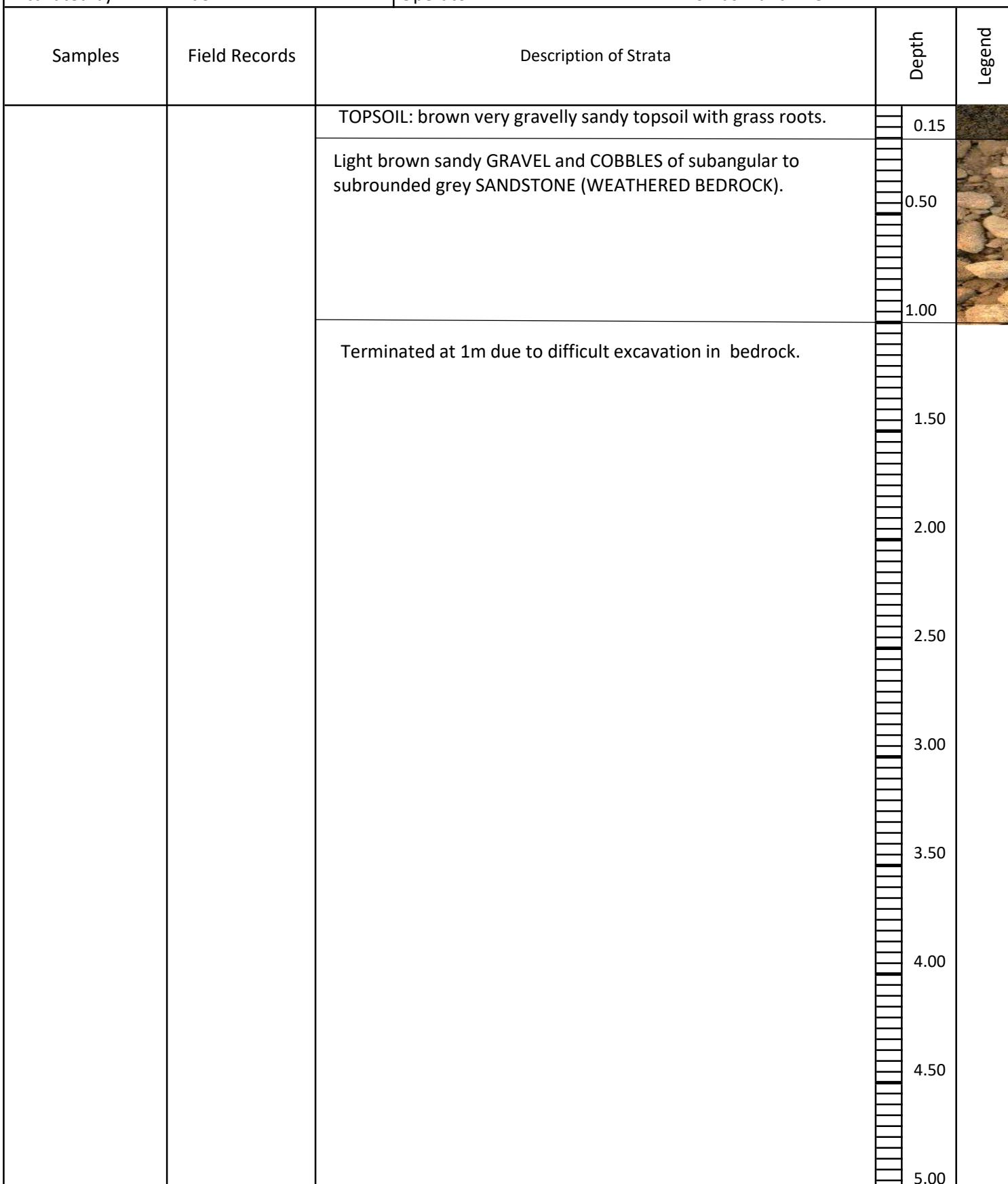
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire



Groundwater:

not observed

Remarks:



Hole ID:
TP16



Location

Sidewalls



Gravel of sandstone



Arisings

Project:
Land off Llarwst Road, Gyffin,
Conwy

Location:
Conwy

Hole ID:
TP17

Job No. 5388 Date: 21.07.22

Sheet
1 of 1

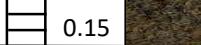
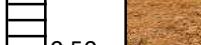
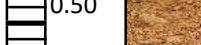
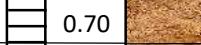
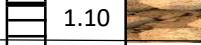
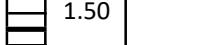
Client: Adra

Excavated by:

JCB

Operator:

Thomas Plant Hire

Samples	Field Records	Description of Strata	Depth	Legend
		TOPSOIL: brown slightly gravelly sandy topsoil with grass roots.	0.15	
		Light brown slightly gravelly SAND. Gravel is fine to coarse subangular sandstone.	0.50	
		Light brown sandy GRAVEL and COBBLES of subangular to subrounded grey SANDSTONE (WEATHERED BEDROCK).	0.70	
		Terminated at 1.1m due to difficult excavation in bedrock.	1.00	
			1.10	
			1.50	
			2.00	
			2.50	
			3.00	
			3.50	
			4.00	
			4.50	
			5.00	

Groundwater:

not observed

Remarks:



Hole ID:

TP17

Location



Sidewalls

Arisings

