

Report No. BC/MB/06.19.05/3.

Report on Drilling and Grouting Operation: Land at Plymouth House, Merthyr Tydfil.

Prepared on behalf of:

Mr and Mrs D. Rees

By:



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Report on Drilling and Grouting Operation: Land at Plymouth House, Merthyr Tydfil.

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Drawing No:		Scale:
<i>BC/MB/06.19.05.01.</i>	<i>General Location Plan.</i>	<i>1:50,000.</i>
<i>BC/MB/06.19.05.02.</i>	<i>Geology Plan.</i>	<i>1:10,560.</i>
<i>BC/MB/06.19.05.03.</i>	<i>Detailed Location Plan.</i>	<i>1:1,250.</i>
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Appendices

Appendix I Graphic Logs of Boreholes.

Appendix II Details of Materials Injected into Boreholes.

Report on Drilling and Grouting Operation: Land at Plymouth House, Merthyr Tydfil.

1 Introduction

This report has been prepared on behalf of our client:

***Mr and Mrs D Rees,
2 Plymouth House,
Milbourne Terrace,
Merthyr Tydfil,
CF47 0UL***

and relates to land at Plymouth House in Merthyr Tydfil, where it is proposed to develop the land for housing. This report discusses a drilling and grouting operation carried out at the Site with a view to stabilising past underground mining. Recommendations are made regarding the risk from shallow mine workings following the stabilisation work.

The following sources of data were used in the compilation of this report:

- i) The findings of the 'Mining Risk Assessment: Land at Plymouth House, Merthyr Tydfil', reference no. BC/MB/06.19.05, published by Blandford Consulting;*
- ii) The findings of the 'Site Investigation Report: Land at Plymouth House, Merthyr Tydfil', reference no. BC/MB/06.19.05/2, published by Blandford Consulting;*
- iii) The findings of the drilling and grouting operation carried out at the Site and*
- iv) the archive records of Blandford Consulting.*

The findings of this report are necessarily based upon the data used in its compilation and may be amended in the future in the light of additional material information. The report must only be used in its entirety for its stated purpose.

/Cont....

2 Brief Description of the Site

The parcel of land that is the subject of this report ('the Site') is located at the southern margins of the town of Merthyr Tydfil; it is approximately 1 km south-east of the centre of the town (see Figure 1 and *General Location Plan, drawing no. BC/MB/06.19.05.01*). The Site is located near the floor of the Taff Valley and is at an approximate elevation of 176m aod: it occupies an area of approximately 0.13 hectares (see *Borehole Location Plan 2, drawing no. BC/MB/06.19.05.08*). The Site lies within a mixed residential area where houses and bungalows are a mixture of terraced, semi-detached and detached.

Figure 1
Aerial View of Site

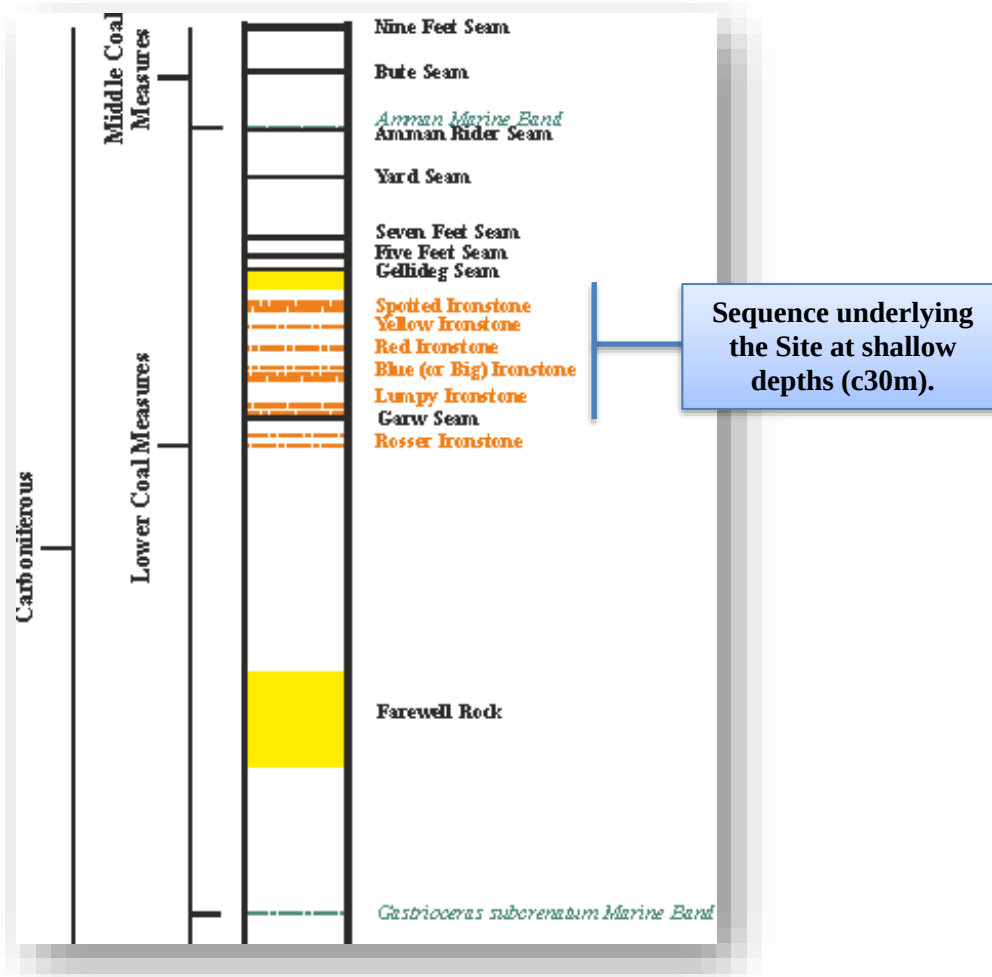


3 Geology of the Site

The earlier reports identified the Site is underlain at shallow depths with strata assigned to the Lower Coal Measures. The sequence underlying the Site at shallow depths includes a series of five ironstone veins, the Garw Coal Seam and the Rosser Ironstones (see Figure 2, Part of the Stratigraphic Column).

/Cont....

Figure 2
Part of the Stratigraphic Column.



The earlier report also identified that the Site is not affected by large scale faulting and it is not affected by landslip conditions. The report also found that published geological information shows the Site to be covered with glacial deposits of river alluvium and with Made Ground that is almost certainly colliery spoil.

4 Mining History

The earlier Site Investigation Report identified the presence of shallow ironstone workings associated with a nearby disused adit. Subsequently, the drilling and grouting operation that is the subject of this report was carried out in order to stabilise the mine workings.

/Cont....

5 Drilling and Grouting Operation

A programme of thirty-four rotary percussive boreholes was designed to assess the nature and extent of old workings underlying the Site. Where old workings were encountered the borehole pattern was based on a simple grid arrangement that would provide access into the old workings for the grout mixture and chippings. The spacing of the boreholes was designed to permit the injected grout to fill the voids and broken ground that resulted from the former mining operations for the ironstone. The boreholes identified that the old workings underlying the Site were comprised of the main adit drive, no workings were encountered off the adit. The findings are consistent with mining close to the entrance of an adit where the workings are close to the surface and the coal measures subject to the effects of weathering. More extensive mining operations would be expected where the drive had reached a greater depth from the surface. The borehole pattern was modified as the drilling programme advanced to provide a grid to stabilise the drive and inhibit grout flowing away from the area to be stabilised.

The boreholes were drilled to a maximum depth of 22m. The locations of the boreholes are shown on the *Borehole Location Plan 2*, drawing no. BC/MB/06.19.05.08 and the borehole logs are included in Appendix I. The boreholes were supervised by a Chartered Geologist and drilled by Apex Drilling Services using a Beretta T44 rig.

The boreholes were monitored for mine gases throughout the drilling operations; the operations were monitored for the presence of methane, carbon monoxide, hydrogen sulphide and levels of oxygen outside the 20% - 21% range. None of the above mine gases were encountered and the readings of oxygen levels all fell within the above range.

Grout comprised of a mixture of Ordinary Portland Cement (OPC) and pulverised fly ash (PFA) were injected into the boreholes in a 1:10 ratio. Where it was considered appropriate, chippings were added to the grout. A total of 169 tonnes of grout and 135.5 tonnes of chippings were injected into the boreholes. The details of the materials injected into each borehole are included at Appendix II.

/Cont....

6 Discussion and Conclusions

A total of thirty-seven boreholes were drilled across the Site, the majority along the line of the adit where it affects Plots 1 and 4; the boreholes positions included a 1m wide perimeter around the two footprints. No old workings were encountered under Plots 2 and 3. The borehole grid was designed to permit an efficient grouting up of the old ironstone adit. A total of 169 tonnes of grout and 135.5 tonnes of chippings were injected into the boreholes. The old workings are considered to have been stabilised and the risk of any remnant voids remaining following the grouting operation being large enough to collapse to the base of the Boulder Clay is considered to be extremely low to negligible. The coal measures are overlain with deposits of glacial till, Boulder Clay, that vary in thickness between 4.40m and 10.6m and with Made Ground (Colliery Spoil) that was found to vary in thickness from 6.30m in Borehole 30 to 15.90m in Borehole 19. The risk of any subsidence that may occur at the base of the Boulder Clay migrating to the surface and adversely affecting the foundations of the proposed dwellings is considered to be negligible.

The shallow mine workings underlying the Site are considered to have been stabilised and may be ignored for building purposes. The boreholes encountered Made Ground (Colliery Spoil) across the Site that is likely to be unsuitable for strip/trench footings; the Made Ground should be assessed in order to determine the most appropriate foundation options.



**Dr Malcolm Blandford,
Chartered Geologist.**

Report Date: 9th July 2020.

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PLANS



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Geologists Working With The Environment....

Study on Land at Plymouth House, Merthyr Tydfil.

General Location Plan.

Plan Scale: 1:50,000.

Key to Symbols:
 Approximate Position of Site.

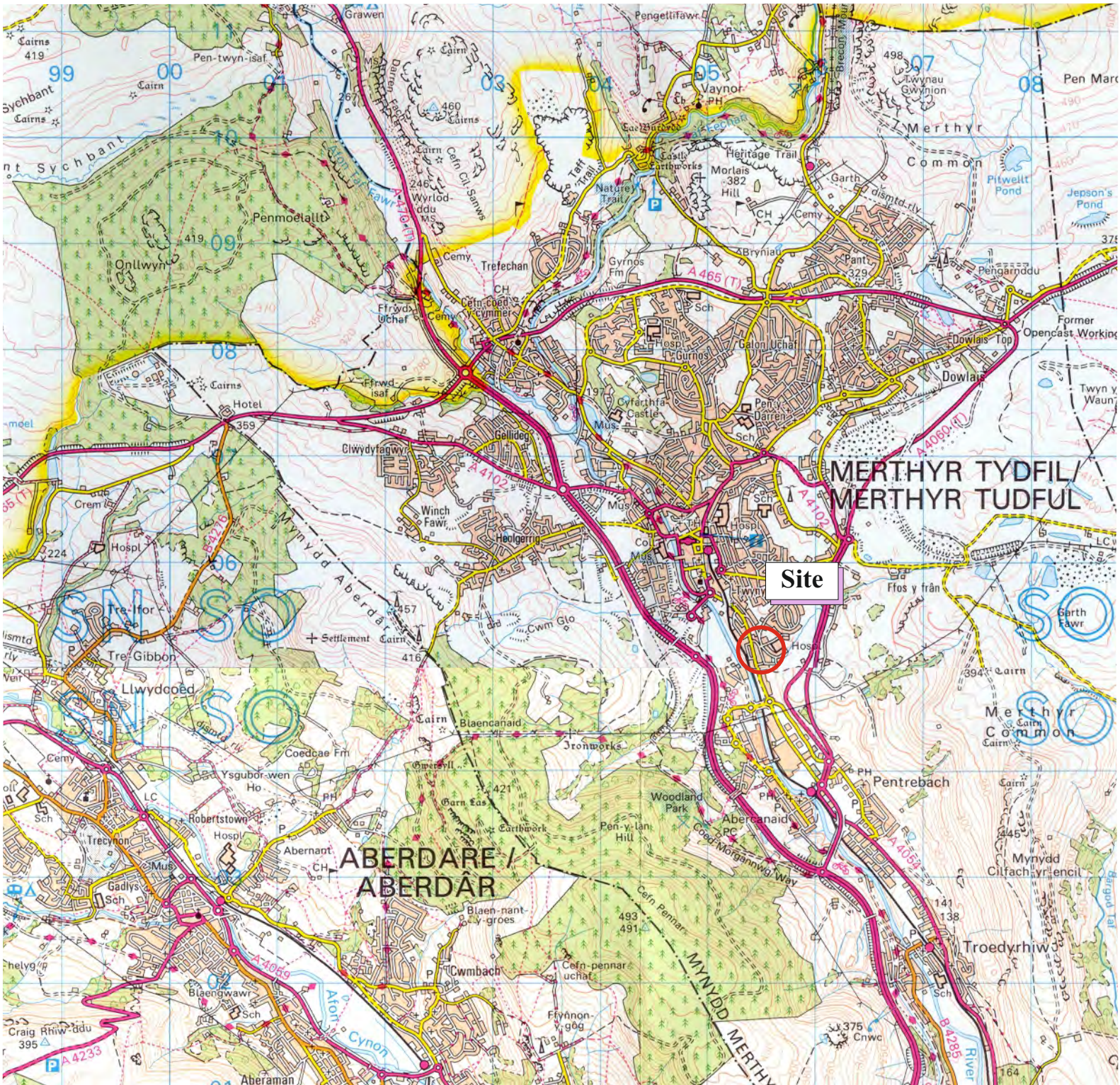
Note:
North is at top of plan.

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Study on Land at Plymouth House, Merthyr Tydfil.

Geology Plan.

Plan Scale: 1:10,560.

Key to Symbols:



Approximate Position of Site.

Note:

North is at top of plan.

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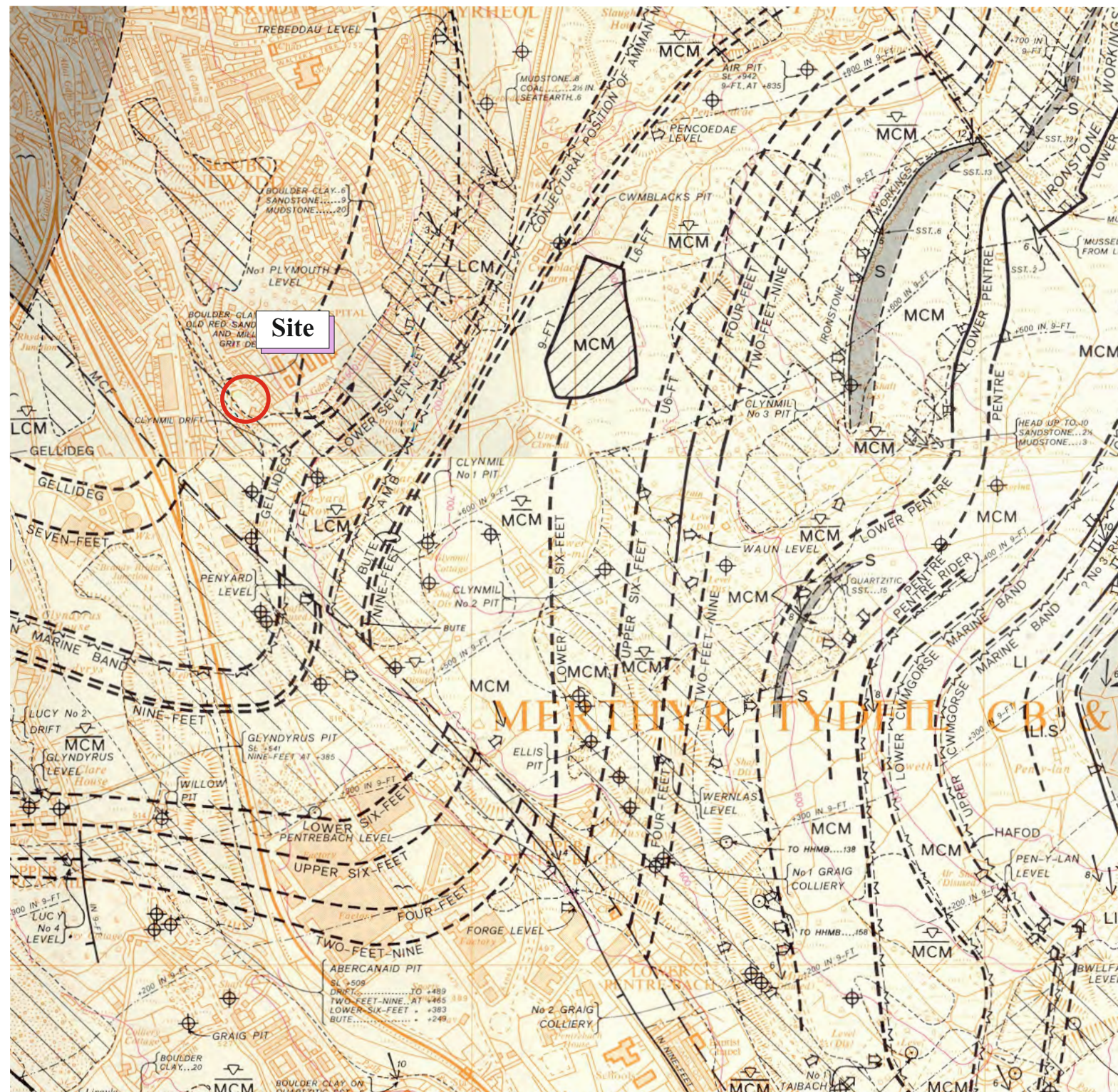


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Drawing No: BC/MB/06.19.05.02.

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Study on Land at Plymouth House, Merthyr Tydfil.

Detailed Location Plan.

Plan Scale: 1:1,250.

Key to Symbols:

— Approximate Site Boundary.

➤ Approximate position of disused mine adit.

Note:

North is as shown on plan.

Drawing extracted from documents provided by client.

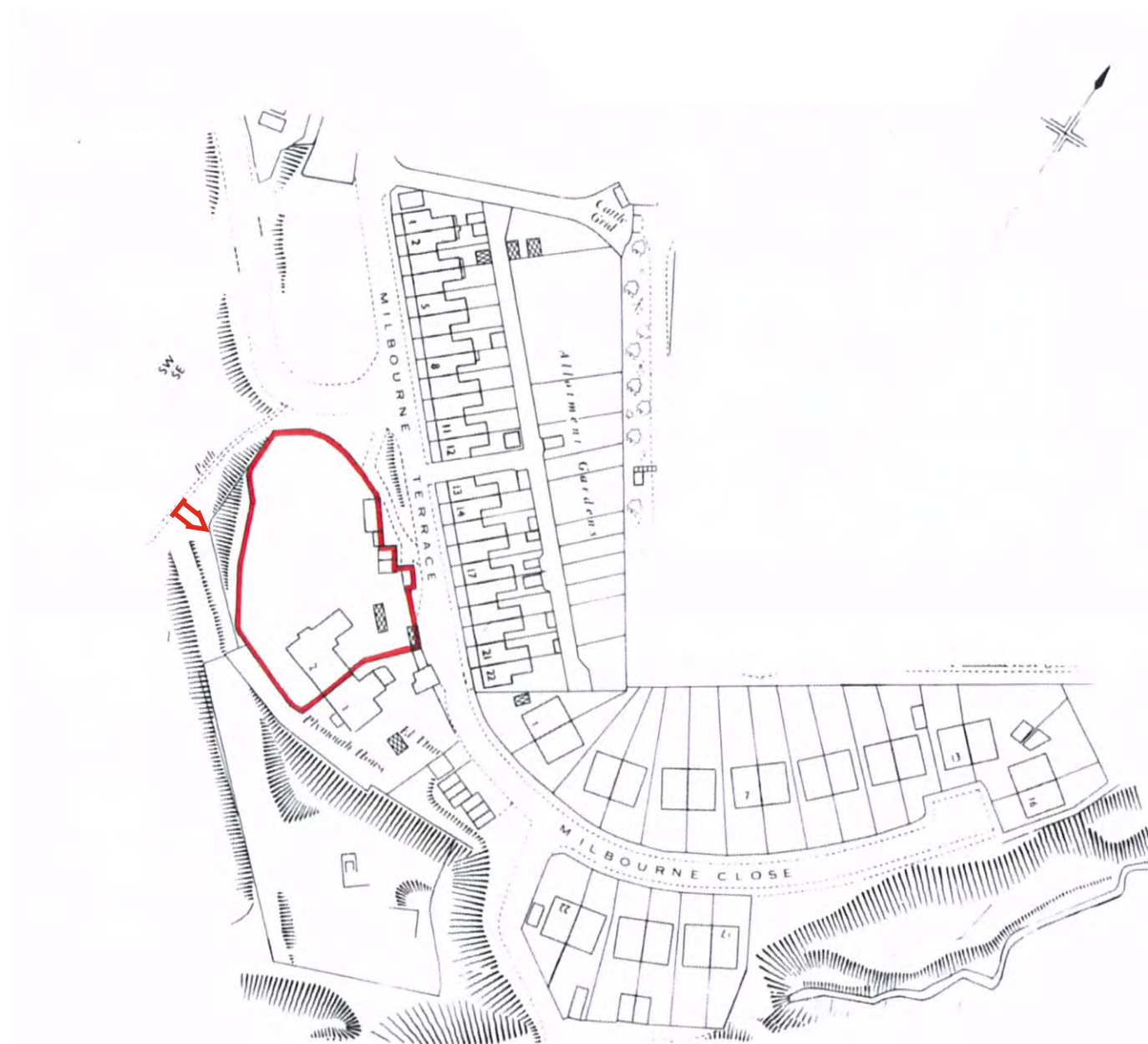
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Drawing No: BC/MB/06.19.05.03.



Study on Land at Plymouth House, Merthyr Tydfil.

Borehole Location Plan 2.

Plan Scale: 1:250.

Key to Symbols:

-  Development Boundary.
-  Borehole Solid.
-  Borehole Old Workings.
-  Not Drilled.
-  Former Site Investigation Boreholes.
-  Area Underlain by Adit.
-  Approximate Position of Mouth of Adit.

Note:

North is as shown on plan.

Drawing based on Proposed Site Plan, drawing No. 592.02A prepared by George and Co.

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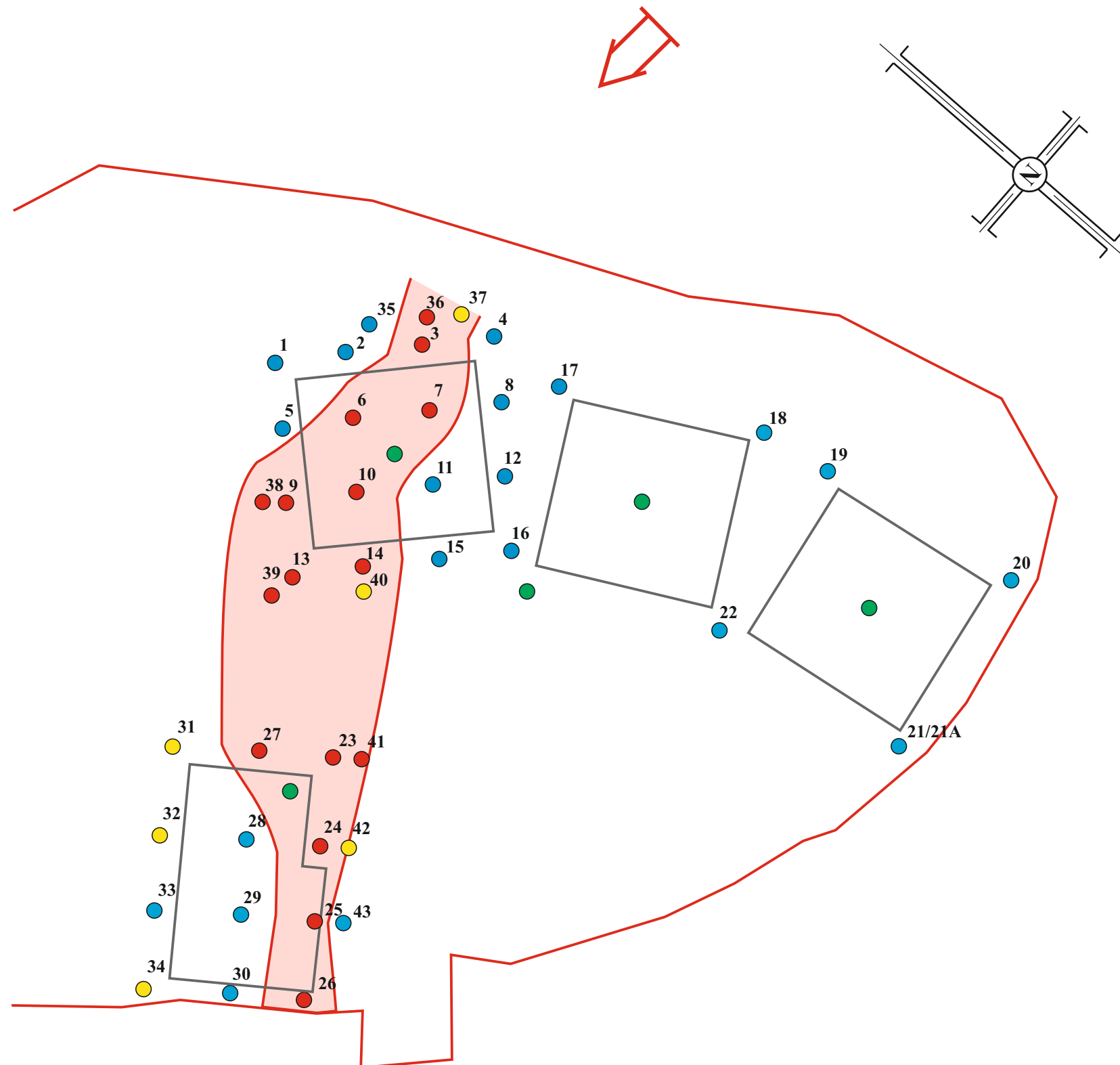


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Drawing No: BC/MB/06.19.05.08.

Geologists Working With The Environment...



APPENDIX I

GRAPHIC LOGS OF BOREHOLES



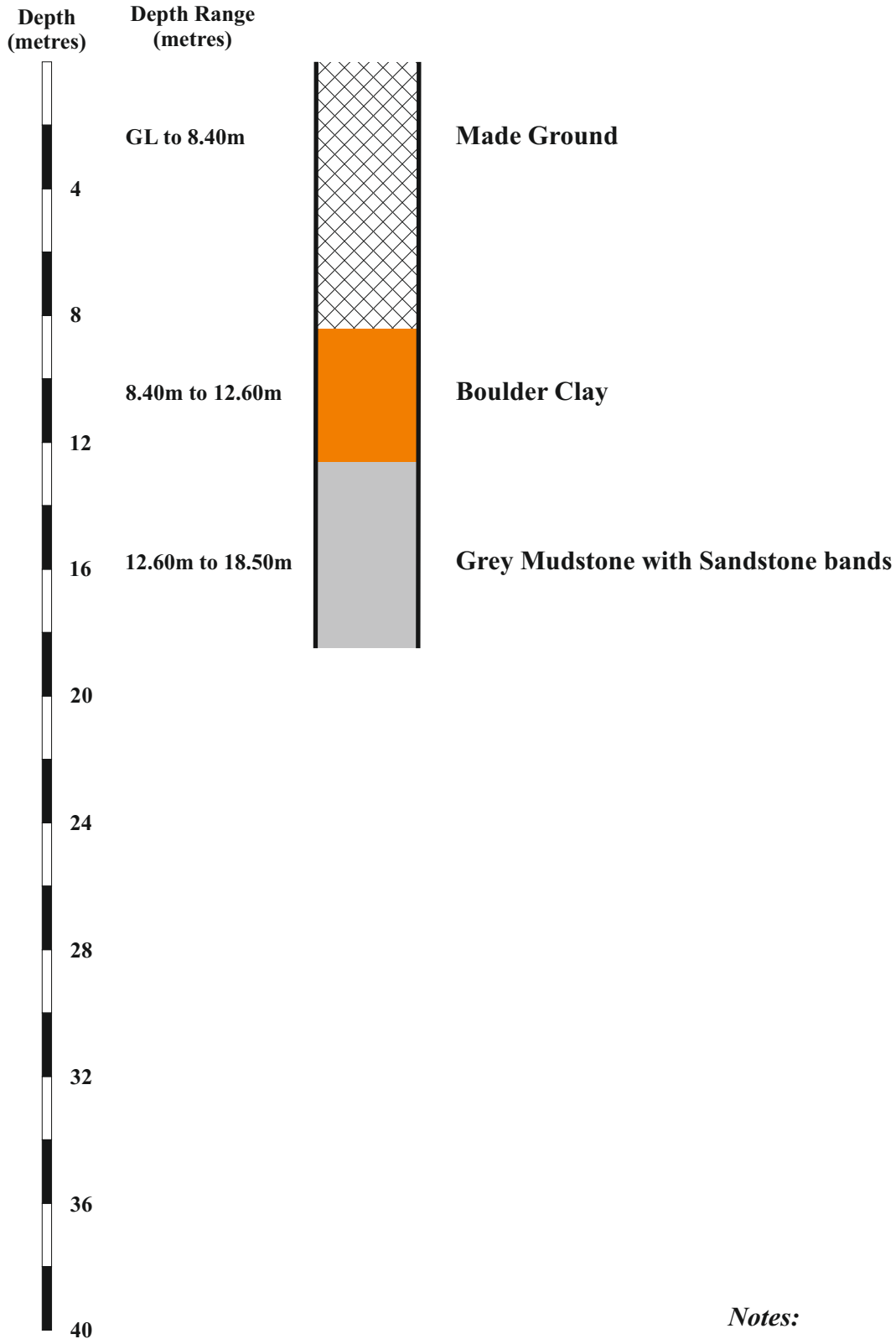
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Study on Land at Plymouth House

Borehole No. 1

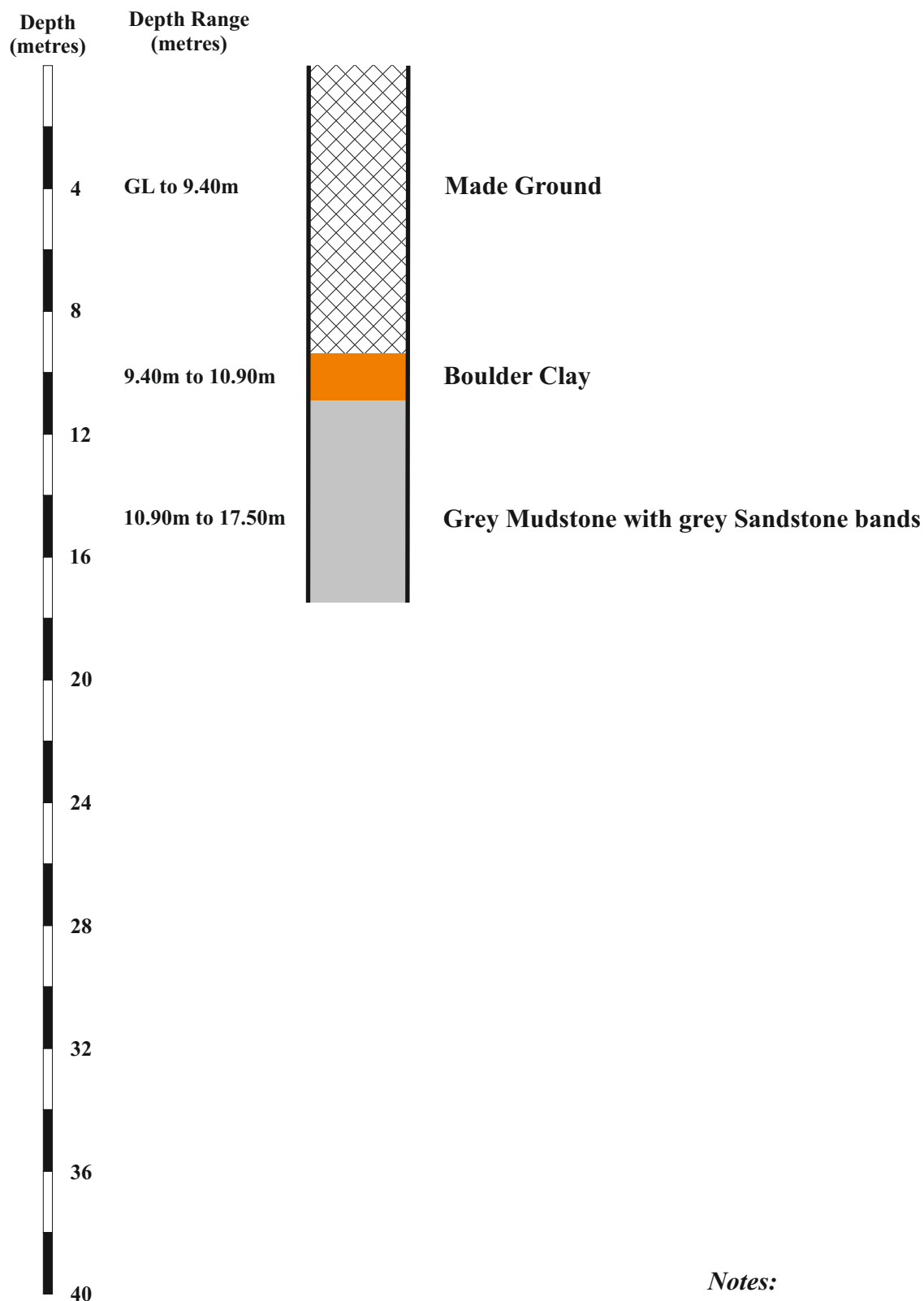


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 18.50m.*
4. *Cased 12.40m.*

Study on Land at Plymouth House

Borehole No. 2

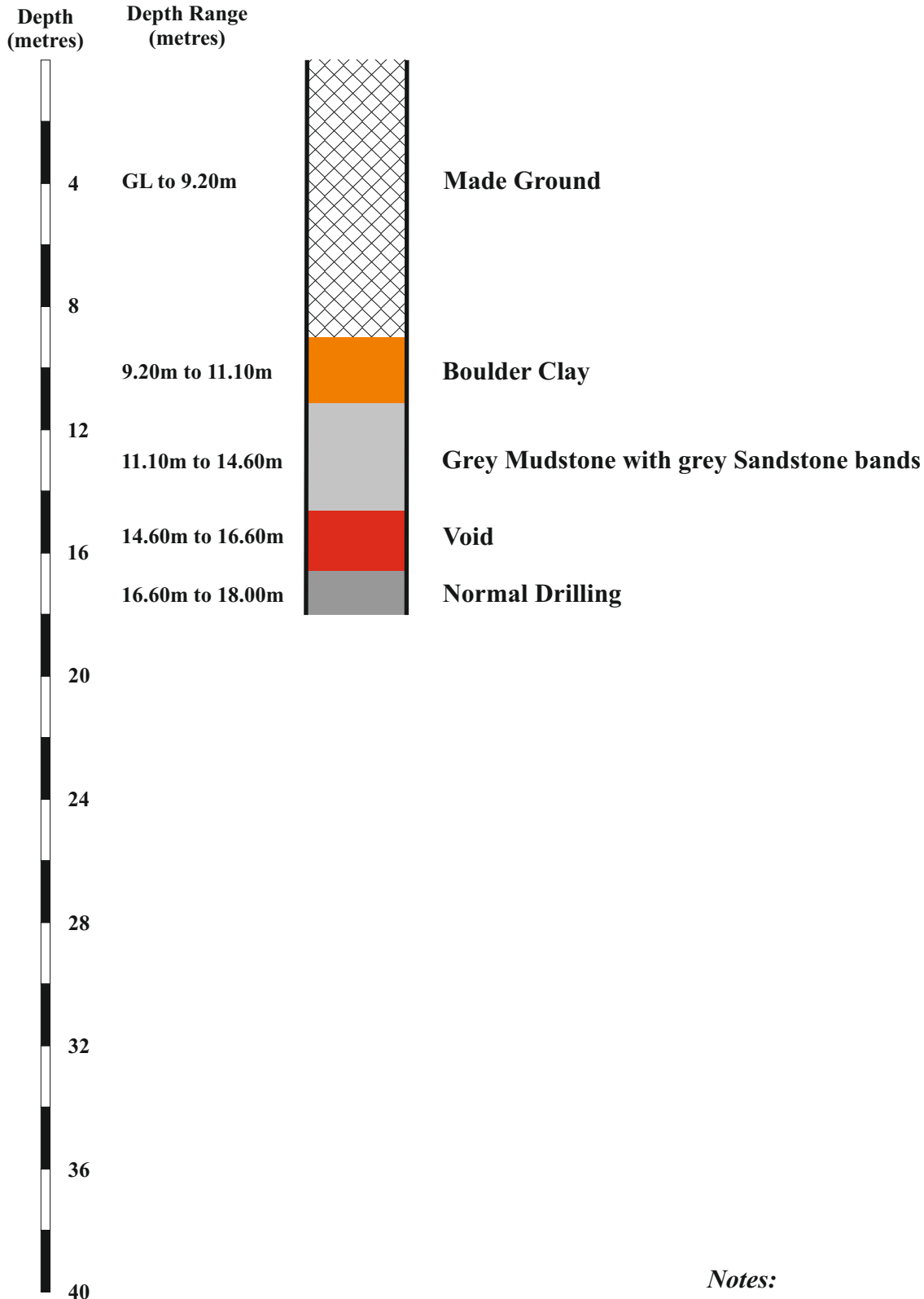


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 3

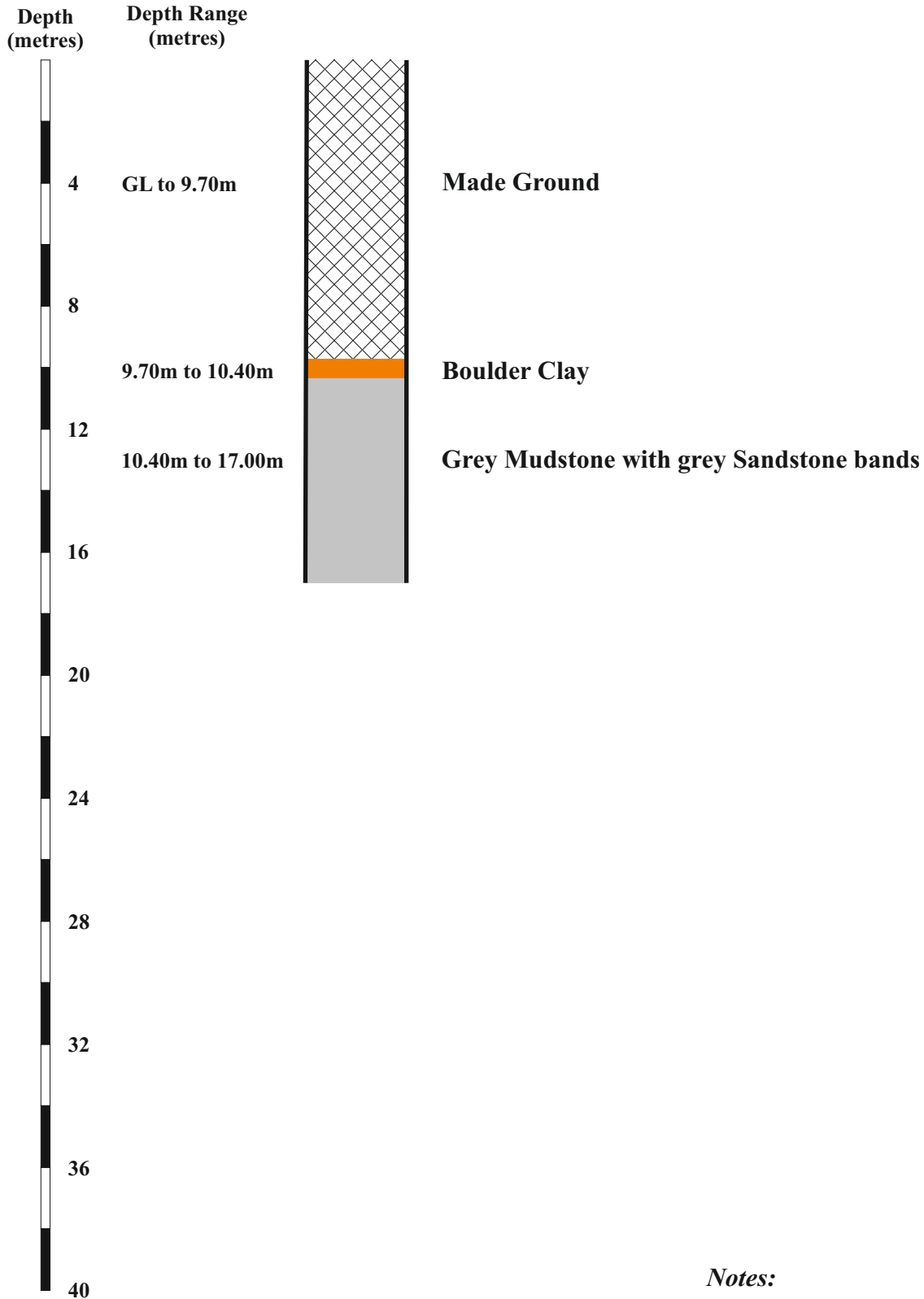


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 18.00m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 4

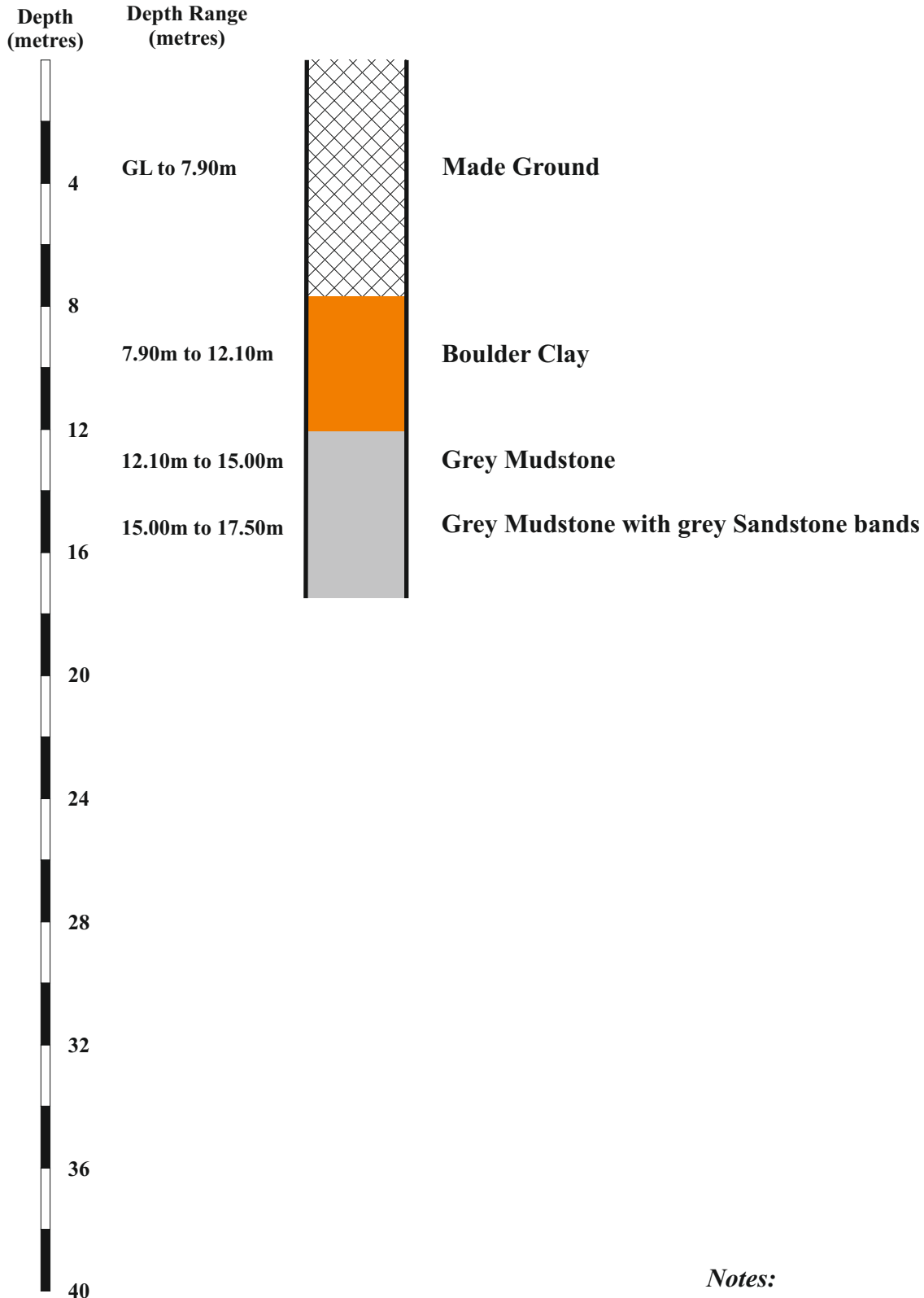


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.00m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 5

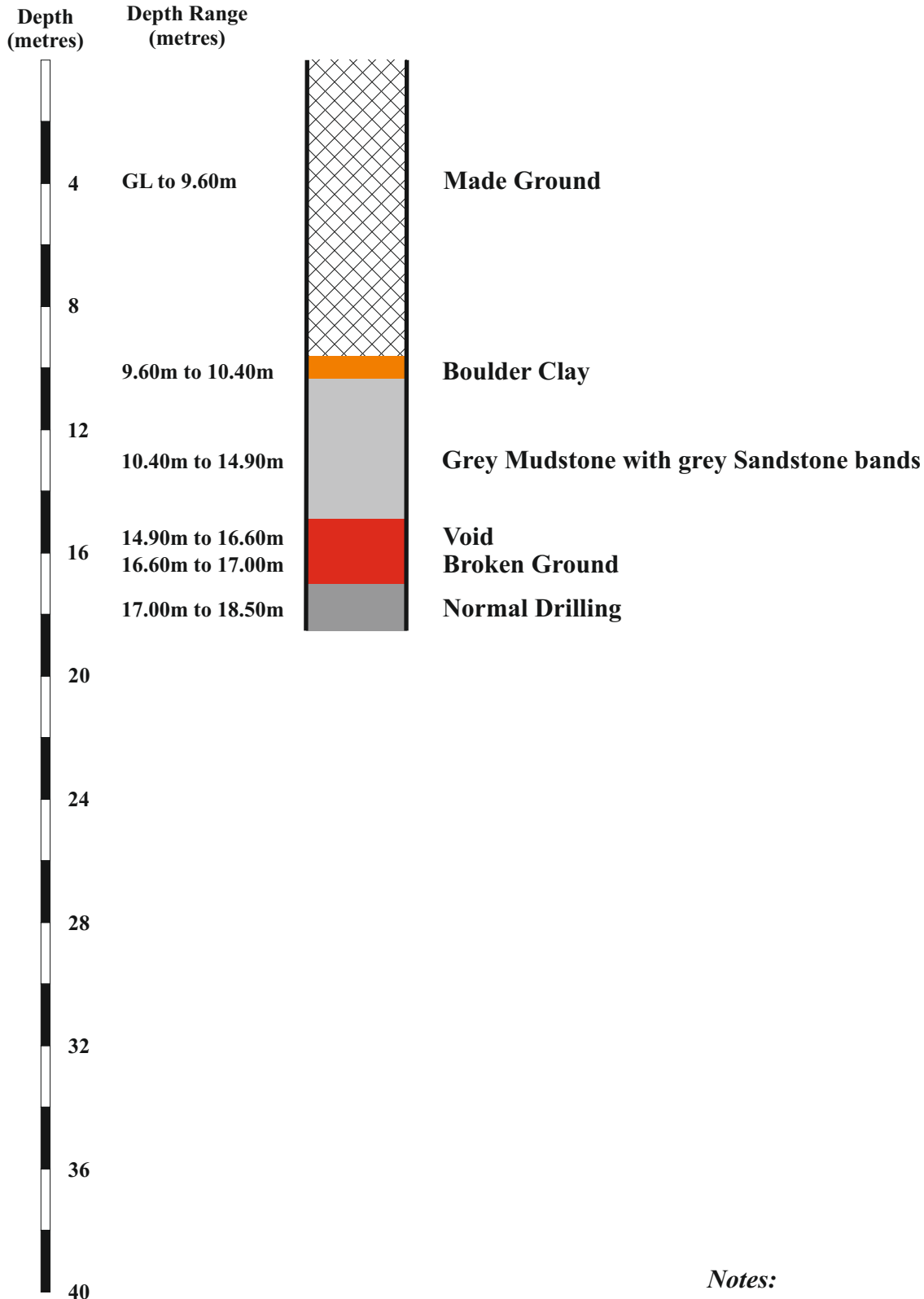


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 6

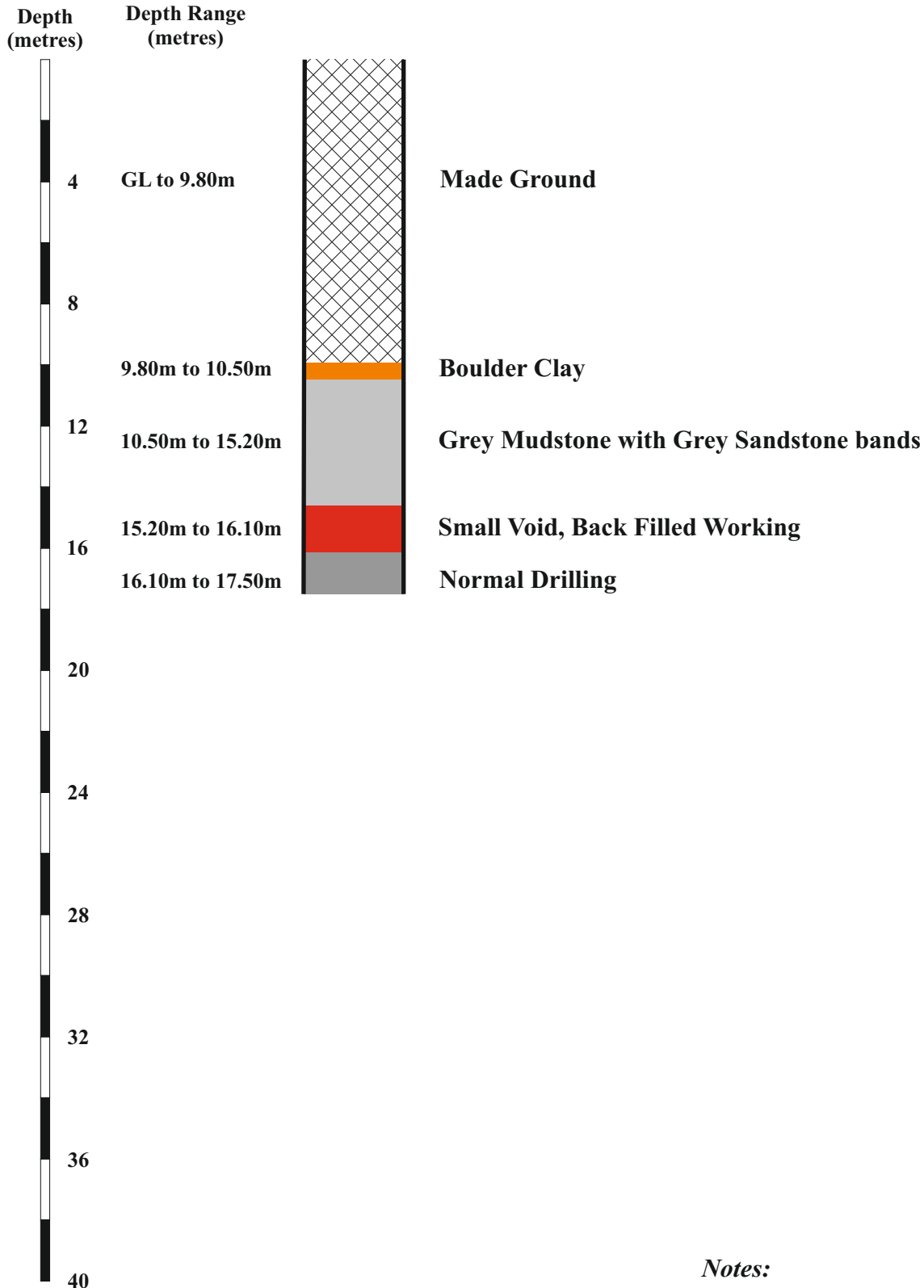


Notes:

1. Driller's Descriptions.
2. Borehole dry.
3. Total depth of borehole, 18.50m.
4. Cased 10.00m.

Study on Land at Plymouth House

Borehole No. 7

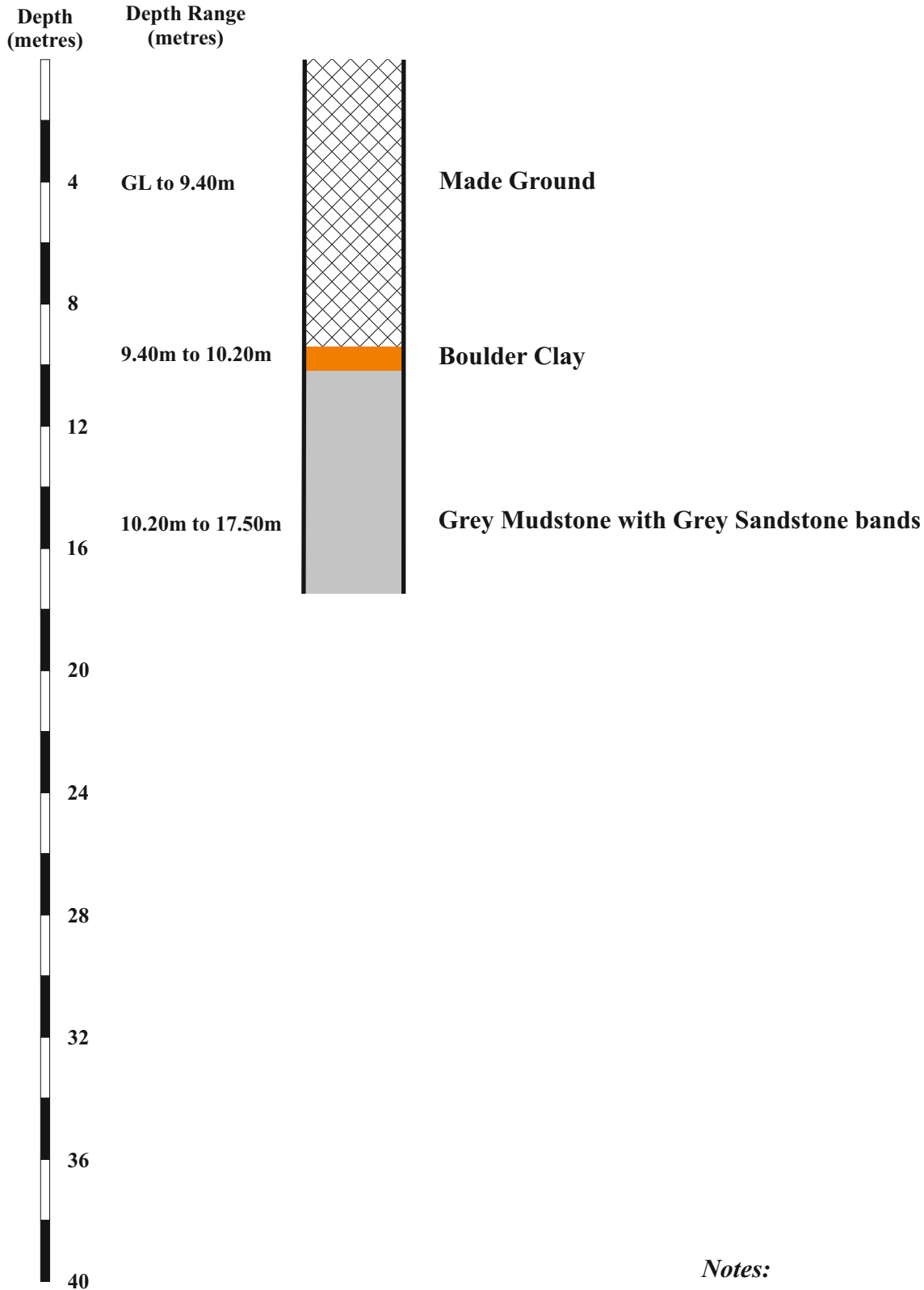


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 8

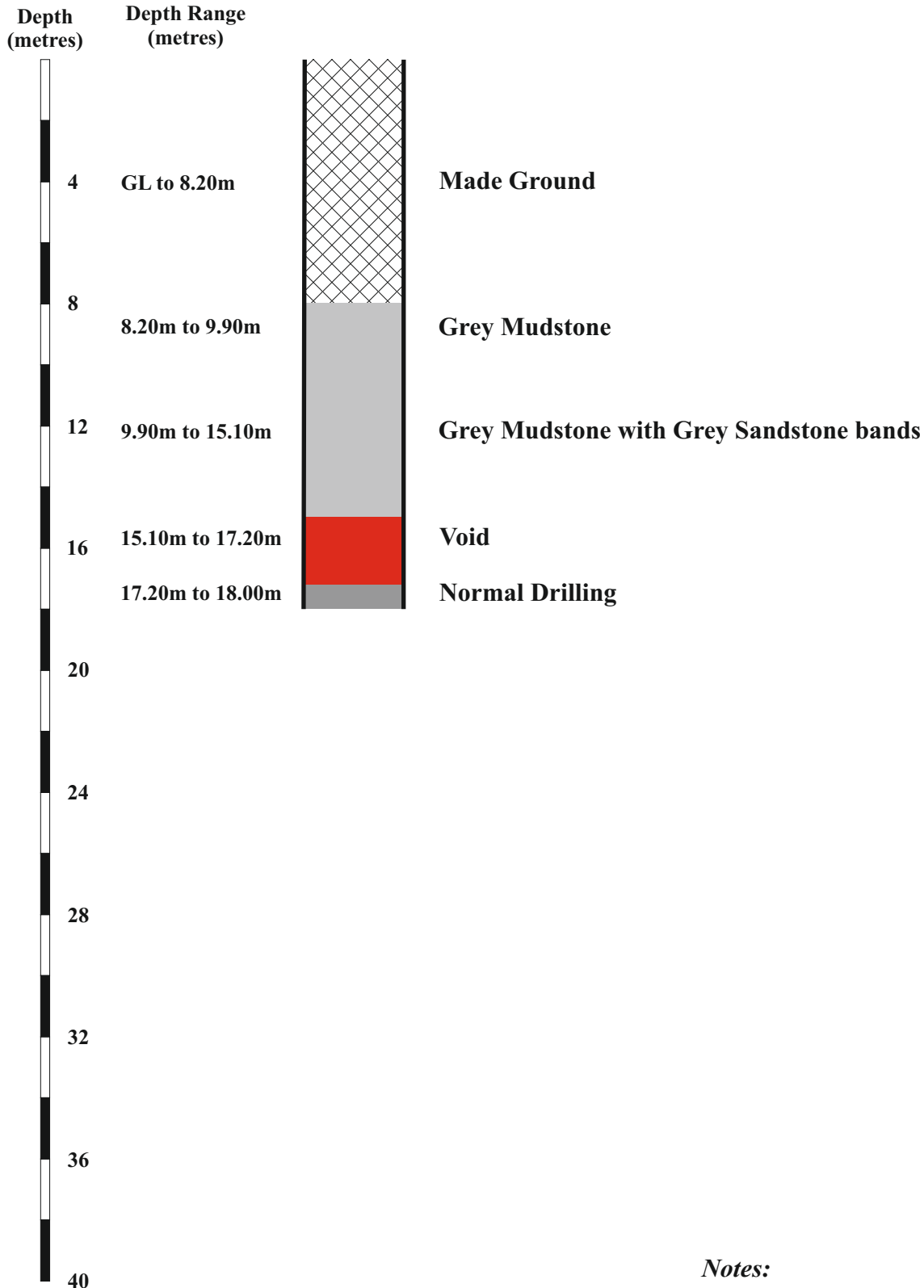


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 9

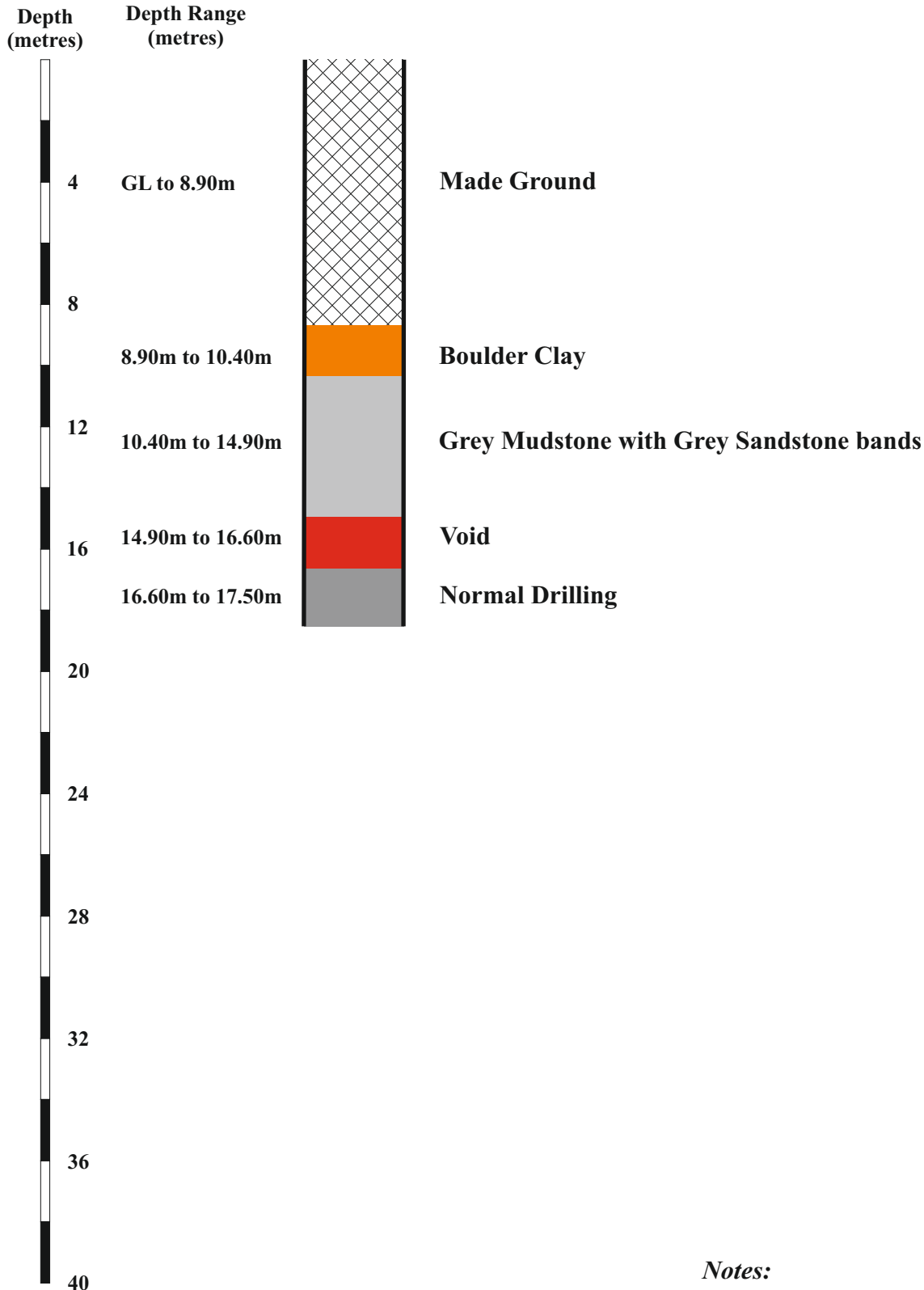


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 18.00m.*
4. *Cased 8.50m.*

Study on Land at Plymouth House

Borehole No. 10

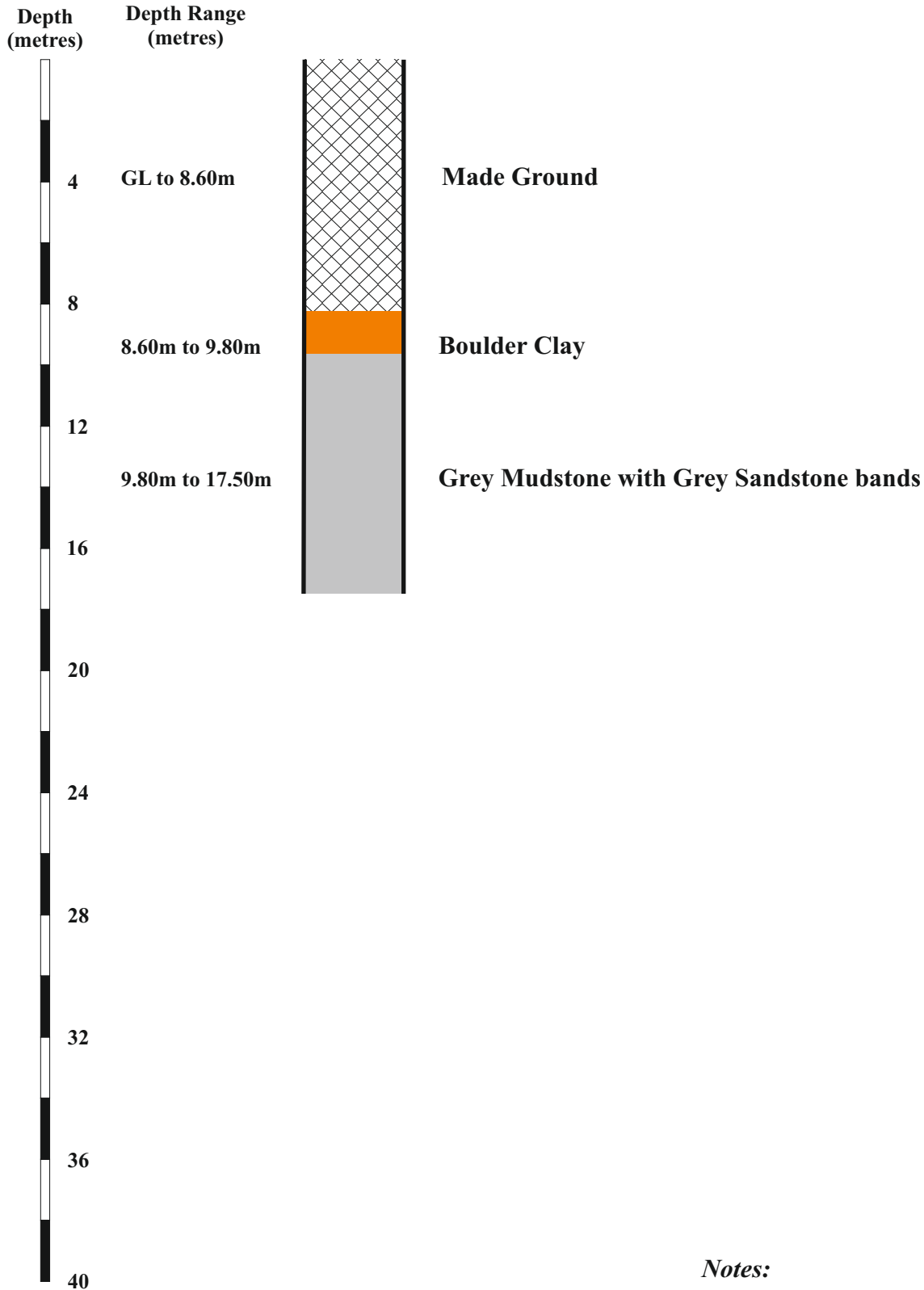


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 11

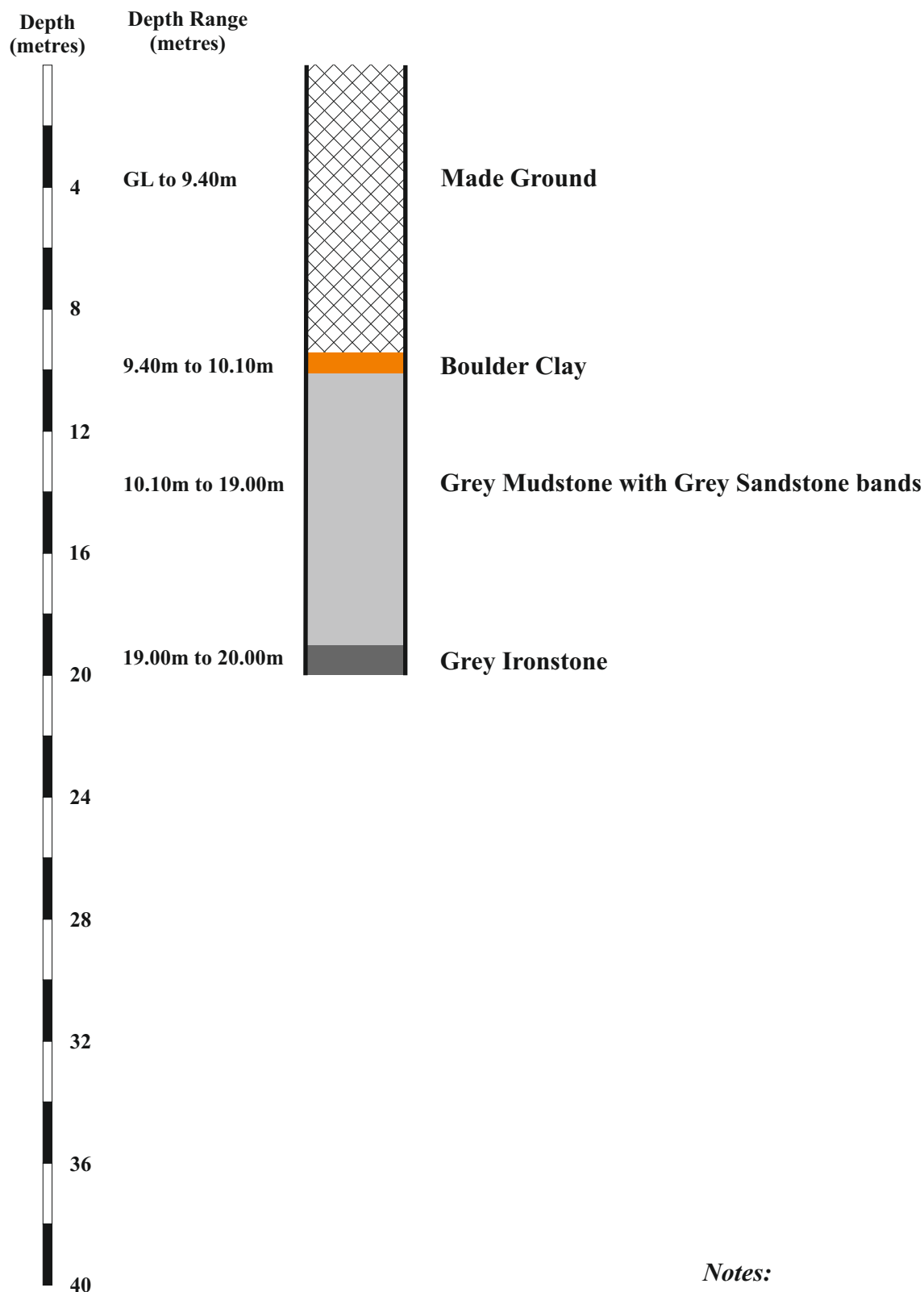


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 8.50m.*

Study on Land at Plymouth House

Borehole No. 12

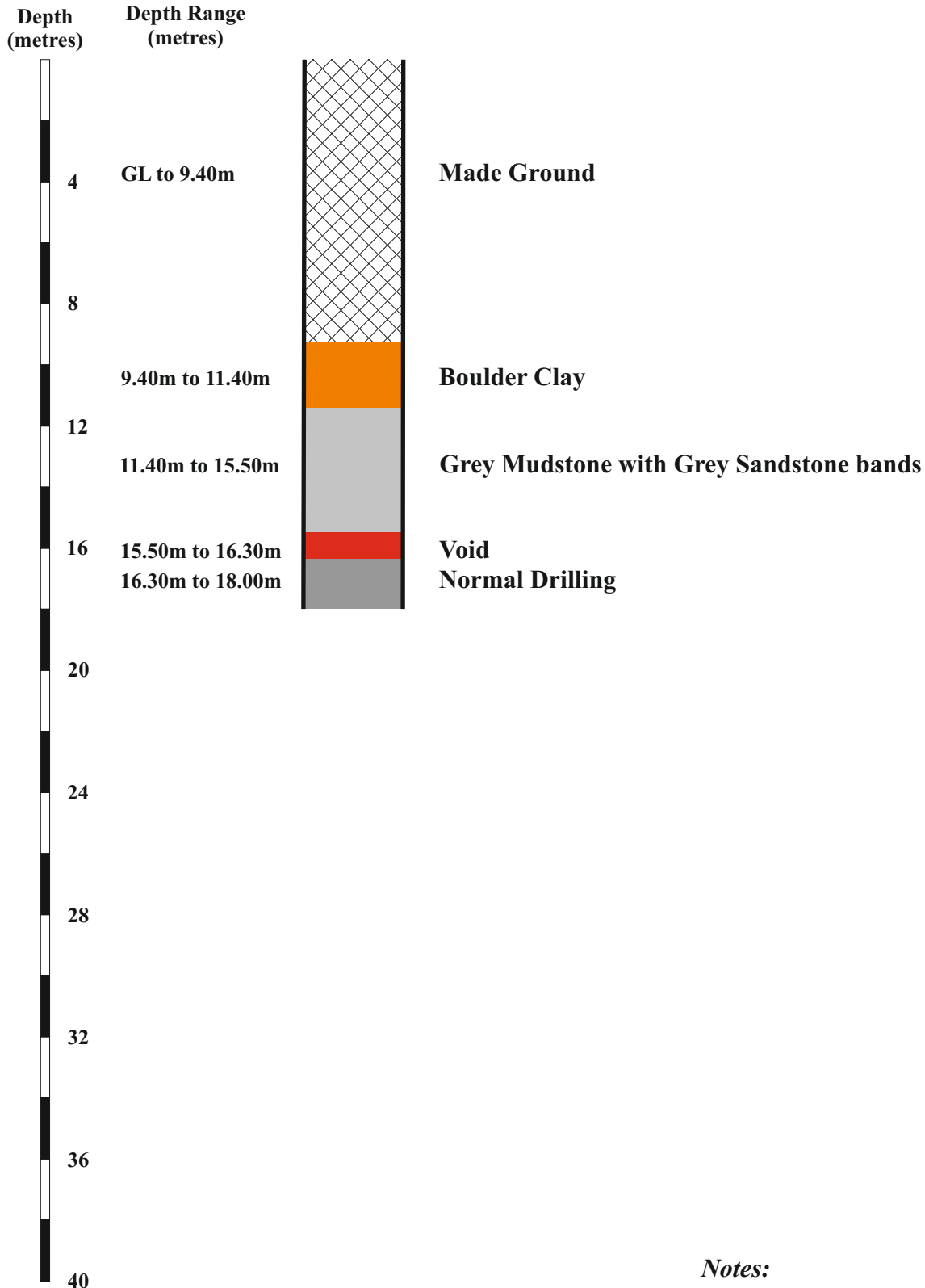


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 20.00m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 13

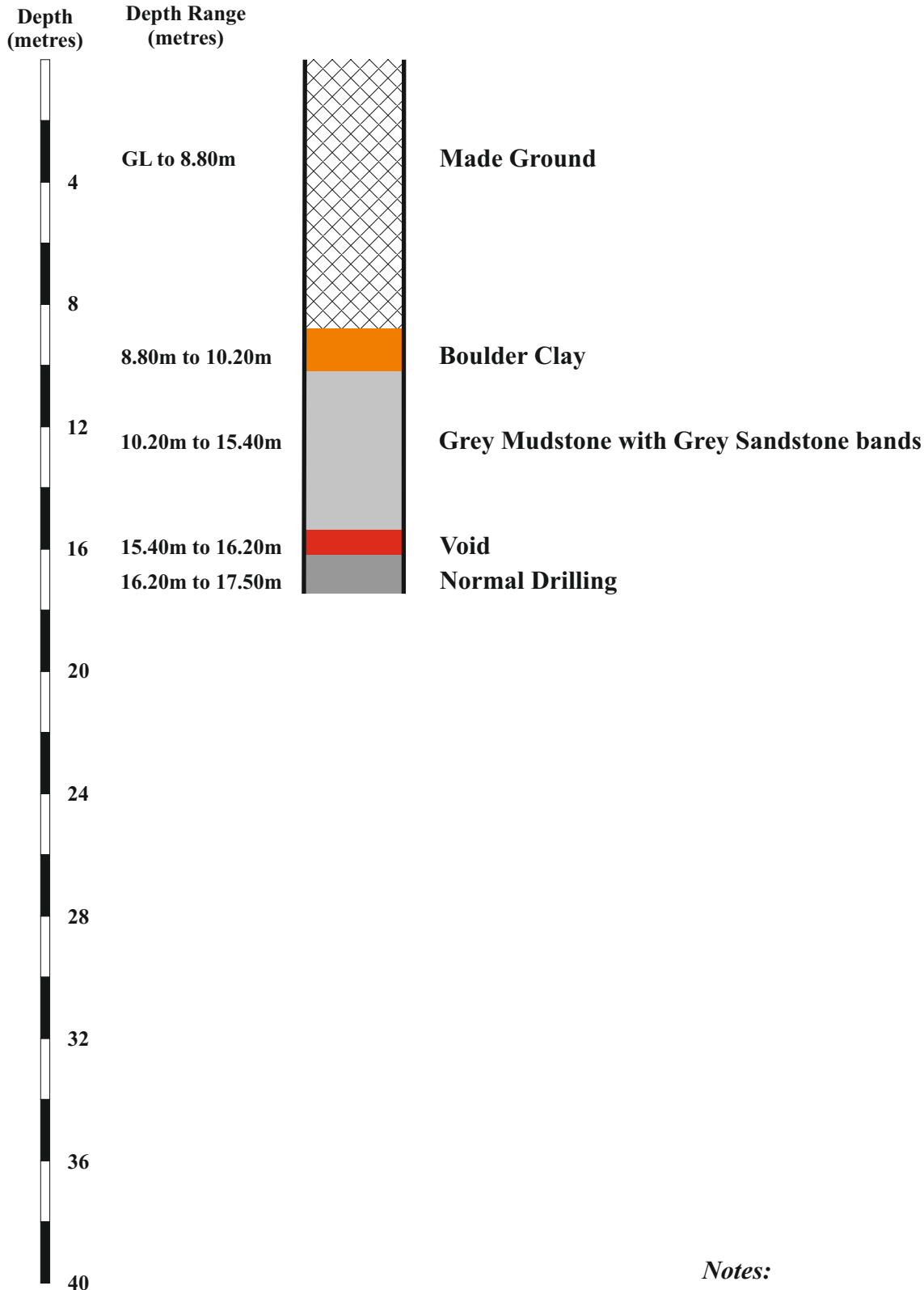


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 18.00m.*
4. *Cased 8.50m.*

Study on Land at Plymouth House

Borehole No. 14

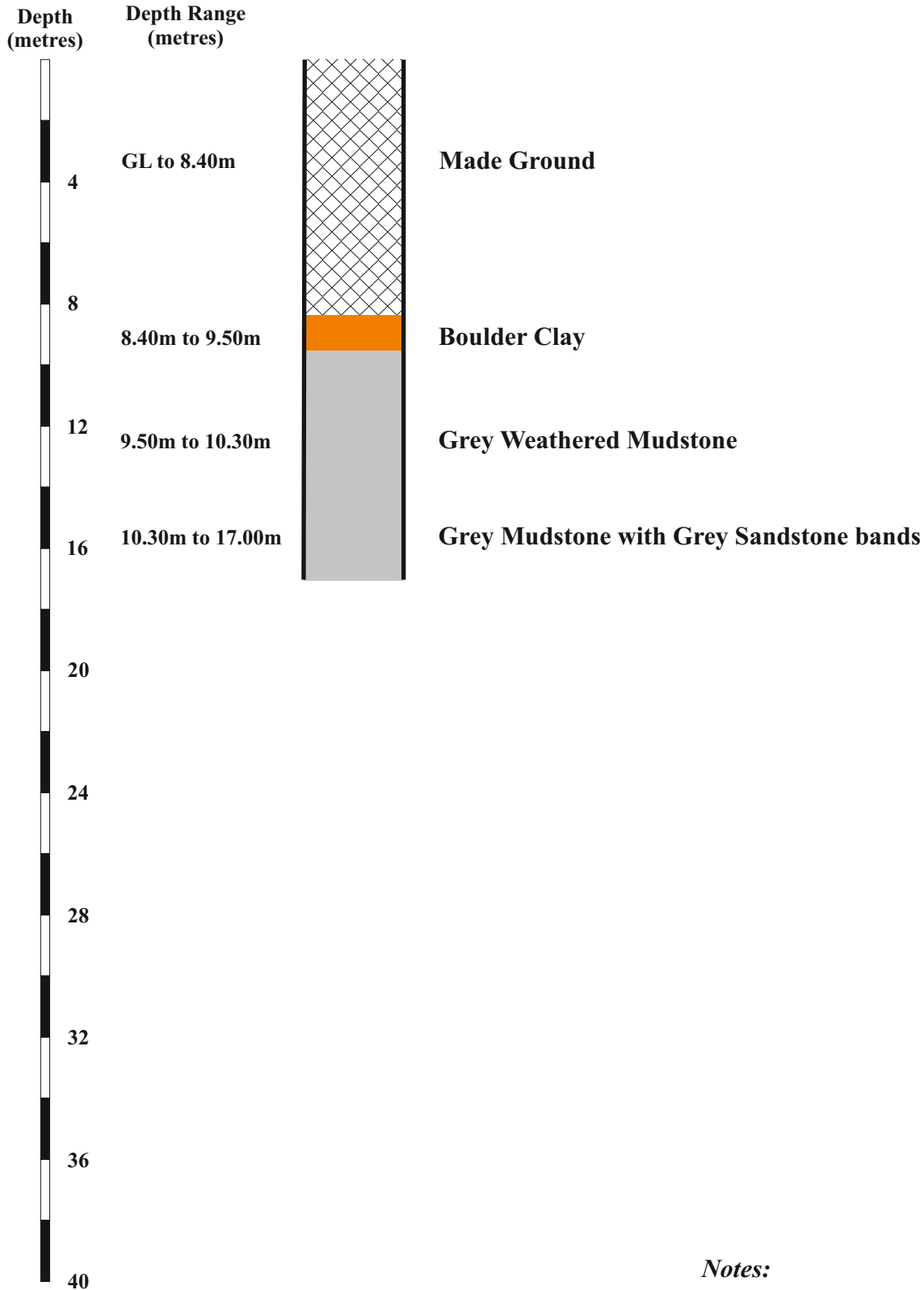


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 15

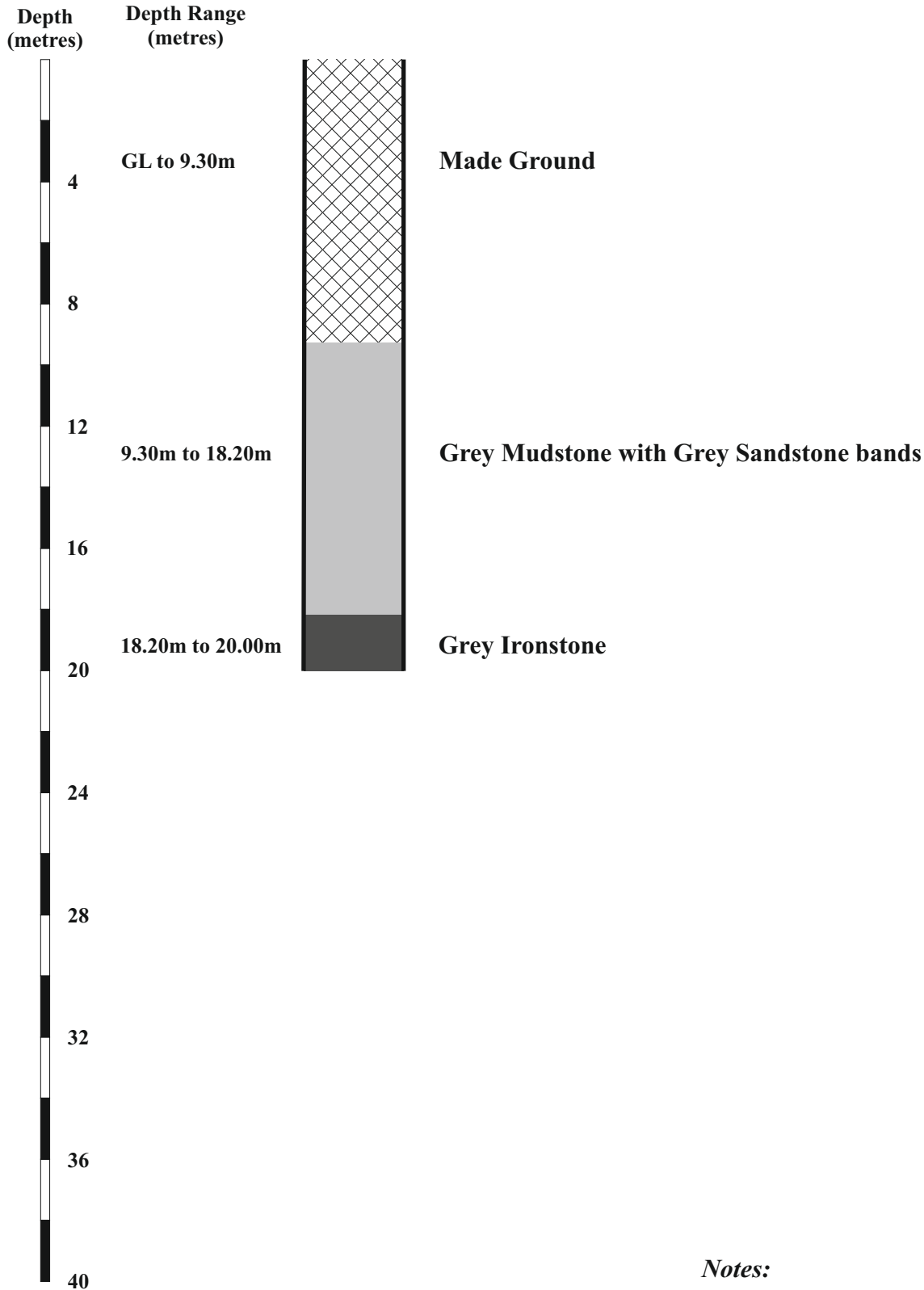


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.00m.*
4. *Cased 8.50m.*

Study on Land at Plymouth House

Borehole No. 16

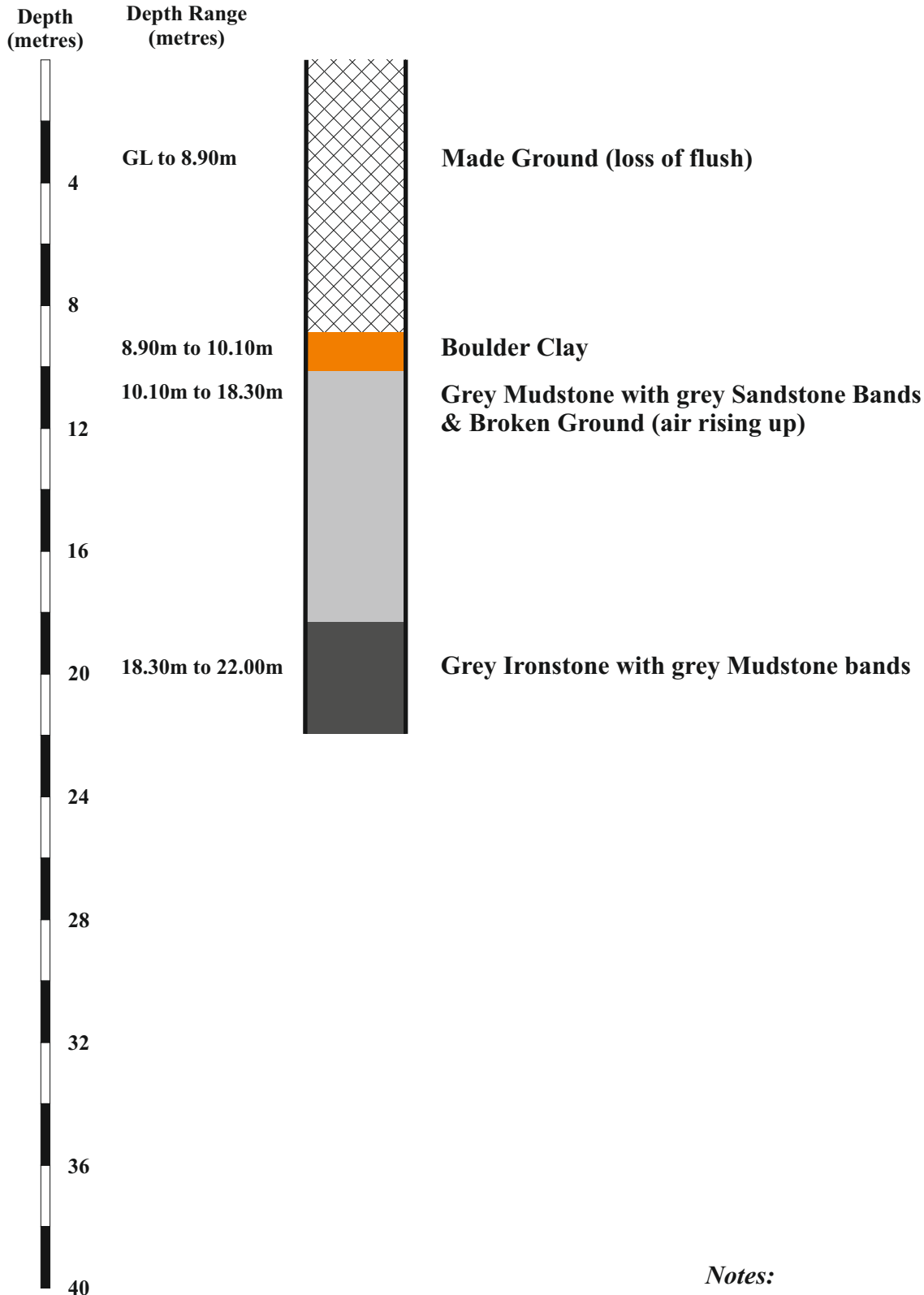


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 20.00m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 17

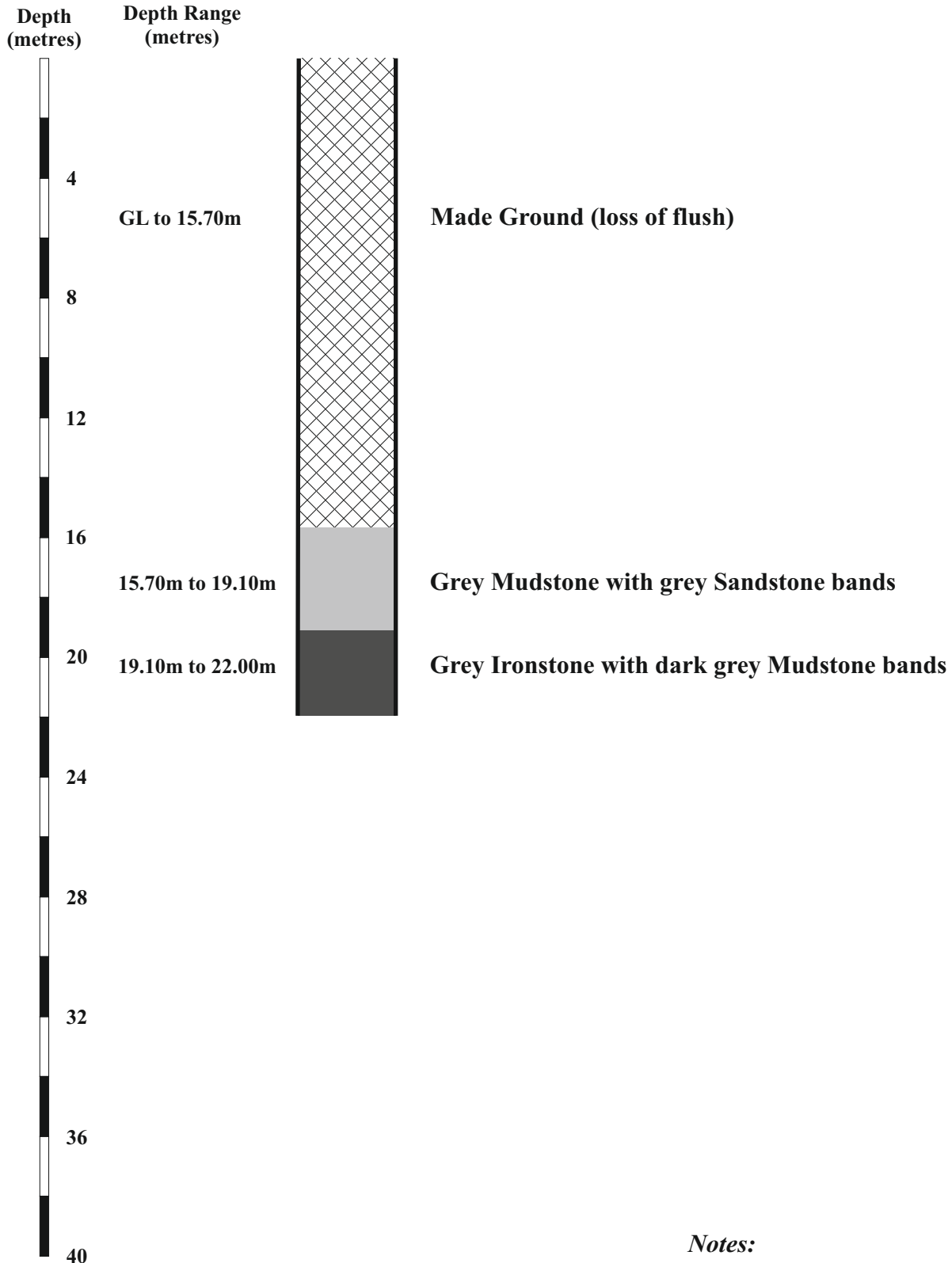


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 22.00m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 18

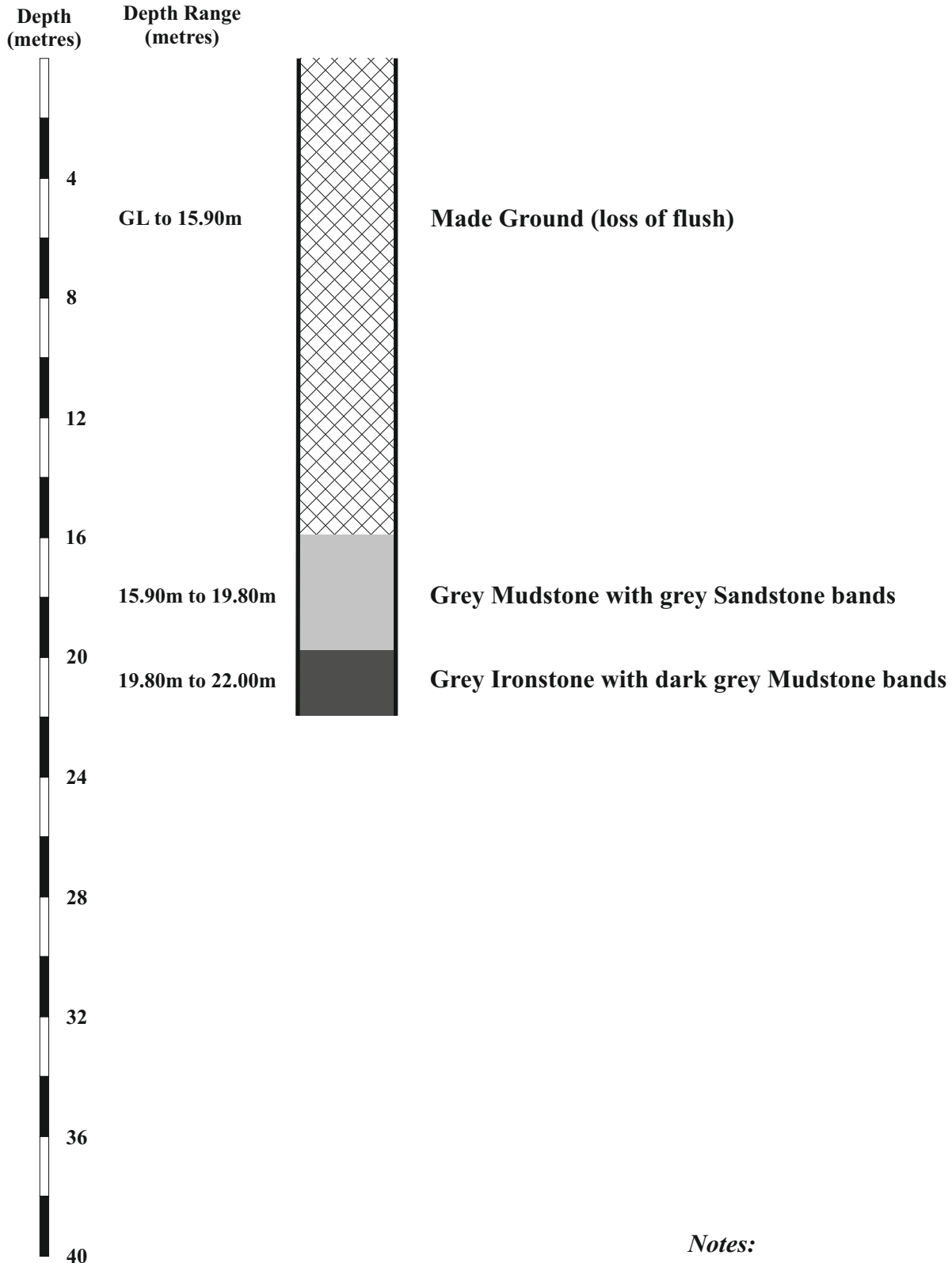


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 22.00m.*
4. *Cased 16.50m.*

Study on Land at Plymouth House

Borehole No. 19

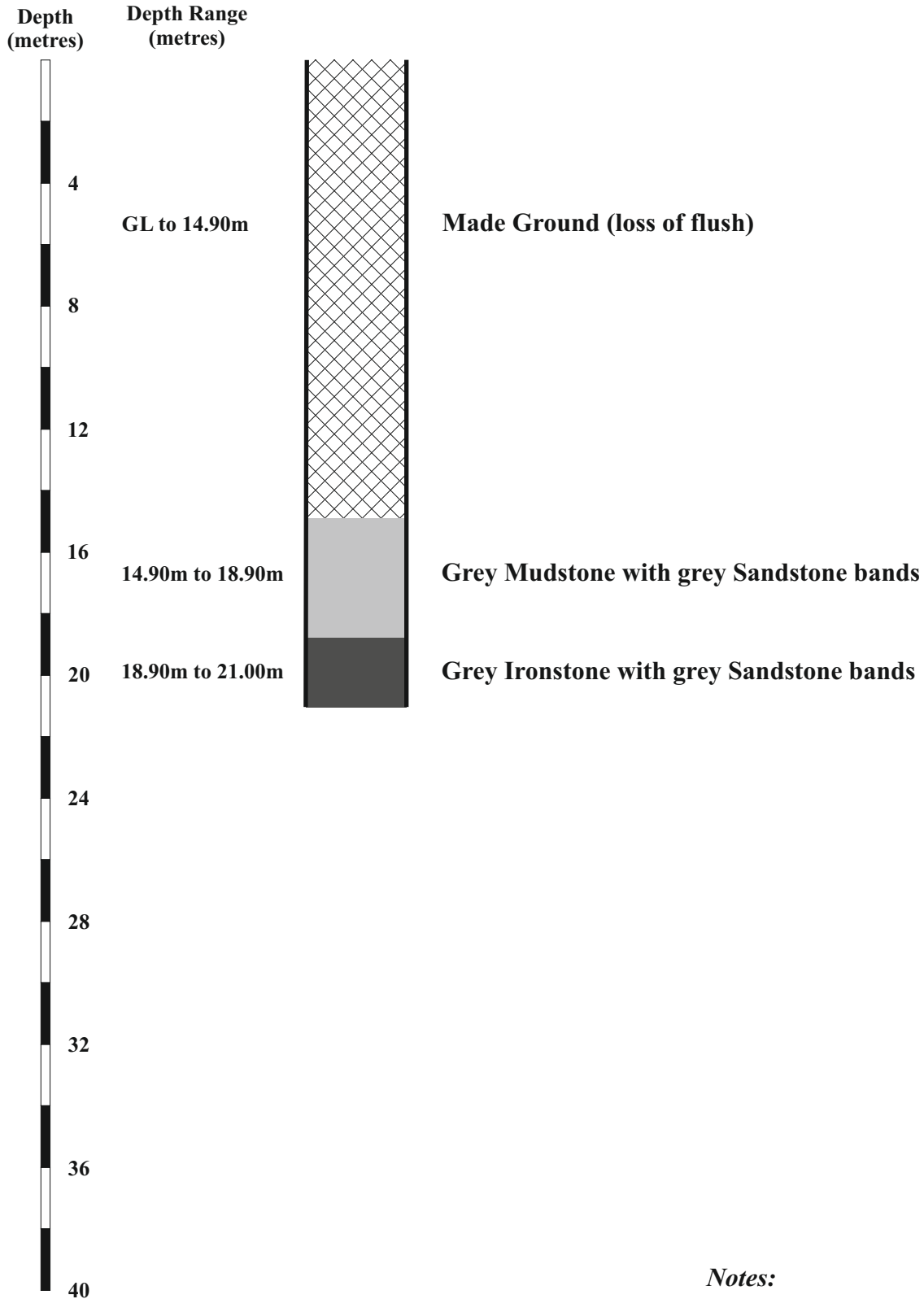


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 22.00m.*
4. *Cased 11.00m.*

Study on Land at Plymouth House

Borehole No. 20

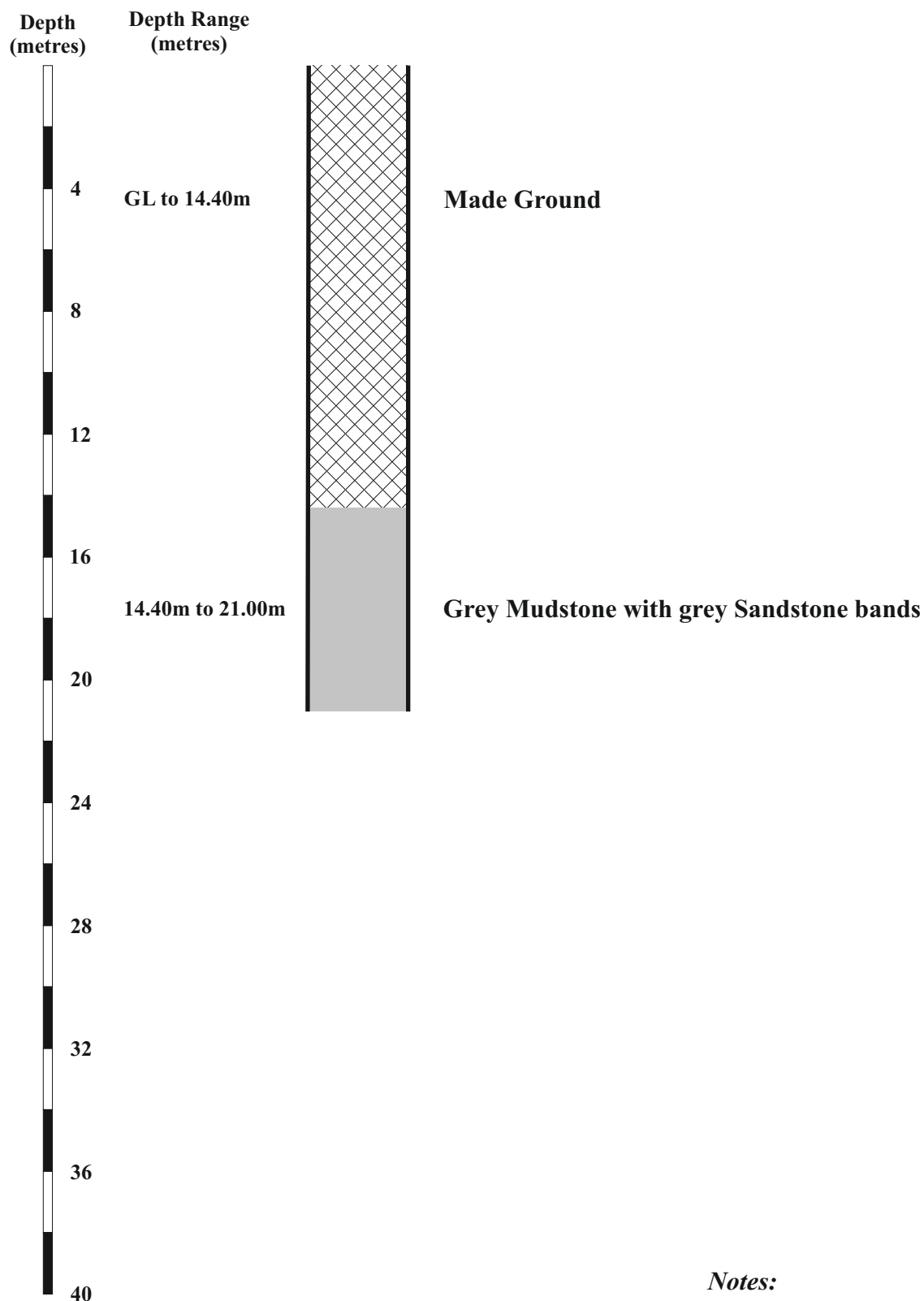


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 21.00m.*
4. *Cased 14.50m.*

Study on Land at Plymouth House

Borehole No. 21

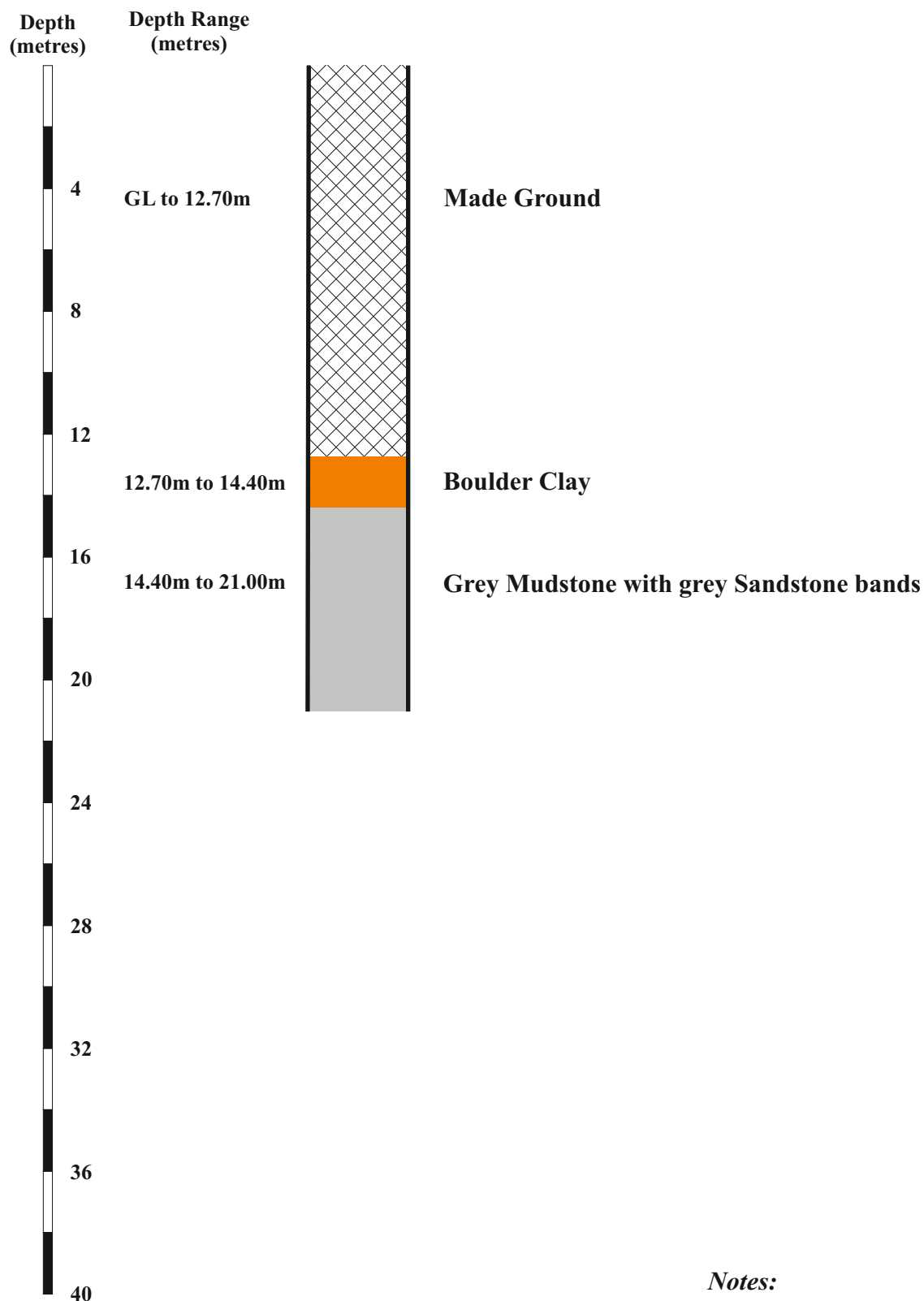


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 21.00m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 22

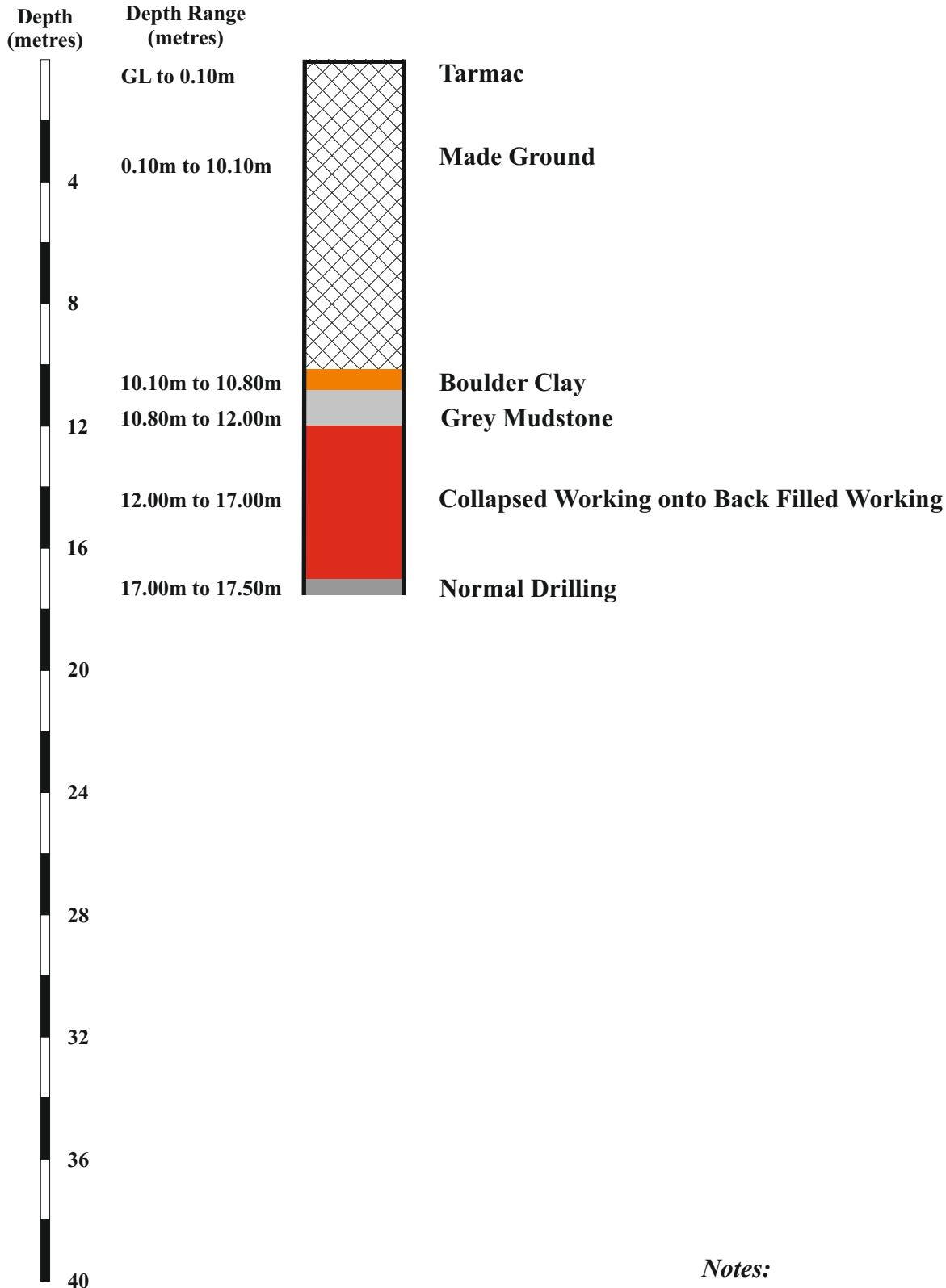


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 21.00m.*
4. *Cased 13.00m.*

Study on Land at Plymouth House

Borehole No. 23

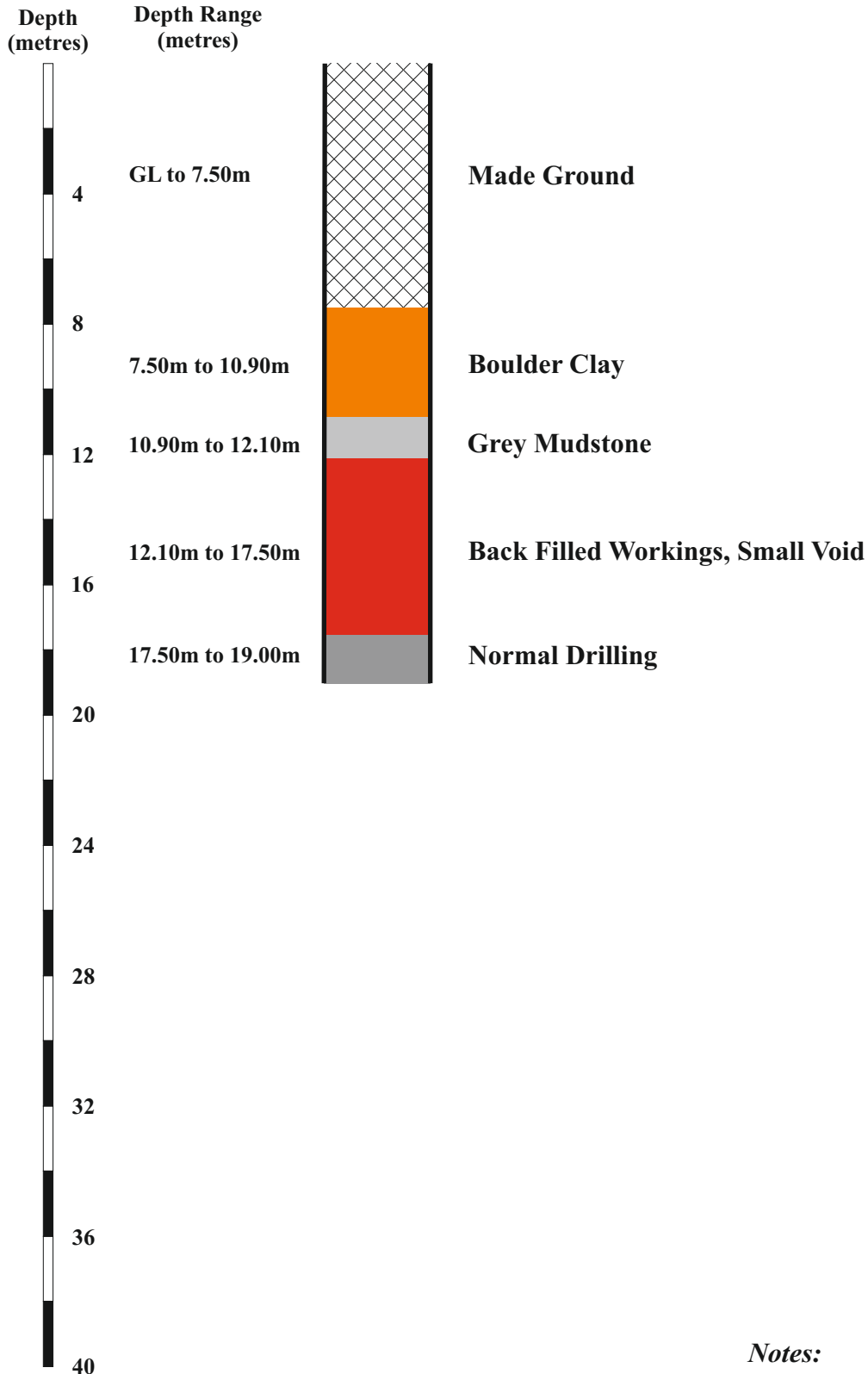


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 8.50m.*

Study on Land at Plymouth House

Borehole No. 24

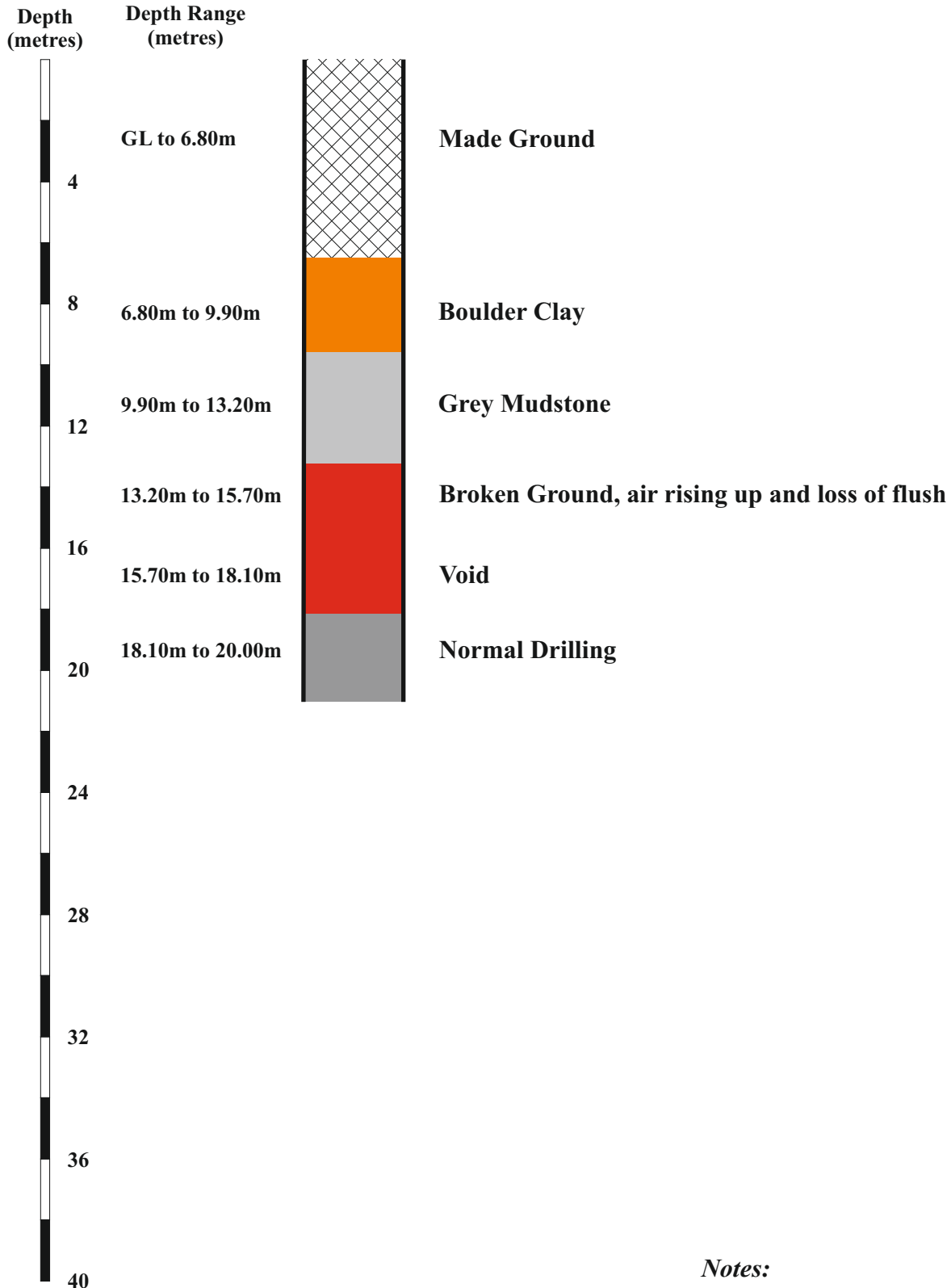


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 19.00m.*
4. *Cased 7.00m.*

Study on Land at Plymouth House

Borehole No. 25

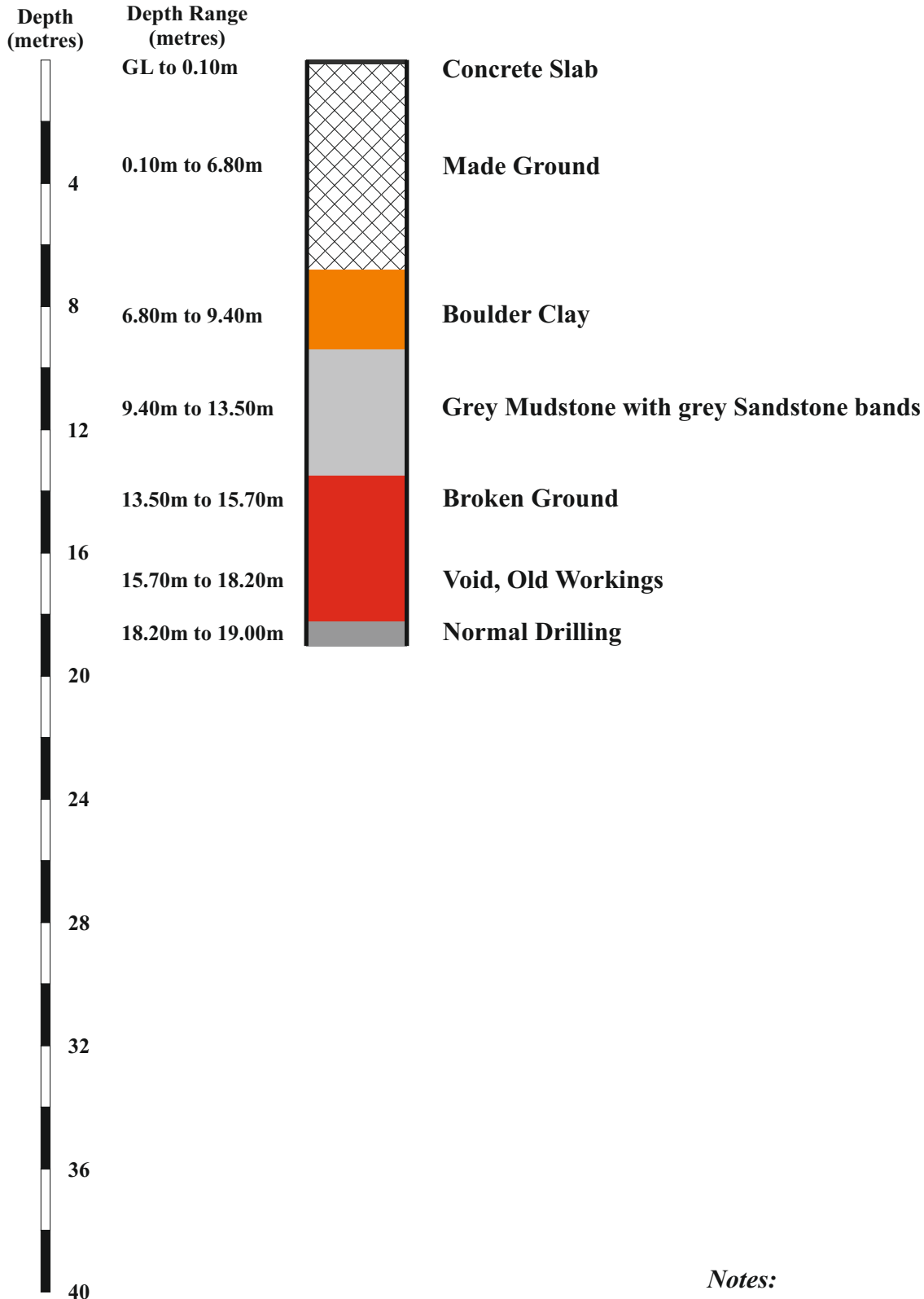


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 20.00m.*
4. *Cased 7.00m.*

Study on Land at Plymouth House

Borehole No. 26

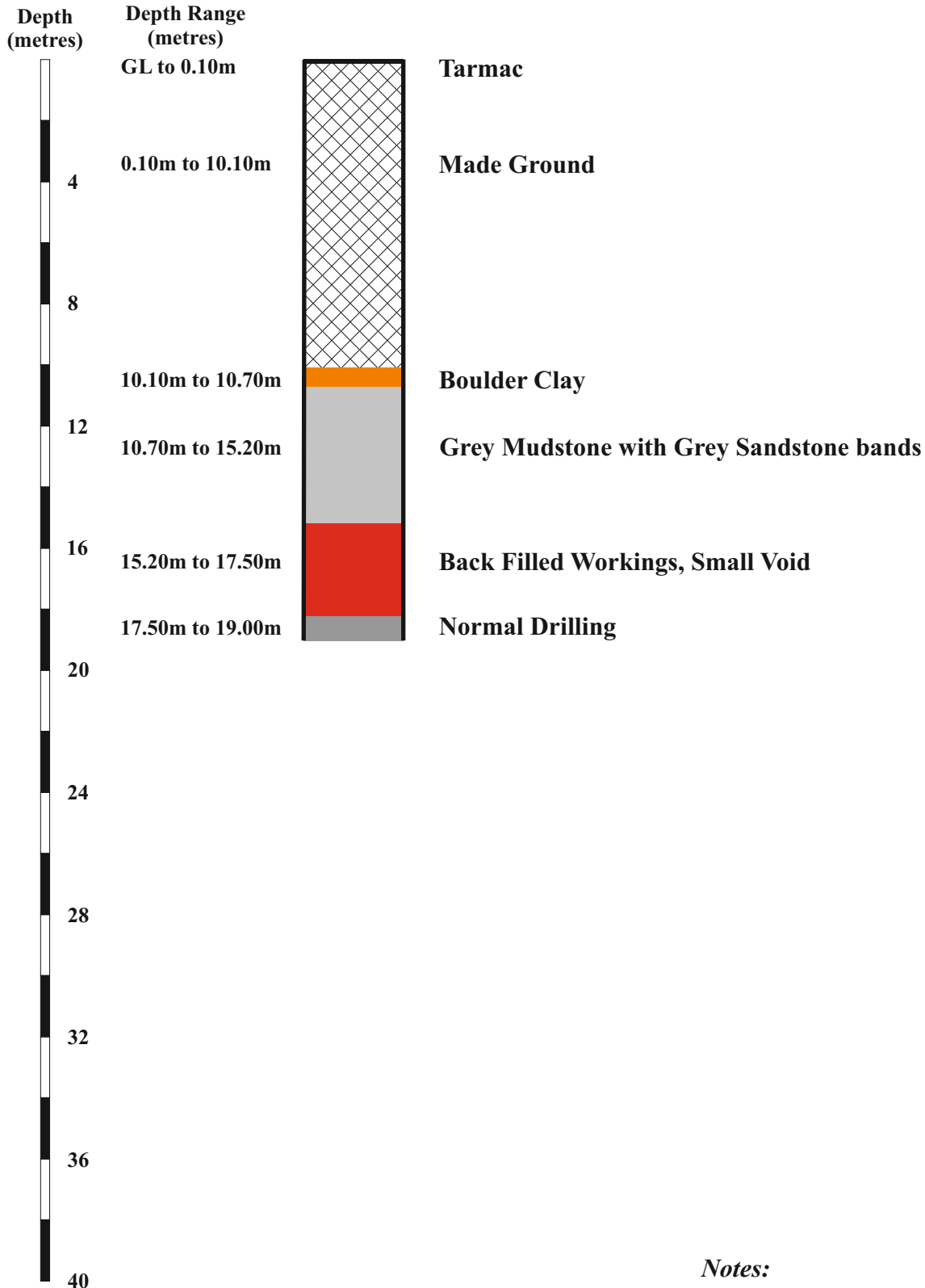


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 19.00m.*
4. *Cased 7.00m.*

Study on Land at Plymouth House

Borehole No. 27

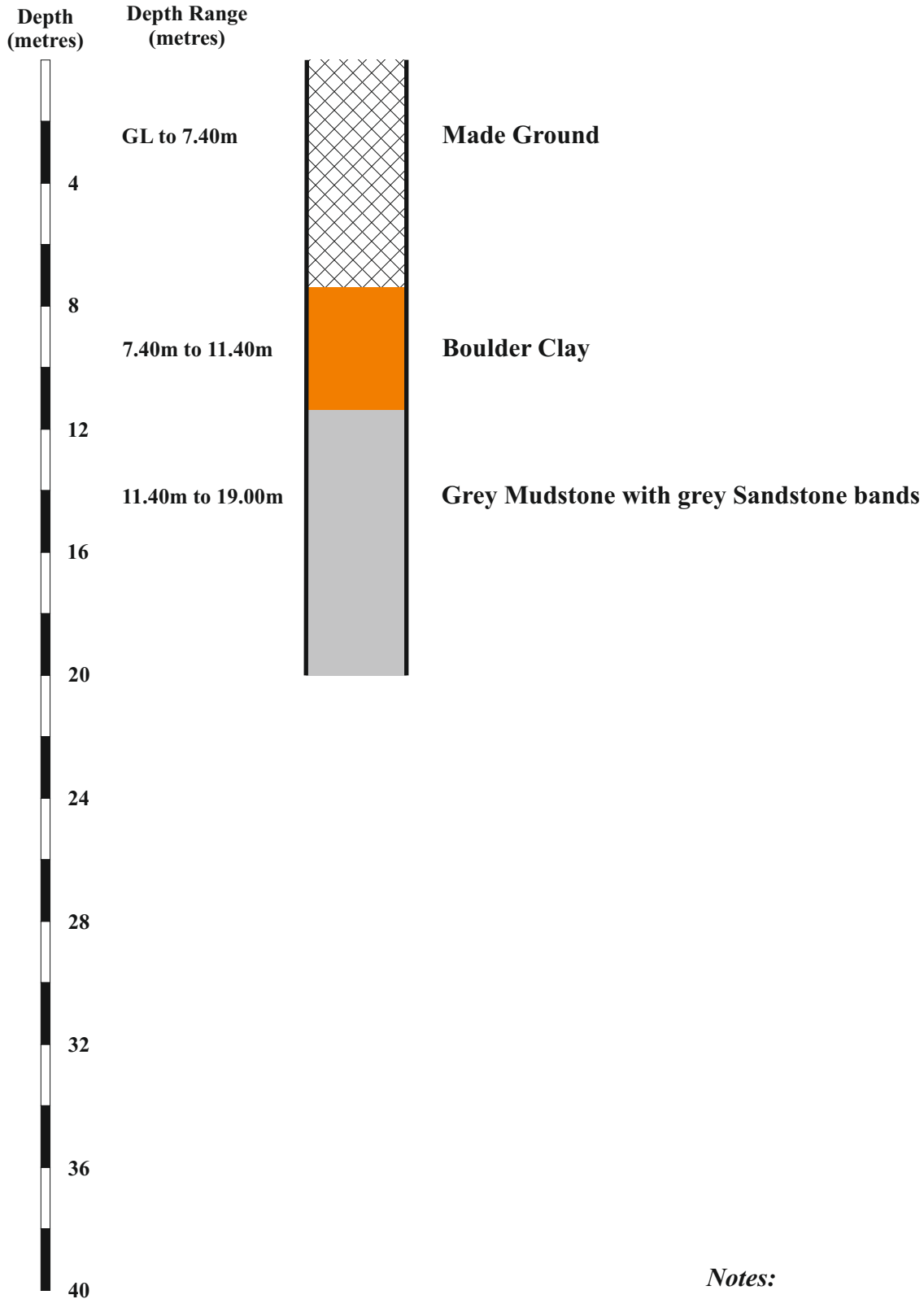


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 19.00m.*
4. *Cased 7.00m.*

Study on Land at Plymouth House

Borehole No. 28

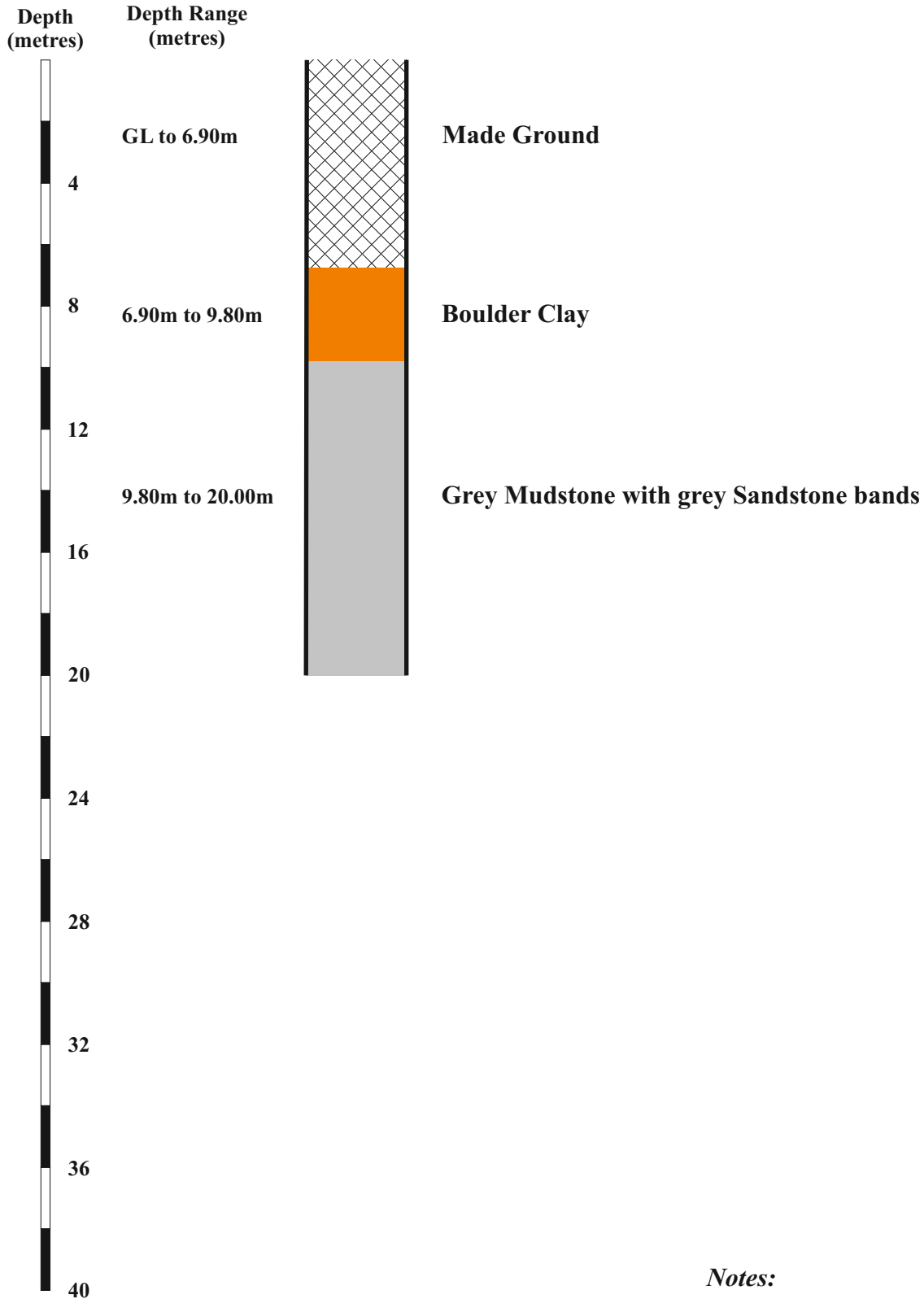


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 19.00m.*
4. *Cased 7.00m.*

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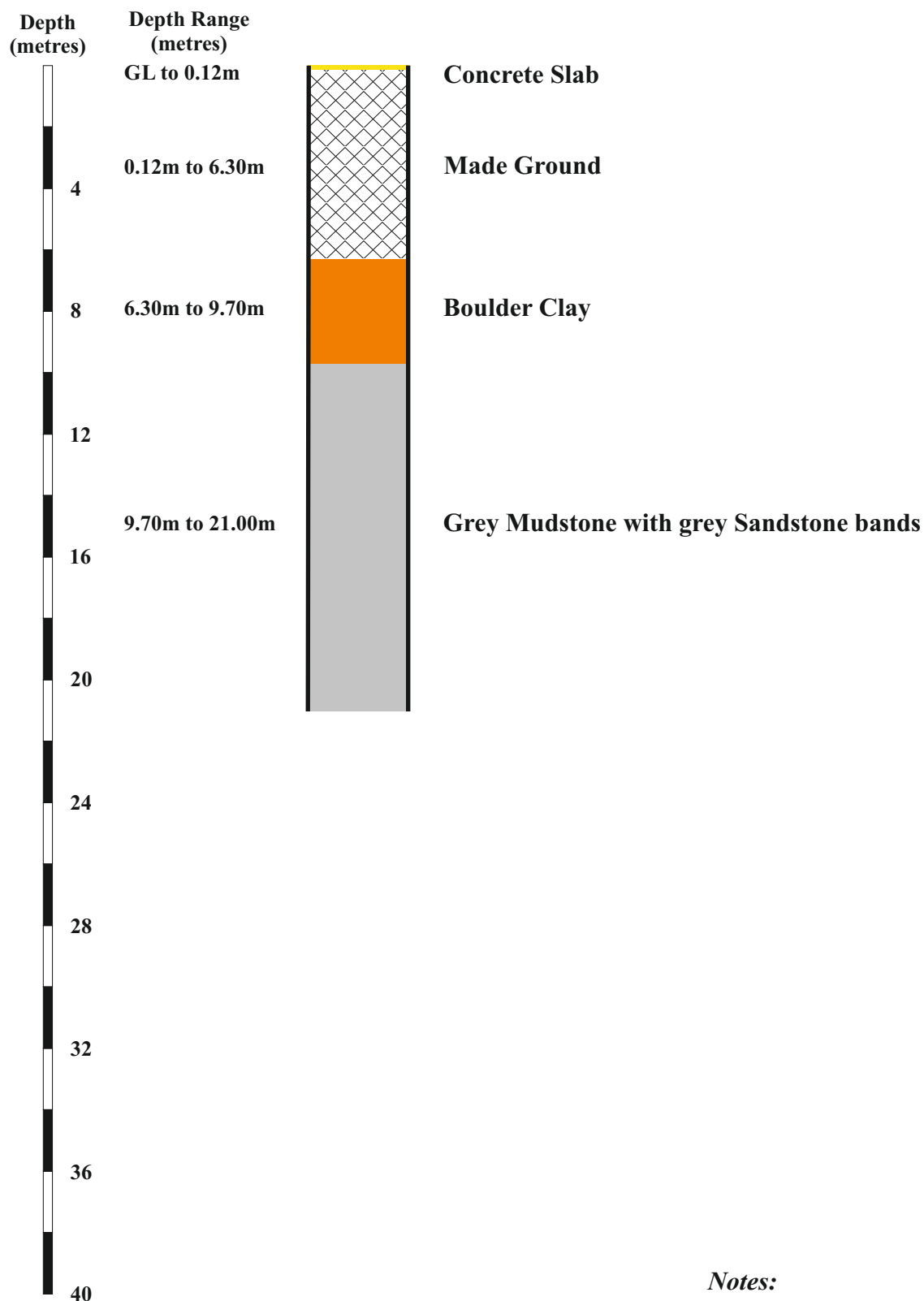
Borehole No. 29



Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 20.00m.*
4. *Cased 7.00m.*

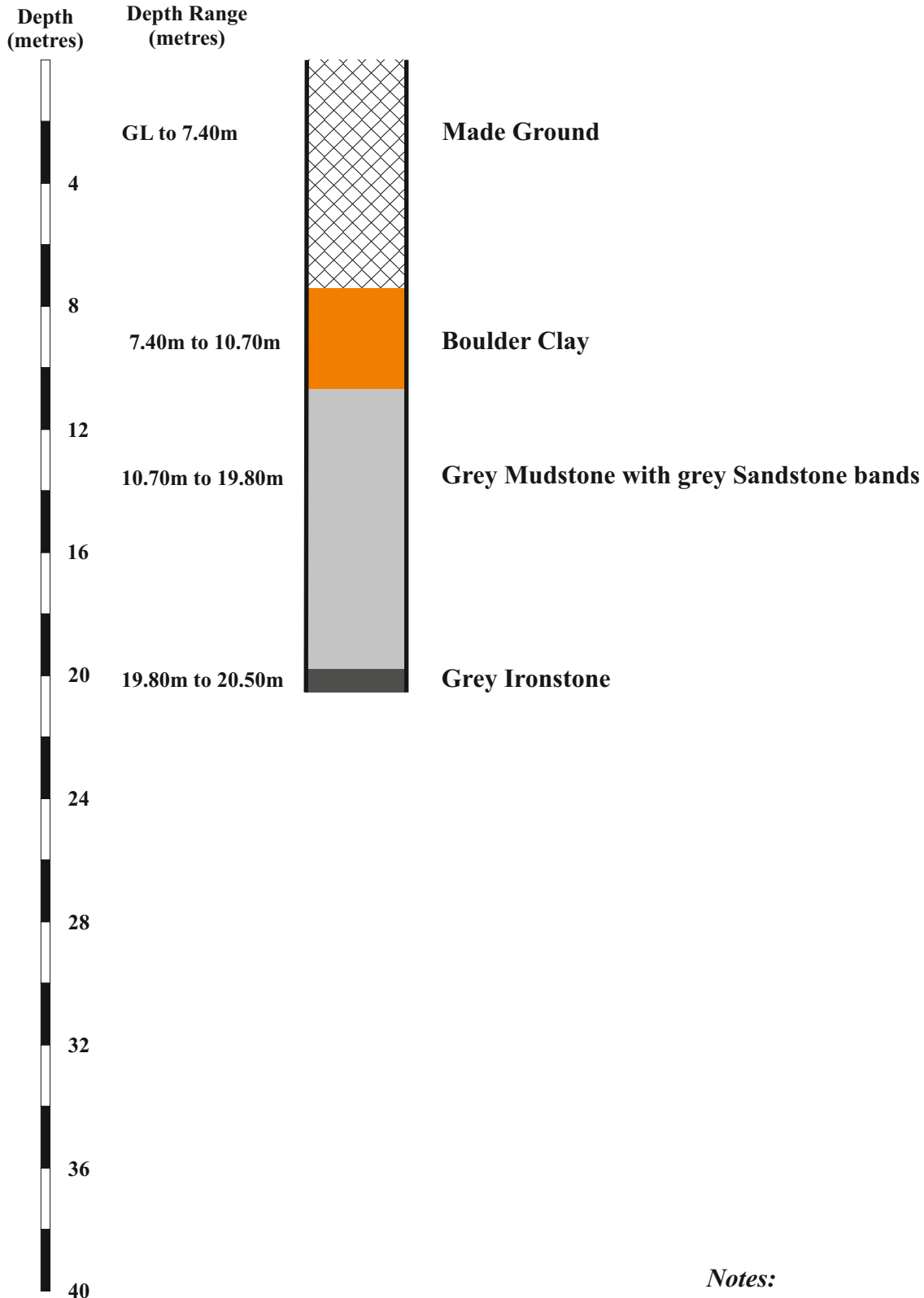
Study on Land at Plymouth House

Borehole No. 30***Notes:***

- 1. Driller's Descriptions.***
- 2. Borehole dry.***
- 3. Total depth of borehole, 21.00m.***
- 4. Cased 7.00m.***

Study on Land at Plymouth House

Borehole No. 33

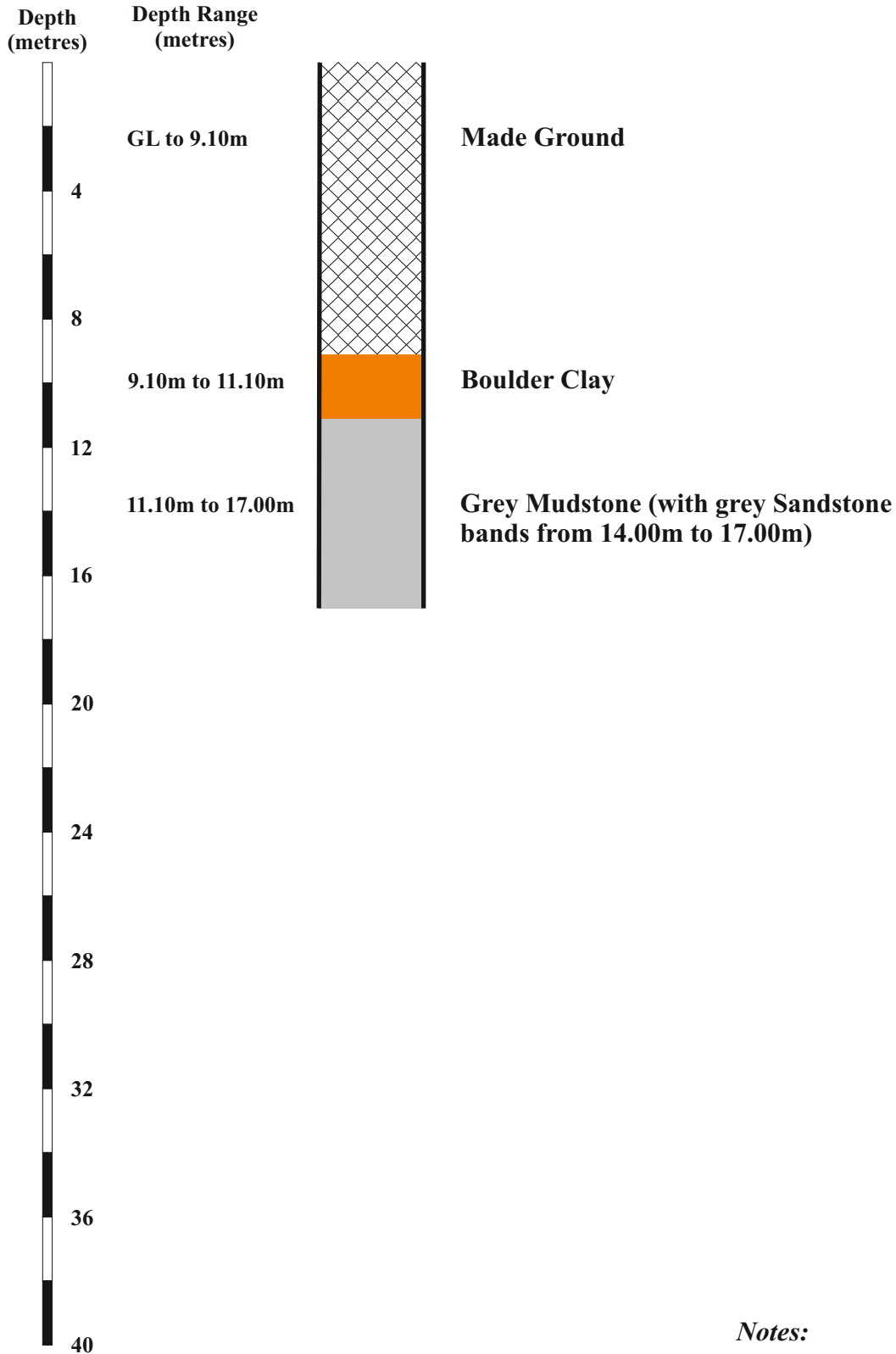


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 20.50m.*
4. *Cased 5.50m.*

Study on Land at Plymouth House

Borehole No. 35

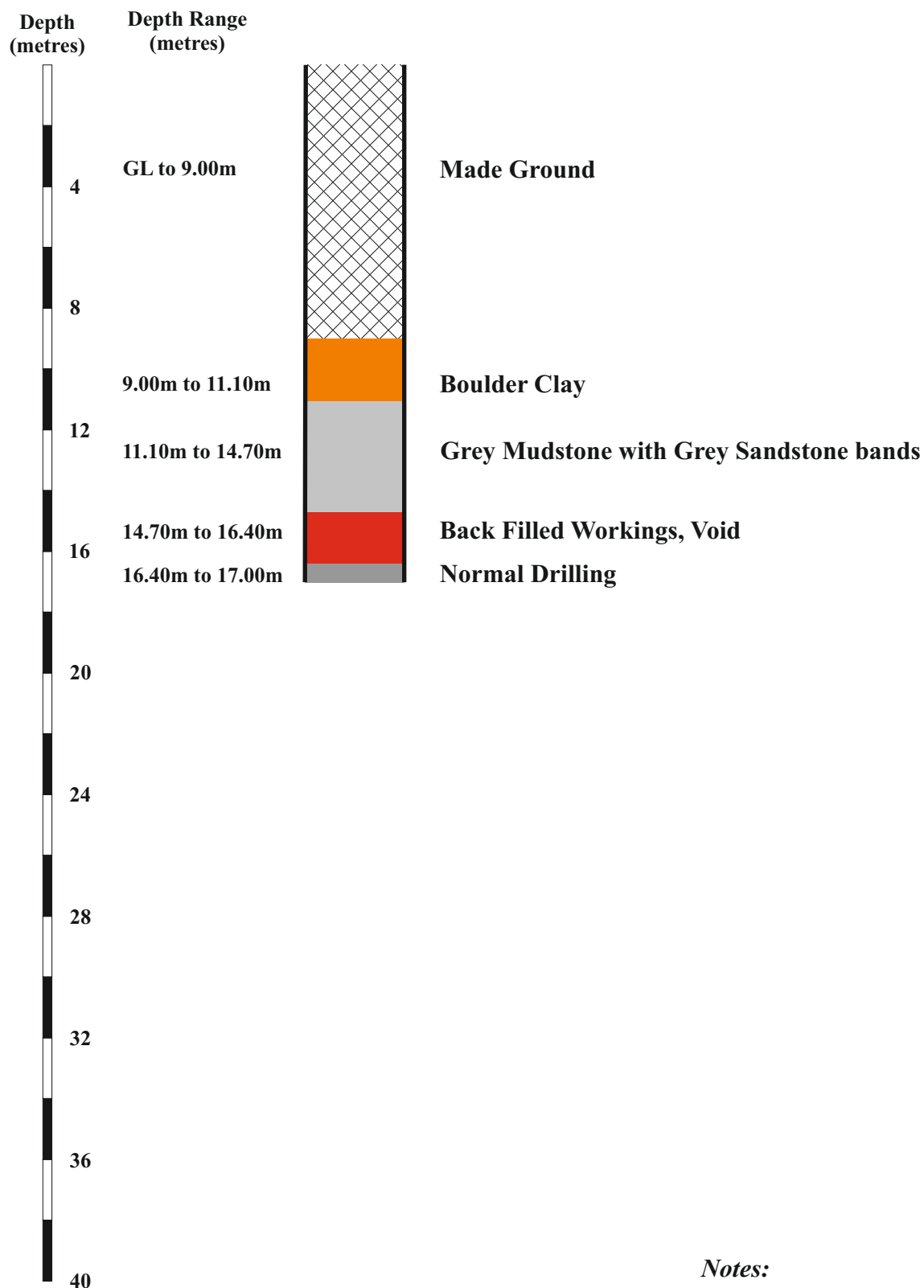


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.00m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 36

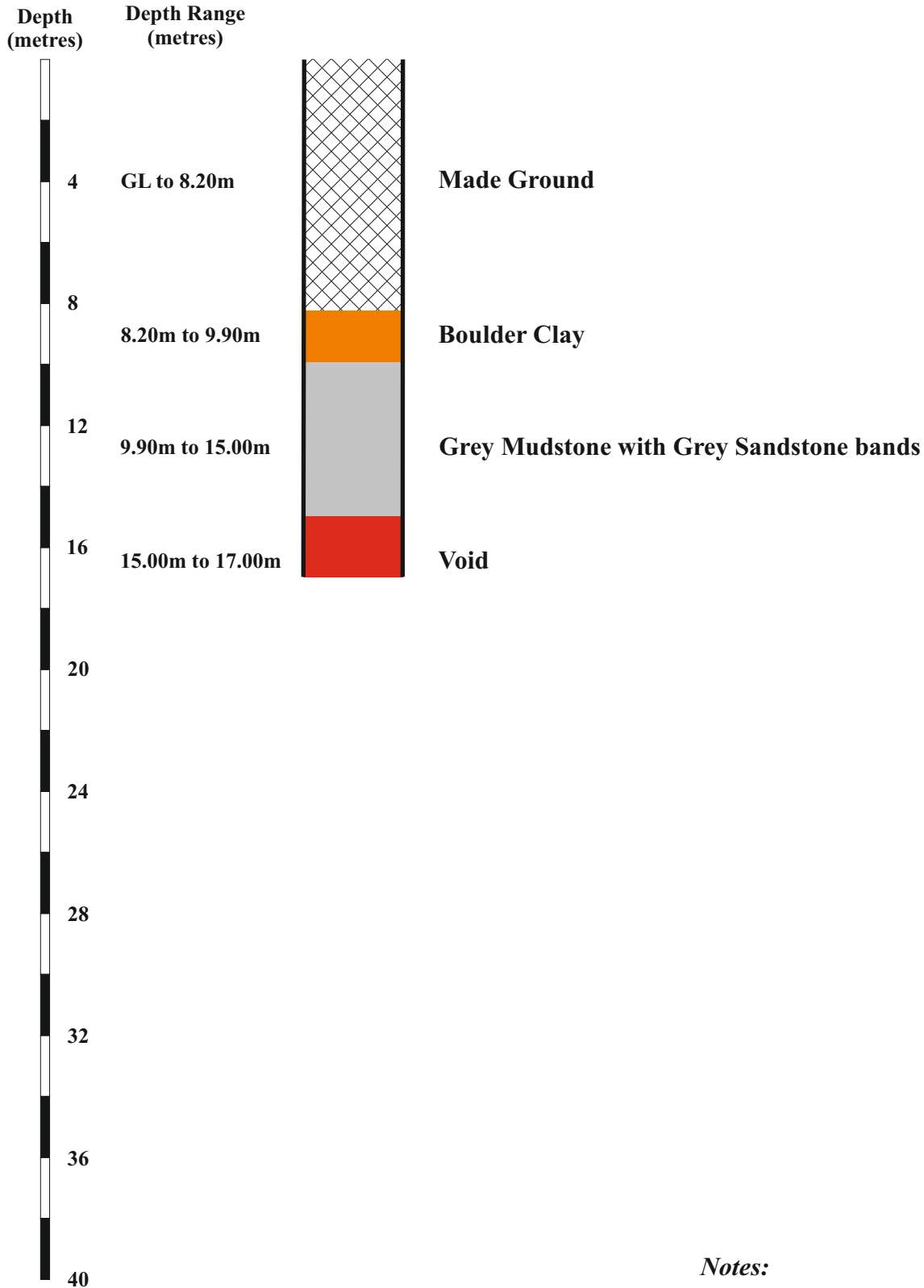


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.00m.*
4. *Cased 10.00m.*

Study on Land at Plymouth House

Borehole No. 38

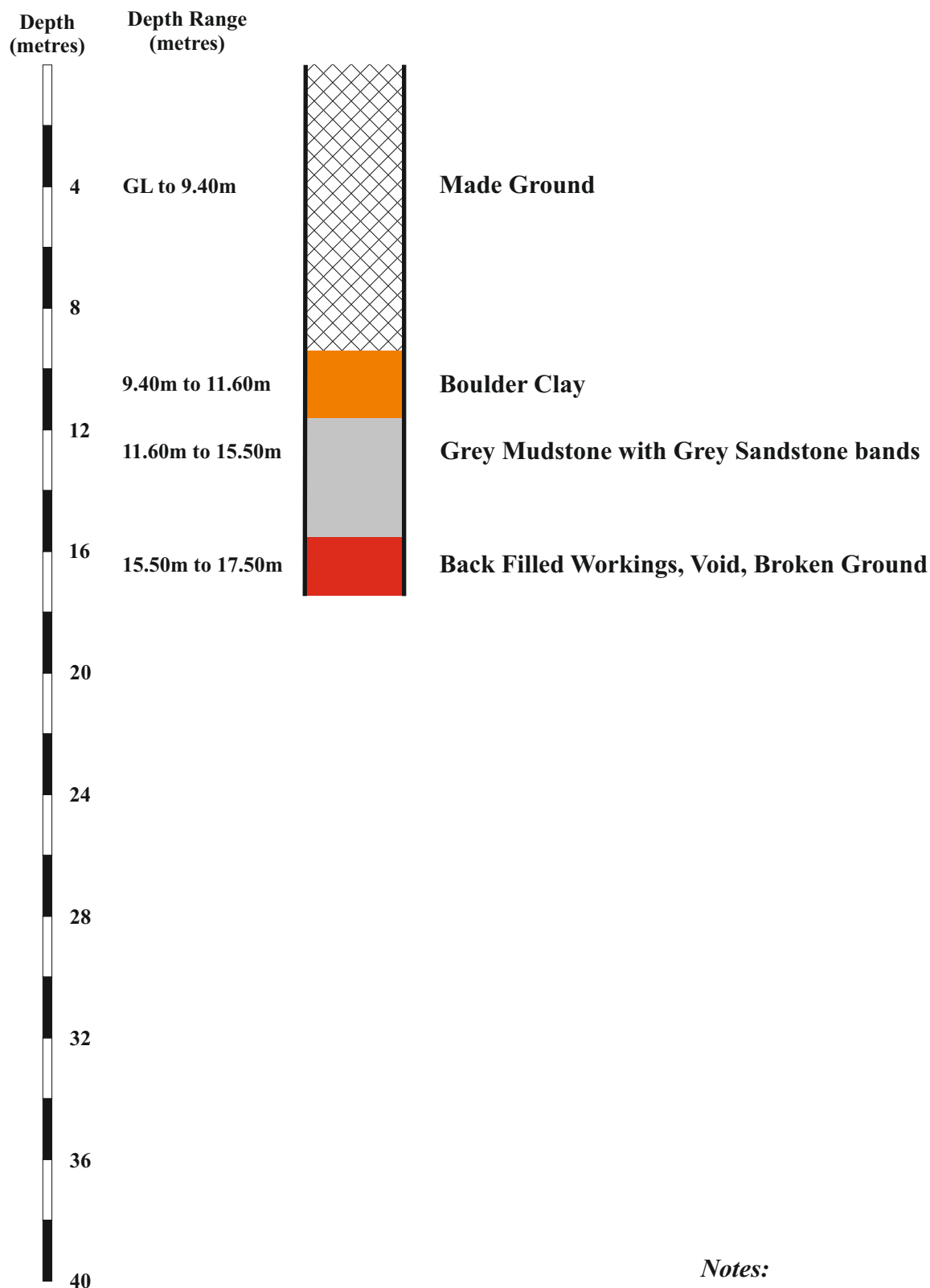


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.00m.*
4. *Cased 8.50m.*

Study on Land at Plymouth House

Borehole No. 39

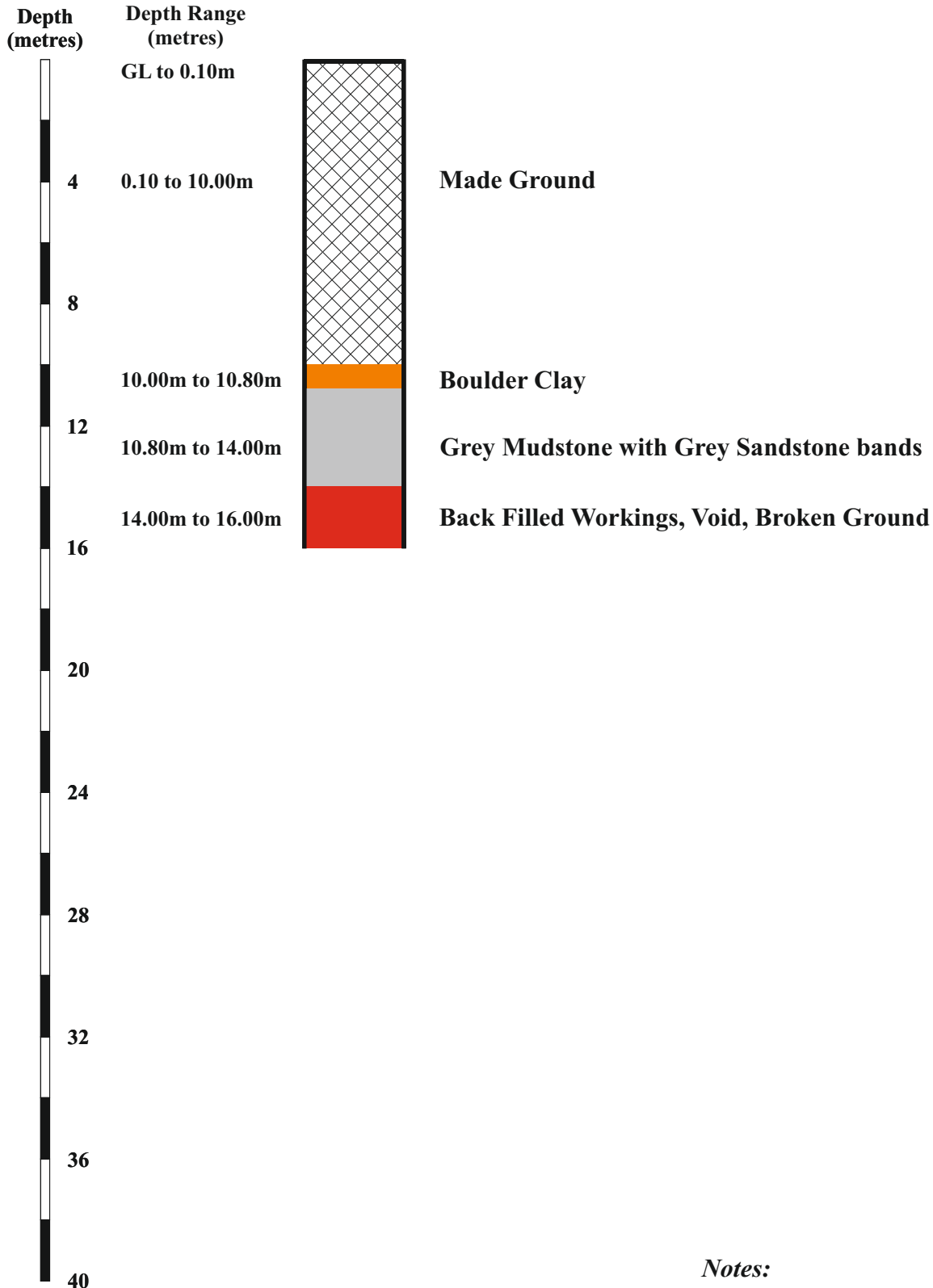


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 17.50m.*
4. *Cased 8.50m.*

Study on Land at Plymouth House

Borehole No. 41

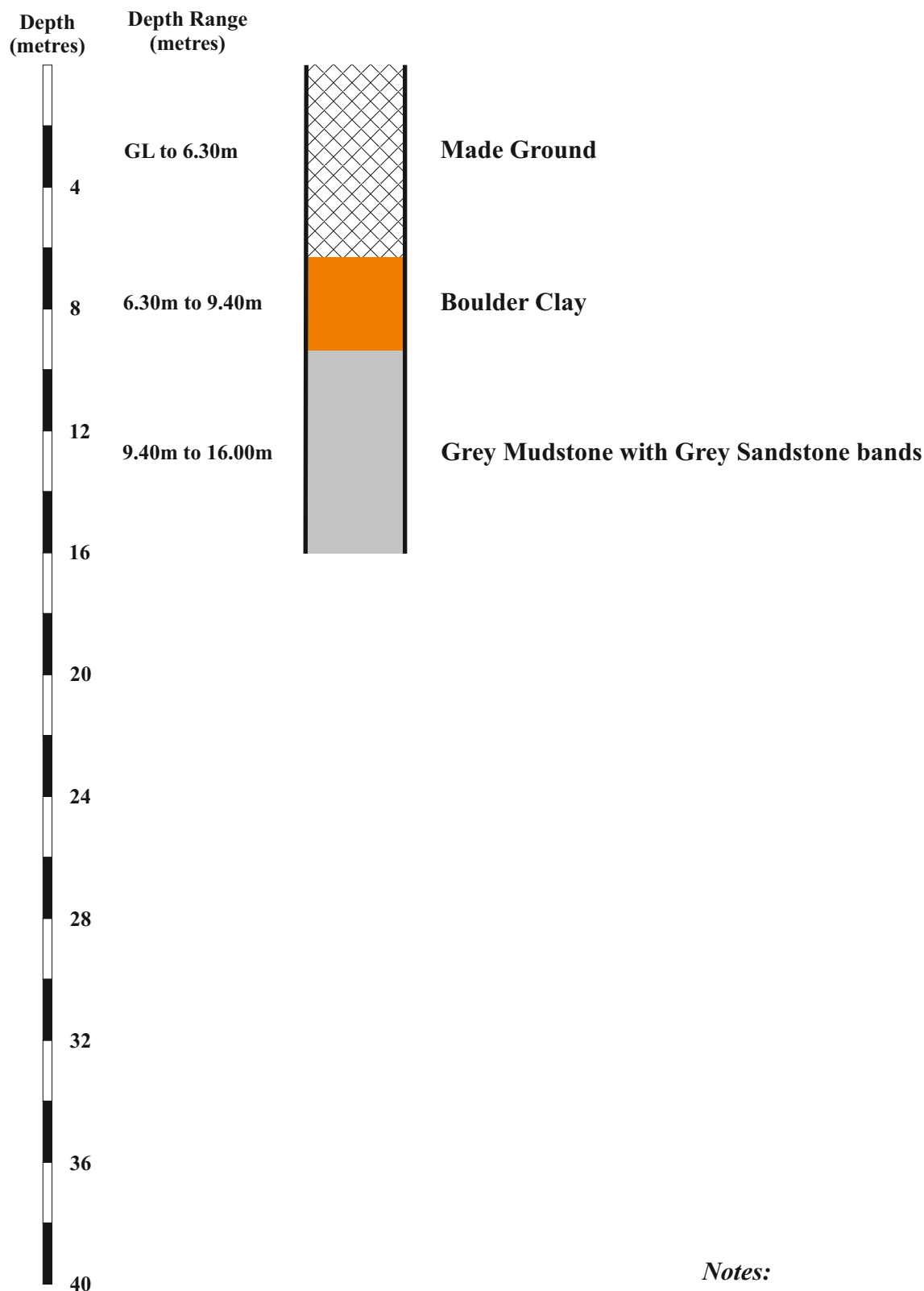


Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 16.00m.*
4. *Cased 8.50m.*

Study on Land at Plymouth House

Borehole No. 43



Notes:

1. *Driller's Descriptions.*
2. *Borehole dry.*
3. *Total depth of borehole, 16.00m.*
4. *Cased 7.00m.*

APPENDIX II

DETAILS OF MATERIALS INJECTED INTO BOREHOLES



THE ENTERPRISE CENTRE,
MERTHYR INDUSTRIAL PARK,
PENTREBACH,
MERTHYR TYDFIL,
SOUTH WALES,
CF48 4DR.

BLANDFORD CONSULTING

Geologists Working With The Environment....

Details of Materials Injected into Boreholes

BH No	Total Depth (m)	Depth to Top of Workings (m)	Thickness of Workings (m)	Total PFA/OPC Injected (t)	Total Chippings Injected (t)	Total tonnage (t)
1	18.5	-	-	0.30	-	0.30
2	17.5	-	-	0.30	-	0.30
3	18.0	14.6	2.0	0.40	-	0.40
4	17.0	-	-	0.30	-	0.30
5	17.5	-	-	0.30	-	0.30
6	18.5	14.9	1.7	36.00	32.00	68.00
7	17.5	15.2	0.90	1.90	0.50	2.40
8	17.5	-	-	0.40	-	0.40
9	18.0	15.1	2.1	2.00	2.00	4.00
10	17.5	14.9	1.7	11.00	12.00	23.00
11	17.5	-	-	0.40	-	0.40
12	20.0	-	-	0.30	-	0.30
13	18.0	15.5	0.8	10.00	10.00	20.00
14	17.5	15.4	0.8	3.00	1.00	4.00
15	17.0	-	-	0.30	-	0.30
16	20.0	-	-	0.30	-	0.30
17	22.0	-	-	0.30	-	0.30
18	22.0	-	-	0.30	-	0.30
19	22.0	-	-	0.40	-	0.40
20	21.0	-	-	0.60	-	0.60
21	21.0	-	-	0.40	-	0.40
22	21.0	-	-	0.30	-	0.30
23	17.5	12.0	5.0	1.50	1.00	2.50
24	19.0	15.2	2.3	-	-	-
25	20.0	13.2	4.9	5.50	4.00	9.50
26	19.0	13.5	4.7	5.00	4.00	9.00
27	19.0	15.2	2.3	1.50	1.00	2.50
28	19.0	-	-	0.50	-	0.50
29	20.0	-	-	9.30	9.00	18.30
30	21.0	-	-	0.30	-	0.30
31	-	-	-	-	-	-
32	-	-	-	-	-	-
33	20.5	-	-	0.40	-	0.40
34	-	-	-	-	-	-
35	17.0	-	-	0.30	-	0.30
36	17.0	14.7	1.7	43.00	47.00	9.00
37	-	-	-	-	-	-
38	17.0	15.0	2.0	19.00	14.00	33.00
39	17.5	15.5	2.0	6.00	5.00	11.00
40	-	-	-	5.00	2.00	7.00
41	16.0	14.0	2.0	2.50	1.00	3.50
42	-	-	-	-	-	-
43	16.0	-	-	0.50	-	0.50
Totals				169.8	135.5	305.3