Tamar Banks
South Hooe
Plymouth
Devon

Results of Palaeoenvironmental Coring

South West Archaeology Ltd. report no. 201026

ARCHAEOLOGICAL SERVICES &
HISTORIC BUILDING RECORDING
SOUTHWEST ARCHAEOLOGY

www.swarch.net

Tel. 01769 573555
Tel. 01872 223164

TAMAR BANKS, SOUTH HOOE, PLYMOUTH, DEVON

RESULTS OF PALAEOENVIRONMENTAL CORING

By Dr. T. Davies

Report Version: DRAFT
Final Draft issued: 26th October 2020
Finalised:

Work undertaken by SWARCH for Bridge Civil Engineering (The Agent)
on behalf of the Environment Agency

SUMMARY

Two c.3m deep cores were collected using a Russian Corer at the location of a proposed breach to the flood defence embankment at South Hooe, Devon. The sediments contained within these cores are consistent with the results of the geotechnical survey of the area undertaken by Red Rock Geo (2020). They contain a mixture of mineral and organic rich sandy and silty clays typical of salt marsh environments that have the potential for the examination of salt marsh development and palaeoenvironmental reconstruction for the Lower River Tamar. Further assessments for research potential are advised by a programme of radiocarbon dating, geoarchaeological and palynological assessment.

October 2020

CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

ACKNOWLEDGMENTS

THE ENVIRONMENT AGENCY (EA)
BRIDGE CIVIL ENGINEERING
DEVON COUNTY HISTORIC ENVIRONMENT TEAM (DCHET)
HISTORIC ENGLAND (HE)

PROJECT CREDITS

DIRECTOR: DR TUDUR DAVIES
FIELDWORK: DR TUDUR DAVIES, PETER WEBB, SEAN STEVENS
REPORT: DR TUDUR DAVIES
GEOARCHAEOLOGICAL ANALYSIS: DR TUDUR DAVIES
EDITING: DR SAMUEL WALLS
GRAPHICS: DR TUDUR DAVIES

1.0 INTRODUCTION

LOCATION: TAMAR BANKS, SOUTH HOOE
PARISH: PLYMOUTH
COUNTY: DEVON
NGR: SX 41720 64290
PLANNING App. NO: 0545/20/SCO
MUSEUM REF NO: PLYBX.2020.10
OASIS NUMBER: SOUTHWES1-396753
SWARCH REF. BFTB20

1.1 PROJECT BACKGROUND

This report presents the results of a palaeoenvironmental coring work undertaken by South West Archaeology Ltd. (SWARCH) as part of the mitigation scheme for the wetland reclamation works on land at South Hooe, Bere Ferrers, Devon. The work was carried out to collect samples of deposits to be impacted by the proposed breach to the embankment on the north side of the River Tamar and assess their broad potential for palaeoenvironmental analysis. The work was carried out in accordance with a Written Scheme of Investigation (Boyd 2020) drawn up in consultation with the Environment Agency Archaeologist (EA); the Devon County Historic Environment Team (DCHET); Historic England (HE) and in line with best practice and CIfA guidelines (2014).

1.2 TOPOGRAPHICAL AND GEOLOGICAL BACKGROUND

The Site is located within the Tamar Valley Area of Outstanding Natural Beauty and the Plymouth Sound and Tamar Estuaries Marine Protected Area, in a tidal river valley that forms part of a large drowned river valley system. It slopes towards the River Tamar, by which it is bound to the south, east and west. The landscape is predominantly open, characterised by large fields, stone walls and hedgerows with the lower steeper reaches of the promontory near the river often occupied by strips of mature woodland. The south facing setting of the site provides views of the wide expanse of the tidal River Tamar as it proceeds to the south towards Plymouth. The site lies at a height of approximately 1m AOD (Figure 1). The BGS indicates that the site is located on salt marsh deposits overlying the Devonian slate deposits of the Tavy Formation (BGS 2020). The extent of the salt marsh sediments are shown to roughly correlate with the extent of the proposed work scheme, corresponding with the area immediately south of the field boundary marking the northern edge of the site. This appears to be confirmed by geotechnical works undertaken at the site by Red Rock Geo (RRG) (2020), which records the presence of grey and black silty clay deposits, interpreted as salt marsh sediments, underlying topsoil and mottled grey, brown and red clay sediments within boreholes from this area.

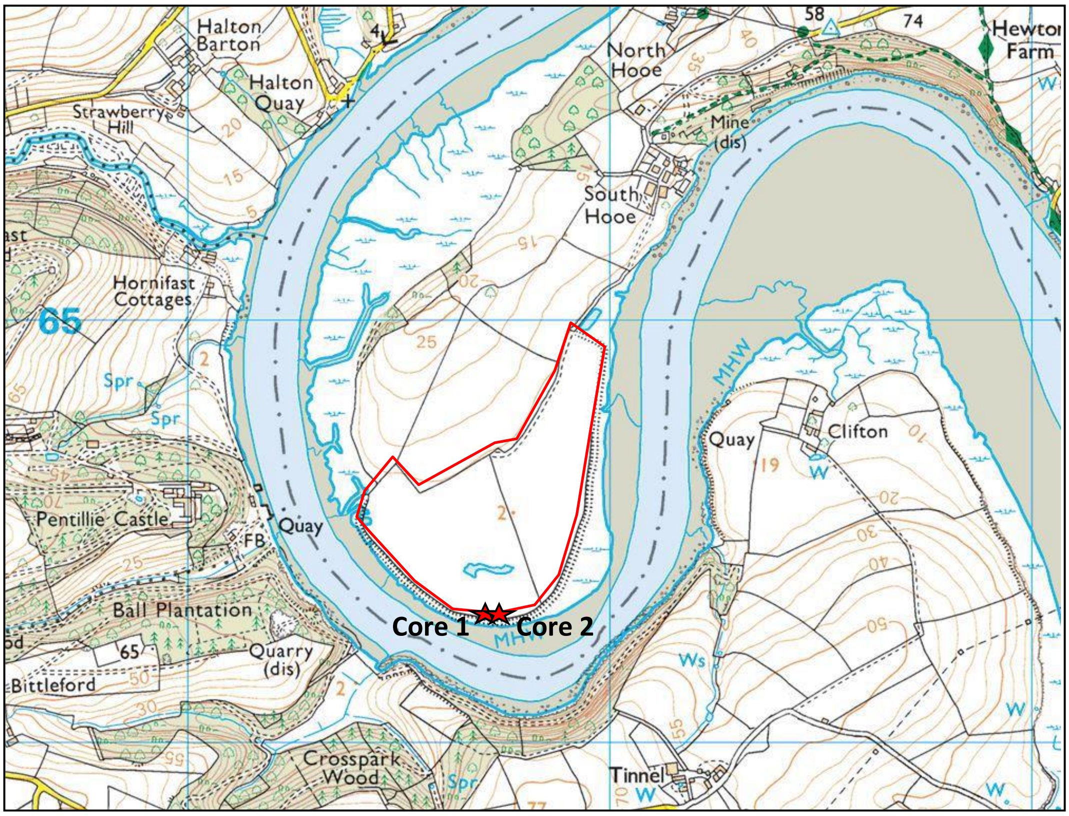

FIGURE 1: SITE AND CORE LOCATION MAP

1.3 METHODOLOGY

Two core samples were retrieved by hand using a Russian Corer to the north of the existing embankment in the southern area of the site. It was intended that samples be collected from adjacent to RRG's previous boreholes in this area (WS1 and WS2) (RRG 2020), but the markers left by the borehole survey were no longer visible on the ground. Therefore, coring locations were established by comparing GPS locations on the Google Maps phone app with the borehole location plan. The two coring sites were subsequently recorded using a hand held Garmin GPSMAP 64.

The individual 50cm core segments were extracted into plastic guttering and wrapped in cling film to avoid contamination and placed in cold storage for preservation. The field record of individual core segments included a photograph and rudimentary description of deposits, which included colour, texture and inclusions. It should be noted that the surface of these core segments were not cleaned in detail in the field. Therefore, some details of stratigraphic change may not have been recognised in the field that may potentially come to light during detailed examination of their stratigraphy under controlled laboratory conditions.

2.0 RESULTS OF GEOARCHAEOLOGICAL CORING

2.1 RESULTS AND DISCUSSION

Coring site coordinates are shown in Table 1, including an estimate of their altitude based on the DTM 1m resolution LiDAR data of the study area. The field descriptions for the two cores are provided in Table 2 and a summary stratigraphic diagram is provided in Figure 2.

Core ID	Easting	Northing	Altitude (mOD)[1]	Coring depth (m below surface)	Coring depth level (mOD)[1]
1	241722	64296	1.00	2.98	-1.98
2	241736	64295	1.00	3.02	-2.02
1. Approximate values based on LiDAR data from surface levels of coring sites					

TABLE 1: CORING SITES LOCATION AND DEPTH

Similar coring depths were obtained for both sampling sites, reaching a depth of 2.98 and 3.02m or a level of -1.98mOD and -2.02mOD for cores 1 and 2 respectively. The sediments within these cores are also relatively similar, though the deposits within the upper c.0.18-0.27m are more varied in character than their lower sediments. These upper sequence of deposits in both cores consist of a mixture of sandy clays, silts and peat, but their colour and consistency varies between the two coring sites. This degree of variation is not unexpected as these upper deposits are likely to represent deposits re-deposited from the excavation of the ditch immediately to the north or material eroded from the embankment immediately to the south. The latter interpretation is the more likely candidate as this hypothesis is supported by the horizontal bedding of these layers (see Figures 3 and 4), which would unlikely form during the process of being redeposited from the excavation of the ditch. The lowest of these upper, more varied layers, at both coring sites consist of a peaty silt and peat deposit (Cores 1 and 2 respectively) that may have formed in situ prior to the construction of the adjacent flood defences. All layers beneath these peaty deposits are consistent across both coring sites in both colour and texture. Their depths and levels, for the most part, are deeper in Core 2 in comparison with Core 1. However, this depth variation is consistent with fluctuations in surface levels across the site as observed in LiDAR data and is therefore believed to represent natural slope variation as opposed to differences in sediment formation processes (e.g. truncation). These lower deposits consist of an upper mottled light orange and mid grey clay overlying gray clay deposits that get darker and coarser in texture with depth. From a level of -0.175mOD and -0.31mOD (units 1.12 in Core 1 and 2.10 in Core 2), laminations of mid-dark grey clay and very dark grey organic rich fine sandy silty clay are observed for c.1m in depth, with increased frequency of the darker laminations towards the base of the unit. In both cores, lighter grey fine sandy clay deposits are noted beneath the organic rich layer for a further c.60cm, below which an organic rich silty clay is recorded to the base of both cores.

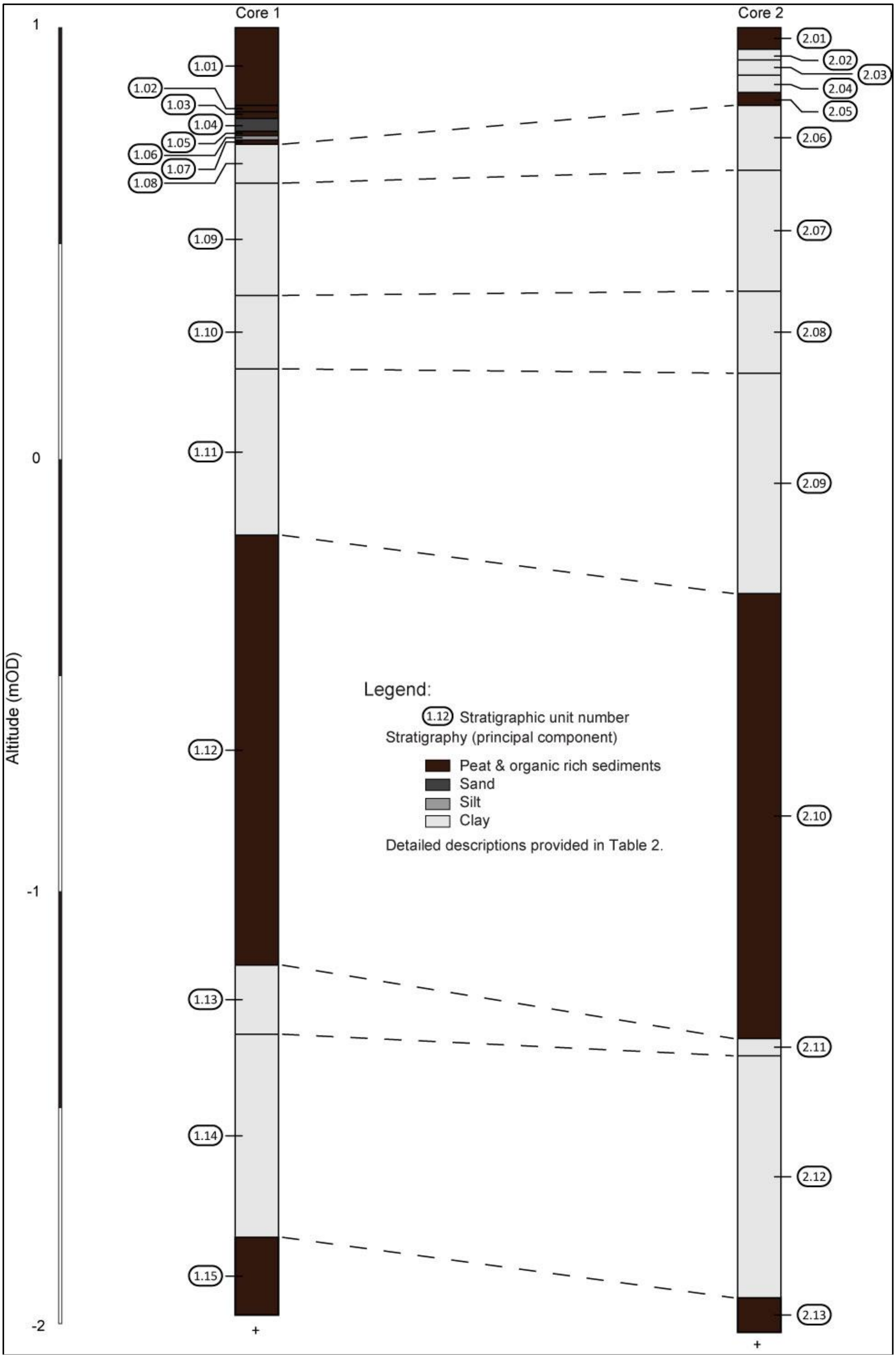

FIGURE 2: CORE 1 AND 2 STRATIGRAPHY DIAGRAMS

The coring depths achieved by the current work is similar to that achieved by the previous geotechnical work at window sample sites WS1 and WS2 (RRG 2020), though there are differences in the descriptions of the deposits. For example, RRG note the presence of dark grey to black silty and sandy clay deposits from 1.83 to -1.77mOD (WS1) and 2.3 to -1.8 mOD (WS2) which they describe as salt marsh deposits, which cannot be directly attributed to any specific layer in the current work. Nevertheless, this simplified description could potentially apply to all the deposits beneath 0.64m in Core 1 and 0.67m in Core 2 which are described as mid grey to very dark grey sandy and silty clays in the current study. There is, however, a level discrepancy of more than 1.79m between the recorded levels of the top of these deposits. It is, however, possible that this difference is the result of re-deposited salt marsh deposits used in the construction of the bank. Indeed, RRG note the presence of made ground above these deposits used in its construction, but may not have been able to differentiate between intact and re-deposited salt marsh deposits using a narrow window sampler. This theory is also supported by the fact that the upper range of the 'salt marsh deposits' noted by RRG in WS1, at 1.83mOD, is higher than the current level of all the former floodplain north of the embankment.

Despite the differences in the recorded levels of deposits between the current work and the RRG study, there is consensus regarding the formation processes of these deposits. The gray clay, sandy clay and silty clay deposits noted by booth studies are typical of the deposits accumulating in salt marsh conditions (cf. Waters 1992: 258-9). The waterlogged condition of these deposits is ideal for the preservation of organic remains, providing a stratified chronological sequence of palaeoenvironmental evidence. As with all alluvial deposits, a degree of secondary deposition should be expected within these sediments (cf. Moore et al 1991: 25), but successful reconstruction of broad historical environmental changes can be achieved through the analysis of such material (e.g. Burrin & Scaife 1984, Long et al. 1999). A chronological range for these deposits could be established by radiocarbon dating of the upper peat deposits and material within the darker clay deposits with increased organic content. However, before any detailed analysis is attempted on these deposits, consideration should be given to sediment formation processes that could affect the reliability of palaeoenvironmental reconstruction. Establishing pollen preservation levels and the chronological range of sediments should also be undertaken as part of an assessment of their research potential. Given the similarity of the sediments within both cores collected for this study, it is believed that they cover a similar chronological range and would therefore represent an identical record of environmental change within this landscape. It is therefore believed that any assessment of research potential should focus on any and only one of these cores.

3.0 CONCLUSION

The two cores collected from South Hooe potentially represent an important palaeoenvironmental record of the lower reaches of the River Tamar. The waterlogged nature of the sediments within these cores could contribute to our understanding of changes in land use surrounding the sampling sites as well as salt marsh development along the River Tamar. It is advised that one of these cores be subject to an assessment of their research potential as follows:

- **Radiocarbon dating** to assess the chronological range of the core.
- **Geoarchaeological assessment** to provide a detailed description of the core to assess deposit formation processes that may affect the reliability of palaeoenvironmental data.
- **Pollen assessment** to establish pollen preservation levels and assess the core's potential to contribute to wider environmental research.

4.0 BIBLIOGRAPHY & REFERENCES

Published Sources:

Burrin, P.J. and Scaife, R.G., 1984: Aspects of Holocene valley sedimentation and floodplain development in southern England. *Proceedings of the Geologists' Association*, *95*(1), pp.81-96.

Long, A.J., Scaife, R.G. and Edwards, R.J., 1999: Pine pollen in intertidal sediments from Poole Harbour, UK; implications for late-Holocene sediment accretion rates and sea-level rise. *Quaternary International*, *55*(1), pp.3-16.

Waters, M.R. 1992: *Principles of Geoarchaeology: a north American Perspective.* University of Arizona Press, Tucson

Websites:

British Geological Survey 2020: *Geology of Britain Viewer*. http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html

DEFRA 2019: *Defra Survey Data*. 1m DTM LiDAR data https://environment.data.gov.uk/DefraDataDownload/?Mode=survey

Unpublished Sources:

Atkins Ltd. 2019: *Tamar Estuary Habitat Creation (South Hooe): Heritage Desk Based Assessment.* Atkins Ltd.

Boyd, N. 2020: *Land at SX417645, South Hooe Peninsula, Bere Ferrers, Devon: Written Scheme of Investigation.* SWARCH WSI No.: BFTB20WSIv1.3.

Red Rock Geo 2020: Geotechnical Survey Report for South Hooe, Bere Ferrers. Report No. 7322

Webb, P. 2020: Land at SX417645, South Hooe Peninsular, Bere Ferrers, Devon: Results of an Archaeological Evaluation. SWARCH Report no. 200716

APPENDIX 1: CORE STRATIGRAPHY RECORD

Core	Unit	Top Depth (m)	Base Depth (m)	Top Level (mOD)	Base Level (mOD)	Unit thickness (m)	Description
1	1.01	0	0.18	1.00	0.82	0.18	mid-dark brown sandy peat
1	1.02	0.18	0.195	0.82	0.805	0.015	mid-dark grey organic rich sandy clay
1	1.03	0.195	0.21	0.805	0.79	0.015	dark brown peat
1	1.04	0.21	0.24	0.79	0.76	0.03	light to mid grey clay-sand
1	1.05	0.24	0.25	0.76	0.75	0.01	mid-dark grey-brown peaty silt
1	1.06	0.25	0.26	0.75	0.74	0.01	light-mid orange-brown sandy silt
1	1.07	0.26	0.27	0.74	0.73	0.01	mid-dark grey-brown peaty silt
1	1.08	0.27	0.36	0.73	0.64	0.09	mottled light orange and mid grey clay
1	1.09	0.36	0.62	0.64	0.38	0.26	mid grey clay
1	1.10	0.62	0.79	0.38	0.21	0.17	mid grey silty clay
1	1.11	0.79	1.175	0.21	-0.175	0.385	mid-dark grey sandy clay
1	1.12	1.175	2.17	-0.175	-1.17	0.995	laminated: mid-dark grey clay and very dark grey fine sandy silty clay (very dark grey laminations more frequent with depth)
1	1.13	2.17	2.33	-1.17	-1.33	0.16	mid-dark grey fine sandy clay
1	1.14	2.45	2.8	-1.45	-1.8	0.47	light-mid grey sandy clay
1	1.15	2.8	2.98	-1.8	-1.98	0.18	mid-very dark grey silty clay (deposits too stiff to reach below 2.98m)
2	2.01	0	0.05	1	0.95	0.05	mid-dark brown sandy peat
2	2.02	0.05	0.075	0.95	0.925	0.025	mid grey sandy clay
2	2.03	0.075	0.11	0.925	0.89	0.035	light grey-brown sandy clay
2	2.04	0.11	0.15	0.89	0.85	0.04	mid grey sandy clay
2	2.05	0.15	0.18	0.85	0.82	0.03	dark brown peat
2	2.06	0.18	0.33	0.82	0.67	0.15	mottled light orange and mid grey clay
2	2.07	0.33	0.61	0.67	0.39	0.28	mid grey clay
2	2.08	0.61	0.8	0.39	0.2	0.19	mid grey silty clay
2	2.09	0.8	1.31	0.2	-0.31	0.51	mid-dark grey sandy clay
2	2.10	1.31	2.34	-0.31	-1.34	1.03	laminated: mid-dark grey clay and very dark grey fine sandy silty clay (very dark grey laminations more frequent with depth)
2	2.11	2.34	2.38	-1.34	-1.38	0.04	mid-dark grey fine sandy clay
2	2.12	2.38	2.94	-1.38	-1.94	0.56	light-mid grey fine sandy clay
2	2.13	2.94	3.02	-1.94	-2.02	0.08	mid-very dark grey silty clay (deposits too stiff to reach below 3.02m)

APPENDIX 2: PHOTOGRAPHIC ARCHIVE

FIGURE 3: CORE SEGMENT 1.1 FROM A DEPTH OF 0-50CM IN CORE 1 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 4: CORE SEGMENT 1.2 FROM A DEPTH OF 45-95CM IN CORE 1 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 5: CORE SEGMENT 1.3 FROM A DEPTH OF 90-140CM IN CORE 1 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 6: CORE SEGMENT 1.4 FROM A DEPTH OF 135-185CM IN CORE 1 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 7: CORE SEGMENT 1.5 FROM A DEPTH OF 180-230CM IN CORE 1 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 8: CORE SEGMENT 1.6 FROM A DEPTH OF 225-275CM IN CORE 1 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 9: CORE SEGMENT 1.7 FROM A DEPTH OF 248-298CM IN CORE 1 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 10: CORE SEGMENT 2.1 FROM A DEPTH OF 0-50CM IN CORE 2 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 11: CORE SEGMENT 2.2 FROM A DEPTH OF 45-95CM IN CORE 2 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 12: CORE SEGMENT 2.3 FROM A DEPTH OF 90-140CM IN CORE 2 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 13: CORE SEGMENT 2.4 FROM A DEPTH OF 135-185CM IN CORE 2 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 14: CORE SEGMENT 2.5 FROM A DEPTH OF 180-230CM IN CORE 2 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 15: CORE SEGMENT 2.6 FROM A DEPTH OF 225-275CM IN CORE 2 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

FIGURE 16: CORE SEGMENT 2.7 FROM A DEPTH OF 252-302CM IN CORE 2 (TOP OF THE CORE ON THE RIGHT HAND SIDE).

ARCHAEOLOGICAL SERVICES & HISTORIC BUILDING RECORDING
SOUTHWEST ARCHAEOLOGY

THE OLD DAIRY
HACCHE LANE BUSINESS PARK
PATHFIELDS BUSINESS PARK
SOUTH MOLTON
DEVON
EX36 3LH

DEVON: 01769 573555
CORNWALL: 01872 223164
EMAIL: MAIL@SWARCH.NET