

BERWICK-UPON-TWEED

Distribution and Significance of Urban Waterlogged Deposits

Project Report



Title	Distribution and significance of urban waterlogged deposits in Berwick-upon-Tweed (Project 3A5.201)
Author:	Karen Derham, Assistant Archaeologist, karen.derham@northumberland.gov.uk , 01670 622655
Approval:	

The Distribution and Significance of Urban Waterlogged Deposits in Berwick-upon-Tweed (Project 3A5.201) was carried out between 2012 and 2013 by Karen Derham for Northumberland County Council with the support of English Heritage.

All the mapping contained in this report is based upon the Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationary Office. © Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Northumberland County Council OS Licence 100049048.

Geological maps are derived from 1:50,000 scale BGS Digital Data under Licence 2012/118 British Geological Survey. © NERC.

LiDAR data is derived from LiDAR Composite (July 2011) © Environment Agency.

Photograph on front cover © Northumberland County Council.

© Northumberland County Council and English Heritage, November 2013.

Contents

Acknowledgements	iii
Figure 1: Location of study area	iv
Summary	1
1 Introduction	2
2 Research Aims and Objectives	5
3 Methodology	6
4 Quantification of the Results	10
5 Discussion	22
6 Recommendations	26
7 Conclusions	27
8 Bibliography	29
9 Gazetteer of investigations used in the project	31
Figures 2 to 15	35

Appendices

Appendix 1: Planning Guidance Note	49
Appendix 2: Amendments to Development Management briefs for archaeological work in Berwick	55
Appendix 3: Berwick Building Study Group Cellar Survey	57
Appendix 4: Category Names	64

Tables

Table 1: Summary of solid geology in events

Table 2: Summary of superficial geology in events

Table 3: Summary of ballast deposits and various 'mixed sands and gravels' in events

Table 4: Summary comparison of period and feature types in events

Table 5: Depth of medieval deposits recorded in archaeological events in the Marygate/Walkergate area

Table 6: Summary of the types of recorded waterlogged deposits in events

Table 7: Summary of waterlogged deposits

Table 8: Summary of known wells and cess pits

Table 9: Summary of Aims and Objectives achieved or not achieved

Illustrations

Fig 1: Location of study area

Fig 2: Location of archaeological and geotechnical interventions

Fig 3: Natural deposits recorded in intrusive interventions across the study area

Fig 4: Solid geology from British Geological Survey Digital Data showing location of solid geology recorded in intrusive interventions across the study area

Fig 5: Superficial geology from British Geological Survey Digital Data showing location of superficial geology recorded in intrusive interventions across the study area

Fig 6: Post-medieval ballast dumping compared with natural sand and gravel

Fig 7: Medieval deposits recorded across the study area superimposed on the 12th century street pattern

Fig 8: Medieval deposits lying directly beneath modern deposits

Fig 9: Dated and undated waterlogged deposits recorded across the study area with well-preserved waterlogging annotated with a star

Fig 10: Types of waterlogged deposits recorded across the study area

Fig 11: The extent of waterlogged deposits in relation to cellars, wells and cess pits

Fig 12: Post-medieval deposits recorded across the study area

Fig 13: Location of profiles (Figs 14 & 15)

Fig 14: Profile 1 from train station car park (NW) to Palace Green (SE)

Fig 15: Profile 2 from Low Greens (NE) to south of Berwick Bridge (SW)

Acknowledgements

Jacqui Huntley, English Heritage Science Advisor North East

David Passmore, Visiting Fellow, School of Geography, Politics & Sociology, Newcastle
University

Liz Williams, Northumberland County Council Heritage & Historic Environment Record Officer

Sara Rushton & Chris Burgess, Northumberland County Council Conservation Team
Managers

Marcus Brewis & Ryan Gilchrist, Northumberland County Council Information Services

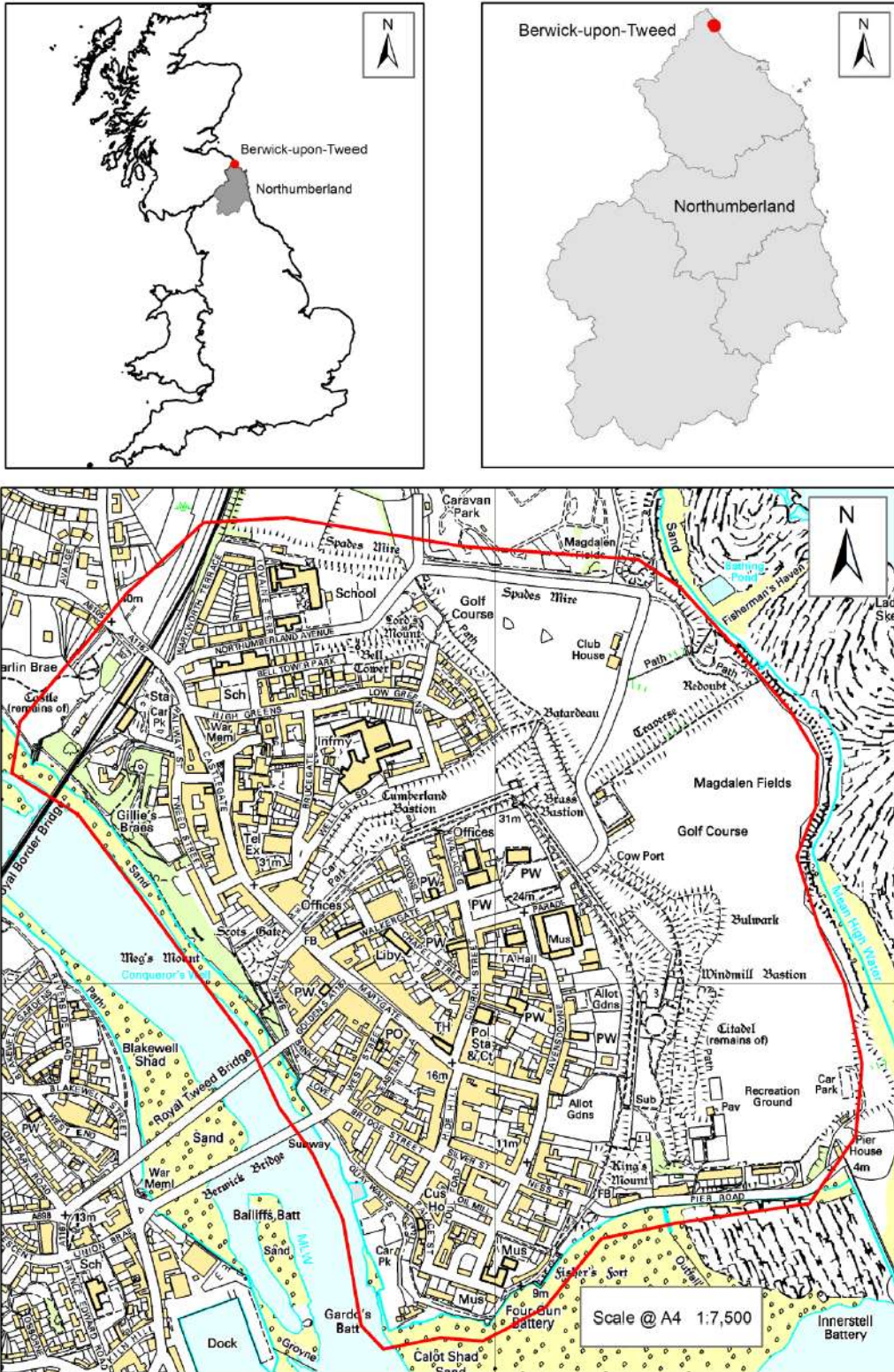


Fig 1: Location of study area

Summary

Northumberland Conservation undertook a project funded by English Heritage to assess the distribution and significance of urban waterlogged deposits in Berwick-upon-Tweed as part of the English Heritage Action Plan based on The National Heritage Protection Plan (NHPP). Existing information from geotechnical and archaeological investigations has been gathered into a database in order to produce a GIS-based 3D deposit model of the below ground deposits in the town.

This information has been used to identify the presence, nature and survival of waterlogged layers and organic remains in relation to medieval and post-medieval layers, underlying natural deposits and later development and disturbance.

The results demonstrate that waterlogged deposits are largely confined to medieval rubbish pits cut into the underlying natural clay and to areas of lower ground next to the Tweed estuary. The nature and depth of overlying deposits do not appear to be a material factor in the survival of waterlogged archaeological remains, with instances of waterlogged deposits surviving at a depth of just 0.12m below current ground level.

Analysis of the data shows that waterlogged deposits and archaeological remains of specific periods are not present at a consistent depth across Berwick. While archaeological investigations on adjacent sites have shown that waterlogged and/or medieval deposits can be located at a comparable depth above Ordnance Datum (aOD), irrespective of the overlying deposits, there is no consistency in predicting the depth of deposits over a wider area.

The current ground level varies considerably across the study area due to both topography and the build-up or reduction of deposits. This variation in current ground level, combined with the variation in depth of archaeological deposits, means that the deposit model should only be considered as generic rather than predictive. A comprehensive programme of geotechnical sampling with specialist involvement would produce the level of resolution necessary to produce a predictive urban deposit model and could form the basis for future, more detailed work.

The project has identified a number of shortcomings in previous archaeological reports from Berwick, where insufficient detail was included about the nature of waterlogged deposits. These shortcomings have been addressed by the revision of archaeological briefs for the town to include more detailed requirements where waterlogging is encountered.

The results of the project have provided a more detailed understanding of the development of the urban structure of Berwick and the factors that influence the waterlogging of deposits within the town. The deposit model will continue to develop as the results of future archaeological investigations are fed into the existing data.

1 INTRODUCTION

Project background

- 1.1 The National Heritage Protection Plan (NHPP) sets out how English Heritage, together with partners in the heritage sector, will prioritise and deliver heritage protection from 2011 to 2015. As a response to the NHPP, English Heritage has devised an Action Plan outlining themes, topics and activities to address specific areas of work which have been identified as priorities.
- 1.2 The NHPP and Action Plan (Measure 3.A.5) recognise that urban waterlogged zones can be extensive and of exceptional significance, providing excellent preservation conditions for organic remains. It is acknowledged that waterlogged deposits can be vulnerable to changes in ground conditions due to various factors including development and changes in land-use. These deposits can frequently be poorly understood and little assessed as standard survey techniques are insufficient to model and map below ground landscapes with any precision.
- 1.3 Measure 3.A.5 of the Action Plan identifies a need for projects to look at the distribution and significance of urban waterlogged deposits in a number of key urban centres, including Berwick-upon-Tweed. The projects are intended to be produced with a view to providing a better understanding of the location and significance of the waterlogged assets to support decision-makers working in the planning system.
- 1.4 As a result, Northumberland Conservation has been commissioned by English Heritage to undertake a project to examine the distribution and significance of urban waterlogged deposits in Berwick-upon-Tweed.
- 1.5 This project falls under Measure 3.A.5 of the Action Plan. Measure 3 looks at the identification of potential, Topic A looks at the identification of heritage assets and their significance and Activity 5 specifically relates to the identification of wetland/waterlogged sites (English Heritage 2012). Within Activity 5, this project encompasses Theme 1: Understanding the distribution, character and value of wetland and waterlogged sites (Heathcote 2012).

Location, topography and geology

- 1.6 Berwick-upon-Tweed is the most northerly town in England and lies on the northern bank of the River Tweed. It is spectacularly sited on a coastal peninsula, surrounded by water on three sides and protected by medieval and Elizabethan walled defences. The royal castle occupied a key location at the neck of the peninsula, overlooking both the town and river (Fig. 1).
- 1.7 The peninsula on which the historic core of Berwick lies is prominent to the north but falls rapidly southwards towards the river. At the northern end of the town, High and Low Greens lie at c.38m above Ordnance Datum (aOD); the Guildhall, at the centre of town, lies at 15m aOD; and Palace Green, within the ancient area of the Ness, lies at 6m aOD.
- 1.8 Superficial geological deposits along the river valley consist of extensive spreads of Holocene alluvial and estuarine clays overlying, in certain areas, deep glacial tills. These deposits overlie bedded sequences of Carboniferous limestone, shale and sandstone. These are interleaved with layers of coal which have been

worked to the south of Berwick (at Scremerston) and clay which has been exploited in outlying areas such as Low Cocklaw (Figs 4 & 5).

- 1.9 The study area (outlined in red on Fig. 1) encompasses the historic core of the town including the remains of the castle in the north-west, the town defences to the north and east and the quayside along the estuary to the south.

Archaeological background

- 1.10 The town has a long history as a contested frontier stronghold between England and Scotland. Documentary evidence strongly indicates there was early medieval settlement activity in this area but the focus of that activity remains unknown (Marlow and Williams 2008, 14). Archaeological evidence shows that Berwick has been settled since at least the 12th century. The town was wealthy and growing by this time and although the early thoroughfares are noted in contemporary documents, it remains uncertain how far urban occupation had extended along these streets by the end of the 13th century (ibid, 17). The lines of medieval streets are shown in light blue on Figure 7.
- 1.11 Plans for a new town, proposed in 1297, appear never to have been executed apart from perhaps an early start on the building of a ring of fortifications around the town (Beresford 1967, 3). Although there are no medieval standing structures in Berwick, apart from the Edwardian Walls, archaeological evidence has demonstrated that medieval stratigraphy throughout the historic town core is frequently deep, complex, fairly undisturbed and includes waterlogged deposits which yield organic material (Marlow and Williams 2008, 20-2).
- 1.12 Archaeological evidence points to an extensive intertidal zone at the south-east end of the peninsula which was consolidated and extended into the river line. Evidence for the transition from early estuary foreshore to built quayside has come from the excavation of deep trenches outside the town walls in the 1990s. Trenches reached the surface of natural river and estuarine silts at 6m below the current ground surface. These layers were overlain with thick deposits of gravel, sands and 'peat', probably the result of river-side deposition and rubbish dumping. They contained pottery from the 13th to 16th centuries and were highly organic, with well-preserved artefacts of leather and wood (Marlow and Williams 2008, 33-4).
- 1.13 Quantities of clean sand and gravel were deposited over the rubbish layers and derive from ballast from ships arriving at the quayside, possibly during the medieval period but mostly in the 18th century. Overlying the ballast sands are mixed layers of rubble and soil used to level the quayside during the later 19th century. It is, however, more difficult to establish the relationship between the early south-west quarter of the town and the Tweed estuary as there is now an abrupt transition from town, to defensive walls, to quayside and then to river walls, which mask what may have been a more gentle graduation in medieval times (Marlow and Williams 2008, 34).

Previous studies

- 1.14 *An Archaeological Study of Berwick-upon-Tweed* by Margaret Ellison: The first comprehensive published account of archaeological work in Berwick was by Margaret Ellison, published by the Northern Archaeological Survey (Ellison 1976). This formed part of a suite of reports published by the NAS in response to

concerns over rescue archaeology. Their long-term aim was to establish a more effective mechanism for coping with the problems of rescue archaeology in the north-eastern counties of England. This work was preceded by a preliminary survey of the archaeological potential and threats by various forms of development. Ellison recognised the importance of archaeological investigation, but at the time there had been only limited excavation in the town. Her survey outlined the history of Berwick and presented a series of maps showing the medieval settlement pattern and areas then being developed or under threat. It concluded with a series of recommendations made in the light of the known evidence and current planning proposals.

- 1.15 *Berwick Extensive Urban Survey (EUS)*: Northumberland County Council is responsible for managing the undesignated heritage assets of the county, primarily through the work of Northumberland Conservation contributing to the development management process. As part of this role, English Heritage commissioned Northumberland Conservation to undertake an Extensive Urban Survey (EUS) of Berwick-upon-Tweed (Marlow and Williams 2008). This project identified and characterised upstanding and buried archaeological deposits. The study charted the development of the town from the medieval period to the present day by accessing historical, documentary and cartographic sources and the results of archaeological investigations. The Berwick EUS recognised the potential for the study of waterlogged deposits but a specific study of that subject was not within its remit.
- 1.16 *Rapid assessment of archaeological interventions in Berwick*: In 2007, Northumberland Conservation undertook a rapid assessment of archaeological interventions in Berwick-upon-Tweed, looking at work which had been carried out on street frontages and back plots. The information was compiled by a volunteer under the supervision of the acting HER Officer (Keith Elliott). The work was summarised in a two-page report and table. The table itemised each archaeological event, the depth of deposits, subsoil and the presence of waterlogged material. The format was loosely based on the Urban Archaeological Database used in the neighbouring authority of Newcastle City. This project did not utilise borehole data known to be held by the British Geological Survey and, owing to the short timescale, did not result in any GIS data.
- 1.17 *Berwick's Future: A Regeneration, Strategy and Implementation Plan for Berwick-upon-Tweed*: In 2008, Northumberland Strategic Partnership (NSP) produced 'Berwick's Future', a Regeneration Strategy and Implementation Plan for Berwick-upon-Tweed. This included an archaeological desk-based study of ten key priority development sites, seven of which are located within the walled town. The study advised on the likely heritage implications of developing the priority sites and drew together relevant information relating to archaeological potential, assessing it in relation to the wider historic significance of the town.
- 1.18 While the document provides a description of below ground profiles for each of the sites, except for the Quayside, these appear to be based on generic values derived from excavations at the Tweeddale Press Building, Walkergate which were then extrapolated across the historic town. The profiles are provided as depths of deposits of specific dates below current ground level with no Ordnance Survey heights or indication of the depth of waterlogged deposits. The document provides a useful overview of the archaeological issues associated with development in Berwick-upon-Tweed but little in the way of detailed information regarding the variation in deposit depths across the town.

2 RESEARCH AIMS AND OBJECTIVES

2.1 The project aims are:

- to assess the survival of vertical stratigraphy and to identify, locate and establish the character of waterlogged deposits and the degree of organic material preservation
- to assess whether there is any correlation between the survival and character of waterlogged deposits and the nature of underlying geology or the date of and nature of archaeological deposits
- to assess factors influencing the survival of waterlogged deposits and the effects of development and dewatering
- to gain a more detailed appreciation of the development of the urban structure
- to assist in developing the appropriate responses to development management proposals where waterlogged organic deposits in Berwick are anticipated

2.2 The project objectives are:

- to develop a simple methodology to ascertain the degree of organic preservation
- to create a predictive GIS-based urban deposit model for assessing the location of waterlogged deposits, utilising archaeological and geotechnical data
- to enhance the HER by enabling future data to be incorporated into a deposit model
- to supplement data gathered during the Extensive Urban Survey
- to identify areas in Berwick where additional information is still required to provide a more complete deposit model
- to develop a strategy to promote the preservation of waterlogged deposits for developments carried out as part of the planning system
- to understand the distribution and significance of waterlogged deposits
- to develop appropriate mitigation strategies for protection and recording of waterlogged deposits
- to get a fuller understanding of significance and research potential of waterlogged deposits
- to develop the North East Regional Research Framework recommendations:
 - SU14: As well as mapping the major horizontal spatial development of towns, better understanding of the survival of vertical stratigraphy is required. All the region's major towns would benefit from detailed urban deposit models, highlighting areas of significance. These should be based on existing fieldwork and, where necessary, newly commissioned investigations. These models should include basic data about the extent and periods of known deposits, as well as qualitative data recording information such as waterlogging
 - SU15: Monitoring of the quality of buried urban archaeological deposits should be on-going. These data should feed into any deposit models (Petts 2006, 207).
- to prepare a guidance note for planners, developers and archaeological consultants/contractors detailing the results of the project, particularly in relation to waterlogged deposits and to set out an approach for dealing with waterlogged deposits in Berwick.

3 METHODOLOGY

Data Sources

3.1 Data was gathered for all identified geotechnical and archaeological

investigations carried out within the medieval and Elizabethan town walls of Berwick (Fig. 2). This dataset was intended to help to identify the extent and nature of waterlogged deposits in relation to their topographical, geological, archaeological and historical context.

- 3.2 Geotechnical data was obtained from the British Geological Survey, which is the main national repository for geotechnical data. All the identified geotechnical investigations were obtained from this source.
- 3.3 The primary source of archaeological information was the collection of largely unpublished reports of archaeological interventions within Berwick over the last 23 years (since the requirements of PPG16 and subsequent planning guidance) held in the Northumberland County Council Historic Environment Record (HER).
- 3.4 A LiDAR dataset, provided by the Environment Agency, was used to generate the current ground level in the profiles generated across the study area (Figs 14 & 15).
- 3.5 All data was recorded on an Excel spreadsheet and analysed using ArcGIS 10 and 3D Analyst.

Definition of deposits (see Appendix 4 for a full list of category names used)

- 3.6 Information on the nature of deposits and the presence or absence of waterlogged or organic remains was extracted from archaeological reports and borehole logs. This information was assessed and subdivided into comparable groups comprising:
 - geological deposits
 - waterlogged deposits
 - medieval deposits (AD1066-1540)
 - post-medieval deposits (1540-1900)
 - medieval/post-medieval deposits (AD1066-1900)
 - modern deposits (1901 to present)
 - undated deposits.
- 3.7 In geotechnical investigations, the archaeological deposits were frequently described as 'made ground' (MDGN). As this definition could encompass a variety of archaeological layers and/or soil-filled features, the definition was retained in the spreadsheet and a date assigned on typological grounds from other sites in Berwick. Where natural deposits were identified as such the geological type was input and they were logged as natural (NTRL).
- 3.8 In archaeological investigations, deposits were more precisely defined in archaeological terms than in the geotechnical boreholes. Features were recorded as soil-cut features (FEAT), masonry (MSNY), floors (FLOR), mortar (MORT) and layers (LAYR); the term 'layer' was used for all deposits which were not identified as a specific feature.
- 3.9 Deposits that were described in the original reports as being waterlogged were taken on trust although it is accepted that some of these may be an archaeological interpretation. Wherever possible, associated environmental evidence was examined as this can provide a better demonstration of waterlogging by the presence, for example, of delicate organic remains such as grass/cereal caryopses (non-charred), or even more robust organic materials

such as wood and especially leather. Whilst it had been hoped to characterise such deposits more precisely, disappointingly there were relatively few interventions where such data were available. Deposits were therefore classed as waterlogged or not waterlogged

- 3.10 Deposits of dark silt, or deposits described as wet but with no reference to organic or waterlogged remains, were not logged as waterlogged. They may have contained organic remains but primary recording lacked sufficient detail for this to be determined.
- 3.11 Individual records were allocated a reliability rating ranging from high to low based on the following criteria:
 - aOD level, detailed description and precise measurements = HIGH
 - no aOD level but detailed description and accurate measurements = MEDIUM
 - no aOD level and uncertainty about precision of description and measurements = LOW

Data collection

- 3.12 Each deposit in a stratigraphic sequence was recorded separately and located as precisely as possible from the information provided in archaeological reports or geotechnical data. A single point was located for each stratigraphic sequence and recorded to a ten-figure grid reference.
- 3.13 Where archaeological excavations measured more than 5m in length stratigraphic sequences were located at multiple points across the site, spaced at around 5m intervals.
- 3.14 In instances where there was particularly deep, complex or waterlogged stratigraphy, the recorded sequence was taken from that point. Where measurements were taken through large features, a second sequence of deposits was also taken adjacent to the feature.
- 3.15 Lenses or features less than 50mm in depth were not included unless they represented the only example of waterlogging or organic deposits.

Grouping of deposits and features

- 3.16 Deposits were grouped together on the spreadsheet where they were either undated deposits of a similar form and nature or where there were deposits and features of a comparable date and thickness. Where waterlogged deposits or organic remains were noted in some but not all of these deposits, a separate record was made specifically relating to the waterlogged remains.

Levels

- 3.17 The thickness and depth above Ordnance Datum (aOD) of each deposit was recorded on the spreadsheet. Where aOD levels were not present, the depth below current ground level was recorded.
- 3.18 Records that did not have aOD levels were assessed to see whether it was possible to extrapolate the level with any precision from known aOD levels in the surrounding area. Measurements were taken between points with reliable aOD

values and those without and calculated accordingly. Consideration was given to any variation in heights across the site and this was reflected in the calculation of aOD levels. Sources of data were noted within each record.

- 3.19 Varying levels of precision were achieved dependent on the source of data, the proximity of the reading and the known difference in ground levels. This was reflected in the reliability rating applied to each record.
- 3.20 Levels were calculated with varying levels of precision using the following sources:
- Levels transferred from adjacent archaeological geotechnical and investigations
 - Spot levels on modern Ordnance Survey (OS) maps
 - Spot levels on the 1855 Town Plan (converted from Imperial to Metric) *The accuracy of using the 1855 maps was checked in four separate locations across the town where accurate aOD levels were present in the same location on modern OS maps or archaeological investigations. Measurements varied from 0.05-0.15m and were therefore deemed to be sufficiently accurate for the purposes of providing aOD levels on data that could otherwise not be used.*
 - Levels transferred using an automatic level from existing benchmarks. *This technique could only be used where the ground level was unlikely to vary significantly from the ground level when the investigation took place, and where certainty about the benchmark could be assured.*
- 3.21 Where the precision of levels was poor or distance between sites with aOD levels was too great, the aOD level of the record were left blank and that record was not used in the final dataset.
- 3.22 Where inaccuracies were apparent once the dataset was processed in 3D analyst, the raw data was reassessed and problems resolved. Where this was not possible, those points were excluded from the final dataset.

Investigation results excluded from the final dataset

- 3.23 A number of sites had no information in the report text or drawings that indicated the thickness of the deposits or the depth of deposits below current ground level or above Ordnance Datum. The maximum amount of information was noted in each record for comparison with future work on adjacent sites, however as the current project is concerned with the production of a 3D deposit model, the records were ultimately excluded from the final GIS dataset.
- 3.24 While the absence of depth information on the majority of these sites does not significantly reduce our understanding of the waterlogged urban deposit model, this is not the case for the site of the new library buildings which replaced the former bus station on Marygate. The evaluation and excavations on the Marygate site revealed well-preserved waterlogged medieval remains, in some places lying directly beneath modern surfaces. Unfortunately the published and grey literature did not contain the required height/depth information and the Great North Museum (the archive repository) was unable to locate the primary archive for the site.
- 3.25 Workable data with aOD levels have been extracted where possible for the Marygate site. Some aOD levels have been extrapolated from known aOD levels

from adjacent sites and a subsequent level survey carried out as part of this project. The difficulties lie in the absence of measurements for the upper modern layers overlying the archaeological layers which prevent precisely establishing the depth of archaeological layers below ground level. This is compounded by the measures undertaken to preserve the majority of the archaeological remains *in situ* which resulted in the ground level being subsequently built-up to an unspecified level. Consequently the current ground levels in certain areas do not reflect the ground level of the evaluation and excavations and extrapolation of levels was not possible.

- 3.26 The failure to locate the archive in the Great North Museum (GNM) has flagged up a number of issues about reporting and archiving requirements. Some of the issues about aOD levels and the provision of plans and sections at a recognisable planning scale have already been addressed in previous Northumberland Conservation briefs for archaeological work produced over the last 10 years. Requirements have been further strengthened in the updated briefs amended as part of this project (see Appendix 2).

Water table height

- 3.27 Where the water table was noted in a borehole and there were various heights given at different times of the day, the highest initial height was recorded for the water table, presuming that there may be other factors for variation if the borehole is open for a period of time. Where it is apparent that the borehole is located in a tidal location, the lowest tidal height was recorded as the deposits at that depth are more likely to be permanently waterlogged rather than subject to tidal fluctuations.

Additional sources of information

- 3.28 The study accessed additional sources of information that may have influenced the production or continuation of conditions that are conducive to the survival of waterlogged remains. These comprised:
- *Wells*: The 1855 Town Plan was examined and a GIS layer was produced showing the location of wells, pants (a local dialect term for a water supply or fountain), Ordnance reservoirs and cess pits shown on the map.
 - *Berwick Cellar Survey*: The Berwick Building Study Group undertook a cellar survey across the study area comprising a Rapid Street Survey (looking at visible signs of cellars from street level), followed by a detailed survey of specific cellars. The results have been used in this report and a summary included in Appendix 3 of this report.
- 3.29 The results of the well and cellar survey are quantified in more detail in section 4 (paragraphs 4.50 to 4.58).

4 QUANTIFICATION OF THE RESULTS

- 4.1 The project collated the results of all relevant archaeological and geological investigations (Fig. 2). These are listed at the end of the report (Section 9).
- 4.2 The project includes data from 503 points across the study area. Some 389 points were recorded across 80 archaeological sites (see paragraphs 3.12 to 3.16). In

comparison 23 geotechnical studies included a total of 114 boreholes, each an individual data point (Fig. 2). As a result, archaeological investigations account for 79% of the points and geotechnical investigations accounted for 21% of the points generated. The project was able to utilise 86% (433) of the separate points.

- 4.3 In each of these points, an individual record was made for each deposit (see paragraph 3.12) resulting in 1793 records. Of these records, 233 were excluded from the final GIS dataset and the 3D model due to a lack of aOD height data. The project was able to utilise 87% (1560) of the points.
- 4.4 The 3D Arc Analyst tool was used to generate successive layers representing the top and base of the following deposits:
 - natural
 - waterlogged
 - medieval
 - post-medieval
 - modern
- 4.5 Layers were also generated for geological deposits to allow further analysis of the potential reasons for waterlogging. These deposits were grouped into:
 - clay
 - sand/gravels
 - sandstone/mudstone
- 4.6 Two deposit profiles (Figs 13, 14 & 15) were generated through across the study area utilising the layers generated in 3D Arc Analyst and the LiDAR dataset.
 - *Profile 1* ran from the station in the north-west to Palace Green in the south-east (Figs 13 & 14). It shows the location of the medieval castle's curtain wall directly beneath the station car park, the build-up of medieval deposits across the town, the focus of waterlogged deposits within the medieval town and the variable build-up of post-medieval deposits.
 - *Profile 2* ran from Low Greens in the north-west to the quayside in the south-west (Figs 13 & 15). It shows the build-up of medieval deposits across the town, the focus of waterlogged deposits in the Marygate area and the variable build-up of post-medieval deposits. The profile crosses the quayside to the west of known post-medieval ballast deposits.
- 4.7 The profiles summarise the build-up of deposits across the study area which is quantified in more detail in this section.

Solid Geology (Fig. 4)

- 4.8 The geological maps indicate that the solid geology was formed during the Carboniferous period and consists of bedded sequences of limestone, shale and sandstone. The bedrock varies across the study area from sandstone/siltstone/mudstone across the western half and limestone/sandstone/siltstone/mudstone across the east of the area separated by a thin band of limestone (Fig. 4).
- 4.9 The permeability range varied from low (minimum) to high (maximum) for the areas either side of the thin limestone band. In comparison the minimum and maximum permeability for the thin limestone band was consistently high (Fig.4).

	Sandstone	Shale	Siltstone	Mudstone
GTEC record	48	11	1	21
<i>No. of Boreholes (with aOD)</i>	33 (22)	8 (7)	1 (0)	16 (13)
ARCH record	0	0	0	0

Table 1: Summary of solid geology recorded in events

- 4.10 Natural geological deposits were recorded across the whole study area. However, due to its depth below current ground level, the solid geology was only located in 42 (9.7%) boreholes with aOD levels (Fig. 4 also Table 1).
- 4.11 The geological definitions used in this project have been taken from the geotechnical reports or borehole data logs. Sandstone bedrock was recorded around the junction of Walkergate and Marygate and on the quayside. It was recorded at a depth of between 3.2m and 6.55m below current ground level (bgl) in the upper town (18.64 to 20.7m aOD) and between 7.6m and 19.7m bgl in the quayside area (-2.87 to -16.2m aOD) (Fig. 4 also Table 1).
- 4.12 In comparison mudstone, siltstone and shale were recorded in broadly the same area and also in the area of Palace Green, Scots Gate and north of the Cat Wall which lies to the rear of properties on the north-east side Bridge Street. These deposits were recorded at a depth of between 2.4m and 7.6m (bgl) in the upper part of the town (20.3m to 19.48m aOD) and between 13m and 18.5m (bgl) in the quayside area (-8.82m to -13.77m aOD) (Fig. 4 also Table 1).

Superficial Geology (Fig. 5)

- 4.13 *Diamicton (Till)*: Geological maps indicate that the most extensive superficial geological deposits are Late Devensian diamictons (Fig. 5) that extend broadly north-south along the line of Marygate and Castlegate and the area to the north and east. These may be interpreted as till deposits associated with Late Devensian glaciation and/or deglaciation. They comprise poorly sorted sediment containing a wide range of particle sizes or gravel suspended in a clay-silt matrix.
- 4.14 *Clay* (Fig. 5, Table 2): Clay deposits with an aOD level were recorded in 15.7% (68) of points across the study area. In most instances archaeological investigations did not exceed the depth of the clay deposits therefore the underlying solid geology was only reached in geotechnical investigations (see Table 1). The majority of clay deposits encountered in the study area lie within the boundary of Late Devensian diamicton mapped by the BGS and are most likely associated with these spreads of till (*pers comm* D Passmore).

	Clay	Sand	Gravel	Sand and gravel
GTEC record	47	26	20	70
<i>No. of boreholes (with aOD)</i>	32 (26)	20 (16)	11 (3)	37 (32)
ARCH record	48	15	1	1
<i>No. of locations (with aOD)</i>	48 (42)	12 (11)	1 (1)	1 (1)

Table 2: Summary of superficial geology recorded in events

- 4.15 *Sand and Gravel* (Figs 5 & 6, Table 2): Sand and gravel deposits with an aOD level were recorded in 14.8% (64) of points across the study area. Sand and gravel was recorded in both geotechnical and archaeological investigations, particularly in the area adjacent to the river and to the west and south of the Cat Wall. The deposits of sand, gravel and ‘mixed sand and gravel’ were grouped together for interpretive purposes following discussions with Dave Passmore, the geotechnical consultant for this project.
- 4.16 While many of the instances of sand and gravel may be associated with natural deposition from fluvial/marine activity, archaeological investigations on the Quayside also revealed a significant build-up of sand and gravel ballast deposits overlying medieval deposits. (Event 26: Berwick Quay Walls, Event 13847: Quayside Walls)
- 4.17 The use of the term ‘sand ballast’ is dependent on the interpretation of the archaeological contractors who undertook the investigations. The function of the Quayside for ballast dumping has been noted historically on Wood’s town map of 1822, for example, referring to the ‘New Quay’ as the ‘Old Ballast Quay’, while the southern portion of the quayside was named ‘New Ballast Quay’.
- 4.18 It is possible that some of the sand and gravel deposits recorded in the geotechnical investigations may also be ballast. The project attempted to establish whether deposits of ‘mixed sand and gravel’ recorded within the geotechnical investigations might be man-made ballast deposits. This was possible where geotechnical investigations were located immediately adjacent to, and at a comparable depth with, ballast deposits identified in archaeological investigations. However it was not possible to reclassify the majority of ‘mixed sand and gravel’ at a greater depth or distance from known ballast deposits. As a result, these deposits continued to be classified as being of natural origin. Future investigative work in these areas may help to clarify this issue.

	Natural sand and gravel	Undated sand and gravel	Post-med Sand and gravel ballast
GTEC record	70	1	5
<i>No. of boreholes (with aOD)</i>	37 (32)	1 (0)	4 (4)
ARCH record	1	13	17
<i>No. of locations (with aOD)</i>	1 (1)	13 (13)	17 (16)

Table 3: Summary of ballast deposits and various ‘mixed sands and gravels’ recorded in events

Medieval deposits (Figs 10 & 11, Table 4)

- 4.19 Medieval deposits were recorded in 37.9% (164) of the points in the study which had aOD levels. Table 4 is a period-based comparison of the various features recorded across the study area. It shows that medieval features represent 71% (49) of soil-cut features, 33.3% (22) of masonry, 26.6% (12) of floors, 28.6% (2) of mortar and 24.3% (79) of layers with aOD levels.
- 4.20 Geotechnical studies often record layers as 'made-ground'. Although many similar layers have been identified as medieval during archaeological excavations, no similar assessment of age was been made in the geotechnical core logs and reports.

	Feature (soil-cut pits etc)	Masonry	Floor	Mortar	Layer	Made ground
Medieval	59	28	13	3	121	0
ARCH No. of locations (with aOD)	59 52 (49)	28 25 (22)	13 12 (12)	3 2 (2)	117 86 (77)	0
GTEC No. of boreholes (with (aOD)	0	0	0	0	4 2 (2)	0
Undated (med/post-med)	6	9	6	3	156	55
ARCH No. of locations (with aOD)	6 6 (6)	9 8 (7)	6 5 (5)	3 3 (3)	129 84 (77)	0
GTEC No. of boreholes (with (aOD)	0	0	0	0	27 15 (10)	55 39 (33)
Post-medieval	17	43	32	2	250	30
ARCH No. of locations (with aOD)	17 17 (14)	39 38 (35)	31 30 (27)	2 2 (2)	242 171 (157)	0
GTEC No. of boreholes (with (aOD)	0	4 4 (2)	1 1 (1)	0	8 7 (2)	30 25 (23)

Table 4: Summary comparison of period and feature types recorded in events

- 4.21 Medieval deposits frequently include multiple intercutting rubbish pits, many of which contain waterlogged material. Medieval deposits have not been recorded across the whole project area (Fig. 7). They are primarily focussed in the extent of the settlement, within the town walls and in the castle area, as shown in the 1580 map of Berwick. Copyright prevents this map being included in this report but the line of the medieval streets has been transcribed on Figure 7 in light blue.
- 4.22 Medieval deposits were recorded at a great variety of depths below current ground level. Medieval deposits were recorded at over 1m below ground level on at least part of the following sites:
- Event 26: Berwick Quay walls
 - Event 28: New Library
 - Event 32: Marygate
 - Event 226: 11 Chapel Street
 - Event 298: 4-8 Woolmarket

- Event 300: Palace Green
- Event 13524: Tweeddale Press
- Event 13877: New Quay
- Event 13889: 77 Marygate
- Event 13910: 50-56 Church St
- Event 14016: King's Arms, Hide Hill
- Event 14206: 59 Low Greens
- Event 14624: Oil Mill Lane
- Event 14707: 2 Chapel Street
- Event 14480: Walkergate

4.23 In comparison, medieval deposits were recorded directly beneath modern deposits (Figure 8) on at least part of the following sites:

- Event 32: Marygate
- Event 36: Police station, Church Street
- Event 46: Golden Square
- Event 310: 104-106 Marygate
- Event 13233: 12-14 Eastern Lane (*except in 2 areas where cobbled surfaces of presumed post-medieval date have been identified at a comparable level with medieval deposits. In the absence of datable evidence these surfaces could be modern*)
- Event 13268: Marygate/Bus station
- Event 13521: Marygate Street works
- Event 13605: Eastern Lane
- Event 13731: 55 Hide Hill
- Event 14279: 5-7 Woolmarket

4.24 The depth of medieval deposits bgl can vary quite significantly across individual sites and between adjacent plots. There is, however, no apparent, corresponding variation in the height of these deposits above Ordnance Datum. This is particularly apparent in the area of Marygate around the new library and Berwick Workspace buildings. While the aOD levels appear to broadly follow the natural topography sloping down from the north-west to the south-east, the depth below ground level can vary from 0.2-1.35m. In order to reflect the slope of the topography, Table 5 is ordered according to the distance measurements from Walkergate in the north heading to the south.

4.25 It is unclear whether the variation in the depth below current ground level across the study area represents differential or erratic dumping of post-medieval deposits or subsequent ground clearance. It is discussed in more detail in paragraph 4.28.

<i>Distance from Walkergate frontage (m)</i>	<i>Depth aOD (m)</i>	<i>Depth bgl (m)</i>	<i>Event</i>	<i>Trench</i>
2	25.85		14480	exc
3.5	25.5	1.35	13524	Tr N end
4	25.06	1.3m	32	B
8.5	26.1	0.8	13524	Tr S end
9	25.58		14480	exc
10.5	25.3		14480	exc

<i>Distance from Walkergate frontage (m)</i>	<i>Depth aOD (m)</i>	<i>Depth bgl (m)</i>	<i>Event</i>	<i>Trench</i>
12	25.15	1.05	13524	TP5
16	25.25	0.32	310	Tr N end
19	26	0.2	13524	TP1
21	25.4	0.2	310	Tr S end
23	24.95	1.3	13524	TP8
23.4	25.08	0.6	28	Ph3 TP3
24	25.5	0.4	13525	BH5
26	24.95	0.95	13524	TP3
27-21.5	24.66 - 24.81	0.4	32	C
29-37	24.12 - 24.02	1.5-1.6	32	A
48	24.06	0.65	28	Ph3 TP2
46	23.95	0.5	32	D
50	21.88 - 22.2	0.5	32	E
50	21.95		13268	exc
66	21.07	0.5	13521	wb
75	21.19	0.52	13521	wb
95	20.37	0.12	13521	wb
118	19.53	0.38	13521	wb

Table 5: Depth of medieval deposits recorded in archaeological events in the Marygate/Walkergate area

- 4.26 Medieval deposits have also been found along the edge of the estuary outside the town walls. These comprise layers containing pottery, bone, shell and waterlogged organic deposits. These deposits probably represent medieval rubbish disposal along the shoreline or possibly material washed up after being dumped elsewhere in the river (Event 26: Berwick Quay Walls).
- 4.27 There is some evidence of medieval midden deposits towards the east of the medieval settlement area and at the southern end of Ravensdowne (Event 14016: King's Arms, Hide Hill; Event 202: 21-23 Ravensdowne). In the case of 21-23 Ravensdowne dating was made on the basis of one sherd of 15th-16th century pottery. Similar deposits were also recorded around Oil Mill Lane (Event 14624) and the Blackburn and Price Garage on Silver Street (Event 14249), where dark brown silt clays in excess of 1-1.7m thick were recorded. A 0.45m thick waterlogged deposit described as 'midden material' was recorded in Trench 1 at Dewar's Lane Granary (Event 13306). Medieval waterlogged midden deposits were also recorded at Ravensdowne Barracks (Event 13185) but with no dimensions or aOD levels, therefore this site was excluded from the final dataset.
- 4.28 To the north of the town walls, a number of deposits of medieval to early post-medieval date were recorded in the Brucegate area, including 42-44 Castlegate, 26-30 Tweed Street and 59 Low Greens (Events 10584, 37, 346 and 14206 respectively). These deposits comprised an accumulation of material probably associated with pasture or cultivation and various pits which are likely to be associated with domestic back plot development and rubbish disposal.

Post-medieval deposits (Fig. 12; Table 4)

- 4.29 Post-medieval deposits were recorded in 60.7% (263) of the points in the study which had aOD levels (Fig. 11 also Table 4). The number and spread of post-medieval deposits reflect the continued use of the medieval town and its expansion to the north and east. Post-medieval midden deposits, in particular, demonstrate a greater expansion of rubbish disposal along the length of Ravensdowne.
- 4.30 Post-medieval deposits were not consistently present on all archaeological sites across the town. The absence of post-medieval deposits does not appear to show any consistent correlation between street frontage, back-plot development, location within the town, or topography (Fig. 8). It is unclear whether this variation represents differential or erratic dumping of post-medieval deposits or subsequent ground clearance. It is perhaps more likely that individual plots were subject to significant soil removal in the 19th or 20th centuries, possibly to lower the ground level to adjacent street level.
- 4.31 Post-medieval ballast dumping was recorded along the quayside and has been discussed in paragraphs 4.15 to 4.18 above (Fig. 6).

Waterlogging (Figs 8, 9 & 10; Table 6)

- 4.32 Sixty-six individual records of waterlogged deposits were recorded representing 10.2% (44) of the points in the study which had aOD levels. Medieval deposits accounted for 75% (33) of the total waterlogged point locations used in the deposit model. The remainder are undated deposits which could be of medieval or post-medieval origin. A single post-medieval waterlogged timber post was recorded in a geotechnical borehole. It was excluded from the final dataset due to inaccuracies in the depth measurements and a lack of aOD levels.
- 4.33 The largely medieval waterlogged deposits were focussed within the core of the medieval settlement. Medieval cut features were recorded in 34% (15) of the waterlogged points with aOD levels with pits representing 22.7% (10) of waterlogged points (Fig. 9; Table 6).
- 4.34 Medieval layers were recorded in 38.6% (17) of the waterlogged points with aOD levels. Four of the locations represent boreholes (1 geotechnical, 2 on an archaeological site) and another was recorded within a test pit. Although recorded as layers in the relevant reports, these deposits were only seen in small investigations and could represent fills in cut features. As a result of this ambiguity, these 4 records have been excluded from any further discussion.
- 4.35 Waterlogged medieval layers were recorded in archaeological investigations on the following sites:
- Event 30: 12-14 Eastern Lane (*Trenches 1 & 3*)
 - Event 46: Golden Square
 - Event 13521: Marygate street works (*section 1, 3, 4 and 5*)
 - Event 13235: Trinity Hall (*Trench 1 & west end of watching brief area*)
 - Event 13877: New Quay (*P1, P2, CSO and between P2 and P12*)

	Pit	Ditch	Well	Posthole	Drain	Midden	Layer/ Made Ground
Medieval	14	4	1	1	1	2	24
ARCH <i>No. of locations (with aOD)</i>	14 11 (10)	4 3 (2)	1 1 (1)	1 1 (1)	1 1 (1)	2 2 (1)	22 15 (15)
GTEC <i>No. of Boreholes (with aOD)</i>	0	0	0	0	0	0	2 2 (2)
Undated (Med/post- med)	1	0	0	0	0	0	17
ARCH <i>No. of locations (with aOD)</i>	1 1 (1)	0	0	0	0	0	12 7 (6)
GTEC <i>No. of Boreholes (with aOD)</i>	0	0	0	0	0	0	5 5 (4)
Post-medieval	0	0	0	0	0	0	1
ARCH <i>No. of locations (with aOD)</i>	0	0	0	0	0	0	0
GTEC <i>No. of Boreholes (with aOD)</i>	0	0	0	0	0	0	1 1 (0)

Table 6: Summary of the types of recorded waterlogged deposits in events

- 4.36 At 12-14 Eastern Lane (Event 30) and Marygate street works (Event 13521), the waterlogged layers were recorded as an accumulation of deposits associated with waterlogged features. In the Trinity Hall (Event 13235) report, waterlogging and gullies were both referred to but there was no indication about whether the two were closely associated. The level of recording at Golden Square (Event 46) was limited. The New Quay waterlogged layers (Event 13877) were located on the quayside and may have been influenced by the tidal nature of this area.
- 4.37 Undated waterlogged layers of potential medieval/post-medieval date were largely focussed in the medieval settlement area. Of the ten locations in this area with aOD levels, eight were identified in boreholes or test pits (4 archaeological, 4 geotechnical). The remaining points were located at Trinity Hall (Event 223: Trench 1) and 55 Hide Hill (Event 13731: Trench 2).
- 4.38 The depth of waterlogged deposits below current ground level varies across the study area. Waterlogged features across much of the town survive between 0.12m and 4.8m bgl. The shallowest deposits survive directly beneath modern levels, the deepest are sealed by post-medieval deposits. In comparison, waterlogged levels along the shore-line and to the south of the Cat Wall have been recorded between 1m and 5.5m bgl, sealed by post-medieval deposits.
- 4.39 The final depth of a site investigation defined whether the full extent of waterlogged deposits was revealed. In many cases, waterlogged deposits exceeded the trench depth. However, where the full depth of the waterlogged deposits was revealed, the majority of those deposits directly overlay natural clay deposits.

- 4.40 There are, however, exceptions to this stratigraphic sequence. In the lower part of the town, investigations at Dewar's Lane Granary (Event 13231) and during the construction of the new Quay Walls (Event 13877 and BGS 18848441) revealed organic peats, organic silt and sands or sandy clay, overlying gravelly sands or silty sands, which were overlying sandy clay. The organically-rich material from the Quay Walls, in the vicinity of the Shoregate, was identified as episodes of dumping by people between the 13th and 16th centuries. Although the origin of similar material from Dewar's Lane Granary was not clear it was regarded as reminiscent of this material and possibly also of anthropogenic origin.
- 4.41 In the upper part of the town, redeposited sandy clay and peat directly overlay mudstone in Event BGS 736671: Scots Gate Berwick 2. In addition, in Event 14279: 5-7 Woolmarket (Trench 1, south-west end), a wattle-lined pit containing organic remains and medieval pottery (see 4.43 below) overlay successive layers of black/grey sand and ash with rare clay lenses, overlying a mid-green plastic clay loam over an unspecified deposit of "natural".

Nature of waterlogged deposits

- 4.42 Where detailed information exists, the quality of preservation is best shown by the survival of more delicate plant remains such as grass caryopses, epidermal fragments, and cereal bran and so on. The sites where the best quality waterlogged remains were recorded are annotated on Figure 9 with a star symbol.
- 4.43 The sites which contained well-preserved remains include:

Event 30: 12-14 Eastern Lane

Context (112) High organic content. Some coarse organic material, bright blue vivianite staining indicative of anaerobic conditions.

Context (207) High organic content, 1 piece of worked leather (probably a fastening flap of a shoe) and large amounts of wood, coarse organic debris, straw and other monocot and moss fragments.

Context (308) Highly humified/silty deposit, wood heather charcoal, much organic material amorphous and unidentifiable, waterlogged seeds varied and abundant.

Event 32: Marygate

Context (77) Contained twigs, overlain by *Context (76)* peaty deposit, no organics detailed.

Fill (74) of stone drain [122] Very green and smelly deposit, no organics specified.

Fill (77) of ditch [80] Twigs overlain by *context (76)* very peaty waterlogged black to dark brown clay.

Deposits (124), (120) & (126) Layers of very organic material (not quantified) cut by feature containing *fills (119) & (118)* containing manure, grass, straw and a leather patch.

Event 310: 104-106 Marygate

Fill (12) of pit [11] Sheep's sorrel (ruderal), bramble (tree/shrub), marsh cinquefoil, sedge and nettle (wetland).

Context (9) bittersweet, sedge and goose grass (wide niche).

Context (10) Waterlogged remains of orache (arable), sheep's sorrel (ruderal), bittersweet (wetland) and sedge (wetland).

Event 13268: Marygate

Fill (5025) lowest fill waterlogged flax seeds and straw, corn cockle, corn spurrey, wild radish, second lowest (5118) leather knife sheath, 3 fills sealed by clay.

Upper fill (5061) & lower fill (5081) large no. of nettle seeds, greater representation of grassland and ground taxa in contexts.

Middle fills (5068) & (5081) Large quantities of heather shoots and flowers.

Event 13521: Marygate Streetworks

Fill (5) of ditch [8] High organic content including fragment of leather shoe.

Event 13525: Tweeddale Press

Context (105) A fragment of leather, very organic, almost gassy odour.

Context (208) Large quantities of organic matter including small fragments of wood and grass/vegetation.

Event 13877: New Quay

Context (2004) Considerable amounts of wood, amorphous organic, moss/bryophyte fragments and charcoal. Waterlogged seeds quite varied but not particularly abundant. Figs, blackberry, radish, dill, hazelnut shell and corn cockle. Both complete corn cockle shells implying processing and removal by hand (unusual) and highly fragmentary - indicating ground with corn.

Context (2011) Majority of organic remains fairly fine indeterminable with wood and bryophyte fragments not abundant. Surprisingly few seeds including fig, radishes, hazelnut shell but otherwise more ruderal to waste ground similar to context (2004).

Contexts (116) & (118) Peaty, coarse organic, probably remains of wood. Not possible to establish if it was structural material, wattling or natural river debris. Heather shoots and wood, mainly waterlogged but some charred. Typical arable weeds and ruderals.

Context (110) Very small amounts of organic material - mainly clinker and coal. No charred remains. Limited plant assemblage made up of seeds of hemlock, nettle and dead nettles with a selection of ruderal to weedy taxa. No strong indication of marine influence, dominant were all plants of nutrient-enriched ground that had lain around for some time.

Context (2019) Wood and fine organic flots with occasional internode of barley. Seeds not abundant most were from taxa characteristic of ruderal habitats with little evidence of grassland or arable cultivation.

Event 14279: 5-7 Woolmarket

Context (106) 'straw-like' material, twig and root fragments (<25mm), 'stems' and 'leaves' from mosses, unidentifiable plant fibres. Sample dominated by well-preserved waterlogged seeds and fruit of wild sp. Principally from waste areas, grasslands and crop fields (detail in report), culm frags of grass family <70mm, wood <80mm, bark <10mm, several leather frags <20mm, moderate-large number of beetle remains incl. woodworm and very well-preserved *Trichuris* egg indicating faecal content.

Context (107) 'straw-like' material, twig and root fragments, 'stems' and 'leaves' from mosses, cereal bran frags, numerous well-preserved waterlogged seeds and fruit representing various habitats but dominated by taxa of waste and open ground (detail in report), detached leaves of bog moss probably originated in peat, large no. of well-preserved insect remains ass. with decaying organic material, fresh and stagnant water, flies and mites, wood and twigs <10mm, undisaggregated organic lumps <20mm, phytolith frags, fungal spores, pollen grain spores, diatoms.

- 4.44 The suggestion of habitat types given above are as set out in each archaeological report. It is recognised, however, that plant taxa may be representative of more than one habitat type.
- 4.45 An assessment of the degree of organic preservation has not been possible as few archaeological reports contain detailed information about preservation. Some lack detailed information about the nature of organic remains present in waterlogged deposits and few have looked at insect remains.
- 4.46 Whilst some reports do contain detailed information about the survival of organic remains, they do not refer to specific context numbers, which has prevented precise location of these waterlogged deposits in the final dataset.
- 4.47 Other sites provide contextual information but no level information and were located at too great a distance from other known levels to precisely calculate their aOD level. These sites included:

- Event 38: Railway Station
- Event 13183: Berwick Bowling Green
- Event 13185: Ravensdowne Barracks
- BGS ID 17116: Marygate Bus Station

4.48 The following table summarises the results obtained from analysis of waterlogged deposits investigated to date.

Waterlogged Event	No of contexts with waterlogged material	Organic remains notes, eg stains, leather, wood, moss	Waterlogged seeds	Bone / shell	Type of intervention
		+ indicates amount of waterlogged remains from some (+) to abundant (+++)			
Event 30: 12-14 Eastern Lane	3	+++	+++	+++	Evaluation
Event 32: Marygate	10	+++	Not present	Present	Evaluation
Event 310: 104-106 Marygate	3	(+)	+	++(+)	Evaluation
Event 13268: Marygate	6	+++	+++	+++	Excavation
Event 13521: Marygate Streetworks	1	+	Not sampled	++	Watching brief
Event 13525: Tweeddale Press	2	+++	Not noted	Not noted	Borehole
Event 13877: New Quay	6	+++	++	+++	Excavation
Event 14279: 5-7 Woolmarket	2	+++	+++	++	evaluation

Table 7: Summary of waterlogged deposits

Intrusive influences on waterlogged deposits

4.49 There are a number of external influences which may have affected either the production or continuation of conditions that are conducive to the survival of waterlogged remains, such as wells and cellars. Through the identification and study of truncated deposits it was thought it might be possible to identify particularly damp areas of the town.

Wells (Fig. 11, Table 8)

4.50 There are historic references to the number of wells in the town. Many of the wells were recorded on the 1852 Board of Health map (Menuge and Dewar 2009, 14). The 1855 Town plan was studied as part of this project, in order to quantify the number and location of wells and assess any correlation with the location of known waterlogged deposits.

4.51 A GIS layer was produced showing the location of wells, pans, Ordnance Reservoirs and cess pits based on information the 1855 Town Plan and from archaeological investigations. Ordnance Reservoirs are likely to be 18th/19th century in date, while cess pools, by their very nature, are unlikely to have continued in use from the medieval or even post-medieval periods. While the

wells and pants are of unknown date, Wallace's Well and Bull Well were recorded with historic writing indicating that they were of some age.

- 4.52 The recorded wells are likely to represent only a fraction of the number of wells that were present across the town from the medieval period onwards. The pants, which are all located on roads or in the Barracks, are likely to be public water sources. The majority of wells are located within burgage plots in middle and northern part of the town and are therefore likely to represent private or group water supplies. The locations of these features were compared with the medieval and waterlogged deposits but no obvious correlations were identified.

	Historic well	Well	Draw Well	Pant	Ordnance Reservoir	Cess pool
1855 map	2	2	1	7	2	3
Archaeological events	2 medieval					1 medieval 1 post-med 1 undated

Table 8: Summary of known wells and cess pits (for locations see Fig. 11)

Cellars (Fig.11)

- 4.53 Previous archaeological investigations have shown that the foundations of 19th and 20th century structures in Berwick can be very shallow with a limited impact on earlier deposits (e.g. Event 13277: Tweeddale Press Buildings test pitting). In contrast, cellars have the potential for a much greater impact on the physical survival of archaeological remains and the ground conditions that are conducive to waterlogging.
- 4.54 Local knowledge in Berwick suggests that there is a range of cellars and basements across the town, including some of potential medieval date. Some cellars lie entirely below the present ground level, while others have been cut into the natural sloping topography.
- 4.55 A pilot study of cellars was carried out to see if it was possible to identify parts of the town where ground conditions are damp or which are prone to flooding; or alternatively to see if cellar construction is indicative of drier ground.
- 4.56 The pilot study was undertaken by volunteers from the Berwick Building Study Group in liaison with the project officer, but was not funded by this project. The study comprised a rapid survey of 27 streets and a more detailed recording programme of ten cellars.
- 4.57 The results of the study, combined with local knowledge, identified that some known cellars or basements were not visible from street level. As a result, the rapid street survey was only useful in identifying visible cellars and not as a predictive tool.
- 4.58 At this time not enough data has been gathered to draw any firm conclusions about the influence of cellars on the survival of waterlogged remains. The results of the study are discussed in detail in Appendix 3.

5 DISCUSSION

- 5.1 The project has collated a wealth of information that can be utilised both within the planning process and for future research. It is, however, primarily concerned with the waterlogged urban deposits within Berwick. As a result, the following discussion is confined to looking at the different factors and influences on the production and survival of waterlogged deposits across Berwick.
- 5.2 It is acknowledged that wet deposits in cut features are not true waterlogged deposits but, in Berwick, the extent and quality of preservation within them is a distinct feature of the town; it was therefore decided they should be included in this project.

Waterlogging and natural deposits

- 5.3 The extent of our knowledge of waterlogged deposits and their relationship to underlying natural deposits is entirely dependent upon the depth of investigation. In many cases, waterlogged deposits exceed the depth of the trench excavated, however, where the underlying deposits were revealed, waterlogged deposits were generally found to directly overlie natural clay.
- 5.4 While the water-retaining properties of clay are likely to have helped produce a perched water table conducive to waterlogging, natural clay deposits extended over an area wider than the recorded extent of waterlogging. Passmore has indicated that variability in sedimentary composition and structure of the till can be expected and may well contribute to variable permeability. The evidence does, however, appear to show that the presence of clay or till is not the only factor leading to waterlogging.
- 5.5 The free draining nature of natural sands and gravels that lie beneath waterlogged deposits in the Quayside area make it more likely that the waterlogging here can be attributed to changes in sea level and tidal fluctuations, rather than to the underlying geology.

Waterlogging and medieval deposits

- 5.6 Prior to this project the general perception was that Berwick had the potential to contain a large number of waterlogged deposits. The results have shown waterlogged deposits are commonly associated with rubbish pits and cut features and are therefore not true waterlogged deposits. This should not be a surprise given the combination of organic rubbish material degrading in pits, generally cut through natural clay; in effect, the pits act as water sumps. The organic material dumped in them has helped water retention, leading to the formation of an anaerobic environment, promoting retarded rates of decay.
- 5.7 There are, however, a number of waterlogged layers across the town, generally representing successive layers of soil accumulation. Some of these layers are associated with waterlogged soil-cut features such as ditches, pits and gullies. Where archaeological investigations do not exceed the depth of these layers, it remains unclear why they are waterlogged. It has not been possible to establish whether these waterlogged layers represent:
- localised conditions that are more conducive to waterlogging
 - up-cast fills from successive phases of deposition in waterlogged pits
 - other unidentified circumstances.

- 5.8 Instances of medieval midden layers have been recorded in a number of locations across the study area. These are largely focused in the eastern part of the town. The definition of these deposits as middens has been taken from archaeological reports and there may be similarities with other medieval deposits simply defined as layers. It was anticipated that middens might be waterlogged because of the organic material they contain but where they have been examined this does not seem to be the case. Only two examples of waterlogged medieval midden layers were found. Firstly, at Ravensdowne Barracks (Event 13185), towards the north-east of the town, which was excluded from the dataset due to insufficient level data. Secondly, at Dewar's Lane Granary (Event 13306: Trench 1), located close to the Quayside, where waterlogging may be accounted for by its intertidal location.
- 5.9 Waterlogged deposits are most likely to occur where the deposit is fine-grained, includes lots of plant material/dung, is compressed, or is permanently below the water table. The absence of waterlogging in the majority of medieval midden deposits in Berwick could be attributed to the absence of one or more of these factors. From the information included in archaeological reports, it was not possible to establish whether the rubbish deposited in pits, as opposed to middens, varied significantly. It was therefore not possible to establish whether the type of rubbish content in pits was more conducive to sustained waterlogging.
- 5.10 There is also the possibility that the dumping, spreading and movement of rubbish over a wider area across a midden enabled deposits to dry out or decay more quickly, therefore making sustained waterlogging more unlikely. As the archaeological investigations of midden deposits have been relatively small-scale, it is difficult to establish how far individual deposits spread and whether they represent a series of short episodes of dumping or larger homogenous episodes of dumping formed over a longer period of time.
- 5.11 In most cases, archaeological investigations did not exceed the depth of midden deposits. As a result, it was not possible to establish whether they directly overlay natural clay, earlier rubbish pits or other medieval layers. It was therefore not possible to establish how the deeper deposits influenced the waterlogging potential of the middens.
- 5.12 Our understanding of the waterlogging, or otherwise, of midden deposits and rubbish pits is likely to improve as more sites are excavated.

Waterlogging and post-medieval deposits

- 5.13 There is currently no evidence of waterlogged deposits in post-medieval contexts. There may be several reasons for this. Firstly, there are a number of waterlogged deposits which remain undated that could originate in the post-medieval period. Secondly, waterlogged post-medieval deposits may have been viewed in the past as less relevant than earlier remains, leading to a failure to fully record them. The consistent lack of waterlogged post-medieval deposits from the range of investigations undertaken across Berwick makes it more likely that the evidence reflects a genuine absence.
- 5.14 In order to try and establish why waterlogging does not appear to continue into the post-medieval period, a comparison was made between the medieval and post-medieval environments.

- 5.15 Natural clay deposits have been shown to be a contributing factor in the survival of waterlogged remains but also continue across the post-medieval settlement area. In addition, waterlogged medieval deposits have been shown to survive at shallow depths and therefore the depth of a deposit is not necessarily a contributing factor to the survival of waterlogged remains.
- 5.16 The main difference between the medieval and post-medieval archaeology is the nature of the deposits themselves. As stated in paragraphs 5.6 to 5.12, medieval period rubbish appears to be predominantly deposited in intercutting rubbish pits with some limited evidence of rubbish disposal in midden layers. There is a lot of evidence of waterlogging in the rubbish pits but not in the majority of midden layers. In the post-medieval period, rubbish disposal appears to be primarily midden-based.
- 5.17 There is the possibility that the post-medieval features and middens are cut into, or overlie deeper, medieval midden deposits. As these are rarely waterlogged, it follows that post-medieval midden layers above such deposits should be expected to drain equally well. In addition, any features cut through potential waterlogged medieval remains may well have improved drainage changing the water retention properties of the underlying archaeology. The absence of waterlogging in any of these features or layers would allow decay of any organic content to occur.
- 5.18 Once again, our understanding and interpretation of these deposits is likely to improve with future investigations.

Waterlogging and intrusive historic structures

- 5.19 The wells and pans recorded on the 1855 Town Plan may be located on the site of earlier, potentially medieval wells. However, with the exception of Bull Well and Wallace's Well, it cannot be definitely confirmed that any of the recorded wells are of any great antiquity. It is also likely that there were a number of earlier wells that were no longer in use in 1855 and hence not located on the map. While the known wells will undoubtedly provide an incomplete picture of the number of historic wells in Berwick, they do show the spread of wells across the town.
- 5.20 If wells are usually located to utilise an existing spring or water seepage, the location of the known wells could/should be of relevance within this project. The spread of wells correlates with the known extent of natural clay deposits but extends beyond the known extent of medieval and waterlogged deposits. The water-retaining qualities of natural clay deposits and the potential presence of springs are likely to be a factor in the survival of waterlogged remains. However, the evidence once again shows that this is more likely to be the case when combined with the presence of cut features that help to promote the localised water retention in the natural impermeable substrate.
- 5.21 The Berwick Cellar Survey has identified a number of cellars and shown that some known cellars have no visible signs at street level. This unfortunately means that although there is an apparent lack of cellars on some streets, the absence of a cellar cannot be confirmed based on a rapid street survey alone.
- 5.22 The initial detailed survey of specific cellars is providing a wealth of information. There are a variety of cellars across the town constructed with a variety of building materials, some spanning the footprint of the building, some just the

frontage. This variety may relate to the date, position or function of the cellar and it is likely that some of the cellars predate the later buildings that are constructed above them.

- 5.23 Six of the ten recorded cellars were described as being wet or prone to flooding. All of these cellars were located outside the area of recorded waterlogged deposits. The only cellar studied in detail within the waterlogged area was at 64-66 Bridge Street and was not described as damp. The nearest archaeological investigations in this area at Love Lane (Event 13335) in the east and 8-10 Bridge Street (Event 176) in the west also did not reveal waterlogged deposits.
- 5.24 In all other instances, there are no archaeological or geotechnical investigations located in proximity to known damp cellars that would help to establish whether waterlogged archaeological deposits are also located in these areas, or whether cellars have influenced the survival of waterlogged remains.
- 5.25 There does not appear to be an obvious correlation between the presence or absence of waterlogged deposits and cellars across the town. It is unclear whether this reflects a genuine lack of association or is due to the nature and location of the collected data both in the cellar survey and in archaeological and geotechnical investigations. It is likely that there are a much greater number of previously unidentified cellars containing additional information which may help our understanding and interpretation of this issue in the future.
- 5.26 Continuation of the cellar survey in the future may help to provide a more detailed understanding of the nature and survival of waterlogged remains and below ground archaeological deposits across Berwick. Notwithstanding this, the results of the study will be a very useful indicator of whether cellars may be present in comparable properties that are subject to assessment or even development in the future.

Modern development and evidence of dewatering of waterlogged deposits

- 5.27 As discussed in paragraph 4.23, waterlogged medieval deposits have been shown to survive directly beneath modern deposits, the shallowest recorded deposit being at a depth of only 0.12m bgl. In these cases, the modern deposits are represented by modern surfacing rather than features such as foundations cutting into the underlying deposits. There is therefore no direct evidence to date the impact or potential dewatering of deposits by intrusive development.
- 5.28 So far, archaeological mitigation of intrusive modern development has required the use of sleeved, continuous flight augured piles or grouped driven micro-piles, in line with English Heritage guidance on piling (Williams, Siddell and Panter 2007). The effectiveness of grouped micro-piles was tested at the Tweeddale Press Buildings/Berwick Workspace (Event 14480). It was shown to be effective at preserving archaeological remains in situ outside the area of grouped piles. The impact of piling will need to be considered on a site by site basis. The long-term effectiveness of these approaches in Berwick has yet to be tested.

Quality of waterlogged deposits

- 5.29 It was hoped that this project would enable a fuller understanding of significance and research potential of waterlogged deposits in Berwick by providing a range of information relating to the quality and location of surviving waterlogged remains.

- 5.30 Unfortunately there was not a sufficient level of detail included in many of the reports to enable wider conclusions to be drawn about the nature of the waterlogged deposits across the town. The shortcomings of previous reporting will be addressed for future projects by the inclusion of more detailed requirements relating to waterlogging in archaeological briefs (see Appendix 2).

Profiles (Figs 13, 14 & 15)

- 5.31 Profiles 1 and 2 summarise the build-up of deposits across the study area, highlighting the areas of medieval and waterlogged potential. Further investigations within the town will further add to the dataset and enable more detailed study in the future. Areas below the red line lie below the depth of investigations and are therefore conjectural.

6 RECOMMENDATIONS

Planning Guidance Note

- 6.1 As part of this project, a Planning Guidance Note (Appendix 1) has been produced for planners, developers and archaeological consultants and/or contractors detailing the results of the project, particularly in relation to waterlogged deposits and setting out an approach for dealing with those deposits within Berwick.

Amending archaeological briefs for Berwick-upon-Tweed

- 6.2 Northumberland Historic Environment Record (HER) will continue to augment the data spreadsheet produced for this project with information from future archaeological projects. It is therefore important that the archaeological reports provide an appropriate level of information arranged in an accessible way for data input.
- 6.3 This will ensure that the monitoring of the quality of buried urban archaeological deposits is on-going and the information is fed into the existing deposit model in line with the regional research framework recommendation SU15: *Monitoring of the quality of buried urban archaeological deposits should be on-going. These data should feed into any deposit models* (Petts 2006, 207).
- 6.4 The requirements for future briefs have been detailed in Appendix 2.
- 6.5 Where re-usable piling is required as part of an archaeological mitigation strategy, the mitigation briefs will be amended to include the requirement for an appendix to be included with the report detailing the location and load bearing capacity of the piles.

Additional research areas

- 6.6 The results of current and future archaeological investigations will continue to add to our understanding of the waterlogged deposits of Berwick. The nature and location of that information will, however, be entirely reliant on the location of proposed development sites and the depth of groundworks.
- 6.7 In order to gain a comprehensive waterlogged urban deposit model of Berwick and a more detailed understanding of the quality and significance of remains

across the town, an extensive geotechnical study would be required taking in street frontages and back plots across the whole town. This work would need to be carried out with direct involvement from an archaeologist and a sedimentologist both in the data collection and interpretation process. The work would also need to be subject to sampling and the specialist analysis of any waterlogged organic deposits that are revealed and any datable artefacts.

- 6.8 The Great Yarmouth Deposit Model provides a useful potential template for this type of borehole survey (Norfolk Historic Environment Service, 2007-2013). In that project, the boreholes were located in three dimensions and were drilled with a Dando Terrier window sampler, a compact, self-powered drilling rig ideal for working within a town. The sampler collected successive 1m length samples of soil in tubes, which were sealed, and taken for laboratory analysis. In the laboratory, the tubes were examined, distinct layers and the location of datable evidence was noted and the depth of the top and bottom of each deposit recorded. The different layers in each borehole log were matched up to form a series of layers over the wider area.

7 CONCLUSIONS

- 7.1 The project has succeeded in achieving most of its aims and objectives, although it has not been possible to achieve them all. This is largely due to insufficient good quality data and the small number of investigations with well-recorded and documented waterlogged deposits. The aims and objectives are summarised in Table 9 below:

Aims and Objectives	Achieved/Not Achieved
Assess the survival of vertical stratigraphy and to identify, locate and establish the character of waterlogged deposits and the degree of organic material preservation	Largely achieved except the assessment of the degree of organic preservation was not possible owing to the limited number of archaeological reports containing this information
Assess whether there is any correlation between the survival and character of waterlogged deposits and the nature of underlying geology or the date of and nature of archaeological deposits	See paragraphs 5.3 – 5.5
Assess factors influencing the survival of waterlogged deposits and the effects of development and dewatering	See paragraphs 5.27 – 5.28
Gain a more detailed appreciation of the development of the urban structure	Achieved
Aims and Objectives	Achieved/Not Achieved
Assist in developing the appropriate responses to development management proposals where waterlogged organic deposits in Berwick are anticipated	See Appendix 1: Planning Guidance Note and Appendix 2: Amendments to development management briefs
To develop a simple methodology to ascertain the degree of organic preservation	See Table 7: Summary of waterlogged deposits

Create a predictive GIS-based urban deposit model for assessing the location of waterlogged deposits, utilising archaeological and geotechnical data	Not achieved: insufficient good quality data currently available
Enhance the HER by enabling future data to be incorporated into a deposit model	The deposit model is part of the HER
Supplement data gathered during the Extensive Urban Survey	Acquisition of borehole data and cellar survey
Identify areas in Berwick where additional information is still required to provide a more complete data model	See paragraphs 6.6 and 6.7, Appendix 1: Planning Guidance Note and Appendix 2: Amendments to development management briefs
Develop a strategy to promote the preservation of waterlogged deposits for developments carried out as part of the planning system	See Appendix 1: Planning Guidance Note
Understand the distribution and significance of waterlogged deposits	Not true waterlogged deposits, see paragraph 5.2
Develop appropriate mitigation strategies for protection and recording of waterlogged deposits	See Amendments to development management briefs (Appendix 2)
Get a fuller understanding of significance and research potential of waterlogged deposits	Not achieved because of shortcomings in many archaeological reports, see paragraphs 5.29 and 5.30
Develop the North East Regional Research Framework recommendations SU14 and SU15	Achieved
Prepare a guidance note for planners, developers and archaeological consultants/contractors	Achieved, see Appendix 1: Planning Guidance Note

Table 9: Summary of Aims and Objectives achieved or not achieved

- 7.2 The Berwick Urban Deposit Model project has shown that waterlogged deposits are largely confined to medieval rubbish pits cut into underlying natural clay deposits or are located below the water table next to the estuary. The nature and/or depth of overlying deposits do not appear to be material factors in the survival of waterlogged archaeological remains with instances of waterlogged deposits surviving at a depth of only 0.12m below current ground level.
- 7.3 The results of data analysis have shown that waterlogged deposits and archaeological remains of specific periods are not present at a consistent depth across Berwick. While archaeological investigations on adjacent sites have shown that waterlogged and/or medieval deposits can be located at a comparable depth irrespective of the overlying deposits, the difficulty lies in predicting the depth of deposits over a wider area. The current ground level varies significantly across the study area due to both topography and the build-up or truncation of deposits.
- 7.4 The project has also highlighted shortcomings in the reporting of organic preservation in some archaeological reports. To remedy this, a revised archaeological brief has been drawn up for use on developments in Berwick which includes more detailed requirements when waterlogged deposits are encountered (see Appendix 2).
- 7.5 The variation in the current ground level, combined with the variation in depth of archaeological deposits, means that although the current dataset contains a

wealth of information it should not be used as a predictive GIS-based urban deposit model. In order for a predictive model to be developed, a comprehensive programme of geotechnical sampling would be required across the town with archaeological and sedimentological specialists involved in data collection, analysis and interpretation.

- 7.6 Although it may not yet be possible to utilise these results predictively, the collation of all the existing information has helped to gain a more detailed understanding of the development of the urban structure of Berwick and the factors that influence the waterlogging of deposits within the town. The deposit model will continue to develop as new archaeological investigations are carried out providing a greater understanding of the urban waterlogged deposits of Berwick, their extent, formation and significance.

8 BIBLIOGRAPHY

- Beresford, M, 1967. *New Towns of the Middle Ages* (Lutterworth Press, London)
- Davis, M J, Gdaniec, K L A, Brice, M and White, L, 2004. *Mitigation of construction impact on archaeological remains*.
- Ellison, M, 1976. "An archaeological survey of Berwick-upon-Tweed" in Clack, P A G and Gosling, P F, *Archaeology in the North*, Report of the Northern Archaeological Survey (147-64)
- English Heritage, 2006. *Management of Research Projects in the Historic Environment: the MoRPHE project managers guide*
- English Heritage, 2012. *The National Heritage Protection Plan Action Plan 2011-15: Revision 1: September 2012 – March 2015*
- Heathcote, J, 2012. *Strategy for Water and Wetland Heritage*. English Heritage Thematic Research Strategies
- Marlow, J and Williams, A, 2008. *Berwick-upon-Tweed. Northumberland Extensive Urban Survey*
- Menuge, A with Dewar, C, 2009. *Berwick-upon-Tweed, Three places, two nations, one town*. (English Heritage)
- Norfolk Historic Environment Service, 2007-2013. *The Great Yarmouth Deposit Model* <http://www.heritage.norfolk.gov.uk/record?tnf382> accessed on 1 March 2013
- Petts, D, 2006. *Shared Visions: The North East Regional Research Framework for the Historic Environment*
- Williams J, Siddell, J and Panter I, 2007. *Piling and Archaeology. An English Heritage Guidance Note*

Maps

c.1580 "The true description of her Majesties towne of Barwick" [British Library Board Cotton Augustus I, II, f14)

1822 Wood's Town map

1855 Ordnance Survey Town Plan (surveyed 1852, engraved 1855, Scale 1:528)

9 GAZETTEER OF INVESTIGATIONS USED IN THE PROJECT

Archaeological investigations

- Event 25: Railway Station boreholes included in desk-based assessment (2000)
- Event 26: Evaluation Berwick Quay Walls (1998)
- Event 27: Evaluation Low Greens (2000)
- Event 28: Watching brief New Library and Social Services Centre (Phase 1 Trenches 4 & 5, Phase 2 Trench 6, Phase 3 Test pit 1, 2, 3, 8) (2000)
- Event 30 & 31: Evaluation 12-14 Eastern Lane (1997)
- Event 32: Evaluation Marygate (Trenches A, C, D & E) (1996)
- Event 35: Berwick Quayside watching brief (1994)
- Event 36: Watching brief Police Station (2000)
- Event 37: Evaluation 42-44 Castlegate (2000)
- Event 38: Evaluation Railway Station (trench by booking office, sample 2 -adjacent to booking hall - Hole No.BH1NE) (2000)
- Event 46: Evaluation Golden Square (2000)
- Event 171 & 173: Watching brief Brucegate (Trenches 1 & 2, N/W and S/E part of site) (2001)
- Event 176: Borehole/Test pit survey of a gap site at Bridge Street (2000)
- Event 202: Watching brief 21-23 Ravensdowne (2002)
- Event 221: Watching brief Railway Station reorganisation of car park (2001)
- Event 223: Evaluation Trinity Hall (2001)
- Event 225: Evaluation Land between Chapel Street and the Parade (2001)
- Event 226: Evaluation 11 Chapel Street (2000)
- Event 227: Evaluation Holy Trinity Middle School (2000)
- Event 231: Watching brief Brucegate (pit 2, 3 & 4) (2002)
- Event 253: Watching brief Brucegate (ground reduction at S end of site) (2002)
- Event 298: Evaluation 4-8 Woolmarket (2002)
- Event 300: Evaluation Palace Green (2001)
- Event 310: Evaluation 104-106 Marygate (2000)
- Event 326: Preliminary evaluation Berwick Railway Station (2002)
- Event 346: Evaluation 26-30 Tweed Street (2002)
- Event 365: Evaluation Railway Station Car Park (2003)
- Event 10584: Evaluation Brucegate (1999)
- Event 13180: Watching brief Railway Station (2003)
- Event 13182: Watching brief during sewerage improvements Railway Station Car Park (1998)
- Event 13183: Watching brief during sewerage improvements Berwick Bowling Green (only 2 depth measurements so included in dataset) (1998)
- Event 13186: Watching brief during sewerage improvements William Leith Building, Pier

Road (only 2 depth measurements so included in dataset) (1998)

Event 13188: Watching brief Love Lane (2003)

Event 13230: Evaluation Land next to Tintagel House (1997)

Event 13231: Watching brief during Ground investigation Dewar's Lane Granary (2004)

Event 13232: Evaluation Ravensdowne Barracks (1997)

Event 13233: Excavation at 12-14 Eastern Lane (1998)

Event 13234: Watching brief Railway Station reorganisation of car park (2002)

Event 13235: Watching brief Trinity Hall (2002)

Event 13268: Excavation Marygate (1999)

Event 13277: Test pitting Tweeddale Press (2004)

Event 13306: Evaluation Dewar's Lane Granary (2004)

Event 13335: Watching brief Love Lane (2004)

Event 13336: Watching brief on Golden Square (2004)

Event 13503: Evaluation Bankhill (2005)

Event 13521: Watching brief Marygate area (2004)

Event 13524: Evaluation Tweeddale Press (2004)

Event 13525: Watching brief on boreholes Tweeddale Press (2005)

Event 13573: Watching brief Railway station (2004)

Event 13605: Excavation Eastern Lane (2005)

Event 13611: Evaluation 119-125 Marygate (2005)

Event 13670: Watching brief 13-15 Coxon's Lane (2006)

Event 13674: Evaluation Berwick defences (Trenches 2, 3 & 6) (2006)

Event 13731: Evaluation 55 Hide Hill (2006)

Event 13732: Evaluation Former playhouse cinema (2006)

Event 13840: Watching brief 5 Ravensdowne (2006)

Event 13847: Watching brief Quayside walls (1995)

Event 13877: New Quay excavation and watching brief (1996)

Event 13889: Archaeological test pitting 77 Marygate (2007)

Event 13910: Evaluation to the rear of the King's Head, 50-56 Church Street (2007)

Event 14003: Excavation 119-125 Marygate (2007)

Event 14016: Evaluation to the rear of the King's Arms, Hide Hill (2008)

Event 14206: Evaluation to the rear of 59 Low Greens (2008)

Event 14249: Evaluation Blackburn and Price Garage, Silver Street (2007)

Event 14279: Evaluation 5-7 Woolmarket (2008)

Event 14340: Watching brief to the rear of 71 Ravensdowne (2009)

Event 14345: Borehole survey Walkergate (1977)

Event 14480: Walkergate Excavations (2006)

Event 14624: Excavations at the junction of Walkergate and Coxon Lane (1974)

Event 14641: Archaeological monitoring John Dewar's Granary development (2010)

Event 14682: Evaluation at 76 Ravensdowne (2010)

Event 14689: Watching brief during utility work on Railway Street (trial pits 1, 2, 3 & 7)
(2010)

Event 14705: Watching brief at the vicarage and parish centre (1993)

Event 14707: Evaluation at 2 Chapel Street (2006)

Event 14949: Watching brief, Railway Street (trial pits 1, 2, 3, 7, 8 & 9) (2011)

Geotechnical investigations

BGS ID 12467: Main Drainage and Sewage disposal (BH1, 14, 15, 16, 19, 20, 21, 55)
(1971)

BGS ID 13406: Berwick Swimming baths site C (Boreholes 5 & 6) (1967)

BGS ID 27894: Berwick Quayside north point harbour (borehole 1a & 2a) (1991)

Borehole ID BH1 & 1a: Palace Green borehole (2001)

BGS ID 736729-736730: Berwick Bridge (5 Pillar no.2 & boreholes 6 & 7 Pillar No. 2
(1922)

BGS ID 736670-736672: Scots Gate Berwick (1, 2 & 2a) (1974)

BGS ID 736724-736725: Berwick Bridge (1 pillar no.2 & 2 pillar no.2) (1922)

BGS ID 736732-736733 & 736736: Berwick Harbour (1, 2 & 5) (1922)

BGS ID 17714334-17714335: Maltings Arts Centre, Berwick (BH1 & 2) (1987)

BGS ID 18848417-18848418: New Quay Walls and associated works, Tweed Estuary (1
& PR3) (1996)

BGS ID 18848421-18848452: New Quay Walls and associated works, Tweed Estuary
(PR4, TP13, 3A, 4, 3, TP2, 5, TP3, TP14, PR5, TP12, 6, TP1, 7, TP8,
TP10, TP9, 16, 11, TP11, 9, 10, TP4A, TP4B, 13, TP15B, TP15, 12, TP5,
TP6, 14 & 15) (1996)

BGS ID 18849623 & 18849625 & 18849627: New Quay Walls and associated works,
Tweed Estuary (4A, 4B & 4C) (1996)

BGS ID 736697-736699: Berwick Quayside (BH1, BH2 & BH3) (1991)

BGS ID 27784: Northern Rock 6-8 Hide Hill BH2 (1993)

BGS ID 21535: 60-68 Marygate BH5 (1974)

BGS ID 16620: 53 Ravensdowne (Boreholes 1 & 2, probe hole 1, 2, 3 & 4) (1997)

BGS ID 25940: Old Library Building (1988)

BGS ID 17116: Marygate bus station (BH 4) (1996)

BGS ID 21535: 60-68 Marygate (BH1, 2, 3, 4 & 5) (1974)

BGS ID 27784: Northern Rock 6-8 Hide Hill (BH1 & 2) (1993)

BGS ID 27894: Proposed New Quayside Wall & Ground Anchors, Berwick River (BH4, 5
& 6) (1993)

Sites with insufficient data to use in the computer model

Event 28: Watching brief New Library and Social Services Centre (Phase 1 Trench 1, 2 &
3, Phase 3 Test pit 4, 5, 6, 7, 9) (2000)

Event 32: Evaluation Marygate (Trench B, parts of E) (1996)

Event 38: Evaluation Railway Station (sample 1 island platform - Hole No IP1SE, lift shaft (2000)

Event 171 & 173: Watching brief Brucegate (N/E and S/W part of site) (2001)

Event 231: Watching brief Brucegate (pit 1) (2002)

Event 253: Watching brief Brucegate (ground reduction at N end of site, lift shaft) (2002)

Event 13181: Watching brief during sewerage improvements Castle Vale residential home (1998)

Event 13183: Watching brief during sewerage improvements Berwick Bowling Green (1998)

Event 13184: Watching brief during sewerage improvements The Parade (1998)

Event 13185: Watching brief during sewerage improvements Ravensdowne Barracks (1998)

Event 13186: Watching brief during sewerage improvements William Leith Building, Pier Road (1998)

Event 13187: Watching brief during sewerage improvements Love Lane/Bridge Street (1998)

Event 13231: Watching brief during Ground investigation Dewar's Lane Granary (TP/BH 4) (2004)

Event 13268: Excavation Marygate (a lot of data had no depth in report) (1999)

Event 13674: Evaluation Berwick defences (Trenches 1, 4, 5 & 7) (2006)

Event 13889: Archaeological test pitting 77 Marygate (test pit 4) (2007)

Event 14632: Watching brief on a flight of steps, Pier Road Maltings (2010)

Event 14641: Archaeological monitoring John Dewar's Granary development (recording within the granary incl. lift shaft) (2010)

Event 14689: Watching brief during utility work on Railway Street (trial pits 4, 5 & 6) (2010)

Event 14949: Watching brief, Railway Street (trial pits 4, 5, 6 & 10) (2011)

BGS ID 736725-736728: Berwick Bridge (2 pillar no.2 (partially), 3 pillar no.7, 4 pillar no.7, 4a pillar no.7 (1922)

BGS ID 736732-736736: Berwick Bridge (BH3, 4, 5 partially) (1922)

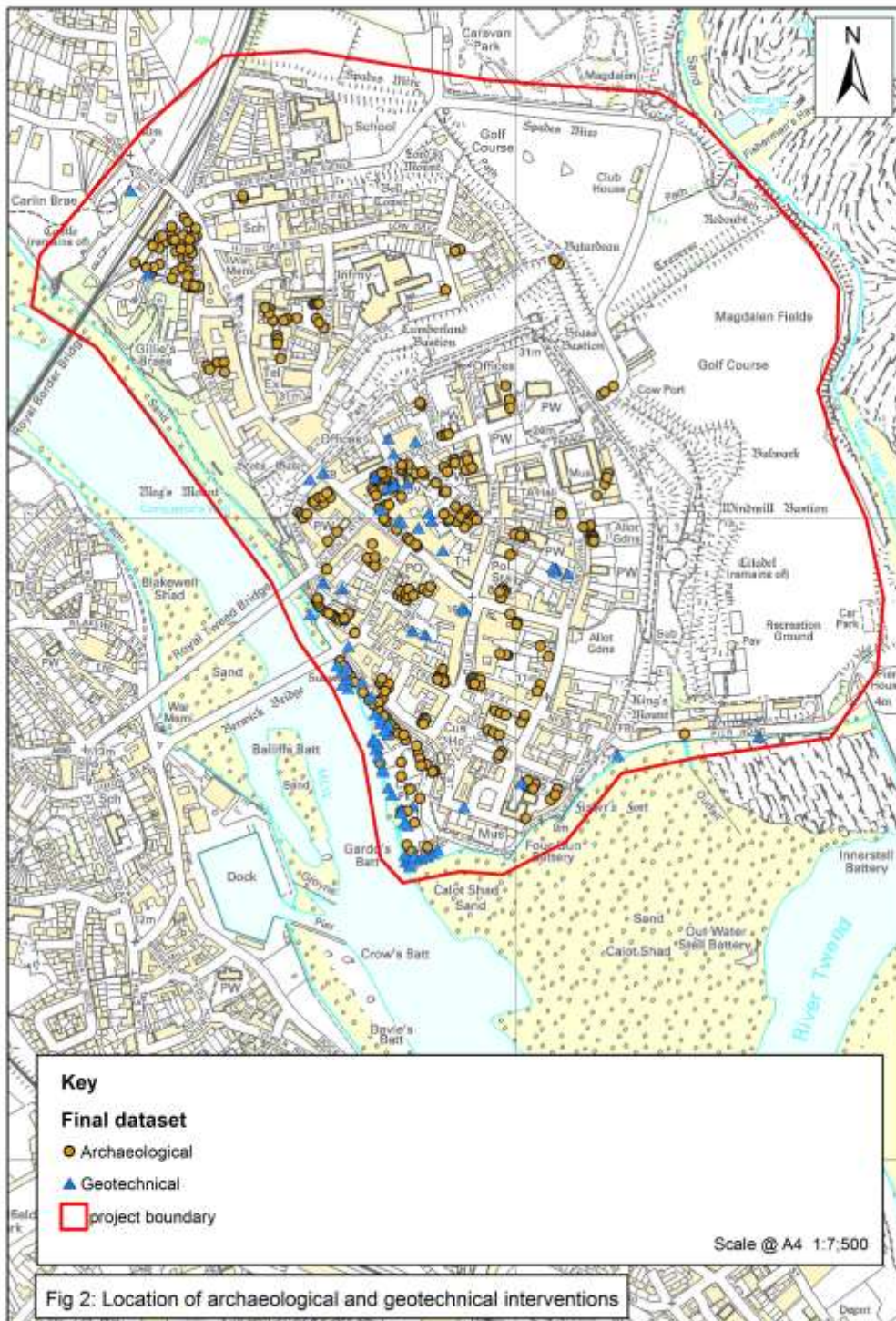
BGS ID 17714336-7: Maltings Arts Centre, Berwick (BH3 & 4) (1987)

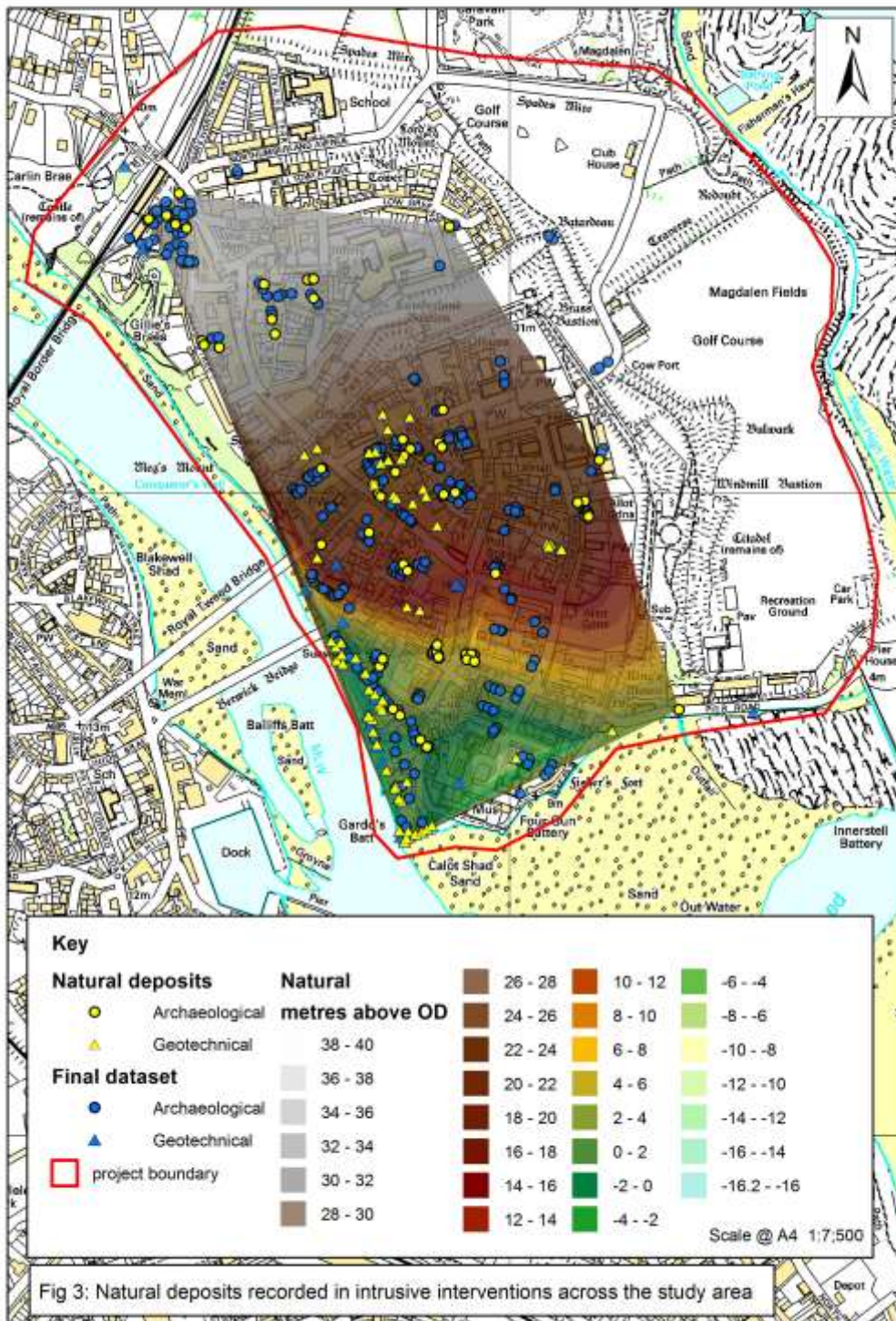
BGS ID 736661: Simpsons Maltings Berwick (1903)

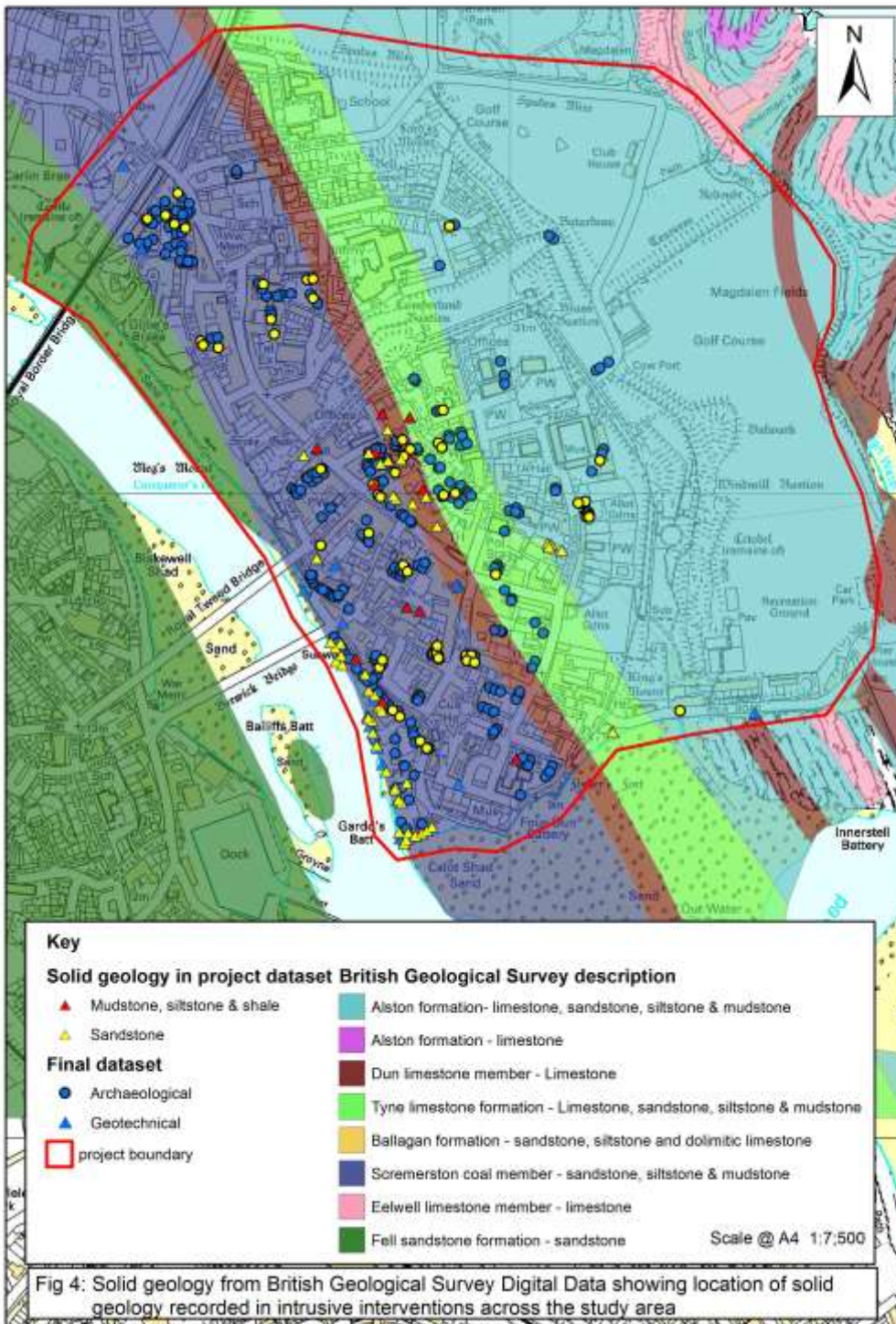
Borehole ID RBH1a & 3: Palace Green (2001)

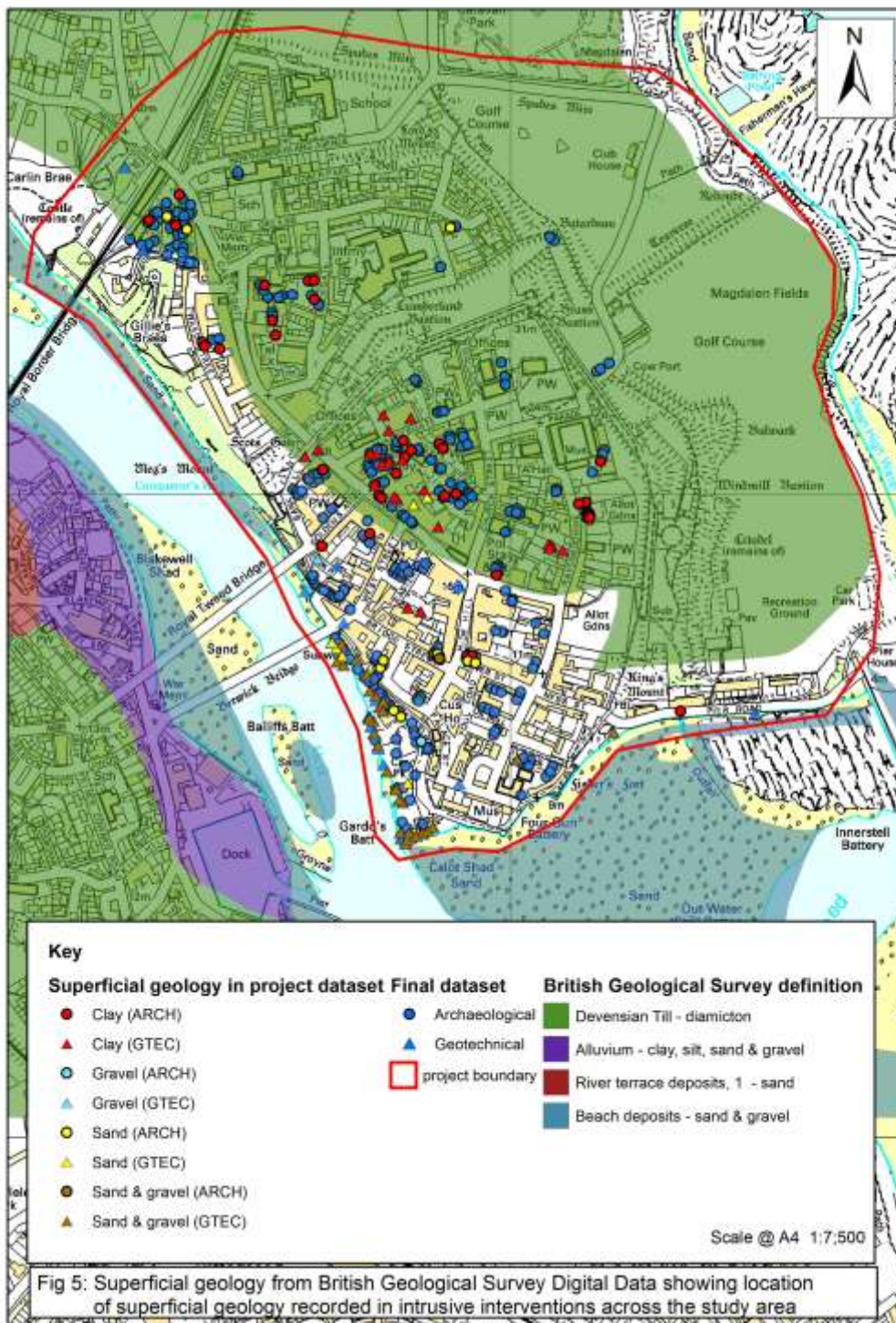
BGS ID 17116: Marygate bus station (BH1, 2, 3 & 5) (1996)

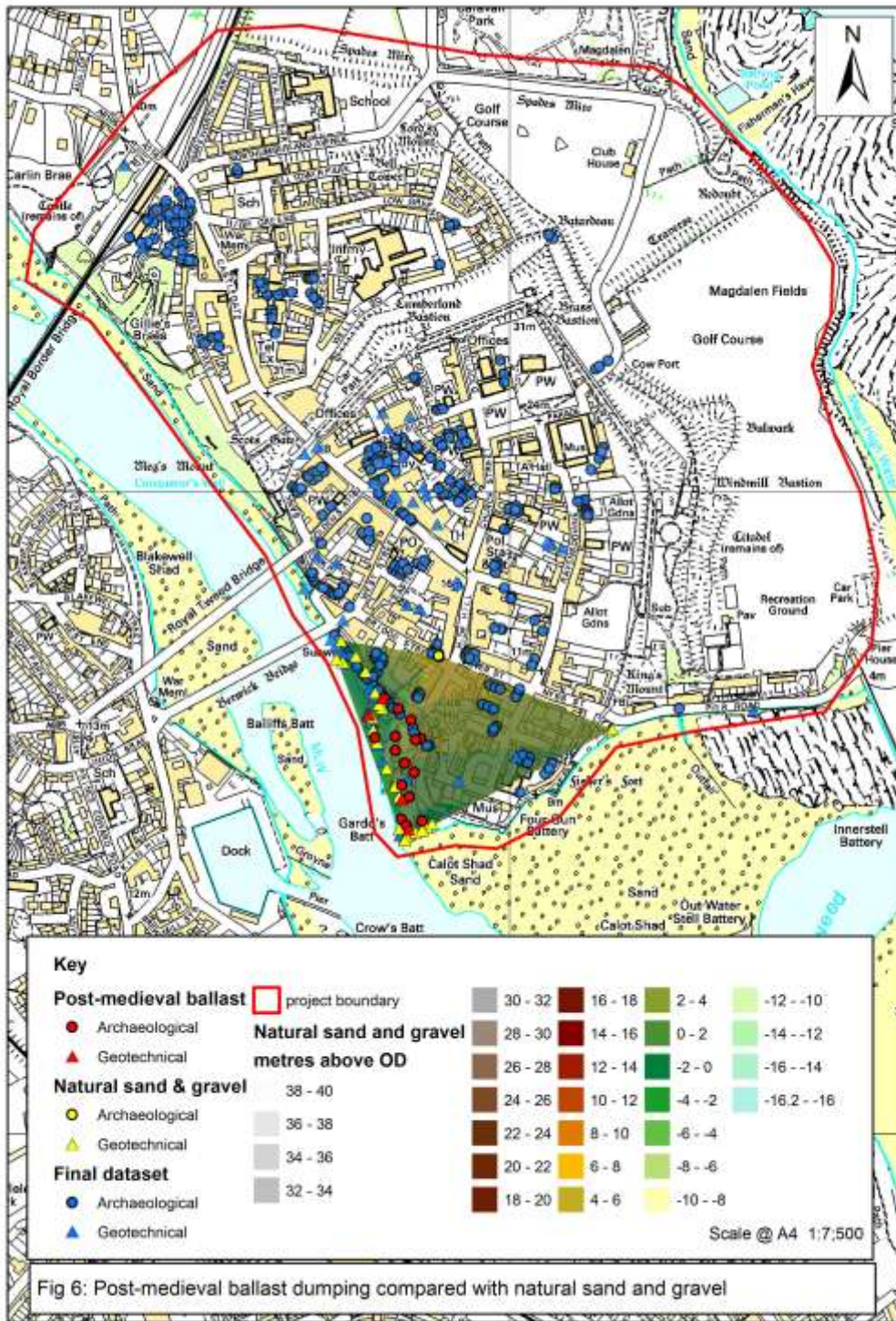
BGS ID 25116: Castle Vale House (BH1, 2, 3 & 4) (1984)

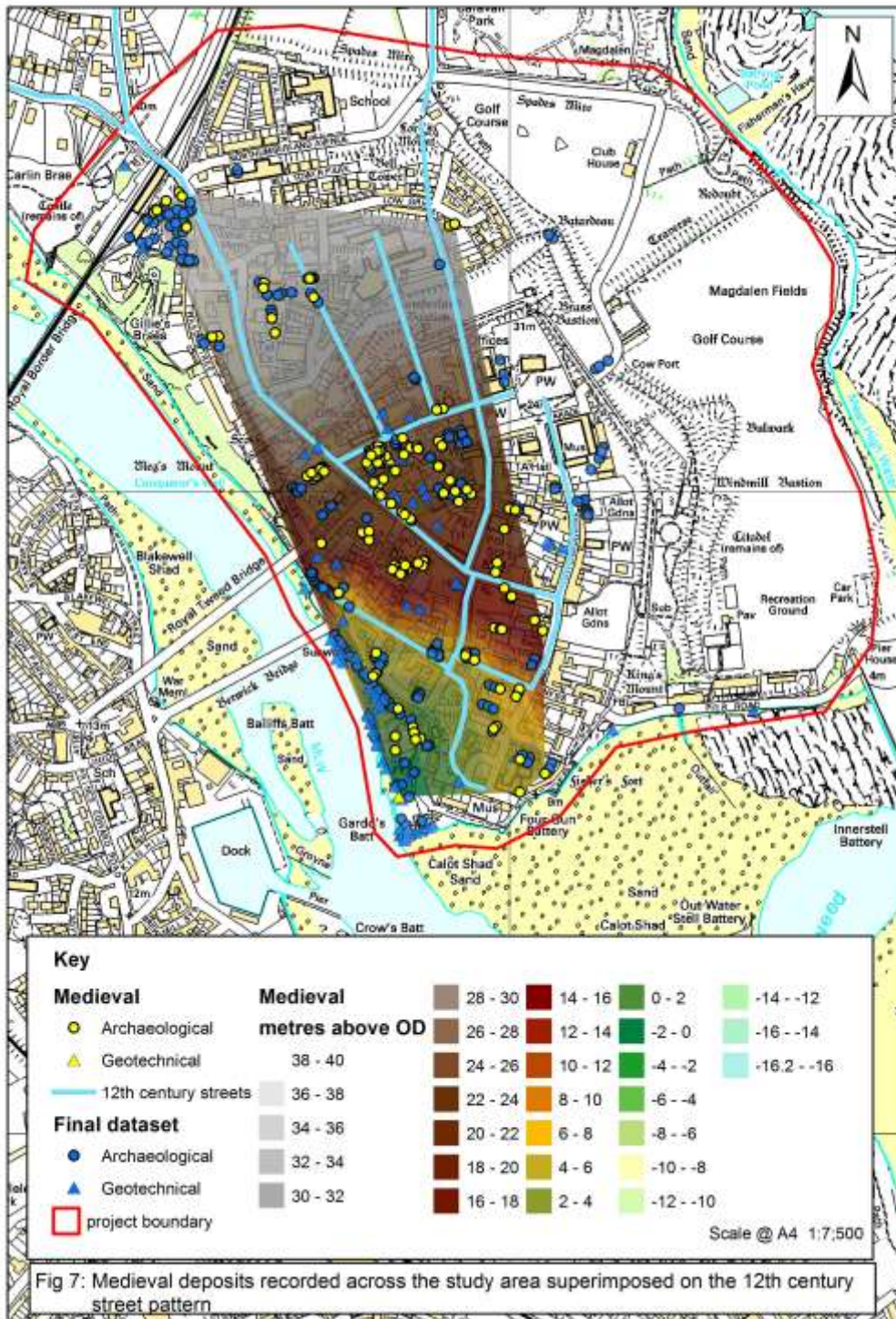


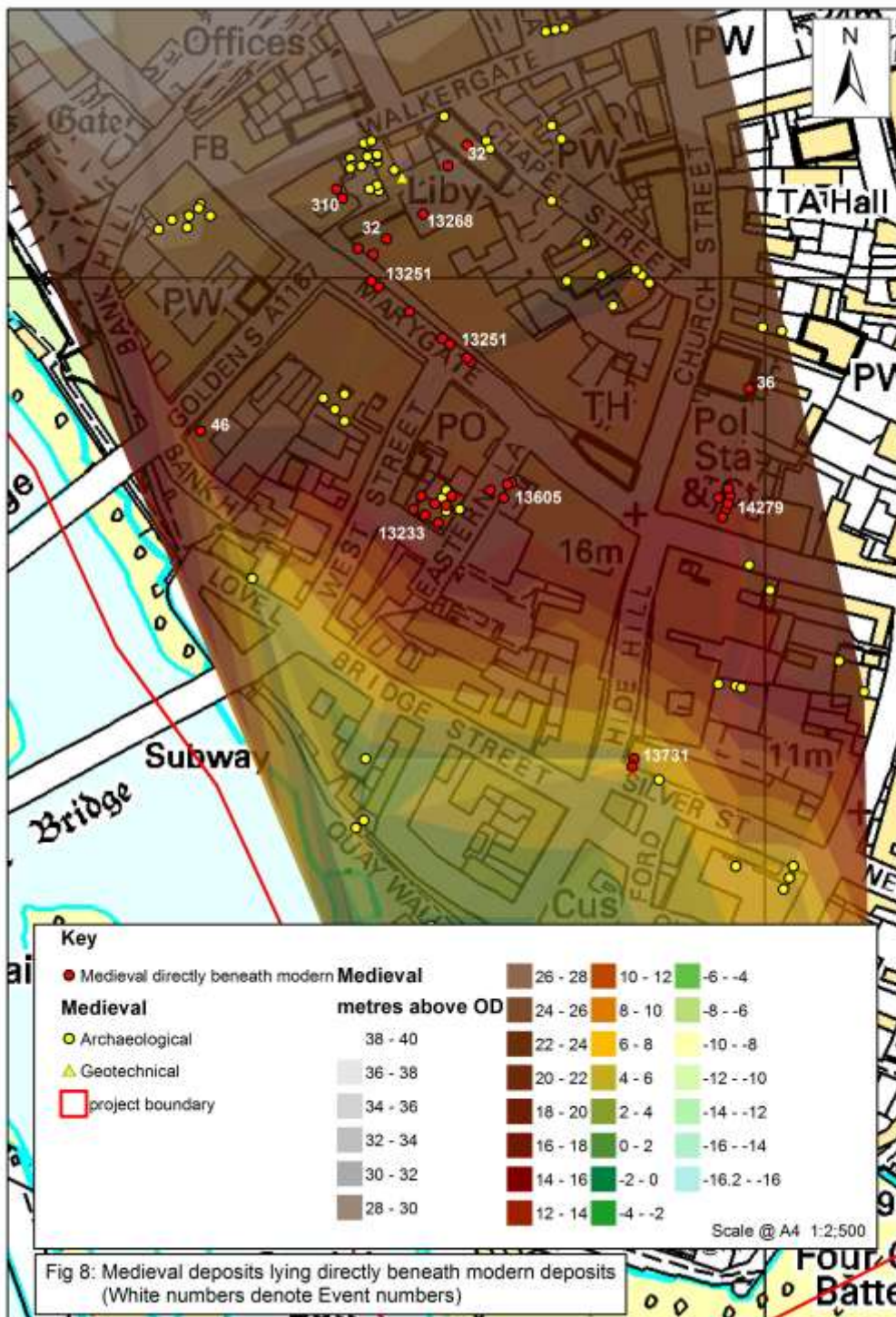


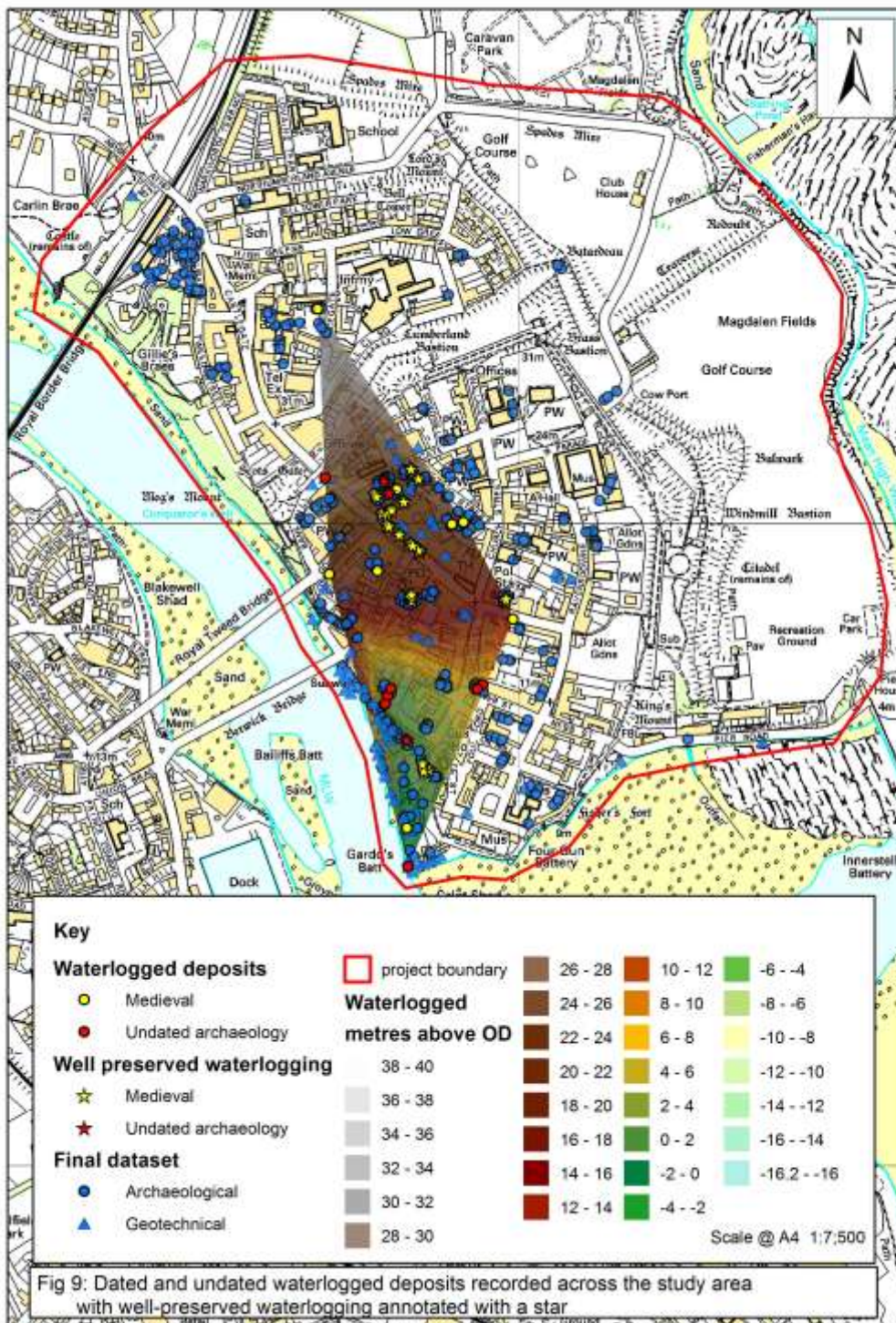












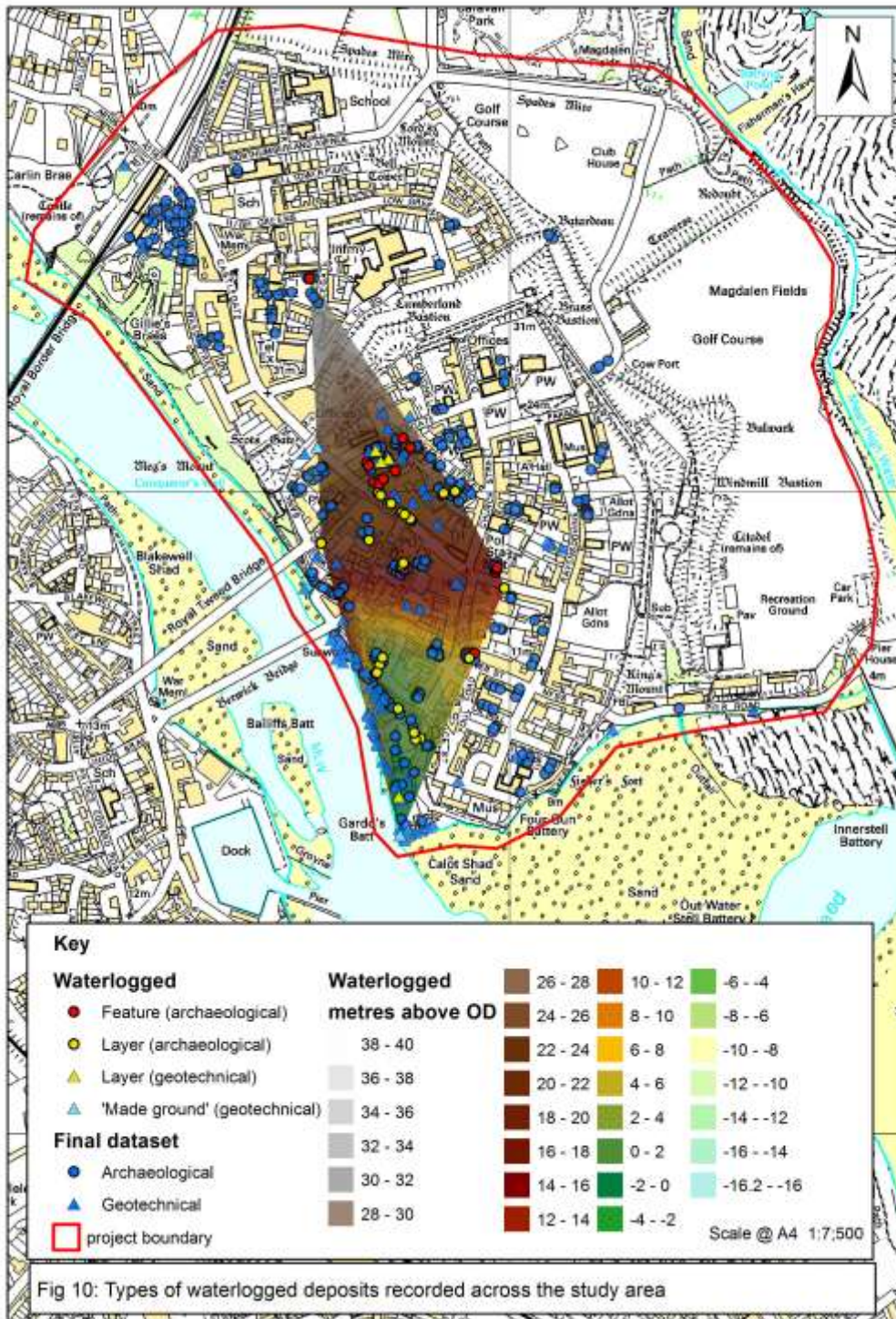
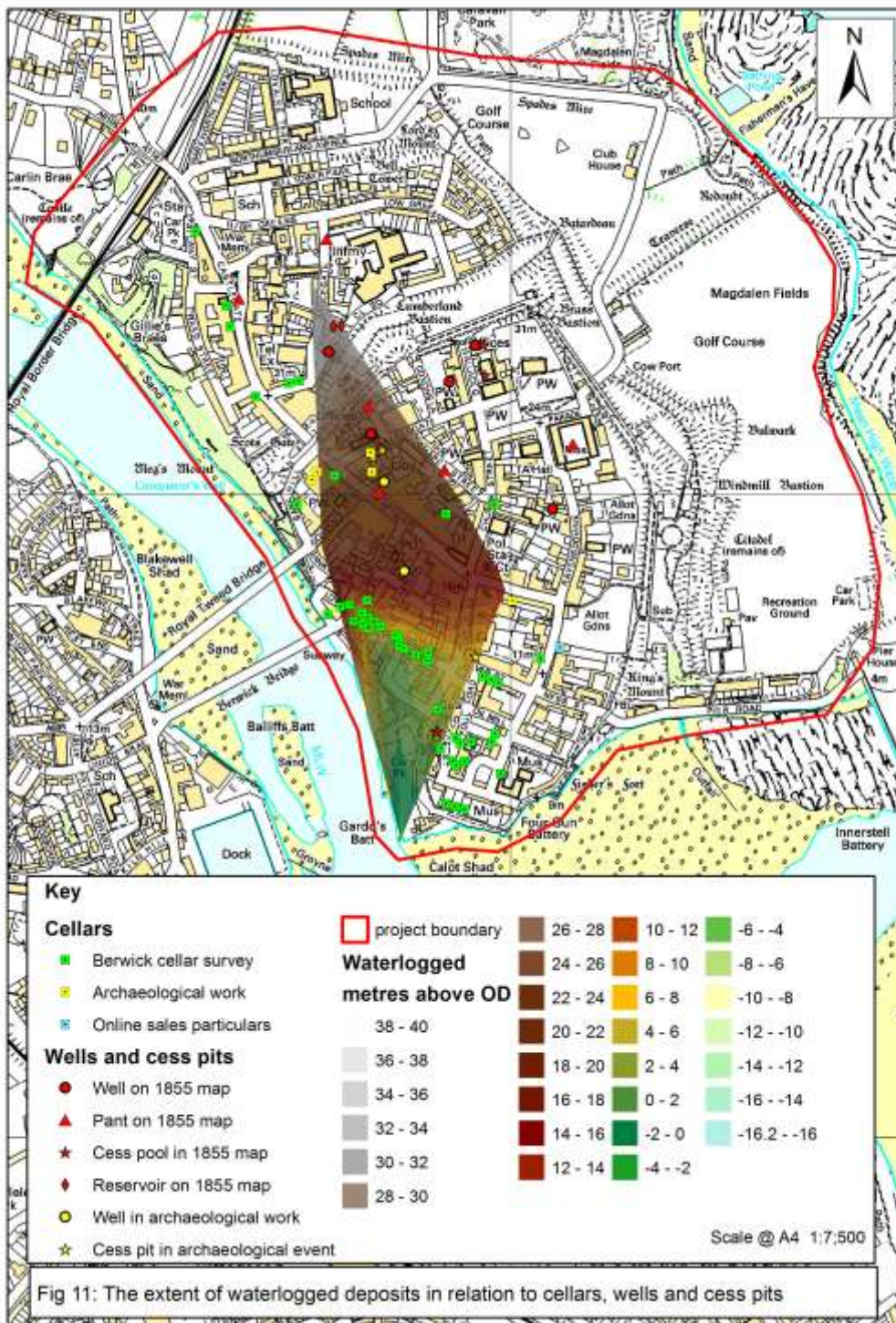
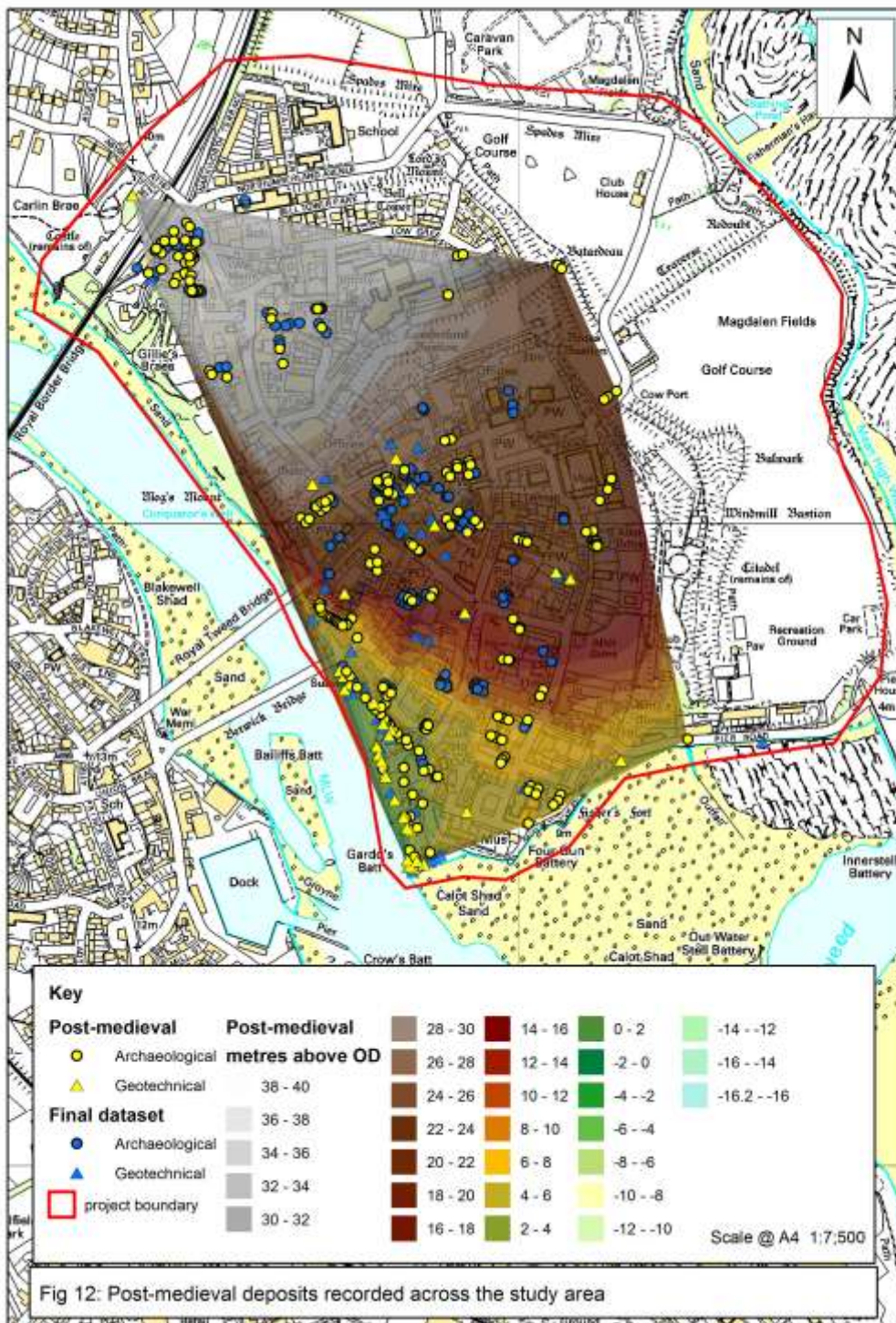
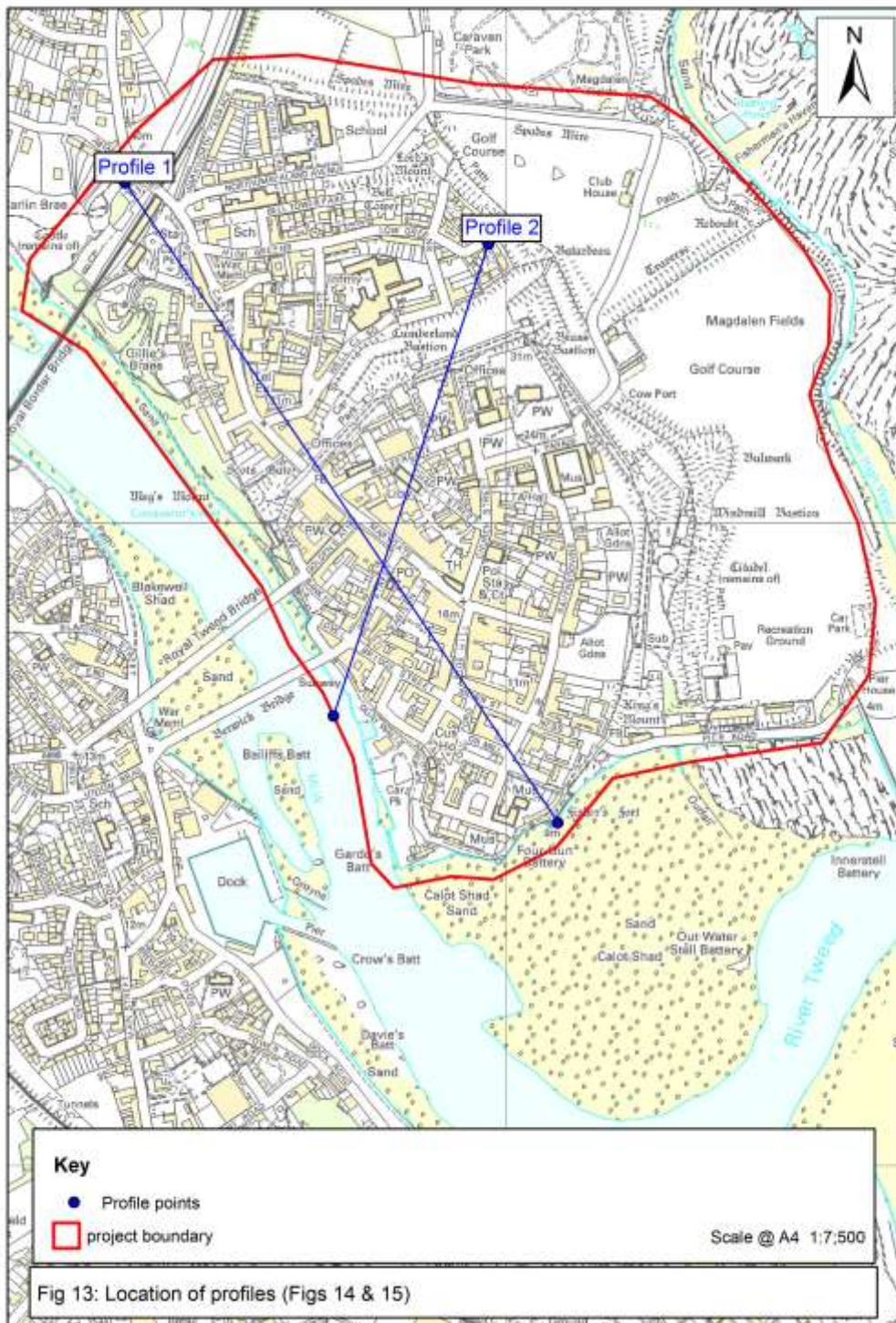


Fig 10: Types of waterlogged deposits recorded across the study area







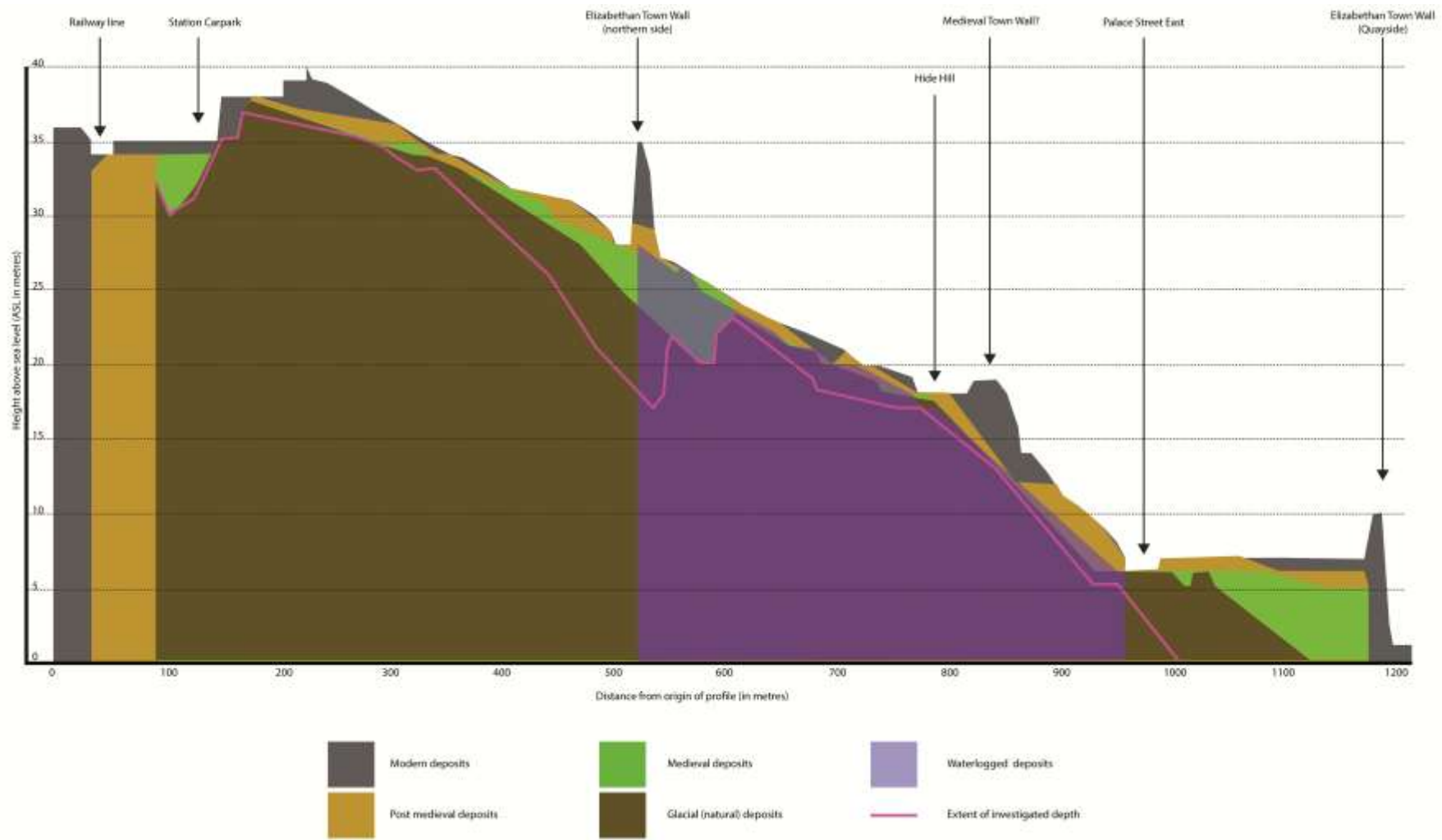


Fig 14: Profile 1 from train station car park (NW) to Palace Green (SE)

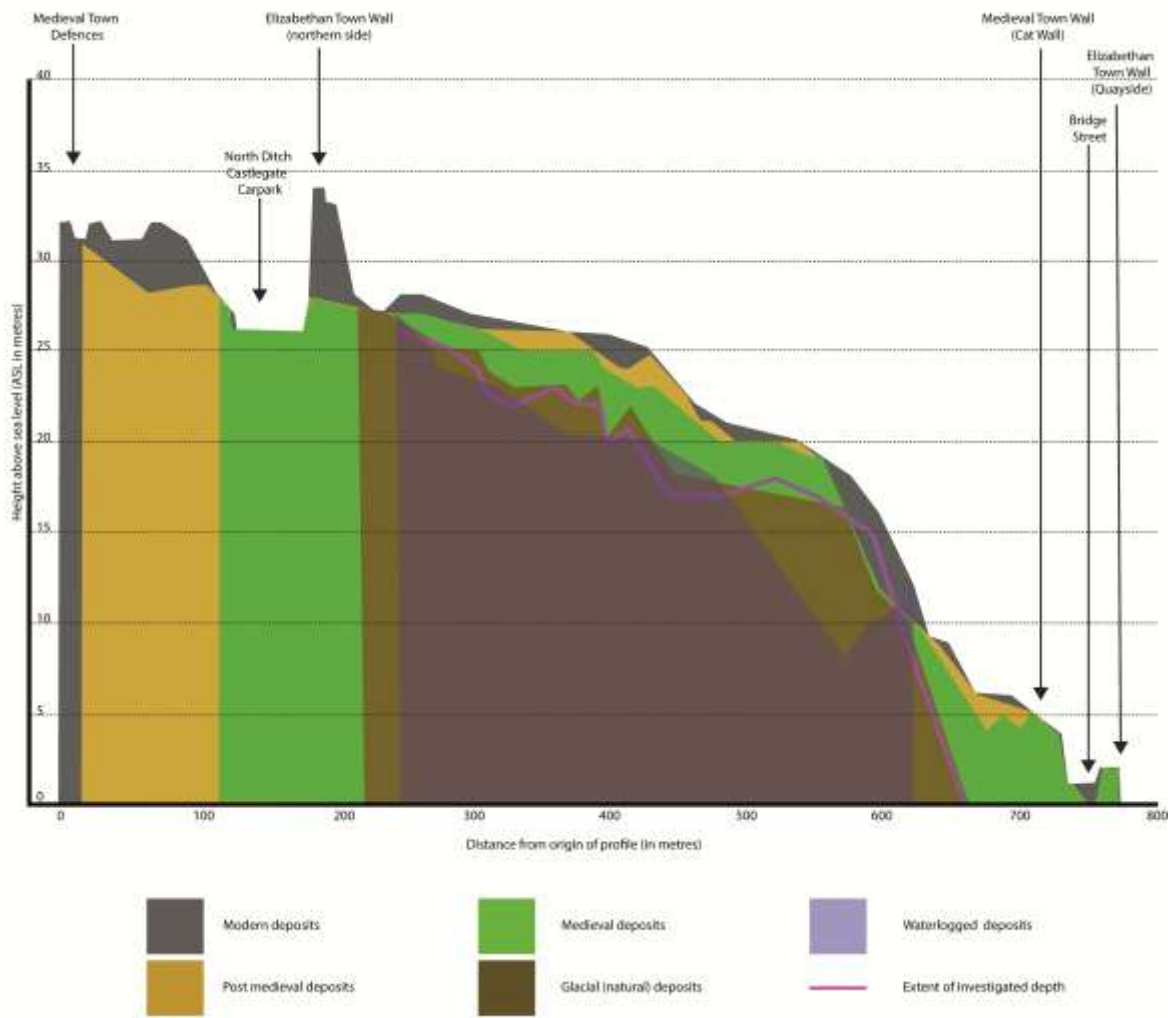


Fig 15: Profile 2 from Low Greens (NE) to south of Berwick Bridge (SW)

APPENDIX 1: Archaeology Planning Guidance Note

1 INTRODUCTION

- 1.1 Archaeological investigations across Berwick show that it has been the focus of settlement since at least the 12th century which has resulted in a significant build-up of deposits across the town. Berwick is of particular significance due to the survival of waterlogged organic remains which so frequently do not survive on archaeological sites across the country. The history and archaeology of Berwick has been summarised in detail in the Extensive Urban Survey carried out by Northumberland Conservation and published in 2008.¹
- 1.2 This guidance note is the result of a detailed study of waterlogged urban deposits in Berwick undertaken in 2013 with funding from English Heritage. It seeks to address issues of data quality through the provision of detailed advice and guidance when working on potentially waterlogged sites in the town.

2 OBJECTIVES OF THIS GUIDANCE

- To explain policy background
- To highlight the archaeological potential across the town
- To advise planners, developers and archaeological consultants/ contractors of the levels of archaeological work that are likely to be required and the stages in the planning process in which this work is required
- To help applicants and developers manage the potential risk associated with development in archaeologically sensitive locations, and to devise cost-effective mitigation solutions
- The Archaeology Guidance Note should be a material consideration for development management purposes

3 POLICY BACKGROUND

- 3.1 The National Planning Policy Framework (NPPF) sets out the requirements relating to the assessment and mitigation of impacts to the heritage resource within the planning system. The Framework identifies that, “where a site on which a development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation” (para. 128). The Local Planning Authority (LPA) should take such assessments into account when considering the impact of proposed developments on heritage assets to avoid or minimise conflict between the heritage asset’s conservation and any aspect of the proposal (para. 129).
- 3.2 The document also highlights that in circumstances where heritage assets will be damaged or lost as a result of development, LPAs should “require developers to record and advance the understanding of the asset to be lost in a manner appropriate to the significance of the asset” (para. 141).
- 3.3 Northumberland County Council is currently in the process of developing the Northumberland Local Development Framework (LDF). The public consultation period for the Preferred Options Paper finished at the end of March 2013. Policies 50 and 53 in the Preferred Options Paper refer to the historic environment.

¹ <http://www.northumberland.gov.uk/Default.aspx?page=5907>

4 BERWICK'S ARCHAEOLOGICAL POTENTIAL

- 4.1 The archaeological significance of Berwick-upon-Tweed has been reflected in the planning requirements for developments within the town since the emergence of Planning Policy Guidance (PPG 16) in 1990. As part of the English Heritage Action Plan in response to the The National Heritage Protection Plan (NHPP), English Heritage funded Northumberland Conservation to undertake a project in 2012-13 looking at the distribution and significance of urban waterlogged deposits in Berwick-upon-Tweed.
- 4.2 The project gathered existing data from all available geotechnical and archaeological investigations looking at the depth of waterlogged, post-medieval, medieval and natural deposits across the town. The data was used to produce a GIS-based 3D computer deposit model and map of the below ground deposits in the town. Future investigations will be incorporated into the deposit model, enabling our understanding of the archaeology of Berwick to be continually updated and refined.
- 4.3 This project has helped to gain a more detailed understanding of the development of the urban structure of Berwick and the factors that influence the waterlogging of deposits within the town. The information to date appears to indicate that waterlogged deposits are predominantly confined to medieval rubbish pits cut into the underlying natural clay deposits and to low-lying areas adjacent to the Tweed estuary. The nature or depth of overlying deposits does not appear to be a material factor in the survival of waterlogged archaeological remains with instances of waterlogged deposits surviving at a depth of just 0.12m below current ground level.
- 4.4 The project has shown that waterlogged deposits and archaeological remains of specific periods are not present at a consistent depth across Berwick. Archaeological investigations on adjacent sites have shown that waterlogged and/or medieval deposits can be located at a comparable depth irrespective of the overlying deposits. The difficulty lies in predicting the depth of deposits over a wider area. The current ground level varies significantly across the town due to both topography and the build-up of deposits. This variation in the current ground level, combined with the variation in depth of archaeological deposits, means that the current dataset can really only be used as a generic rather than a predictive tool for anticipating the nature and depth of archaeological remains.

5 ESTABLISHING THE ARCHAEOLOGICAL POTENTIAL OF A SITE

- 5.1 The flowchart (Fig. 1) summarises the archaeological decision making process in the planning system which is discussed in more detail below.
- 5.2 The Berwick UDM project has identified the difficulty of producing a predictive deposit model across a town where the depth and survival of archaeological remains can vary so significantly.
- 5.3 When considering a development site within Berwick, it is recommended that the developer or their agent contact NCC Planning for a pre-application enquiry at the earliest opportunity. The planning authority will involve Northumberland Conservation who will consider:
 - The archaeological potential of the site
 - The physical impact of the proposed development on archaeology
- 5.4 Where the nature, extent, significance and depth of archaeological remains are known, a mitigation strategy can be formulated to be included in a planning condition. Equally,

where it can be demonstrated that the development will not impact on archaeological remains, no archaeological work will be required.

- 5.5 Where the site is located in an area of archaeological potential but the nature, extent, significance and depth of archaeological remains are not known, it is not possible to make a quantifiable decision about the archaeological impact of the proposed development. In order to establish this information, intrusive evaluation is usually required.

Evaluation

- 5.6 Where evaluation is required to aid the decision making process, a planning application cannot be determined until this work is completed. This approach is consistent with Paragraph 128 of the NPPF.
- 5.7 **Test pitting:** In some cases, it may be possible to test the depth of modern and post-medieval deposits of lesser significance and limit the groundworks required for the development to a depth that avoids the most sensitive archaeology and therefore prevents the need for extensive evaluation and extensive excavation. This work would need to be carried out by professional archaeologists employed by the developer working to a strategy agreed with Northumberland Conservation. Where test pitting shows that significant remains survive at a shallow depth that will still be affected by the development, trial trenching will be required.
- 5.8 **Trial trenching:** Where the development is likely to have a significant impact on archaeological remains and groundworks cannot be kept to a shallow depth, it is vital to understand the nature, extent and significance of the archaeology and the impact of the development. This is achieved by the excavation of trial trenching, the number and location of which will be defined by the development. This work would need to be carried out by professional archaeologists employed by the developer working to a strategy agreed with Northumberland Conservation.
- 5.9 Where piling may be required on the site and the archaeological deposits exceed the safe depth of excavation, trenches will either need to be shored or a borehole dug in the base of the trench to establish the depth of deposits and the presence or absence of waterlogging. This technique simply tests the depth of deposits, it does not quantify their nature, significance or the density of features. It should therefore never be used in lieu of trenching.
- 5.10 Post-excavation analysis, particularly of waterlogged deposits will require specialist input. Additional time may need to be allowed for this. Conservation of fragile archaeological artefacts and remains may also be required. This information will enable an informed decision to be made on the archaeological significance of the site and the impact of the proposed development.

6 MANAGING ARCHAEOLOGICAL REMAINS THROUGH MITIGATION

Preservation *in situ*

- 6.1 Where archaeological remains have been shown to be of national significance, they should to be preserved *in situ* for future generations. In other cases the developer may also wish to preserve remains of lesser importance *in situ* to avoid the cost of excavating a high density of archaeological remains. In the majority of cases this can be achieved in a number of ways (see below). Given the significance of the remains, the preservation strategies will need to be agreed before an application is determined so that the strategy can be tied into a planning condition.
- 6.2 **Groundworks kept to a depth which avoids significant remains:** In many instances this

can be achieved with pad or raft foundations. Dependent on the site, this work may require archaeological monitoring work (see paragraph 6.5).

- 6.3 *Piling*: This can be an effective technique for preserving archaeological remains *in situ* providing that:
- Less than 2% of the archaeological deposits are affected by piling (5% when including associated groundworks)
 - Piling does not result in significant 'dragging' of deposits
 - Concrete piles cast *in situ* are sleeved to prevent dewatering or chemical changes occurring in waterlogged deposits affecting their survival
 - The piles can be re-used for subsequent development on site
- 6.4 Any piling strategy will need to adhere to these requirements. Continuous flight augured (CFA) piles have been shown to be the very effective at avoiding dragging of soil deposits but may not be appropriate where masonry may be present, unless appropriately robust equipment is used. Permanent sleeving will be required where liquid concrete is injected into the ground to prevent seepage into adjacent deposits and hydrological or chemical changes to waterlogged deposits. Pre-auguring the location of preformed displacement piles is another possible option. Piling techniques will be considered on a site by site basis and a test pile may be required in advance of the agreement of a piling strategy.²
- 6.5 If piles can be designed for future reuse, potentially on a larger building, then a 5% loss of archaeological remains is generally deemed to be an acceptable loss. This percentage will need to include associated works and additional piles above the minimum requirement in case piles need to be moved due to below ground obstructions. If it is not possible to engineer re-usable piles then a lower percentage impact will be acceptable, taking into consideration potential future impacts on archaeological remains. The potential zone of impact of the pile over a wider area will need to be added into the calculations. The impact will be also increased for grouped piles.
- 6.6 The groundworks associated with piling including piling caps and ground beams may require archaeological mitigation work dependent on the nature and significance of the remains on the site (see paragraphs 6.9 to 6.11).
- 6.7 *Re-use of existing piles*: Where it is possible to re-use existing piles, this is the preferred option from an archaeological perspective.
- 6.8 *Recommend refusal*: On the rare occasions where nationally important remains cannot be preserved *in situ*, Northumberland Conservation will recommend refusal or the redesign of the development.

Preservation by record

- 6.9 Where remains of regional or local importance are identified or where the development is likely to have a low impact on archaeological remains, a mitigation strategy can be formulated which will be tied into a planning condition. All stages of archaeological work, reporting and archiving will need to be completed before a planning condition can be fully discharged. This is likely to comprise one or more of the following dependent on the nature and significance of the remains and the impact of the proposed development:

² Williams J., Siddell, J. & Panter I. 2007 Piling and Archaeology. An English Heritage Guidance Note <http://www.english-heritage.org.uk/content/publications/publicationsNew/guidelines-standards/piling-and-archaeology/pilingforwebtagged.pdf>

- 6.10 *Full open area excavation*: The most significant or higher density of remains will need to be dealt with by an excavation carried out by professional archaeologists employed by the developer in advance of development work commencing. The fieldwork will be followed by post-excavation analysis and assessment, reporting and in most instances publication and archiving.
- 6.11 *Watching brief*: Where there is a lower density of less significant archaeological remains and a lower impact from the development, a watching brief will need to be carried out. In this exercise, professional archaeologists employed by the developer will monitor the groundworks required for the development and where archaeological remains are revealed, they will be given sufficient time to quickly excavate and record those remains. Fieldwork, post-excavation work, reporting and archiving will also be required.
- 6.12 Where waterlogged artefacts and deposits are excavated, specialist post-excavation analysis and conservation will be required on all archaeological investigations.

7 FURTHER INFORMATION

For further information please contact:

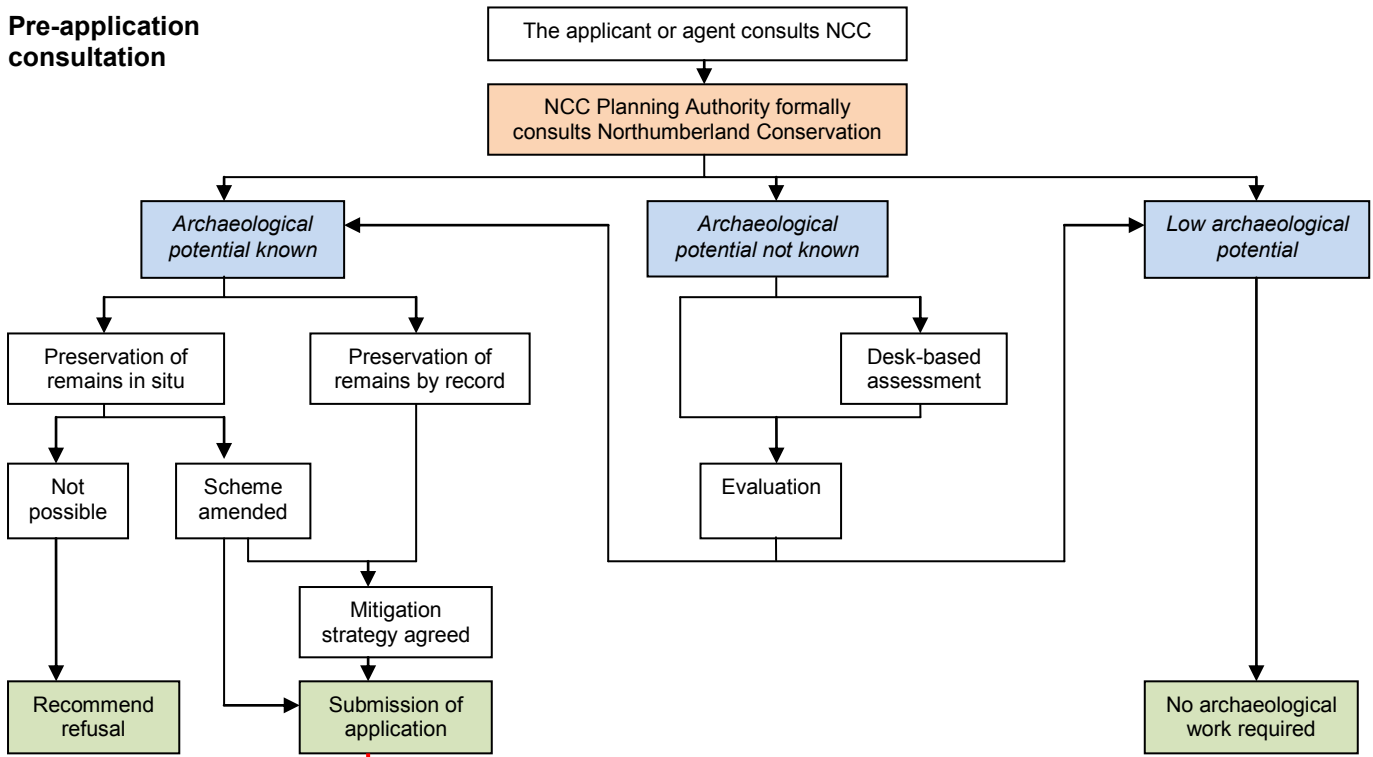
Nick Best
Northumberland Conservation
Development Services
Northumberland County Council
County Hall
Morpeth
NE61 2EF

Tel: 01670 622657

e-mail: nick.best@northumberland.gov.uk

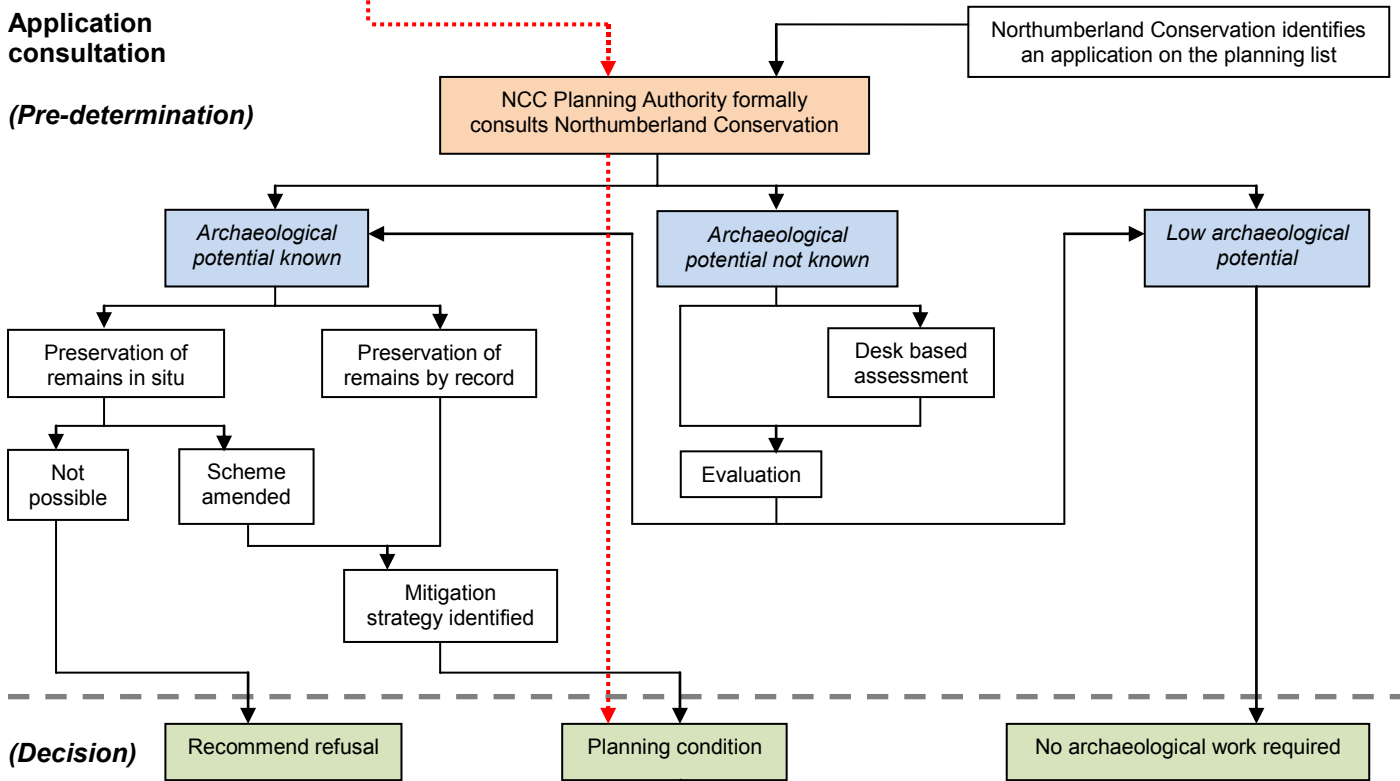
Summary of archaeology in the planning process

Pre-application consultation



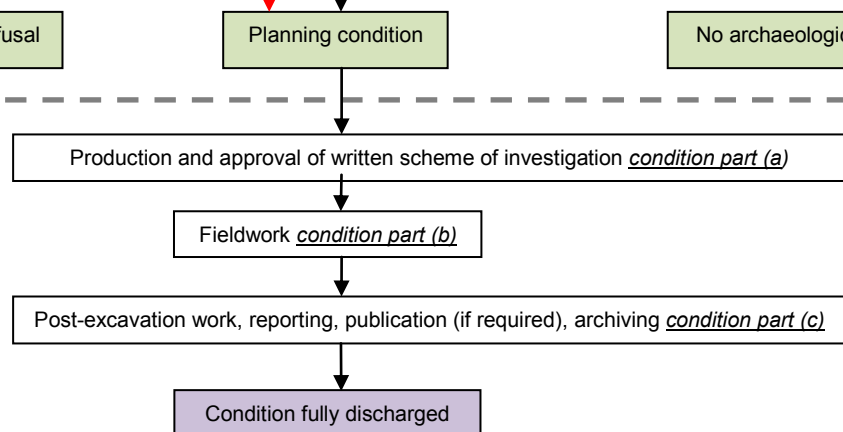
Application consultation

(Pre-determination)



(Decision)

(Discharge of conditions)



APPENDIX 2: Amendments to Development Management briefs for archaeological work in Berwick-upon-Tweed

1 INTRODUCTION

- 1.1 The dataset produced as part of this project will continue to be maintained and updated by the Northumberland Historic Environment Record (HER). As a result, the dataset will continue to provide the most up-to-date understanding of Berwick's urban deposits.
- 1.2 The information in the dataset is a resource that will be used in informing future archaeological investigations, which in turn will add to the resource. The archaeological briefs produced by Northumberland Conservation and the written schemes of investigation approved by Northumberland Conservation will therefore need to include a requirement to access this resource at the project planning stage and provide information within the report that can readily be added to the dataset.
- 1.3 As a result the template for Northumberland Conservation briefs for intrusive work in Berwick will be updated to include the following amendments:

2 ARCHAEOLOGICAL BACKGROUND

- 2.1 Berwick has been the subject of an Extensive Urban Survey³ which synthesised historic, documentary, cartographic and archaeological sources to provide an understanding of the nature and development of this historic town. In 2012-13, a further project was carried out on the distribution and significance of urban waterlogged deposits in Berwick, resulting in the production of an urban deposit model based on a detailed dataset of all known intrusive investigations within the town. This dataset contains information about the nature and extent of archaeological and natural deposits and their depths below current ground level and above Ordnance Datum. The project has shown that significant remains survive at varying levels across the town from c.0.12m to several metres below current ground level. It is currently not possible to establish a pattern to the depth of survival across the town and as a result, sites will be to be considered on a case by case basis.
- 2.2 Given the detail in the existing studies in Berwick, a full archaeological desk-based assessment is not required in this instance, providing that the written scheme of investigation contains a suitably robust and detailed archaeological background section. This section will need to draw together all available evidence in order to assess the archaeological potential of the site. As a minimum, the archaeological background section will need to access and utilise the information provided in:
 - The Berwick Extensive Urban Survey.
 - Levels above Ordnance Survey (aOD) across the site and the aOD depth of medieval, post-medieval and waterlogged remains on adjacent sites (information gained from Northumberland HER who manage the Berwick Urban Deposit Model).
 - Maps from 1st Edition OS (c.1860) to the present day which can be accessed on the Keys to the Past website⁴ and/or the Northumberland Communities website⁵ in order to locate any previous buildings, structures or disturbance on the site.
 - A site visit.

³ <http://www.northumberland.gov.uk/Default.aspx?page=5907>

⁴ <http://www.keystothepast.info>

⁵ <http://communities.northumberland.gov.uk/>

3 EVALUATION EXCAVATION REQUIREMENTS

- 3.1 Where development will require piling to a greater depth than can be safely evaluated, at least one borehole is required at the base of each evaluation trench to a depth where base geology is encountered.
- 3.2 Where a trench exceeds 5m in length a borehole will be required every 5m along the length of the trench.

4 INFORMATION TO BE INCLUDED IN THE REPORT

4.1 The final report will require as a minimum:

- Specialist analysis of all well-sealed and closely dated deposits, including waterlogged and/or organic remains, with reference to specific context numbers within the results and discussion sections of the specialist report.
- The following table in an Appendix to record the stratigraphic build-up of deposits at a fixed point. This information will be required for each trench that is excavated and, if the size of the trench/excavation area exceeds 5m in length, a stratigraphic sequence of deposits is required at 5m intervals across the excavation area.

Trench number	Context number	Nature of deposit (feature/layer)	Depth below current ground level	Depth above Ordnance Datum	10 figure grid reference	Modern (1901 to present)	Post-medieval (1540 to 1900)	Medieval (1066 to 1540)	Water-logged (Y/N)	Natural geology

APPENDIX 3: Berwick Building Study Group Cellar Survey

1 INTRODUCTION

- 1.1 Between June 2012 and April 2013 Northumberland Conservation undertook an English Heritage funded project looking at the distribution and significance of urban waterlogged deposits in Berwick-upon-Tweed and the contributing factors that aided in their development. Whilst the project mainly focussed on the nature and build-up of archaeological deposits, it also assessed the impact of later development, wells, cess pits and cellars on the development and survival of waterlogged archaeological remains.
- 1.2 The project officer, Karen Derham, approached the Berwick Building Study Group at the data collection stage of the project to discuss the potential for cellars across Berwick. Those initial discussions indicated that there are a range of cellars and basements across Berwick, some in which all four sides are below current ground level, while others have a ground floor room at street level but are cut into the natural sloping topography to the rear. The Berwick Building Study Group also cited examples where earlier cellars of potential medieval date have continued in use although the standing buildings above them are later in date.
- 1.3 Following those discussions, the Berwick Buildings Study Group undertook a voluntary pilot cellar survey of Berwick town from September to December 2012. The results of the cellar survey were provided to Karen Derham who correlated the results for inclusion into the final report for the English Heritage-funded project and produced the following summary report.

2 METHODOLOGY

- 2.1 The cellar survey comprised two stages of recording. The first stage of recording comprised a rapid street survey looking for visible signs of cellars or basements on the street and comparing it with the known locations of cellars. The second stage comprised a more detailed programme of cellar recording where access to the cellar was possible. Details were noted on a pro forma sheet and plans and profiles sketched on the back of that sheet.
- 2.2 The results of the Cellar Survey have been digitised as point data onto a GIS layer by Karen Derham for inclusion in the Berwick Urban Deposit Model project (UDM). This layer also includes point information about any cellars recorded during archaeological investigations across the study area. The information provided by the Berwick Buildings Study Group will be recorded in the Northumberland County Council (NCC) Historic Environment Record (HER) as a record of the work which can be utilised for future research. The GIS layer will continue to be managed and maintained by NCC HER and will be updated when further cellars are identified.

3 RESULTS

The Rapid Street Survey

- 3.1 The Rapid Street Survey combined a street survey with local knowledge and covered the following streets listed in alphabetical order:

Street Name	Visible cellars	Other source of information
Bank Hill	-	No. 4 - source not specified Adjacent building to No. 4 – previous occupier
Bridge End	Barrels Ale House - 2 light wells in pavement.	Barrels Ale House - Basement rooms/cellars in use as bar/function room. Blocked arch in west wall no longer visible
Bridge Street	No.55 and 57 - 2 sets of glass blocks	No. 9 cellar in use as office

Street Name	Visible cellars	Other source of information
	in pavement outside	No. 14 – BBSG told of its location. Large cellar accessible via trap door and ladder No. 25 No. 27 - Present occupier No. 42 No. 44 - Told by someone who used to work there No 51 - Modern construction but access to Victorian ovens No. 56 - walls lined with modern plaster No. 60 - Stone walls with alcove to east No. 62 Nos 64-66 Tunnels to rear. Enter at ground level but may go underground due to slope of West Street
Bridge Terrace	Berwick House - 2 light wells in pavement	
Castlegate	-	Nos 19, 57, 75 & 103 visible signs not specified, detailed survey undertaken
Crawford's Alley	-	Youngman's carpet warehouse - large cellars. Stone walls with slight damp in some areas visible signs not specified
Church Street	-	Kings Head - visible signs not specified
Dewars Lane	No visible signs	
Drivers Lane	No visible signs	
Foul Ford	No visible signs	
Hide Hill	No visible signs	
Love Lane	No visible signs	No. 3 - Estate agents
Marygate	Fairburn's Butchers shop - glass blocks at ground level in the front wall	No 121 known to have a cellar
Ness Street	No visible signs	
Oil Mill Lane	No visible signs	
Palace Green	No. 12 Palace Green - nothing visible No.18. Basement – habitable rooms	12 Palace Green – BBSG informed there is a basement & a cellar (with entrance hole and almost full)
Palace Street	No. 14 – habitable room Nos 15 & 17 - Access hatches visible No. 18 - Evidence of blocked grille Nos 31 & 31A- semi basement window visible	No. 18 previous occupier
Palace Street East	-	Governor's House – known to have extensive cellars No. 4 - cellars below courtyard adjacent to Weddell's Lane No. 6 - Air raid shelter & filled-in cellar beneath garden
Quay Walls	Houses have front doors at first floor level on the walls side. Rooms below have been used as ice houses and for storage but are at ground (quayside) level There is a tunnel, at ground level and within the walls running along the front of the Quay Walls houses	
Ravensdowne	-	Nos 4 & 7 known to have cellars
Sandgate	Hen and Chickens - Delivery hatch in pavement	
Scott's Place	No. 6 - Coal hole in pavement, cellar beneath	No. 4 – known cellar Nos 5 & 7 believed to have cellars
Silver Street	No visible signs	Nos 8, 10 & 12 known to have large vaulted cellars
The Avenue	No visible signs	
Weddell's Lane	No visible signs	
Wellington Terrace	-	Basements at front (ground floor at rear).
West Street	-	No 51 - poss. basement
Woolmarket	No visible signs	

- 3.2 The Rapid Street survey is of interest not just for the cellars that it identified but also when compared with local knowledge of the cellars in the area.
- 3.3 It is interesting to note that in the Rapid Street Survey, the only visible evidence of cellars on Bridge Street was noted in the pavement outside 55 and 57 Bridge Street. In comparison, a previous detailed survey of Bridge Street by the Berwick Buildings Study Group revealed cellars in fourteen of the properties. In the same way, there were no visible signs of cellars on Silver Street although large vaulted cellars are known to survive under numbers 8, 10 and 12. There are also no visible signs on Palace Green although cellars are known at 12 and 18 Palace Green and Love Lane although 2 Love Lane is known to have a cellar.
- 3.4 In addition, a number of streets did not have any visible signs of cellars despite the close proximity of known cellars. These included:
- Foul Ford in close proximity to 15 Palace Street
 - Love Lane in close proximity to 2 and 64 Bridge Street
 - Weddell's Lane in close proximity to 4 Palace Street East
- 3.5 There are also no visible signs of cellars along Dewars Lane, Drivers Lane, Hide Hill, Ness Street, Oil Mill Lane, The Avenue and Woolmarket, however based on the results in other areas, the absence of visible cellars cannot necessarily lead to the conclusion that cellars were not present in these locations.

Detailed cellar survey

- 3.6 Detailed survey was carried out in nine different properties although two cellars were recorded separately under the Castle Hotel, 103 Castlegate. The results of the survey work are appended at the end of this document.
- 3.7 Initial detailed survey of specific cellars has provided a wealth of information. There are a variety of cellars across the town, some spanning the footprint of the building, some just the frontage, constructed with a variety of building materials. This variety may relate to the date, position or function of the cellar and it is likely that some of the cellars predate the later buildings that are constructed above them. This is however still a small and undated dataset and as such the correlations and interpretation of the data is limited.

Summary of the detailed cellar survey combined with known cellars from archaeological investigations in the study area

Name	Evidence	Does the cellar extend across whole building footprint?	Length (m)	Width (m)	Height (m)	Walls	Floor	Prone to flooding or dampness?	Notes
6 Scotts Place	Visible from street/Access	Whole frontage	4.35	4.35	1.65	Stone	Cobbles	Yes	Under front room of south facing terrace. Most houses on this short street appear to have cellars
Red Lion, 19 Castlegate	Access	No	10.32 N-S	5.15 E-W	1.95	Stone	Concrete	Yes	
White Swan B&B, 57 Castlegate	Local knowledge							Yes	Present owner says cellar was accessible until 35 years ago
Free Trade, 75 Castlegate	Access	No	4.15 N-S	3.7 E-W	1.9	Stone, whitewash	Concrete	Yes	covered "soakaway" in the centre of floor with a "stream" approx. 1m below
Castle Hotel (1), 103 Castlegate	Access	no	4.96 N-S	4.65 E-W	2	Plaster, render	Concrete	No	This cellar is one of two under the property. It is accessed from NE of small yard at the rear (west) of the property
Castle Hotel (2), 103 Castlegate	Access	No	5.95 N-S	8 E-W	2	Stone, render	Concrete	No	This cellar is one of two under the property. It is accessed from behind the public bar
64-66 Bridge Street	Local knowledge	No	c.3 NW-SE	c.3	c.2	Stone?, Brick	Not known	No	
4 Palace Street East	Local knowledge/questionnaire/access	No	5.92 E-W (Chamber 12.22)	3.40 (Chamber 0.62)	2.3 (Chamber 2.18)	Brick	Stone	Wet walls and floor	There is a rectangular chamber with a brick arched roof in 3 sections (2 dividing walls) there is a raised side chamber which is stepped and opens up to ground level which is visible in the courtyard
31a Palace Street	Visible from street/Access	no	8.31 (front to back)	2.4m at front 2.08m at back	1.98	Stone, plaster, render	Concrete	Yes slight damp	This cellar is made up of 3 separate areas under the Hall way and part of the rooms but not the whole property with stairs coming down through the middle going into the middle of the cellar
2 Love Lane	Access	Front section only	c.25 NW-SE	6 NE-SW	1.8	Stone, brick?	Stone, beaten earth cobbles	No	

Event 14003: 119-125 Marygate Area 1 cellar 1	Archaeological excavation	No	4.8 NE-SW	2.2	at least 2.2	brick	Exceeds depth of excavation	No	Possibly 18th century. Sprung barrel vaulted brick roof width may be greater but under later wall to north-west in date.
Event 14003: 119-125 Marygate Area 1 cellar 2	Archaeological excavation	No	NE-SW	c.6m				No	Modern. SW wall with staircase going into cellar. NE extent of cellar not referred to in archaeological report - may continue up to street frontage
Event 310: 104-106 Marygate evaluation SE end	Archaeological excavation	No					Exceeds depth of excavation	No	Backfilled cellar
Event 298: 4-8 Woolmarket evaluation trench 2 S end	Archaeological excavation	No				stone	Exceeds depth of excavation	water leaking into trench at 1.1m bgl	Backfilled cellar
Event 14480: Walkergate Excavations NW corner of excavation	Archaeological excavation	No				brick	sandstone flags	no	Phase 4 (1072) small brick cellar with brick and sandstone flagged floor (1069)

- 3.8 Six of the ten recorded cellars were described as being wet or prone to flooding. All of these cellars were located outside the area of waterlogged deposits recorded as part of the Berwick UDM. In all these instances there are no recorded archaeological or geotechnical investigations located in proximity to the known damp cellars that would help to establish whether waterlogged archaeological deposits are also located in these areas.
- 3.9 The only cellar recorded in detail within the waterlogged area identified as part of the Berwick UDM was at 64-66 Bridge Street. This cellar was not described as damp or waterlogged but neither were the nearest archaeological investigations in this area at Love Lane (Event 13335) in the east and 8-10 Bridge Street (Event 176) in the west. This is discussed in more detail in section 4.3 below.

4 DISCUSSION

- 4.1 The Rapid Street Survey has proved to be a useful exercise identifying the presence of cellars where visible from street level. The results have, however shown that in Berwick, cellars do not always have a visible sign of their existence from street level. Consequently, an absence of visible signs of cellars should not be regarded as evidence that a cellar is not present on the site. As a result the Rapid Street Survey can be used as an effective tool for identifying cellars but not predicting their presence or absence.
- 4.2 The detailed cellar surveys provided a lot of interesting and detailed information about specific cellars and their construction. Combining the information in the detailed surveys with the information within the Berwick UDM and identifying any correlations proved, however, to be difficult. The location of the detailed cellar survey was dependent on the location of known cellars that were accessible. In comparison the data generated in the Berwick UDM was dependent on the location of known geotechnical and archaeological investigations which was largely dictated by the location of development proposals. As a result there are few instances where the depth of cellars below current ground level can be correlated with the depth of known archaeological remains and waterlogged deposits. Damp cellars may or may not be associated with waterlogged archaeological deposits but without sufficient data, a definite conclusion cannot be drawn.
- 4.3 Within the area of potential waterlogging identified as part of the Berwick UDM, the only example of a damp cellar was at 64-66 Bridge Street which is located in an area where the adjacent archaeological sites also did not reveal any evidence of damp or waterlogging. Bridge Street is located in the lower part of the town where the known examples of waterlogging have been limited to sites on the Quayside which are likely to be subject to tidal fluctuations. Nevertheless, Bridge Street is generally regarded as having been on the site of the medieval quayside and a focus of settlement since the medieval period. It would therefore logically be a prime location of medieval waterlogged deposits. In reality the dataset is not yet extensive enough to draw any definite conclusions.

5 CONCLUSION

- 5.1 While at the moment there does not appear to be an obvious correlation between the presence or absence of waterlogged deposits and cellars due to the nature and location of the collected data, the Cellar Survey has provided a good initial assessment of the presence of cellars across the town. It is likely that there will be a much greater number of previously unidentified cellars within the town containing a wealth of additional information.
- 5.2 Any future additional information that can be added to the initial Cellar Survey or the Berwick UDM will hopefully contribute to a more detailed understanding of the presence of cellars and the nature and survival of waterlogged remains and below ground archaeological deposits across Berwick.

5.3 Nevertheless, the results of the initial Cellar Survey will remain a solid foundation on which we can build a greater understanding of the nature and known location of cellars across Berwick.

6 ACKNOWLEDGEMENTS

6.1 The Berwick Buildings Study Group.

APPENDIX 4: Category Names

The following table lists all assignable category names used to record geotechnical and archaeological deposits and features in this project.

Type	Layer Code	Description
Geology - bedrock	LMST	limestone
	MDST	mudstone
	SDST	sandstone
	SLST	siltstone
Geology - superficial	ALVM	alluvium
	BCHD	beach deposits
	CLAY	clay
	CLVM	colluvium
	SAND	sand
	PEAT	peat/coarse organic
	TILL	till
	GRVL	gravel
	SDGV	sand and gravel
	SILT	silt
	SHLE	shale
	MRNE	marine/estuarine
	ORGR	organic rich
	ORGI	organic inclusions
	LAMS	laminated sediments
	MDGD	made ground
Archaeology	COTA	concrete/tarmac
	CVTY	cavity
	FEAT	cut soil filled feature
	FLOR	floor
	LAYR	layer
	MORT	mortar
	MSNY	masonry
	TPSL	topsoil
Archaeological Date	EMED	early medieval AD410-1066
	MEDV	medieval AD1066-1540
	MEPM	medieval or post medieval
	MODN	modern disturbance/layers
	PMED	post-medieval AD1540-1800
	UNDT	undated
	NTRL	natural deposits
Work type	ARCH	archaeological work
	GTEC	geotechnical work

Northumberland Conservation
Development Services
Local Services
Northumberland County Council
County Hall
MORPETH
NE61 2EF

Tel: 01670 620305

Email: archaeology@northumberland.gov.uk

Web: www.northumberland.gov.uk/archaeology