

Wearmouth-Jarrow geoarchaeological evaluation (Phase 2 of 3)

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Introduction

This report describes the results of the Phase 1 geoarchaeological evaluation and investigation of palaeoenvironmental records in the area of the Wearmouth-Jarrow candidate World Heritage site, and outlines the proposal for Phase 2 of the project. The overarching aim of this element of the project is to reconstruct the contemporary landscape setting of the monastic sites (especially the character and extent of local woodland and human land-use activities) and the surrounding area. Phase 1 constituted a desk-based analysis of the landscape and sediment associations in the Wearmouth-Jarrow area, with a particular focus on alluvial-estuarine environments in the vicinity of St Paul's and St Peter's monasteries. Phase 2 aims to investigate the character, age and palaeoenvironmental potential of Holocene sedimentary sequences identified as prospect sites by Phase 1 and is intended to provide the basis for a full geoarchaeological and palaeoecological analysis of selected sedimentary sequences in Phase 3. This final element of the project will be a laboratory-based exercise that is entirely contingent on the character and dating of organic-rich sedimentary sequences recovered by Phase 2; accordingly there is no attempt to provide any further details or costings of Phase 3 here.

Phase 1 results

Phase 1 constituted a desk-based evaluation of potential sediment core sites using a combination of OS historic maps, geological maps, aerial photographs and borehole data (obtained from the BGS). This analysis sought to identify any surviving surface wetlands (where evident on map and AP coverage) and alluvial-estuarine sites in the valleys of the Don and Wear that have escaped direct disturbance by building or infrastructural developments, and which present the most likely context for preservation of organic materials suitable for ¹⁴C and palaeoecological analysis. Investigation of borehole records in the vicinity of the monastic sites was also undertaken to permit identification of local potential sedimentary records that are buried beneath made ground.

Figure DP1 shows the superficial geology mapped by the BGS for the Wearmouth-Jarrow area including the upstream hinterland of the Tyne and Wear rivers west to Washington. The superficial geology is dominated by extensive deposits of Late Devensian glaciolacustrine clays, including the Pelaw Clay, with smaller areas of till and, along the major river courses, deposits of glaciofluvial sand and gravel, Holocene alluvium and fine-grained estuarine sediments. In addition, one small area of surficial

Quaternary peat is mapped as infilling the shallow valley of a small unnamed tributary stream of the River Wear between the Barmston and Columbia districts of Washington some 8.5km west of St Peter's Monastery. Peats in this location extend over an elongate area with maximum dimensions of 550m by 170m and are traversed by the A195 Expressway. They represent the sole example of mapped wetland deposits within the study area defined in Figure DP1.

Detailed investigations of topography and borehole records have focused on the areas surrounding the monastery grounds at Monkwearmouth and Jarrow and, in view of the potential for Holocene palaeoenvironmental records in mapped peat deposits, the Barmston-Columbia locality near Washington (henceforth termed the A195 Expressway site). Borehole logs in all three areas were examined at the BGS record office at Edinburgh and a total of twenty-five logs are described below in the context of the three detailed study sites (see also Table 1).

1. The River Don at Jarrow / St Paul's Monastery

St Paul's Monastery lies on an upstanding glaciofluvial sand and gravel terrace associated with Late Devensian deglaciation (Fig. DP2) and is bounded to the east and south by tidal clays, silts and sands associated with Jarrow Slake and the lower reaches of the River Don, a small south bank tributary of the Tyne. Relatively low elevation (<10m OD) surfaces flanking the Don are not mapped on the BGS superficial geology coverage but are depicted on historic OS maps spanning c.1862-1967 as part of the Jarrow Slake muds downstream of Jarrow Bridge and, upstream of the bridge, as salt marsh traversed by the meandering channel of the Don (Fig. DP2). Between 1967 and 1976 the channel of the Don was straightened and the salt marsh has subsequently been reclaimed as parkland with wooded patches and grass.

A total of thirteen borehole logs were examined in a 1km stretch of the River Don immediately east and south of the Jarrow monastery (Fig. DP2); these were located at sites adjacent to the present channel (NZ36NW141/2) or on flanking alluvial surfaces within 200m of the channel. Three cores located in the area of Jarrow Slake to the east of the monastery revealed up to 11.6m of inorganic muds, sand and gravel overlying a stony / gravelly clay interpreted here as till (NZ36NW141/2 and 3, NZ36NW954; Table 1, Fig. DP2). To the south of the monastery on the southern side of the valley floor the former salt marsh sediments have been assessed by examination of ten borehole logs (Fig. DP2); these have proved a variable thickness of fine-grained alluvial / estuarine sediments up to 14.5m thick, overlying sand and gravel and capped at the surface by topsoil or up to 2.7m of made ground (Fig. 2a and b; Table 1). In six of these cores the fine grained sediments were described as black or grey-brown organic-rich sand, silt and clay (NZ36N14574/3, NZ36NW376-9 inclusive, and NZ36SW77/6; Fig. DP2, Table 1). The

frequent presence of made ground suggests that some degree of disturbance associated with channel embanking or reclamation has impacted at least the upper part of the sedimentary sequence and is liable to preclude hand-operated coring; however, at the site of NZ36NW77/6 the organic-rich unit has a depositional thickness of 2.43m and is capped by penetrable topsoil and sandy silty clay (Table 1). This locality, some 270m from the monastery (Fig. 2a and b), would appear to offer the most readily accessible sedimentary sequence of potential interest. Accordingly, it is proposed to undertake 2-3 exploratory sediment cores in this area.

In addition to work on the valley floor of the Don it is also proposed to undertake sediment coring in the ditch / gully feature identified in Drewett's Park immediately north of St Paul's. This feature was identified during the Project's campaign of combined geoprospection in summer 2009. It is overlain by 19th- and 20th-century features, and initial geophysics results suggest it is also sealed below the remains of ridge-and-furrow agriculture. Given its dimensions and location, it could represent a northern boundary to the monastic complex at St Paul's. We propose to undertake exploratory sediment coring in the area in order to establish the depth and character of any infill sediments.

2. St Peter's Monastery

St Peter's monastery lies on an elevated terrace (c. 15m OD) some 250m north of the present bank of the River Wear (Fig. DP3) that is mapped as part of extensive Late Devensian glaciolacustrine and glaciofluvial deposits by the BGS. Both the area surrounding the monastery grounds and the slopes south to the river margin have been extensively urbanised since the mid-19th century while the river-front to the east has been the site of nineteenth and twentieth century shipyards until redevelopment of the area as part of the St Peter's campus (University of Sunderland) over the past 10 years. Borehole records for the area surrounding the monastery grounds confirm the glacial origin of the local terraces and the extensive areas of made ground associated with river-front redevelopment (Fig. DP3); five borehole logs are listed in Table 1. Three boreholes located in the immediate vicinity of the monastery grounds (NZ45NW15, NZ45NW117 and NZ45NW118; Table 1, Fig. DP3) prove up to 1.8m of made ground overlying till and, although these are inconsistent with the BGS mapping of the locality as glaciofluvial and glaciolacustrine deposits, they suggest little prospect for material of Holocene palaeoenvironmental value. Two cores taken from lower elevation surfaces (c. 8m OD) some 160m to the south of the monastery reveal limestone rockhead at a depth of c.30m that is buried by thick deposits of sand and gravel with occasional thin beds of silt and clay up to 3.4m thick (NZ45NW573 and NZ45NW342, Table 1, Fig. DP3). These sediments are provisionally interpreted as glaciofluvial deposits although traces of

organic material between 25-29m in depth (c.-17 to -21m OD) in core NZ45NW573 (Table 1) are probably of perimarine origin.

Accordingly there is little prospect of sedimentary sequences with good palaeoenvironmental potential surviving in the locality outside the immediate monastery grounds.

3. A195 Expressway, Washington

The A195 Expressway site lies in a shallow valley of a small unnamed tributary stream of the River Wear between the Barmston and Columbia districts of Washington, Tyne and Wear (Fig. DP1), 1.2km upstream from the confluence with the Wear and 8.5km from St Peter's Monastery. Although presently urbanised, the 1862 and 1899 OS maps show the area as poorly drained open fields that lie upstream of the Washington Chemical Works reservoir (Fig. DP4a and b), and the local valley fill is mapped by the BGS Superficial Geology coverage as Quaternary peat deposits that are surrounded by glaciofluvial sand and gravel spreads (Fig. DP5). Much of the area has been urbanised during the twentieth century and has been bisected by the A195, but areas of open ground survive to either side of the expressway and are potentially available for sediment coring (Fig. DP4b).

A total of seven borehole records were examined in this area, of which six were located in the vicinity of the A195 corridor and within or immediately north of the locality mapped as peat (NZ35NW309, NZ35NW656-659 inclusive and NZ35NW661; Fig. DP5, Table 1). These boreholes record either made ground or inorganic sand, silt and clay (with occasional gravel) to a depth of between 6-10m and are not regarded as prospective sites for palaeoenvironmental analysis. To the west of the A195, however, borehole NZ35NW52/15 records 1.82m of black clayey peat immediately below the surface that overlies a further 1.82m of slightly organic silty sand and, below 3.65m, inorganic fine-medium sand (Fig. DP5, Table 1). Although this borehole is currently overlain by a housing estate, the site lies only 35m east of open playing fields associated with the JFK Primary School and which remain within the area mapped as peat by the BGS (Figs. DP5 and 6). A further area of open field is also present immediately east of the A195 and also lies within the area mapped as peat (Figs. DP5 and 6). These areas of open ground are considered to have good potential for preservation of Holocene peat deposits that may include material contemporary with the period of interest. Pollen records from a small site of this type will predominantly reflect vegetation changes in immediate locality of the site rather than the wider region, but may give valuable insight into land-use patterns in the hinterland of the monastery site at Wearmouth. Accordingly it is proposed to undertake sediment coring (c.1-2 cores) in both areas of open ground subject to access permissions.

Phase 2 objectives

1. Sediment coring, description and interpretation of Holocene sedimentary sequences in (i) former salt marsh deposits to the south of the R. Don at Jarrow, (ii) the ditch / gully feature identified in the parkland immediately north of St Paul's and (iii) peat deposits in the vicinity of the A195 expressway at Barmston-Columbia, Washington.
2. Assessment of organic-rich sediments recovered in (1) for the content and preservation of pollen, plant macrofossils and insect fauna and, in tidally influenced sediments at Jarrow, ostracods, foraminifera and diatom assemblages.
3. ^{14}C dating of the upper and lower parts of organic-rich sedimentary sequences recovered in (1).
4. On the basis of 1-3, a preliminary interpretation of Late Pleistocene and Holocene environmental change and human activity in the Wearmouth-Jarrow area, with particular attention to the 1st millennium AD, and recommendations for detailed analysis in Phase 3.

Phase 2 Methodology

(i) Sediment coring

Prospective wetland and floodplain sites will be cored by a combination of hand-operated augers and a Cobra/Stitz percussion auger that permits recovery of continuous cores; Phase 1 analysis indicates that this coring technology should be sufficient to recover the shallow (<5m) sedimentary sequences of interest here. All cores will be logged for colour, texture, bedding structures and inclusions (e.g. charcoal, organic matter, archaeological materials), and all organic-rich sedimentary sequences (including buried soils) will be removed intact to the laboratory at Newcastle for cold storage and sub-sampling.

(ii) ^{14}C analyses

A programme of ^{14}C analyses will be developed in collaboration with English Heritage with the aim of dating the upper and lower levels of organic-rich sedimentary sequences; this will enable subsequent (Phase 3) palaeoecological analyses to be targeted at deposits that most relevant to the project's aim of elucidating 1st millennium AD environments, while also securing a chronology for sediments spanning Holocene timescales that may yield longer-term perspectives on regional environmental change.

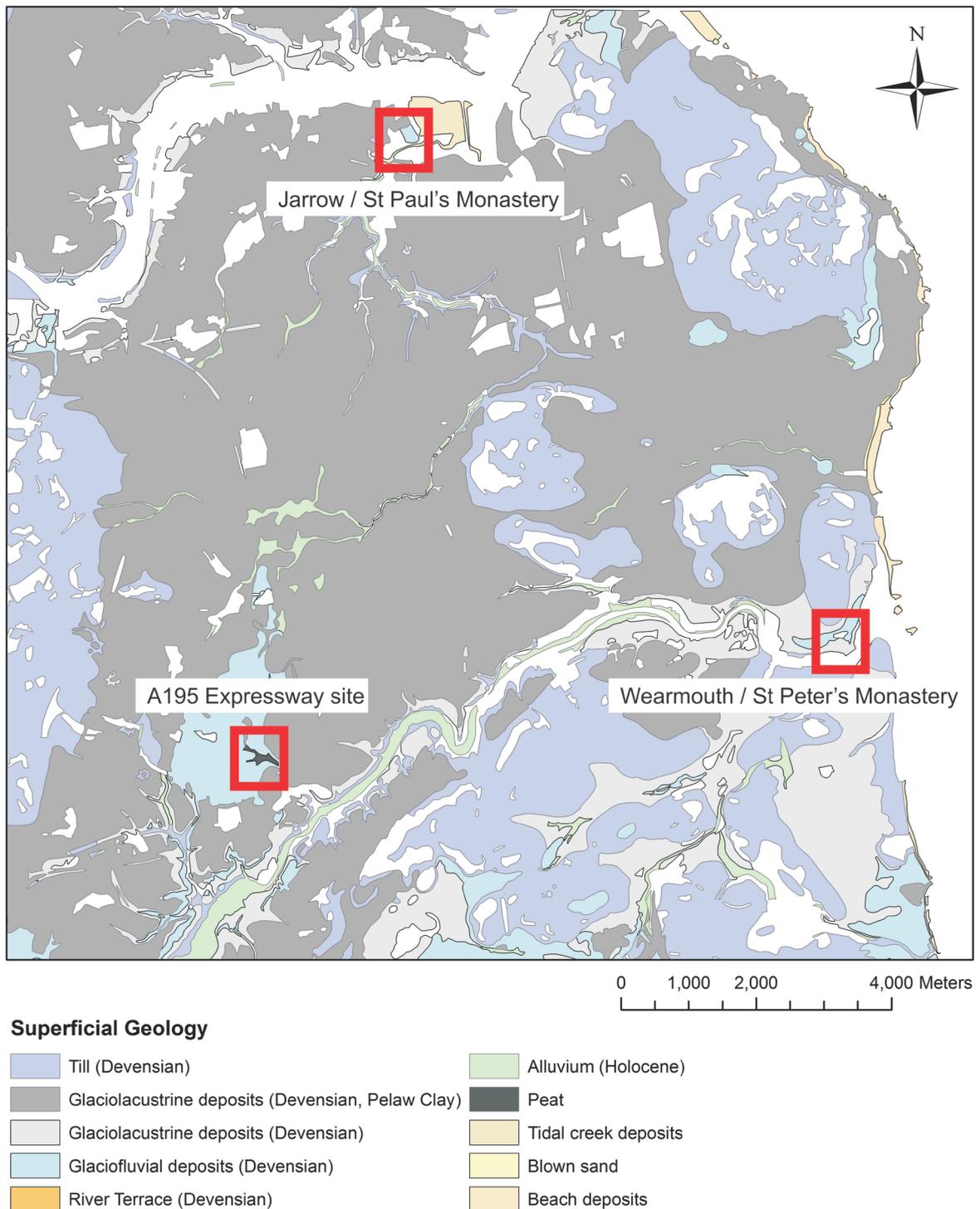
(iii) Palaeoecological analysis

A variety of palaeoecological analyses will be undertaken to ascertain the potential of recorded organic-rich sedimentary sequences for yielding information on local and regional environments and vegetation assemblages. Of particular interest here is the potential of these sediments as 'off-site' records of human activity (e.g. woodland management, pastoralism, cereal cultivation etc) which renders them as an archaeological resource, but analyses will also seek to determine the full range of terrestrial, freshwater and estuarine environmental settings preserved in the sampled sediment; accordingly, analyses will include assessment of the content and preservation of pollen, plant macrofossils, insect fauna and, for sediment cores in perimarine or estuarine settings, foraminifera, ostracods and diatoms. It is anticipated that up to a maximum of 20 sediment sub-samples will be subjected to palaeoecological assessment, and all analyses will be undertaken by experienced analysts using standard (EH-

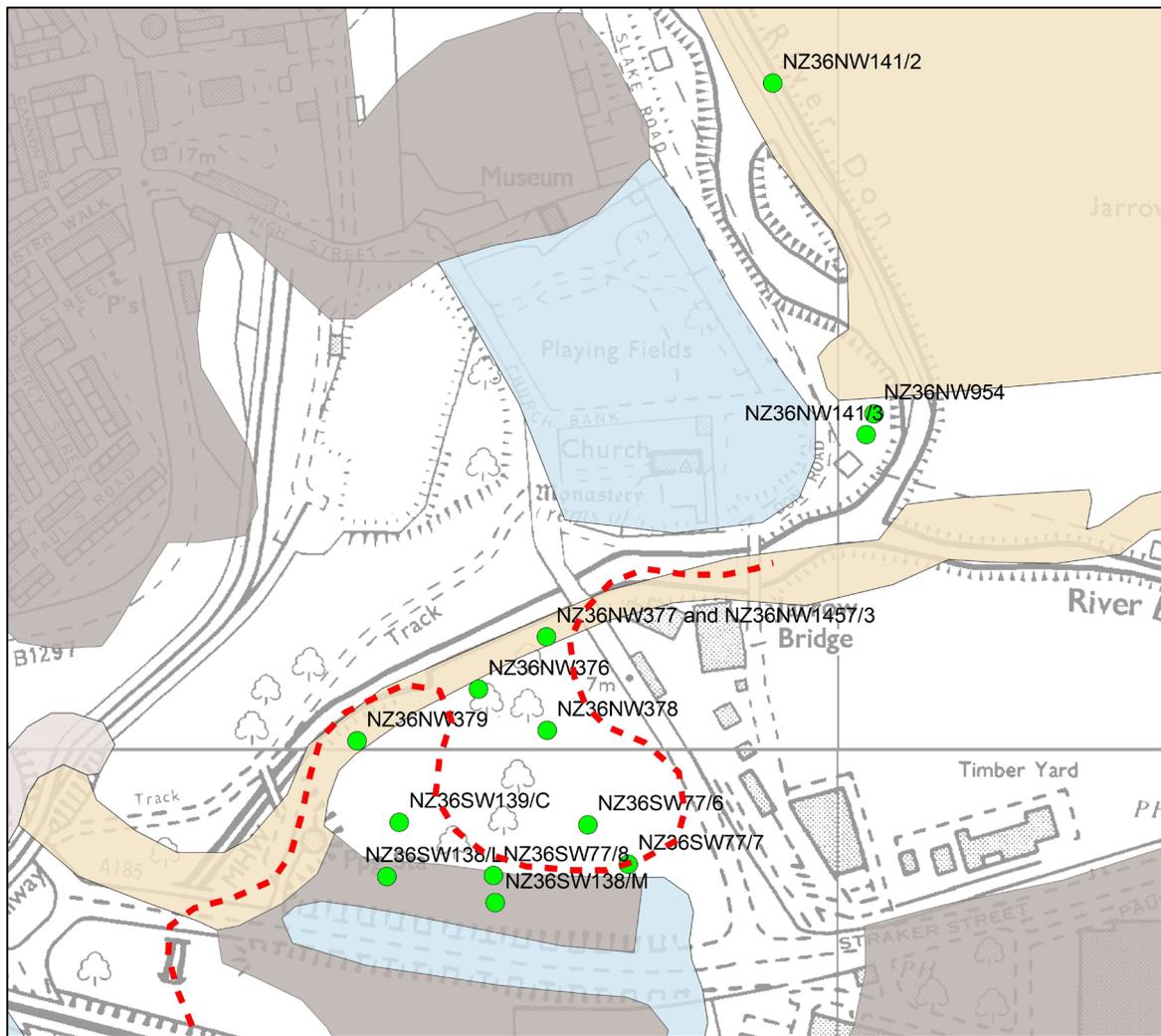
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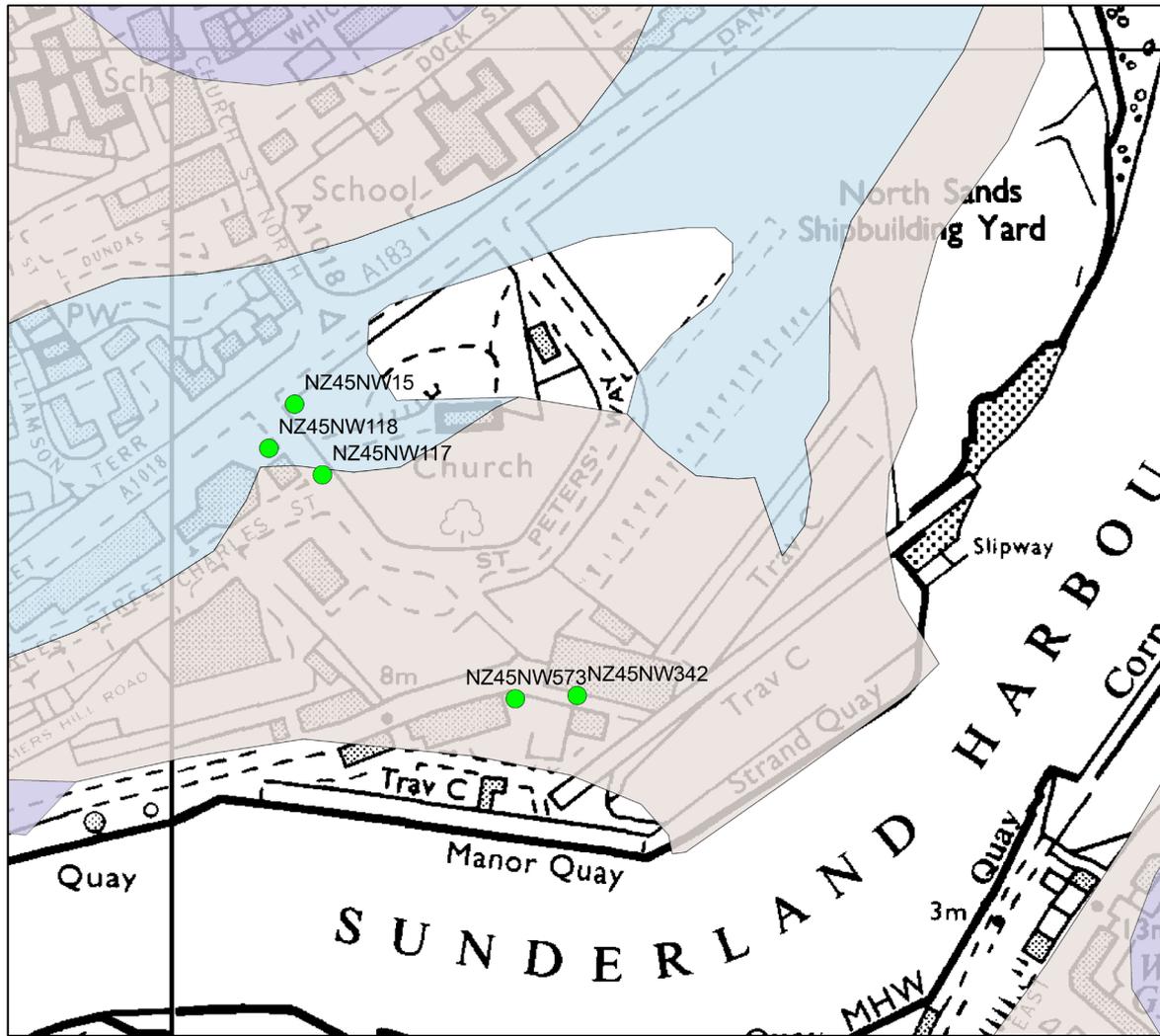


Superficial geology

- Glaciofluvial deposits (Devensian)
- Glaciolacustrine deposits (Devensian, Pelaw Clay)
- Tidal creek deposits

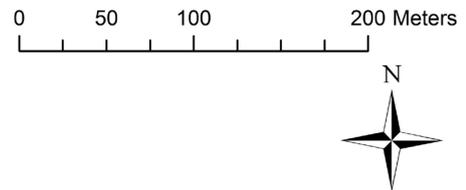


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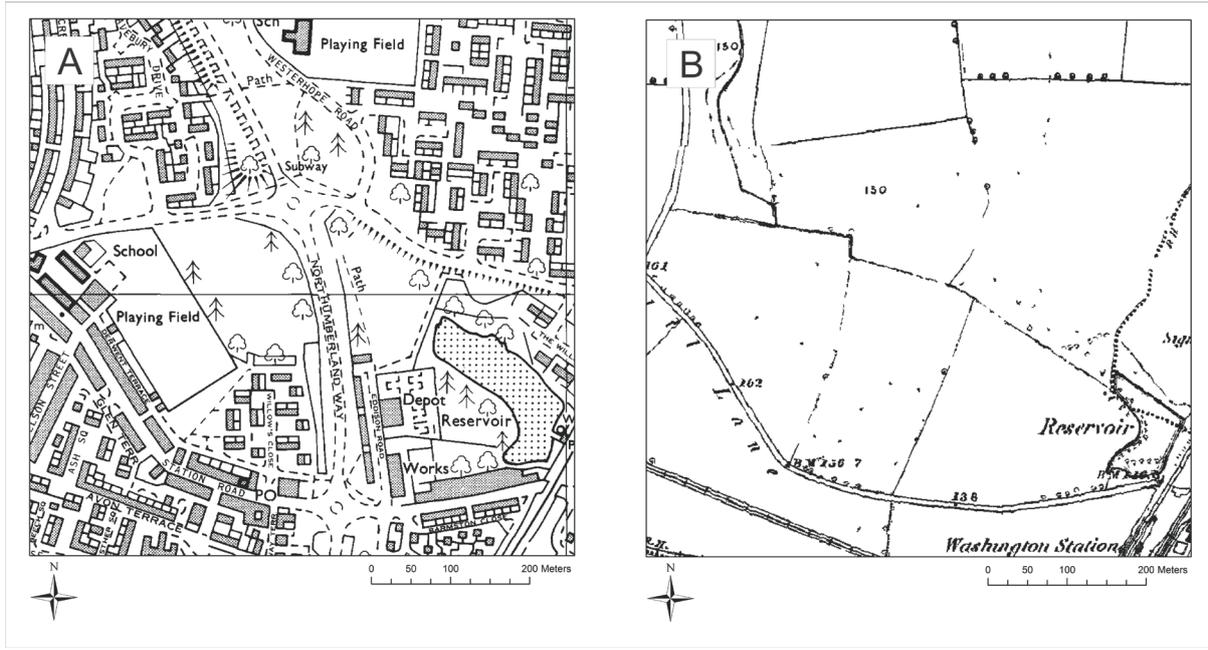


Superficial geology

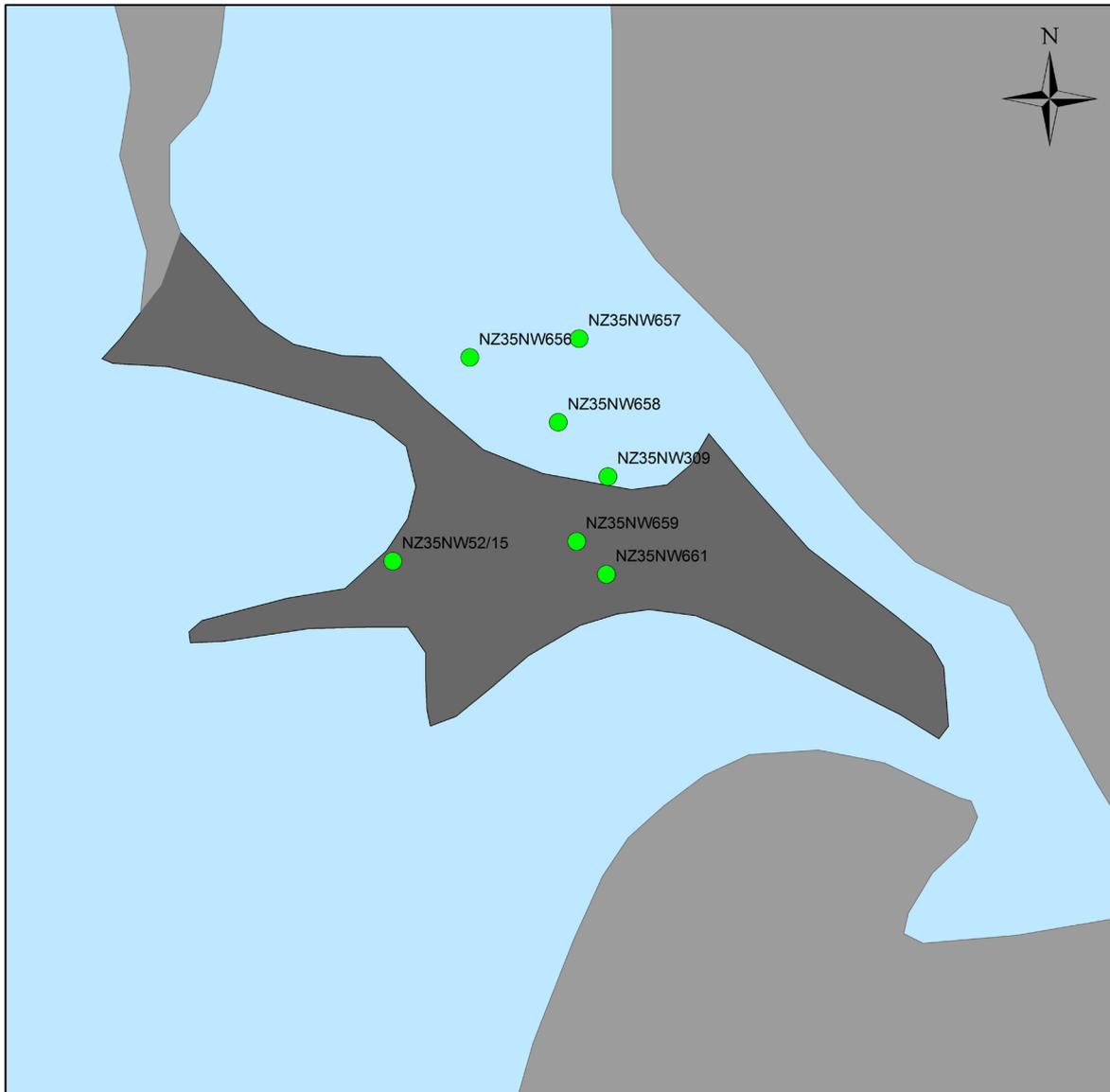
- Till (Devensian)
- Glaciolacustrine deposits (Devensian)
- Glaciofluvial deposits (Devensian)



3. Superficial geology of the St Peter's Monastery and River Wear area showing locations of borehole records investigated during Phase 1 geoarchaeological evaluation. © Crown Copyright / database right 2008. A British Geological Survey / EDINA supplied service.



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Superficial Geology

- Glaciolacustrine deposits (Devensian, Pelaw Clay)
- Glaciofluvial deposits (Devensian)
- Peat

0 50 100 200 Meters

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0 50 100 200 Meters

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