

**AN ARCHAEOLOGICAL WATCHING BRIEF ON
THE NORTH CUT-AND-COVER TUNNEL,
(NORTH TRANSITION SHAFT TO TYNE VIEW TERRACE),
FOR THE NEW TYNE CROSSING,
EAST HOWDON, NORTH TYNESIDE,
TYNE AND WEAR**

**Pre-Construct Archaeology Limited for
Bouygues Travaux Publics (UK Branch)
New Tyne Crossing, PCA Report No. 2
November 2009**

PRE-CONSTRUCT ARCHAEOLOGY

**An Archaeological Watching Brief on the North Cut-and-Cover Tunnel,
(North Transition Shaft to Tyne View Terrace) for the New Tyne Crossing,
East Howdon, North Tyneside, Tyne and Wear**

New Tyne Crossing, PCA Report No. 2

Central National Grid Reference: NZ 3309 6616 to 3310 6626

Site Code: STH (NCC) 09

Commissioning Client:

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November 2009**

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1. NON-TECHNICAL SUMMARY

- 1.1 An archaeological monitoring and recording exercise was undertaken April-June 2009 by Pre-Construct Archaeology Limited along part of the route of the North Cut-and-Cover Tunnel for the New Tyne Crossing between Howdon Yard and Tyne View Terrace, East Howdon, North Tyneside, Tyne and Wear.
- 1.2 The work was part of an overall programme of archaeological investigation undertaken as a planning condition in association with construction of the New Tyne Crossing. A Specification for the overall programme of work was compiled by the Tyne and Wear Archaeology Officer. An archaeological evaluation had been undertaken in 2007 ahead of construction.
- 1.3 The North Cut-and-Cover Tunnel of the New Tyne Crossing is approximately 320m long and links the riverside North Transition Shaft structure in Howdon Yard to the new toll plaza at the exit of the A19(T) in East Howdon. The southernmost 100m of this tunnel runs between Howdon Yard, at National Grid Reference NZ 3309 6616, to the line of Tyne View Terrace, the A187 link road, at NZ 3310 6626.
- 1.4 The potential for archaeological remains along the southernmost section of the North Cut-and-Cover Tunnel was considered generally low, since the land occupied by Howdon Yard and Tyne View Terrace was created by reclamation of the river foreshore in the second half of the 19th century as the modern river frontage was established. One of the 2007 evaluation trenches, located in Howdon Yard to the east of the North Cut-and-Cover Tunnel, recorded imported material, predominantly sand, of likely 19th century origin, to a depth of more than 2.5m below the existing ground surface. Due to the restricted nature of that work, however, some uncertainty remained over the potential for archaeological remains in this area.
- 1.5 The watching brief allowed remote recording of geological, alluvial and archaeological deposits. The earliest deposit recorded was evidently natural Boulder Clay, seen at one location at c. 7-8m below existing ground level. A substantial deposit, at least 4.0m thick, of alluvial material was noted along the monitored section of the route, this representing the former extent of the river. This was overlain by gravel ballast derived from probable 19th century infilling of the river channel and reclamation of the foreshore. Structural remains of likely later post-medieval and early modern date – mostly of limited archaeological significance – represented the latest riverfront activity prior to modern era re-development of Howdon Basin.

2. INTRODUCTION

2.1 General Background

- 2.1.1 This report details the results of an archaeological monitoring and recording exercise (hereafter 'watching brief') undertaken April-June 2009 by Pre-Construct Archaeology Limited (PCA) along the southernmost 100m of the route of the North Cut-and-Cover Tunnel for the New Tyne Crossing through Howdon Yard, East Howdon, North Tyneside.
- 2.1.2 The New Tyne Crossing is being constructed by Bouygues Travaux Publics (UK Branch) (Bouygues TP) between Jarrow, South Tyneside and East Howdon, North Tyneside (Figure 1). The route runs up to 100m to the east of the line of the existing vehicular tunnel. The new structure involves construction of an immersed tube tunnel within the river, this connecting at dedicated transition shafts built on each riverfront to sections of 'cut-and-cover' tunnel extending inland (Figure 2).
- 2.1.3 The watching brief was undertaken as a condition of planning permission for the New Tyne Crossing which required that a programme of archaeological observation be undertaken during construction groundworks to record items or finds of archaeological or historic interest. A Specification for the overall programme of archaeological watching brief was compiled by the Tyne and Wear Archaeology Officer.¹ One element of this programme was an archaeological watching brief during groundworks for, in the first instance, a 100m long section of the North Cut-and-Cover Tunnel, between the North Transition Shaft on the riverfront of Howdon Basin in Howdon Yard and the line of Tyne View Terrace, the A187 link road.
- 2.1.4 The potential for archaeological remains in Howdon Yard and northwards to Tyne View Terrace is generally low since it is known that this area is essentially a man-made platform created in the second half of the 19th century as part of industrial era development along the Tyne. In 2007 an archaeological evaluation was undertaken to investigate the archaeological potential of the New Tyne Crossing route.² An evaluation trench sited in Howdon Yard - to the east of the line of the North Cut-and-Cover Tunnel - recorded dumped material, predominantly sand, of likely 19th century origin, to a depth of 2.70m below the existing ground surface. However, due to the restricted nature of that work, some uncertainty remained over the potential for archaeological remains in this area.
- 2.1.5 The completed Site Archive for the overall programme of archaeological watching brief undertaken by PCA along the route of the New Tyne Crossing, comprising written, drawn, and photographic records, will be deposited at Tyne and Wear Museum Archive, Arbeia, South Shields. The site code for the work undertaken along the route of the North Cut-and-Cover Tunnel between the North Transition Shaft and Tyne View Terrace, East Howdon, is STH (NCC) 09. The Online Access to the Index of Archaeological Investigations (OASIS) reference number for the overall programme of archaeological watching brief is: preconst1-64156.

¹ Newcastle City Council 2008. The Specification forms Appendix A to this report.

² Archaeological Services Durham University 2007.



Figure 1. Site location
Scale 1:25,000

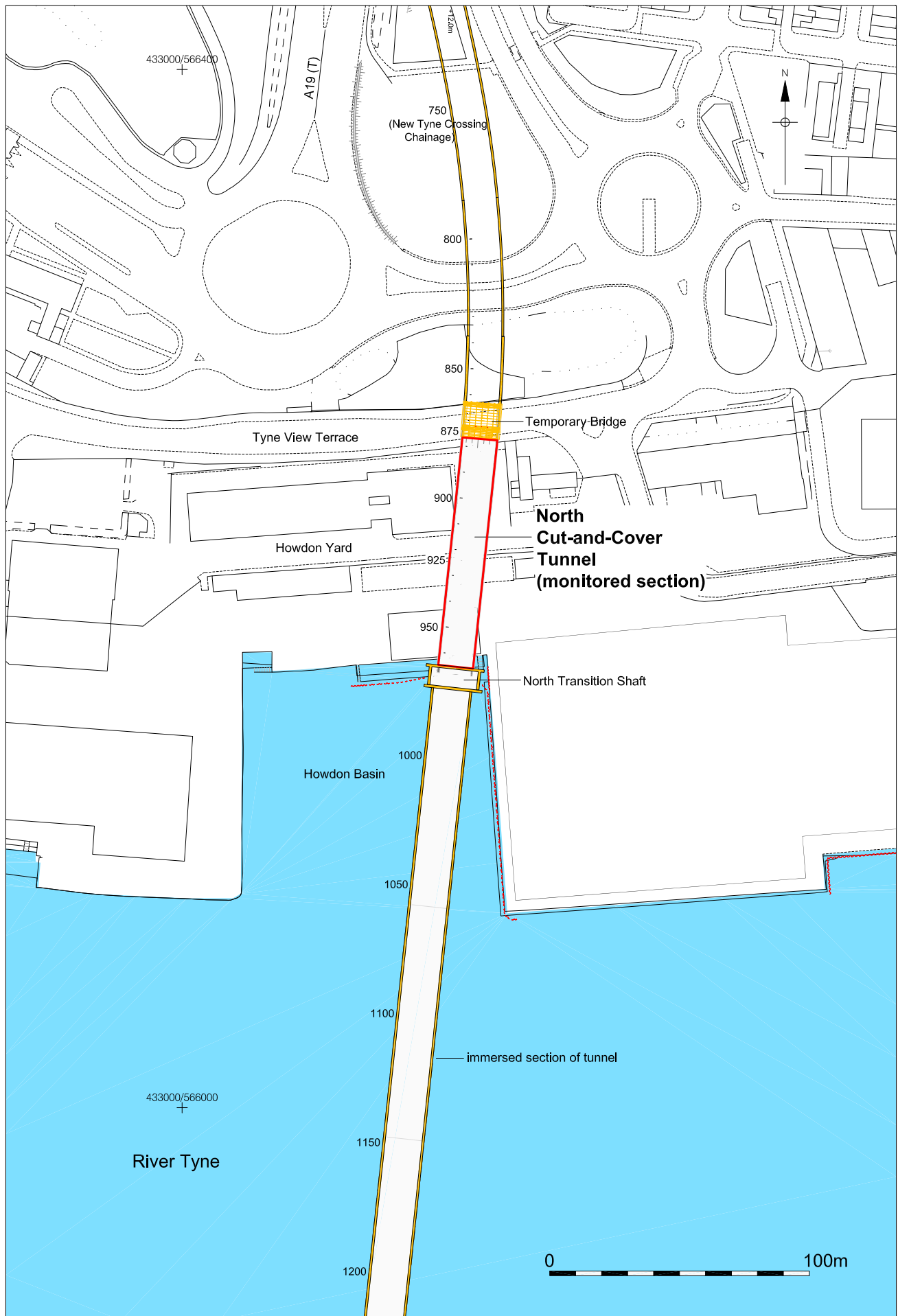


Figure 2. Site location, detail
Scale 1:2,000

2.2 Site Location and Description

- 2.2.1 Howdon Yard lies to the south of Tyne View Terrace, the A187, a link road feeding the A19(T) roundabout and the A187 East Howdon Bypass, close to the entrance/exit of the existing Tyne Tunnel in East Howdon. From the roundabout, the A19(T) runs northwards, then north-westwards, through North Tyneside (Figure 1).
- 2.2.2 The North Transition Shaft for the New Tyne Crossing is sited on the riverfront of Howdon Basin in Howdon Yard at central National Grid Reference NZ 3309 6616 (Figure 2). Extending inland from the shaft is the North Cut-and-Cover Tunnel, with an overall length of c. 318m, emerging at ground level at a new toll plaza at the revised exit of the A19(T). The southernmost 100m of the North Cut-and-Cover Tunnel - the area of interest herein described – extends to the site of a temporary bridge installed along part of Tyne View Terrace so that vehicles could continue to safely use the road while construction activity was undertaken below. The central National Grid Reference for the northern end of this section of the North Cut-and-Cover Tunnel at the temporary bridge is NZ 3310 6626 (Figure 2).
- 2.2.3 Howdon Yard is essentially a man-made riverside platform constructed in the second half of the 19th century. Immediately prior to the construction of the New Tyne Crossing, it comprised extensive open yard areas set at differing levels and variously surfaced with concrete, tarmac and rubble hardcore. Several buildings of early modern/modern date occupied the northern portion of the yard, adjacent to Tyne View Terrace. By the time of the archaeological watching brief, Howdon Yard was a major construction site as the New Tyne Crossing development progressed.

2.3 Geology and Topography

- 2.3.1 The solid geology of the route of the New Tyne Crossing is dominated by rock of the Upper Carboniferous (Silesian), specifically the Westphalian or Coal Measures. The Coal Measures, as the name suggests, is the geological unit that was extensively mined for coal throughout Tyneside, in the post-medieval and early modern eras. The Measures typically comprise a cyclothemic sequence of mudstone, sandstone, siltstone, seat earth and coal.
- 2.3.2 The drift geology of the route consists of interbedded sands and clays of glacio-fluvial origin overlain by sometimes significant thicknesses of alluvial material, predominantly sand and gravel.
- 2.3.3 Prior to the scheme, the ground surface at the riverfront in Howdon Yard lay at c. 4.0m aOD. To the north, the yard was terraced to take into account the rising valley side of the Tyne, with ground level along Tyne View Terrace at the entrance to the yard at c. 6.70m aOD.

2.4 Planning Background

- 2.4.1 The archaeological watching brief herein described was commissioned by Bouygues TP in advance of construction of the New Tyne Crossing, between Jarrow in South Tyneside and East Howdon in North Tyneside.

- 2.4.2 Planning permission for the scheme was granted in 2005 and Condition 11, 'Protection of items of archaeological interest', stipulated that *'an archaeologist nominated by the relevant local planning authority shall be granted access at all reasonable times to observe construction works in progress and record items or finds of archaeological or historic interest'*. The justification for the condition was *'to ensure adequate recording, protection and potential preservation of archaeological remains'*.
- 2.4.3 *Planning Policy Guidance Note 16: 'Archaeology and Planning'* (PPG16)³ currently provides advice at a national level concerning the safeguarding of archaeological remains within the planning process. At the time of writing, PPG16 is under review as part of a consultation paper on a new planning policy statement on the historic environment. In addition, the Unitary Development Plan (2002) of North Tyneside Borough Council contains Policy E19 'Sites of Archaeological Significance', within which Policy E19/6 states: *'Where assessment and evaluation have established that proposed development will affect a site or area of archaeological interest the applicant will be required to preserve archaeological remains in situ unless this is clearly inappropriate or destruction of the remains is demonstrably unavoidable, in which case a programme of archaeological works will be required to be submitted and agreed with the local planning authority before the start of development'*.
- 2.4.4 In 2002 the Tyne and Wear Passenger Transport Authority commissioned an environmental statement for the New Tyne Crossing, which included a study of the impact of the scheme on archaeology and cultural heritage.⁴ In 2007 the same body commissioned the aforementioned archaeological evaluation, which demonstrated that industrial activity had affected the whole of the tunnel route and where archaeological remains were found they were of low significance. The evaluation produced particularly uninformative results on the north side of the Tyne. In the two trial trenches investigated along this portion of the route, the natural sub-stratum was not reached and no archaeological deposits, other than those related to creation of the modern ground surface, were recorded.
- 2.4.5 For the construction phase of the scheme, the aforementioned Specification for the programme of archaeological watching brief was produced by the Tyne and Wear Archaeology Officer, part of the Tyne and Wear Specialist Conservation Team, attached to the Historic Environment Section of Newcastle City Council.
- 2.4.6 Design of the programme of archaeological watching brief required careful consideration of the methodology of construction of the New Tyne Crossing. The immersed tube tunnel for road traffic would connect to sections of the tunnel extending inland using 'cut-and-cover' technology. Connection between the immersed tunnel and the cut-and-cover sections was at dedicated transition structures built on each riverfront.

³ Department of the Environment 1990.

⁴ Ove Arup & Partners 2002.

- 2.4.7 Cut-and-cover involves diaphragm walls being constructed underground, in order to create a supported space within which the tunnel excavation can be made. The diaphragm walls comprise two parallel, continuous, concrete underground walls. Once cast, the area between the walls is excavated in a phased manner, with temporary props placed between the walls for support. The tunnel is thus constructed *in situ*, using base and roof slabs to provide lateral support, with the temporary support props being removed as each base slab is inserted. Once the tunnel is constructed, the space above the roof slabs is backfilled to create the necessary ground level above.
- 2.4.8 The Specification for the archaeological watching brief suggested five specific areas along the new tunnel route should be targeted for observation. The area of relevance to the work herein described is a 100m stretch, moving inland from the North Transition Shaft, of the cut-and-cover excavation. In acknowledging the uniqueness of the project, the Specification highlighted the uncertainty surrounding the appropriateness of the suggested methodology and the need for regular review to establish whether or not the methodology was working.

2.5 Archaeological and Historical Background

The summary below is mostly taken from the aforementioned environmental statement report, which should be consulted for full details. The research and writing of those responsible is fully acknowledged.

- 2.5.1 No prehistoric or Roman period activity had been identified along the entire route of the New Tyne Crossing. For the portion of the route north of the river in East Howdon there is similarly low potential for medieval period remains.
- 2.5.2 East Howdon has greater potential for post-medieval archaeological remains. Prior to 19th century reclamation to create the modern riverfront, there was formerly an inlet in the northern riverbank into which the Howdon Burn emptied, and this probably formed a natural harbour. Moll's map of the Tyne from c. 1650 annotates the inlet 'Howdon Ponds', while documentary records indicate that there was a quay and extensive ballast hills at Howdon at this time.
- 2.5.3 The Howdon riverside was particularly known for salt-making in the post-medieval period; documentary evidence in fact suggests that salt was produced in the area as early as 1539. From the 17th century, or earlier, the area in which Howdon Yard now lies was known as Howdon Pans; since salt was extracted by boiling sea water in lead or iron tanks (pans). The Tyne estuary became such a major focus for salt extraction due to the abundance of 'pancoal', a poor quality fuel not worth the cost of transporting. Glass may also have been manufactured at Howdon Pans in the 17th century, although the exact location of any such works is uncertain.
- 2.5.4 Shipbuilding began at Howdon in the 1750s and a large graving dock was in place by 1759. The yard operated by the Hurry family at Howdon was one of most significant shipbuilding enterprises on the Tyne in the 18th century. A substantial establishment with numerous slipways, a dry dock, and an extensive quayside the facility is known to have been an important element of the Tyneside whaling trade in this period. Although production at Hurry's yard ceased in 1811, after the firm went bankrupt, shipbuilding continued at Howdon throughout the 19th century through the endeavours of various firms, and at several sites.

- 2.5.5 By the mid 19th century there were concerted efforts in place to improve the River Tyne in the Howdon area. A topographical dictionary from the time describes how the channel of the river between Willington Quay and Howdon had been greatly deepened and improved by laying ballast in the river bed, to contract its width.⁵ Various 1st editions of the Ordnance Survey map from c. 1860 show the shipbuilding yard at Howdon Pans well to the north of the modern riverfront. To the east was an expanse of mudflats on the western side of the extensive Northumberland Dock. The area immediately to the north of the riverfront at Howdon Pans was fairly well developed for industrial enterprises by this date, for example, to the north-west was the site of Howdon Colliery, which had opened in the late 18th or early 19th century but was out of use by the 1830s, while, to the east, a series of staithes in the Northumberland Dock were served from the north by a branching network of railway lines.
- 2.5.6 By the end of the 19th century, further extensive reclamation of the Tyne foreshore west of the Northumberland Dock had completely altered the topography of Howdon Pans. Various 2nd editions of the Ordnance Survey map from c. 1895 shows that the river frontage had been advanced to the same line as that of the Northumberland Dock. This is documented as being the result of works by the River Tyne Commissioners prior to 1882 which involved extensive dredging and improvement operations of the kind previously described. Infilling is known to have occurred behind the newly established waterfront, meaning that the sites of the former Howdon shipyard and Howdon dock were levelled. A dock facility was, however, retained as part of the development, this notable for its dolphin moorings, as depicted on the larger scale 2nd editions of the Ordnance Survey map. This land creation at the riverside resulted in the creation of new streets such as Tyne View Terrace, now the A187 link road, running parallel to the riverfront to the north of Howdon Yard. The Tyne Commissioners built engineering workshops on the reclaimed site, while the Northumberland Shipyard was established to the east.
- 2.5.7 'Howdon Yard (Tyne Improvement Commissioners)' is shown in detail on mid 20th century editions of the Ordnance Survey map. Further development of the riverfront occurred in the second half of the 20th century, including the creation of the Howdon Basin dock facility. Howdon Yard - as it existed when construction of the New Tyne Crossing began in 2008 – encompassed the area formerly occupied by both the Tyne Commissioners' Yard and the Northumberland Shipyard at Howdon Pans. By this time the yard was generally known as AMEC's Howdon Yard, having been leased by the Port of Tyne Authority to AMEC and a number of sub-tenants.

⁵ Lewis (ed.) 1848, p. 579.

3. PROJECT AIMS AND RESEARCH OBJECTIVES

3.1 Project Aims

- 3.1.1 The project was threat-led since construction of the New Tyne Crossing had potential to destroy important archaeological remains. Accordingly, the aforementioned planning condition was put in place to ensure the adequate recording, protection and potential preservation of any such remains. The Specification for the archaeological watching brief stipulated that observation of specific elements of construction work should at least allow overall depths of 'made ground' from 19th century and later reclamation of the river margins to be recorded, thereby establishing the depth of the natural sub-stratum or early alluvial material and thus possibly informing knowledge of former river bank profiles.
- 3.1.2 These broad project aims were to be achieved through a programme of archaeological observation of construction groundworks, specifically excavation into existing ground surfaces. The specific works to be monitored were:
- groundworks for the transition shaft structure on each side of the river;
 - groundworks for the cut-and-cover sections of the tunnel on each side of the river, with a 100m section closest to the river being monitored, on each side, in the first instance;
 - groundworks for a 50m stretch of the cut-and-cover section of the tunnel to the south of Ormonde Street, Jarrow (in the vicinity of 2007 evaluation trench ET205) where there was considered to be potential for archaeological remains related to the former Jarrow Colliery.
- 3.1.3 Additional aims of the project were:
- to compile a series of reports describing the results of, and working methods employed during, each element of the programme of archaeological monitoring;
 - to compile an overall Site Archive consisting of all site and project documentary and photographic records, to be deposited in an appropriate collecting museum.
- 3.1.4 This report details the results and working methods of the watching brief undertaken along a 100m length of the North Cut-and-Cover Tunnel, between the North Transition Shaft in Howdon Yard and a temporary bridge erected to maintain traffic flow along Tyne View Terrace, East Howdon, North Tyneside.

3.2 Research Objectives

- 3.2.1 The overall recording project has the potential to make a significant contribution to archaeological knowledge of the area. *Shared Visions: The North-East Regional Research Framework for the Historic Environment* (NERRF)⁶ highlights the importance of research as a vital element of development-led archaeological work and sets out key research priorities for all periods of the past so that all elements of commercial archaeological work can be related to wider regional and national priorities for the study of archaeology and the historic environment.

⁶ Petts and Gerrard 2006.

4. METHODOLOGY

4.1 Fieldwork

- 4.1.1 The fieldwork was undertaken in accordance with the aforementioned Specification prepared by the Tyne and Wear Specialist Conservation Team and guidelines set out in the Institute for Archaeologists' guidance document, '*Standard and guidance for archaeological watching brief*'.⁷
- 4.1.2 Archaeological monitoring was undertaken along a 100m length of the North Cut-and-Cover Tunnel between the North Transition Shaft in Howdon Yard and the temporary bridge on Tyne View Terrace intermittently between 6 April and 18 June 2009. The New Tyne Crossing route chainage marker system (e.g. CH 900m, etc.) was employed as the general basis for locating operations within the cut-and-cover works.⁸ The section of the North Cut-and-Cover Tunnel subject to archaeological monitoring ran between approximate CH 965m (at the North Transition Shaft) and approximate CH 875m (the south side of the temporary bridge on Tyne View Terrace). In addition, the sequentially numbered temporary support props (e.g. P43, etc.) for the diaphragm walls were used to further clarify locations within the cut-and-cover works.
- 4.1.3 The general method of construction for the cut-and-cover tunnels has been described above. No archaeological monitoring took place during construction of the parallel, continuous, concrete diaphragm walls for the North Cut-and-Cover Tunnel. However, with the diaphragm walls in place, phased excavation of the area between the walls was monitored. In general, 360° excavators of varying size, sited at the basal level of excavation for each phase, excavated into a vertical section (up to c. 6m high) of material. In each phase, the work progressed northwards from the North Transition Shaft towards the south side of the temporary bridge on Tyne View Terrace with temporary props being placed between the walls for support, as described (Figures 3 and 4).
- 4.1.4 During the watching brief herein described, hand cleaning of exposures was largely impossible due to the methodology employed for the cut-and-cover excavations, as described. While archaeological deposits and structures observed remotely were recorded on the PCA *pro forma* 'Context Recording Sheet', it is acknowledged that detailed context definition was generally impossible. A photographic record of the work was compiled. The numbered support props, as described, were used to clarify the location of any significant exposures.

4.2 Post-Fieldwork

- 4.2.1 The complete Site Archive, for the overall programme of archaeological work along the route of the New Tyne Crossing, will be packaged for long-term curation. The portion of the Site Archive relating to the North Cut-and-Cover Tunnel comprises written, drawn and photographic records (including all material generated electronically during post-excavation).

⁷ IfA 2001.

⁸ The system began at CH 0m, located on the A19(T) open northern approach to the new tunnel, north of the new toll plaza, in East Howdon, the approximate mid point of the River Tyne was at CH 1150m and the route crossed beneath line of High Street, Jarrow at CH 1925m.

- 4.2.2 No material was recovered during the watching brief relating to the North Cut-and-Cover Tunnel that required specialist stabilisation or an assessment of potential for conservation research. In preparing the complete Site Archive for deposition, all relevant standards and guidelines documents referenced in the Archaeological Archives Forum guidelines document⁹ will be adhered to, in particular a well-established United Kingdom Institute for Conservation (UKIC) document¹⁰ and a forthcoming IfA publication.¹¹
- 4.2.3 At the time of deposition of the complete Site Archive, the depositional requirements of the receiving body, in this case the Tyne and Wear Museum Archive, Arbeia, South Shields, will be met in full.

⁹ Brown 2007.

¹⁰ Walker, UKIC 1990.

¹¹ IfA forthcoming.

5. ARCHAEOLOGICAL RESULTS

In this instance, individual unique 'context' numbers - indicated in the following text as, for example [07] - have been assigned to stratigraphic deposits - as far as these could be ascertained without detailed cleaning - as well as to some riverside features and structures, none of which could be examined closely due to the method of working. The archaeological sequence is described as a series of broad phases although the phases have not been numbered due to the general uncertainty regarding context definition and stratigraphic relationships. Interpretation has been added to the data, where possible, and the phases have been correlated with recognised historical and geological periods, again where possible.

5.1 Natural Sub-stratum: Boulder Clay

- 5.1.1 In the vicinity of Props 46 and 47 (approximate CH 910-920m) in the monitored section of North Cut-and-Cover Tunnel, a layer, [06], of compact mid yellowish brown clayey silt was observed at a depth (as far as could be determined given the conditions under which the work was undertaken) of c. 7-8m below the modern ground surface of Howdon Yard. This material - evidently Boulder Clay - is likely to represent the mantle of glacial debris that overlies the solid geology of the river valley between Newcastle and the mouth of the Tyne.

5.2 Alluvium: River Silts

- 5.2.1 In the vicinity of Props 46 and 47 (approximate CH 910-920m) and continuing northwards in the monitored section of North Cut-and-Cover Tunnel (Figure 5), a substantial layered deposit, [05], mostly comprising interleaved lenses of mid greyish blue clayey silt and mid grey silt, was exposed overlying the Boulder Clay. At least c. 4.0m thick in the vicinity of Prop 46 (Figure 6), the deposit contained frequent small marine shells and fine rounded stones. Parts of two large timbers, evidently tree stumps, were noted within the deposit in the vicinity of Prop 47, these evidently not *in situ* and presumably having been deposited within the former channel of the river. This material is interpreted as alluvium that accumulated within the river channel prior to 19th century reclamation of the foreshore. The date at which it accumulated is uncertain.
- 5.2.2 Overlying river silt [05] in the vicinity of Prop 47 and continuing northwards was a distinctive layer, [04], of soft black organic silt. Up to c. 0.90m thick at this location, the deposit contained frequent fine and medium rounded and sub-rounded stones, frequent small marine shells, occasional fragments of wood and occasional fragments of brick and animal bone throughout. This material is interpreted as alluvium that accumulated within the river channel prior to 19th century reclamation of the foreshore. The date at which it accumulated is uncertain but the presence of brick fragments within the material suggests a later post-medieval date, probably 18th-19th century.
- 5.2.3 Overlying organic silt [04] in the vicinity of Prop 47 and continuing northwards was a layer, [03], comprising soft light grey sandy silt. Of variable thickness and up to c. 0.50m thick at this location, the deposit was sterile with no inclusions recorded. This material is interpreted as alluvium that accumulated on the tidal foreshore of the river at Howdon Pans prior to 19th century reclamation. The date at which it accumulated is uncertain.

5.3 19th Century?: Ballast

- 5.3.1 Overlying silt layer [03] in the vicinity of Props 46 and 47 (approximate CH 910-920m) and continuing northwards was a layered deposit, [02], generally comprising successive layers of loose sand and gravel, varying in colour from light yellowish brown to mid orange brown. Occasional small marine shells and occasional small fragments of clay tobacco pipe were noted within parts of the overall deposit. Overall, the material was of variable thickness, but a gradual but definite depletion to the north was noted, for example, it was up to c. 1.80m thick at Prop 47, but only c. 0.40m thick at Prop 43 (approximate CH 890m), this c. 30m to the north. This material has been interpreted as dumped ballast, broadly derived from 19th century infilling of the river channel and reclamation of the foreshore at Howdon Pans, but probably the result of successive phases of such activity undertaken over many years, even decades.

5.4 19th Century?: Riverfront Structure

- 5.4.1 In the vicinity of Prop 45 (approximate CH 900m) the remains of a possible former riverfront structure, [07], were observed (Figure 7). It consisted of unmortared sandstone masonry evidently supported by a series of sharpened timber posts, these sunk deep into organic layer [04]. The masonry appeared to be bedded down upon a layer of gravel ballast c. 0.20m thick, while other, similar ballast material evidently surrounding and overlying the structure likely post-dated its abandonment.

5.5 19th/20th Century: Riverfront Structures

- 5.5.1 Immediately to the north of structure [07] were the remains of what appeared to be a more recent riverfront structure, [08]. It was evidently composed entirely of timber and comprised horizontal planking retained by squared uprights driven into the uppermost surviving gravel ballast deposit at this location (Figure 8). It was likely a jetty or pier of late 19th or 20th century date.
- 5.5.2 In the vicinity of Prop 44 (approximate CH 895m) a concrete and brick structure, [09], was observed. This was probably of 20th century origin and was likely the remains of a pier or similar on the former riverfront of Howdon Basin.

5.6 Modern: 'Made Ground'

- 5.6.1 Overlying the gravel ballast in the vicinity of Props 46 and 47 (approximate CH 910-920m) and continuing northwards was a substantial compact layer, [01], comprising well-sorted demolition rubble, up to c. 2.0m thick. Pottery, glass, metal objects, bone, wood fragments and shell were all noted within the deposit, which is interpreted as probably deriving from 20th century development of Howdon Yard.



Figure 3. View of the North Cut-and-Cover Tunnel from ground level in Howdon Yard, looking north, April 2009.



Figure 4. View along the interior of the North Cut-and-Cover Tunnel in Howdon Yard, looking north, April 2009.



Figure 5. Machine excavation of alluvial material from the interior of the North Cut-and-Cover Tunnel in Howdon Yard, looking north, April 2009.



Figure 6. Section through alluvial material in the vicinity of Prop 46, North Cut-and-Cover Tunnel, looking north, April 2009 (4m scale).



Figure 7. Stone and timber structure in the vicinity of Prop 44, North Cut-and-Cover Tunnel, looking north, April 2009.



Figure 8. Timber structure in the vicinity of Prop 44, North Cut-and-Cover Tunnel, looking north, April 2009.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

- 6.1.1 The watching brief undertaken during the excavation of the North Cut-and-Cover Tunnel for the New Tyne Crossing between the North Transition Shaft and the temporary bridge on Tyne View Terrace allowed remote recording of geological, alluvial and archaeological deposits.
- 6.1.2 The earliest deposit recorded remotely was evidently natural Boulder Clay, seen at one location at c. 7-8m below existing ground level. Substantial alluvial material, at least 4.0m thick, was noted along the monitored section of the route, this representing the former extent of the river prior to canalisation of the natural channel. This material was overlain by gravel ballast probably derived from 19th century infilling of the river channel and reclamation of the foreshore at Howdon Pans. The ballast was seen to decrease in thickness progressing inland, as might be expected.
- 6.1.3 Structural remains of likely later post-medieval and early modern date – mostly of limited archaeological significance - represented the latest riverfront activity prior to modern era re-development of Howdon Basin in the form it survived prior to the construction of the New Tyne Crossing. For the most part, these structures appeared to post-date the majority of 19th century ballast material.

6.2 Recommendations

- 6.2.1 No further work is required on the information recovered during this element of the overall programme of watching brief, with the relevant portion of the Site Archive, including a copy of this report, comprising the permanent record of the work undertaken.

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8. ACKNOWLEDGEMENTS AND CREDITS

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PCA Credits

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APPENDIX A
PROJECT SPECIFICATION

**SPECIFICATION FOR ARCHAEOLOGICAL WORK TO RECORD SUSPECTED
ARCHAEOLOGICAL DEPOSITS DURING THE CONSTRUCTION OF THE NEW TYNE
TUNNEL, HOWDON AND JARROW, TYNE AND WEAR**

Introduction

Planning permission has been granted for an additional vehicular tunnel under the River Tyne, with portals at Howdon on the north side and Jarrow on the south side.

The commissioning client will supply a set of plans to the appointed archaeologist.

The archaeological and cultural heritage section of the Environmental Statement (Northern Archaeological Associates for Ove Arup, May 2002) concluded that whilst a number of archaeological sites had been identified on the line of the proposed tunnel, the archaeological potential of much of the route is low due to the scale of nineteenth and twentieth century redevelopment.

Main known archaeological features within the study area:

Howdon***Salt Pans – HER 5258***

Salt may have been produced at Howdon Pans as early as 1539, made by boiling sea water in lead or iron tanks (pans) grouped in pairs or fours with a central gangway for stoking the fires. Salterns were very common on the Tyne in the seventeenth century, but the trade was in decline by the end of the eighteenth century partially due to cheaply produced salt from Cheshire. Two salt pans are thought to have existed at Howdon on flat land reclaimed from the river. These were apparently swept away for the docks and shipyards.

Glassworks – HER 5078

Glass was made at Howdon from as early as 1670 by the Henzell and Tyzack families. The works were sold to Matthew Ridley in 1759. The location of the site and its date of closure have not been established.

Shipbuilding – HER 2110 and 2197

Shipbuilding began at Howdon in 1758 at Hurry's shipbuilding yard. A large graving dock was constructed in early 1759. The yard had four slipways, a dry dock, a quay, a ropery and sailmaking loft. Hurry went bankrupt in 1806 and his yard closed in 1811. Other shipbuilding firms continued at Howdon throughout the 1800s including T. Brown and C. Smith, Palmers and Banks.

Howdon Colliery – HER 1178

The colliery opened either in 1775 or 1804 and operated until 1831 when the workings became flooded. It was linked to a further pit at Percy Main by a waggonway.

Howdon Whale Processing Site – HER 5468

Howdon was a centre of blubber boiling and whale bone processing. Ships from here hunted near Greenland. Souvenir whalebone arches and vertebrae from these voyages were set up in the area. Samuel Hieronymus Grimm [who made a living from accompanying the well-to-do on their travels and recorded his journeys in pen-and-ink drawings] drew a stile made of whale ribs at Howdon Pans in the eighteenth century. The Newcastle Whale Fishing Company was formed on 4 December 1751. Meanwhile Francis Hurry, who had begun building ships at Howdon in 1758, took an interest in Greenland whaling in 1764 with Thomas Airey, whose daughter he had married. On the foreshore, on the east side of Howdon Burn, were facilities for whale bone cleaning and blubber boiling and storage facilities for harpoons, lines etc. Their first ship was "Newcastle", 340 tons, but she was burnt down in 1766.

There were extensive ballast hills at Howdon from the seventeenth century. The present river frontage at Howdon was created before 1882 by the River Tyne Commissioners, who also

dredged the river channel. The shipyard and dock were levelled and the sites infilled to create new streets like Tyne View Terrace and engineering workshops.

Jarrow

Earliest documented settlement at Jarrow is the Anglo-Saxon monastery which lies to the south-east of the proposed tunnel. Laura Sole (Education Manager, Bede's World) has advised that Ecgrith Place, shown on a nineteenth century map of Jarrow Hall by Simon Temple on the Jarrow riverbank (copy held by HER original in TWAS), could potentially be the site of a port associated with Jarrow monastery. Jarrow was also a medieval village. The medieval settlement lies in close proximity to the monastery in the Church Bank area.

Moll's map of 1650 shows two ballast quays possibly within the study area. Fryer's map of circa 1773 shows extensive ballast hills behind a river quay and possibly coke ovens or salt pans. These are still shown on Ordnance Survey first edition, bisected by waggonways.

Jarrow Brown Ware Pottery – HER 2252

There was a pottery south of Dunkirk Place in the early nineteenth century, operated by G. Grey & Co. in 1851 and by J.B. Hodgson in 1852-3. Jarrow Brownware Pottery closed in 1855.

Jarrow Colliery- HER 2258

Jarrow Colliery was opened in 1803 by Simon Temple who leased the coal royalties from the Dean and Chapter of Durham Cathedral. Subsequent owners included Thomas and Robert Brown, D. Brown, W. Blackett and N. Wood, Anderson and Philipson (1850s). It closed in 1851 after an explosion but was subsequently purchased by the Hetton Coal Company and worked from their other pits.

Pontop and Jarrow Railway, Springwell Staith Branch – HER 2205

Part of the original course of the Bowes Railway. The staiths lay immediately to the east of the existing Tyne Tunnel.

In the nineteenth century a shipyard was opened by Simon Temple (owner of Alfred Pit in Jarrow) at the end of a quay and houses built at Dunkirk Place. A patent slipway was opened for ship repair by T and R Dunn in 1829.

Palmer's Shipbuilding and Iron Works – HER 2534

A wood shipyard, owned by a Thomas Metcalfe, had occupied a stretch of the Jarrow riverside from the 1830s. This yard was subsumed in Palmer's Shipyard which was founded in 1851 as a dedicated iron shipyard by a partnership of the brothers' Charles Mark and George Palmer, reputedly as a direct means of speeding up the transport of coal from their coal interests to markets by sea. In 1906, the overhead gantry cranes powered by electricity, which became symbols of the yard, were constructed. Subsequent to the First World War, oil tankers were the most prolifically produced ship type. In 1933 Palmer's closed and was acquired by National Shipbuilders Security Ltd. In 1935 the site was demolished, though the large Hebburn dry dock was taken over by Vickers-Armstrong and continued in use as Palmer's Hebburn Ltd.

Boreholes suggest that made ground exists on both banks of the River Tyne. On the northern bank between 6.6 and 8.7m of made ground appears to be present between the southern end of A19 and the river. This seems to support the cartographic evidence which suggests that there has been encroachment into "Howdon Gut" and a southward advance of the riverfront. On the southern bank, made ground deposits vary between 8.4 and 11.4m in depth, representing the former ballast hills overlying the former foreshore. The river's edge may have advanced as much as 100m.

The made ground could reflect reclamation deposits or buried earlier ground surfaces. The construction of the new tunnel could potentially affect structural remains associated with the Howdon shipbuilding yard, which is transected by the work. At Jarrow the tunnel transects the site of a former smithy and the waste heap associated with Jarrow Colliery, the former ballast hill, a coke works and cinder works. On both sides of the river traces of former quays, salt pans and river foreshore features may also be exposed by the work. The ES therefore

recommended a programme of archaeological evaluation on either side of the river in advance of tunnel construction work to ascertain if archaeological deposits survive.

In February 2007, seven archaeological evaluation trenches were excavated by Archaeological Services Durham University on the line of the proposed tunnel.

The aims of the evaluation were:

- To establish the upper limit of preservation of structural remains and surfaces
- To determine the southern edge of ballast deposits at Jarrow, and whether any post medieval structural remains survive above the ballast
- To define the extent of the area of archaeological interest
- To confirm the sequence and extent of reclamation on both sides of the river
- To establish the nature of activities undertaken close to the foreshore
- To record the nature, date and degree of survival of archaeological remains

Two trenches were excavated on the north side of the Tyne (one on the grassed area 200m east of the tunnel toll gates and the other in the former AMEC yard south of Tyne View Terrace). Neither trench reached natural subsoil, (all seven trenches were excavated to a maximum depth of 3m), and neither trench recorded archaeological deposits. The trench closest to the river was inundated with water.

Five trenches were excavated on the south side. The trench closest to the river (Tyne Street) did not penetrate through the ballast layer and so did not reach natural subsoil. The next trench (Tyne Street/Clayton Street) recorded re-deposited natural boulder clay but subsoil itself was not recorded.

The three final trenches excavated further away from the riverbank did reach subsoil at a depth between 1.6 and 2.3m below present ground level.

In trench ET204 (Commercial Road/Saxon Way) a brick cellar of a former off-licence was recorded.

The finds in trench ET205 (Staple Road) were of most interest. This was part of a yard for Temple Main Pit, part of Jarrow Colliery (HER 2258). Jarrow Colliery was opened in 1803 by Simon Temple who leased the coal royalties from the Dean and Chapter of Durham Cathedral. Subsequent owners included Thomas and Robert Brown, D. Brown, W. Blackett and N. Wood, Anderson and Philipson (1850s). It closed in 1851 after an explosion but was subsequently purchased by the Hetton Coal Company and worked from their other pits. Glacial subsoil was recorded at a depth of 1.98m. Above this was a deposit of stiff yellow-green clay, cut by a sandstone culvert covered with wooden planks. There was a second smaller brick culvert also capped with wooden planks. Other structural remains included a single course of sandstone blocks and three modern brick walls with colliery waste in-between. This was overlain by demolition rubble and a layer of black sandy silt containing coal and coal dust, presumably associated with the use and demolition of Temple Main Colliery.

Finds from the evaluation were sixteenth to twentieth century pottery sherds, most was late in date; a fragment of nineteenth century wine bottle, five fragments of clay tobacco pipe (one bowl was stamped) and two pieces of animal bone.

The results of the evaluation showed that large-scale industrial activity has affected the whole tunnel route. Where archaeological remains were found (such as the colliery yard site), they are low in significance.

However where natural subsoil was not reached by the trenches, there is a possibility that archaeological remains underlie the considerable depth of ballast and modern overburden (up to 10m deep). Such remains could potentially be associated with the nearby Anglo-Saxon monastery at Jarrow, which is a candidate World Heritage Site.

Following discussions with engineers, it has become clear that it would be unsafe and unfeasible to attempt to dig archaeological trenches to this depth. Water penetration would also make this exercise difficult if not impossible close to the river banks.

It has therefore been agreed that the best way to approach this is for an archaeological contractor to monitor the excavation of structure shafts and cut and cover sections of the tunnel. This will hopefully enable the further recording of industrial remains associated with Temple Main Pit, will ascertain the depth of made ground and thus the depth of natural subsoil and the original profile of the river banks, and will record any deeply buried archaeological remains as best is possible given health and safety restrictions.

The appointed archaeologist will be fully briefed by the commissioning client on site operating and safety procedures before work commences. The archaeologists will at all times follow the advice of the construction management team regarding access to excavations and time available for recording.

As this project is unique, it is not yet known how successful the suggested methodology for the archaeological work will be. The process will need to be regularly reviewed to see if the methodology is working.

Should no archaeological remains be found, or should the methodology not be working archaeologically, the County Archaeology Officer may decide to reduce the scope of the watching brief, or stop it altogether.

Tunnel construction work is due to start in Spring 2008 and will finish in 2012. The watching brief will **not** be needed on a daily basis for the whole period as this would be extremely expensive and time-consuming, probably for very little archaeological gain.

There are several targeted areas where the watching brief is needed:

- During the excavation of the two transition structure shafts on either side of the river
- During cut and cover sections on north side of river (it is suggested that in the first instance 100m of tunnel is monitored closest to the river).
- During cut and cover sections on south side of river - in first instance a 100m stretch of tunnel in vicinity of trenches ET202 and ET203 where natural subsoil was not reached
- During cut and cover sections for a 50m stretch in vicinity of trench ET205 where the colliery yard was recorded.

The watching brief is obviously only needed to the depth of natural subsoil (and not within the engineered fill deposited during construction of the transition structure platforms and subsequently excavated during construction of the transition shafts).

The two transition shafts will be dug into the riverbank using the diaphragm walling method. They will each measure around 15m in diameter and will be up to 30m deep (obviously natural subsoil will be much shallower than this).

Cut and cover sections of the tunnel in total will extend for around 320m on either side of the river, will be around 15m wide and up to 30m deep. As detailed above, it is not envisaged that the total 640m will be archaeologically monitored, only the river sides and area of the colliery yard.

On the south side of the river, the section of tunnel nearest to the riverbank will be bored in places. In this event there will be nothing to archaeologically monitor and in any case archaeological remains will remain in-situ as the tunnel will be bored beneath them.

In the event of construction workers finding something of potential archaeological interest where the appointed archaeologist is not present, the appointed archaeologist will be contacted immediately in order that the find can be inspected and recording can be undertaken if necessary.

Other potential archaeological issues:

The section of tunnel which runs under the river itself will be located in a dredged channel. There is a possibility that dredging operations could destroy archaeological remains such as boats, keels or staiths, but it is noted that extensive and deep dredging operations

undertaken by the River Tyne Commissioners in the late nineteenth century probably removed such features. Their dredging operations would have focused on the centre of the river however and so historic features may survive closer to the river banks.

The divers who will be employed to assist in putting the tunnel sections into place in the dredged channel will alert the County Archaeologist to anything of possible archaeological interest.

A second phase of archaeological recording will be needed at the listed Gaslight Public House, Commercial Road, Jarrow, if it is decided that the pub is to be demolished. This work will be subject to a separate specification.

The archaeological work is required in accordance with PPG16 and UDP Policies E18/6 (North Tyneside Council UDP) and ENV8/3 (South Tyneside Council UDP).

The appointed archaeologist must familiarise themselves with the results of previous archaeological work on the site before starting work.

All staff on site must understand the project aims and methodologies.

All work must be carried out in compliance with the codes of practice of the Institute of Field Archaeologists and must follow the IFA Standard and Guidance for Archaeological Field Evaluations, Excavation or Watching Briefs as appropriate.

The North-East Regional Research Framework for the Historic Environment (2006) notes the importance of research as a vital element of development-led archaeological work. It sets out key research priorities for all periods of the past allowing commercial contractors to demonstrate how their fieldwork relates to wider regional and national priorities for the study of archaeology and the historic environment. The aim of NERRF is to ensure that all fieldwork is carried out in a secure research context and that commercial contractors ensure that their investigations ask the right questions.

ARCHAEOLOGICAL BRIEF

Before starting work the appointed archaeologist will provide a project design to Bouygues, the TWPTA and County Archaeologist for approval, detailing the methodology to be employed.

Tasks

A construction timetable has yet to be agreed. Tenders for the Watching Brief should therefore be a cost per day including overheads such as travel costs and equipment. Reporting and other costs must also be identified. Contingency costs will be provided for environmental sampling and scientific dating per sample and for finds analysis. Approval from Bouygues must be obtained before incurring any of these contingency costs. Any variation on the agreed timetable will be notified by the client, who will give a minimum of 48 hours notice of a change on the days of site attendance. Close liaison between the parties involved will be needed to co-ordinate this element of the work.

The work involves undertaking a structured watching brief to observe and record any archaeological deposits and finds. The absence of deposits and finds must be recorded as negative evidence. **The Watching Brief will not aim to hinder the construction programme, however should archaeological remains be found, the appointed archaeologist must be allowed sufficient time to record the archaeological deposits.**

The level of recording needed will depend on the nature and date of the archaeological features and most importantly on health and safety considerations. It is envisaged that remains of the colliery yard on the south side of the river will be rapidly hand cleaned, photographed and drawn, excavated and sampled where needed, because the depth of deposits here (less than 2m) does not represent a safety issue. Machining here will need to

be undertaken under strict archaeological supervision, with care and in shallow layers so as not to destroy archaeological remains before they are recorded.

Elsewhere, the County Archaeology Officer has been provisionally advised that depending on onsite conditions etc. it may be possible for an archaeologist to safely enter the 'trench' to undertake recording, even at depth, as the sides will be safely supported by concrete walls. This will be at the discretion, and under the supervision, of the construction management team. Where feasible and where safe to do so, important archaeological features should be recorded by scale drawing and photograph, excavated and environmentally sampled.

However, where the appointed archaeologist is advised by construction management/supervision staff, that it is not safe to enter the 'trench' to hand clean and draw the features, a simple photographic record taken with a zoom lens from the top of the 'trench' will have to suffice. The approximate position of the feature must still be marked on a site location plan in the finished report.

Fieldwork - General Conditions

The Archaeological Contractor must detail measures taken to ensure the safe conduct of work.

The Client may wish to see copies of the Archaeological Contractor's Health and Safety Policies.

The Archaeological Contractor must be able to provide written proof that the necessary levels of Insurance Cover are in place.

The Archaeological Contractor must maintain a Site Diary for the benefit of the Client, detailing the nature of work undertaken on a day by day basis, with full details of Site Staff present, duration of time on site, etc. and contact with third parties.

All staff employed by the Archaeological Contractor shall be professional field archaeologists with appropriate skills and experience to undertake work to the highest professional standards.

Recording

Where feasible a full written, drawn (accurate scale plans, elevations and section drawings) and photographic record (of all contexts in black and white print and colour transparency with clearly visible graduated metric scale) will be made.

Pro-forma context sheets will be used.

Where feasible all archaeological features, deposits and the depth of natural subsoil will be levelled. Levels will be expressed as metres above Ordnance Datum.

Where feasible a 'Harris' matrix will be compiled where stratified deposits are recorded.

Environmental Sampling and Scientific Dating

It may be feasible for environmental samples to be taken from suitable archaeological deposits.

Scientific investigations should be undertaken in a manner consistent with "The Management of Archaeological Projects", English Heritage 1991 and with "Archaeological Science at PPG16 Interventions: Best Practice for Curators and Commissioning Archaeologists", English Heritage, 2003.

Aims of environmental sampling – to determine the abundance/concentration of the material within the features and how well the material is preserved, to characterise the resource (the

site) and each phase, to determine the significance of the material and its group value, what crop processing activities took place on the site? What does this tell us about the nature of the site? Is there any evidence for changes in the farming practice through time? How did people use this landscape? Can we place certain activities at certain locations within the site? Function and date of individual features such as pits, hearths etc. Are the charred assemblages the result of ritual deposition or rubbish? Is the charcoal the result of domestic or industrial fuel?

Advice on the sampling strategy for environmental samples and samples for scientific dating etc. must be sought from Jacqui Huntley, English Heritage Regional Advisor for Archaeological Science (0191 3341137 or 07713 400387).

Deposits should be sampled for retrieval and assessment of the preservation conditions and potential for analysis of biological remains (English Heritage 2002). Flotation samples and samples taken for coarse-mesh sieving from dry deposits should be processed at the time of fieldwork wherever possible. Sieving recovers fish, amphibian, small bird and mammal bone, small parts of adult mammals and young infused bones which may be under-represented otherwise. However it is noted that clay soils in this region make sieving difficult. Discuss the potential for sieving with Regional Advisor for Archaeological Science.

Environmental samples (bulk soil samples of 30 litres volume, to be sub-sampled at a later stage) will be collected by the excavator from suitable (i.e. uncontaminated) deposits. It is suggested that a large number of samples be collected during evaluation from which a selection of the most suitable (uncontaminated) can be processed. All tenders will give a price for the full analysis, report production and publication per sample.

Deposits will be assessed for their potential for radiocarbon, archaeomagnetic (guidance is available in the Centre for Archaeology Guideline on Archaeometallurgy 2001) and Optically Stimulated Luminescence dating. Timbers will be assessed for their potential for dendrochronology dating. Sampling should follow procedures in "Dendrochronology: guidelines on producing and interpreting dendrochronological dates", Hillam, 1998. All tenders will quote the price of these techniques per sample.

The following information should be provided with the environmental samples to be processed – brief account of nature and history of the site, aims and objectives of the project, summary of archaeological results, context types and stratigraphic relationships, phase and dating information, sampling and processing methods, sample locations, preservation conditions, residuality/contamination etc.

Laboratory processing of samples shall only be undertaken if deposits are found to be reasonably well dated, or linked to recognisable features and from contexts the derivation of which can be understood with a degree of confidence.

A range of features, and all phases of activity, need to be sampled for charred plant remains and charcoal. Ceramic features should not be avoided as the plant remains from these features may help to date them. Deep features should be sampled in spits to pick up changes over time. Part, or all of each of the contexts should be processed. In general samples should be processed in their entirety. All flots should be scanned, and some of the residues.

Pollen samples can be taken from features such as lakes, ponds, palaeochannels, estuaries, saltmarshes, mires, alluvium and colluvium, and from waterlogged layers in wells, ditches and latrines etc. Substances such as honey, beer or food residues can be detected in vessels. Activities such as threshing, crop processing and the retting of flax can be identified. When taken on site, pollen samples should overlap. Your regional science advisor can advise on the type of corer or auger which would be most appropriate for your site. Samples need to be wrapped in clingfilm and kept dark and cool. Make a description of the sediments in which the pollen was found, and send this with the sample to be assessed.

Coastal or estuary sites (even those which are now well drained) are suitable for sampling for foraminifera. Diatoms can also be found on marine sites, but also in urban settings (sewers, wells, drains, ditches etc). They only survive in waterlogged conditions. These aquatic microfossils are used as proxy indicators of the former aquatic ecological conditions on site,

changes in sea levels and temperature, salinity, PH and pollution. Forams are taken from cores, monolith tins or bulk samples. Diatoms are cut from monolith tins or cores or taken as spot samples.

Insects, which are useful as palaeoenvironmental indicators, survive best in waterlogged deposits such as palaeochannels and wells. They can provide information on climate change and landscape reconstruction as some species are adapted to particular temperatures, habitats or even particular trees. Certain insects can indicate the function of a feature or building (eg. Weevils, which were introduced by the Romans, often indicate granary sites, parasites will indicate the presence of particular animals such as sheep or horse, latrine flies survive in the mineral deposits in latrines, or in the daub of medieval buildings etc). Samples need to be sealed (eg. in a plastic box).

Where there is evidence for industrial activity, macroscopic technological residues should be collected by hand. Separate samples should be collected for micro-slugs (hammer-scale and spherical droplets). Guidance is available in the English Heritage "Archaeometallurgy" guidelines, 2001.

Buried soils and sediment sequences should be inspected and recorded on site by a recognised geoarchaeologist. Procedures and techniques in the English Heritage document "Environmental Archaeology", 2002 and "Geoarchaeology", 2004 should be followed.

Sampling strategies for wooden structures should follow the methodologies presented in "Waterlogged wood. Guidelines on the recording, sampling, conservation and curation of waterlogged wood" R. Brunning, 1996. If timbers are likely to be present on your site, contact a wood specialist beforehand. Pre-excavation planning – determine questions to ask, agree on a sampling strategy, allocate reasonable time and budget. Soil samples should be taken of the sediments surrounding the timber. Keep the timbers wet! Record them asap on-site – plan, photograph, record the size and orientation of the wood (radial, tangential, transverse), any toolmarks, joints, presence of bark, insect damage, recent breaks, and if another piece of wood was on top of or below the piece sampled. Both vertical and horizontal positioning of wattling must be recorded. Wood samples can provide information on woodland management such as medieval coppicing, type of taxa (native or foreign), conversion technology (how the wood was turned into planks), building techniques and type of tools used.

Waterlogged organic materials should be dealt with following recommendations in "Guidelines for the care of waterlogged archaeological leather", English Heritage and Archaeological Leather Group 1995.

Animal Bone

Animal bone can explore themes such as hunting and fowling, fishing, plant use and trade, seasonality, diet, age structures, farrowing areas, species ratios, local environment.

Animal bone assemblages should be assessed by a recognised specialist.

The specialist will need to know a brief account of the nature and history of the site, an account of the purpose, methods (details of sampling) for recovery of animal bones, and the main aims and results of the excavation, details of any specific questions that the excavator wants the animal bone specialist to consider, information about other relevant finds from the excavation (e.g. bone tools, fishing equipment, weaving equipment), specific information about each context that has produced significant quantities of animal bone (recovery method, phase, context type, position in relation to major structures, contamination by more recent material, some indication of the amount of bone (by weight or by container size)). See "Ancient Monuments Laboratory Advisory Note, "Assessment of animal bone collections from excavations", Sebastian Payne, 1991 and "The Assessment of a collection of animal bones", S. Davis, n.d., Ancient Monuments Laboratory.

Human Remains

Human remains must be treated with care, dignity and respect.

Excavators must comply with the relevant legislation (essentially the Burial Act 1857) and local environmental health concerns. If found, human remains must be left in-situ, covered and protected. The archaeological contractor will be responsible for informing the police, coroner and County Archaeologist. If it is agreed that removal of the remains is essential, the archaeological contractor will apply for a licence from the Home Office and their regulations must be complied with.

Site inspection by a recognised osteologist is desirable for isolated burials and essential for cemeteries. The remains will be recorded in-situ and subsequently lifted, washed in water (without additives). They will be marked and packed to standards compatible with "Excavation and post-excavation treatment of cremated and inhumed human remains", McKinley and Roberts, 1993. After excavation, the remains will be subject to specialist assessment.

Analysis of the osteological material should take place according to published guidelines "Human Remains from Archaeological Sites, Guidelines for producing assessment documents and analytical reports, English Heritage, 2002.

Some of the potential benefits from the study of human skeletons – demography, growth profiles, patterns of disease, genetic relationships, activity patterns, diet, burial practices, human evolution. New scientific techniques available include DNA and stable isotope analyses.

The final placing of the remains after scientific study and analysis will be agreed beforehand.

Further guidance is available in:

"Guidance for best practice for treatment of human remains excavated from Christian burial grounds in England", The Church of England and English Heritage, 2005 (www.english-heritage.org.uk/upload/pdf/16602_HumanRemains1.pdf)

"Church Archaeology: its care and management", Council for the Care of Churches, 1999

The Advisory Panel on the Archaeology of Christian burials in England can provide free well-informed advice with consideration of relevant religious, ethical, legal, archaeological and scientific issues. Panel's website:

<http://www.britarch.ac.uk/churches/humanremains/index.html>

or email the secretary simon.mays@english-heritage.org.uk

Treasure

Defined as:

- Any metallic object, other than a coin, provided that at least 10% by weight of metal is precious metal and that is at least 300 years old when found
- Any group of two or more metallic objects of any composition of prehistoric date that come from the same find
- All coins from the same find provided that they are at least 300 years old when found, but if the coins contain less than 10% gold or silver there must be at least ten
- Any object, whatever it is made of, that is found in the same place as, or had previously been together with, another object that is Treasure
- Any object that would previously have been treasure trove, but does not fall within the specific categories given above. Only objects that are less than 300 years old, that are made substantially of gold or silver, that have been deliberately hidden with the intention of recovery and whose owners or heirs are unknown will come into this category

If anything is found which could be Treasure, under the Treasure Act 1996, it is a legal requirement to report it to the local coroner within 14 days of discovery. The Archaeological Contractor must comply with the procedures set out in The Treasure Act 1996. Any treasure must be reported to the coroner and to The Portable Antiquities Scheme Finds Liaison Officer, Rob Collins (0191 2225076 or Robert.Collins@newcastle.ac.uk) who can provide guidance on the Treasure Act procedures.

Post-excavation and report production

Finds Processing and Storage

Finds shall be recorded and processed in accordance with the IFA Guidelines for Finds Work

Finds will be assessed by an experienced finds specialist.

The Archaeological Contractor will process and catalogue the finds in accordance with Museum and Galleries Commissions Guidelines (1992) and the UKIC Conservation Guidelines, and arrange for the long term disposal of the objects on behalf of the Client. A catalogue of finds and a record of discard policies, will be lodged with the finds for ease of curation.

Assessment should include x-radiography of all iron objects (after initial screening to exclude recent debris) and a selection of non-ferrous artefacts (including all coins). Refer to "Guidelines on the x-radiography of archaeological metalwork, English Heritage, 2006.

If necessary, pottery sherds and bricks should be recommended for Thermo-luminescence dating.

Finds processing, storage and conservation methods must be broadly in line with current practice, as exemplified by the IFA "Standard and guidance for the collection, documentation, conservation and research of archaeological materials", 2001. Finds should be appropriately packaged and stored under optimum conditions, as detailed in the RESCUE/UKIC publication "First Aid for Finds" (Watkinson and Neal 1998). Proposals for ultimate storage of finds should follow the UKIC publication "Guidelines for the Preparation of Excavation Archives for Long-term Storage" (Walker 1990). Details of methodologies may be requested from the Archaeological Contractor.

Other useful guidance – "A Strategy for the Care and Investigation of Finds", English Heritage, 2003, "Finds and Conservation Training Package", English Heritage, 2003.

All objects must be stored in appropriate materials and conditions to ensure minimal deterioration. Advice can be sought from Jacqui Huntley of English Heritage (0191 3341137 or 07713 400387) where necessary.

The report

1. Because the construction project will last five years, regular interim reports will be required by the Client, Planning Authority and County Archaeologist. It is envisaged that a written report including a site location plan and any relevant photographs and drawings will be required for each separate section of tunnel which is monitored, and one each for the two shafts. These will be submitted a maximum of three months after each section of work. Whilst work is ongoing, weekly or fortnightly updates via email to all interested parties will also be needed. The distribution list for these updates must be agreed with Bouygues.

2. The production of Site Archives and Finds Analysis will be undertaken according to English Heritage Guidelines (Managing Archaeological Projects 2nd Edition) and 'Archaeological Archives – a guide to best practice in creation, compilation, transfer and curation', Duncan H. Brown, Archaeological Archives Forum, July 2007.

3. At the conclusion of the whole process a full report summarising everything which has been recorded will be produced. All drawn work should be to publication standard. The report must include:

- * Location plans of work and grid references of site
- * Site narrative – interpretative, structural and stratigraphic history of the site
- * Any plans showing major features and deposit spreads, by phase, and section locations
- * Any sections through excavated features
- * Elevation drawings of any walls etc.
- * Artefact reports – full text, descriptions and illustrations of finds

- * Tables and matrices summarising feature and artefact sequences.
 - * Archive descriptions of contexts, grouped by phase (not for publication)
 - * Deposit sequence summary (for publication/deposition)
 - * Colour photographs of work in progress and of archaeological features and finds
 - * Laboratory reports and summaries of any dating and environmental data, with collection methodology.
 - * A consideration of the results of the field-work within the wider research context (ref. NERRF).
 - * Copy of this specification
4. Seven bound and collated copies of the final report need to be submitted:
- four for the commissioning client. A digital copy of the report on CD is also required.
 - two for the planning authorities (North Tyneside Council and South Tyneside Council)
 - one for deposition in the County HER at the address below. A digital copy of the report on CD is also required by the HER in a plastic case. Please do not attach this to the report.

The report and CD for the HER must be sent by the archaeological consultant or their client directly to the address below. If the report is sent via the planning department, every page of the report will be stamped with the planning application number which ruins the illustrations. The HER is also often sent a photocopy instead of a bound colour original which is unacceptable.

5. If significant archaeological features are found, the results may also warrant publication in a suitable archaeological journal. The tender should therefore include an estimated figure for the production of a short report of, for example 20 pages, in a journal such as *Archaeologia Aeliana* or *Durham Archaeological Journal*. This is merely to give the commissioning client an indication of potential costs.

Site Archive

The site archive (records and materials recovered) should be prepared in accordance with *Managing Archaeological Projects*, Second Edition, 5.4 and appendix 3 (HBMC 1991), "Archaeological documentary archives" IFA Paper No. 1, "Archaeological Archives – creation, preparation, transfer and curation" *Archaeological Archives Forum* etc. and *Guidelines for the Preparation of Excavation Archives for Long Term Storage* (UKIC 1990) and 'Archaeological Archives – a guide to best practice in creation, compilation, transfer and curation', Duncan H. Brown, *Archaeological Archives Forum*, July 2007.

This should include indexing, ordering, quantification and checking for consistency of all original context sheets, object records, bulk find records, sample records, skeleton records, photographic records, drawing records, photographs, drawings, level books, site note-books, spot-dating records and conservation records etc. All artefacts and ecofacts retained from the site must be packed in appropriate materials. A summary account of the context record, prepared by the supervising archaeologist, should be included.

The archive will be placed in a suitable form in the appropriate museum (typically Museum of Antiquities, Newcastle for sites north of the Tyne and Tyne and Wear Museums for sites south of the Tyne, but there are different rules for Roman sites etc. check with these institutions) with the client's permission.

A letter will be sent to the County Archaeology Officer within six months of the report having been submitted, confirming where the archive has been deposited.

OASIS

The Tyne and Wear County Archaeologist supports the Online Access to the Index of Archaeological Investigations (OASIS) project. This project aims to provide an online index/access to the large and growing body of archaeological grey literature, created as a result of developer-funded fieldwork.

The archaeological contractor is therefore required to register with OASIS and to complete the online OASIS form for their evaluation at <http://ads.ahds.ac.uk/project/oasis/>. Please ensure that tenders for this work takes into account the time needed to complete the form.

Once the OASIS record has been completed and signed off by the HER and NMR the information will be incorporated into the English Heritage Excavation Index, hosted online by the Archaeology Data Service.

The ultimate aim of OASIS is for an online virtual library of grey literature to be built up, linked to the index. The unit therefore has the option of uploading their grey literature report as part of their OASIS record, as a Microsoft Word document, rich text format, pdf or html format. The grey literature report will only be mounted by the ADS if both the unit and the HER give their agreement. The grey literature report will be made available through a library catalogue facility.

Please ensure that you and your client understand this procedure. If you choose to upload your grey literature report please ensure that your client agrees to this in writing to the HER at the address below.

For general enquiries about the OASIS project aims and the use of the form please contact: Mark Barratt at the National Monuments Record (tel. 01793 414600 or oasis@english-heritage.org.uk). For enquiries of a technical nature please contact: Catherine Hardman at the Archaeology Data Service (tel. 01904 433954 or oasis@ads.ahds.ac.uk). Or contact the Tyne and Wear Archaeology Officer at the address below.

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Ref: Tyne Tunnel Watching Brief
August 2007
Planning Application: 02/01491/TWA2TT

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