AN ARCHAEOLOGICAL WATCHING BRIEF WITHIN THE FORMER ST HILDA'S CHURCHYARD, CORONATION STREET, SOUTH SHIELDS, TYNE AND WEAR

WATCHING BRIEF AND OSTEOLOGICAL ANALYSIS REPORT

November 2019

PRE-CONSTRUCT ARCHAEOLOGY

An Archaeological Watching Brief within the former St Hilda's Churchyard, Coronation Street, South Shields, Tyne and Wear

Site Code: CSS18

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WATCHING BRIEF REPORT

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1. NON-TECHNICAL SUMMARY

1.1 An archaeological watching brief was undertaken by Pre-Construct Archaeology Limited at Coronation Street, South Shields, Tyne and Wear (central National Grid Reference NZ 3613 7601). The fieldwork, undertaken between 11th July and 20th September 2018, was commissioned by Bowmer and Kirkland during road widening and utilities works along Coronation Street. Groundworks included ground reduction for the road and pavement and associated features such as drainage gullies. The western end of Coronation Street is located within the southern extent of the churchyard of St Hilda's Church which was deconsecrated when the road was realigned in the 1970s. Ground reduction work along the northern side of the street commenced initially without archaeological supervision; all work was suspended when disarticulated human bones were encountered. A specification for the archaeological monitoring work was issued by Tyne and Wear Archaeology Service, Newcastle City Council. Work resumed when a Ministry of Justice Licence to remove human remains from the site was granted.

1.2 Excavations undertaken by Oxford Archaeology North in 2006 in the south-eastern corner of the disused churchyard, ahead of the construction of a supermarket, recovered a large number of articulated burials. Further burials were excavated in 2007 during a watching brief along a 2m-wide and 100m-long sewer trench excavated to a depth of 2.2m which was located within the centre of Coronation Street, at its western end. Several *in-situ* burials and a brick shaft grave were also encountered during two watching briefs undertaken around the Coronation Street sewerage pumping station. In total funeral remains from *c*. 240 burials were recovered with three burial horizons identified. The earliest, some 5.5m below modern ground surface, contained mainly very young children probably representing unbaptised children buried beyond the original boundaries of the churchyard. A densely-packed later burial horizon developed from *c.* 1818 until 1855, following the deposition of a thick ground raising ballast dump.

1.3 Three areas were subject to archaeological monitoring during the current groundworks at the site. Along the northern side of Coronation Street ground reduction to a depth of at least *c.* 650mm was required across a *c*. 1m-wide area for a distance of *c.* 60m to allow the road to be widened (Trench 1). Ground reduction on the southern side of the road was only required to the depth of the substrate of the road; in this area ground reduction took place across a *c*. 2m-wide area for a distance of *c*. 60m (Trench 2), with two drainage chambers inserted to a depth of 1.20m. Ground reduction took place across an irregular shaped area within the roundabout at the western end of Coronation Street (Trench 3).

1.4 Burials and associated archaeological remains were only encountered within Trench 1. All burials and disarticulated bone were cut into or mixed within a ground raising deposit which in the earlier investigations was fully excavated, revealing it to be up to 3m thick. It is known from documentary sources that this was imported ballast material deposited from 1816 to 1818 to raise the level of the churchyard to allow further inhumations to be interred within

the churchyard, which by this date was almost full to capacity. The human remains encountered during this watching brief therefore date from *c.* 1818 to *c*. 1855, when burials ceased.

1.5 Seven *in-situ* inhumations were encountered within the eastern half of Trench 1, including one within a brick shaft grave; all inhumations were recorded and exhumed. A quantity of disarticulated human bone was also recovered during the ground reduction works. At the eastern end of Trench 1 the demolished remains of the brick boundary wall of St Hilda's Churchyard were encountered, with a cobbled surface to the east forming part an earlier surface of St Hilda's Lane.

1.6 The skeletal assemblage recovered from the watching brief has provided a rich source of osteological information to supplement the datasets from the earlier archaeological investigations within St Hilda's churchyard. The number and variety of pathologies, both dental and skeletal, as well as the demographic data collected will be of use in helping to identify and define trends relating to society, industry, nutrition, and health both within the local post-medieval community represented in the churchyard itself and in the wider region.

1.7 The coffin fittings recovered from the work contribute significantly to our understanding of funerary material culture of St Hilda's churchyard. A large elaborately decorated breastplate from the coffin of the young woman buried in the brick shaft grave is of a design registered in 1851, providing a close date for the burial of 1851–1855.

1.8 Apart from examination of the burial register to attempt to discover the identity of the young woman buried in the brick grave, no further analysis is required on any of the data set recovered from the investigations. It is recommended that the results of this work are published in the regional journal *Archaeologia Aeliana,* the journal of the Society of Antiquaries of Newcastle upon Tyne. The finds from the brick shaft grave merit publication in a standalone paper and it is recommended that a note be prepared for inclusion in *Post-Medieval Archaeology.* For this purpose, it is recommended that the breastplate and the one complete coffin grip are photographed, and that permission is sought to include images of the original registered design from The National Archive.

2 INTRODUCTION

2.1 Project Background

2.1.1 A programme of road widening and utilities works along the western end of Coronation Street, South Shields, Tyne and Wear required ground reduction within the southern extent of the former churchyard of St Hilda's Church (central National Grid Reference NZ 3613 6701) (Figures 1 and 2). The western end of Coronation Street was realigned to its present course in the 1970s, crossing the southern side of the churchyard. Ground reduction along the northern side of the street commenced initially without archaeological supervision. All work was suspended when disarticulated human bones were encountered. A specification for archaeological monitoring work was subsequently issued by Tyne and Wear Archaeology Service, Newcastle City Council. Work resumed when a Ministry of Justice Licence to remove human remains from the site was granted. The archaeological watching brief was undertaken by Pre-Construct Archaeology Limited (PCA) between 11th July and 20th September 2018, commissioned by Bowmer and Kirkland.

2.1.2 Groundworks included ground reduction for the road and pavement and associated features such as drainage gullies. On the north side of the road a trench (Trench 1) at least 650mm deep by 1m wide was required for the foundation of the new road. Several complete inhumations were encountered within the trench; all burials were exhumed which in some areas necessitated excavating below the level required for the road foundation. A brick-lined shaft grave was partially situated within the trench; the excavation area had to be widened so that the burial could be removed and the brick grave infilled to avoid the presence of a void under the road. The trench on the south side of the road (Trench 2) did not require the same depth of excavation, although test pits and the insertion of two drainage chambers at a depth of 1.20m were required. No human remains were encountered in this area or in Trench 3, located within the roundabout at the western end of Coronation Street.

2.1.3 At the time of writing the Site Archive (PCA site code: CSS 18) was held at the Durham Office of PCA. The retained element, comprising the written, drawn and photographic records and retained coffin furniture, will be deposited with a suitable museum. The human remains will be reburied at Harton Cemetery, South Shields.

2.1.4 The Online Access to the Index of Archaeological Investigations (OASIS) reference number for the project is: preconst1-374778

2.2 Site Location and Description

2.2.1 Coronation Street runs south-westwards from South Shields town centre towards the south-east bank of the River Tyne (Figure 1). Groundworks were monitored within the western part of the road, eastwards from the junction with Station Road to east of St Hilda's Lane (Figure 2). This section of Coronation Street is located within the southern extent of the churchyard of St Hilda's Church, located to the north. Old Coronation Street road originally followed a

more sinuous route and was realigned in the 1970s, crossing the southern extent of the churchyard.

2.2.2 Three areas (Trenches 1-3) were subject to archaeological monitoring during the groundworks at the site (Figure 2). Trench 1 was situated along the northern side of Coronation Street running south-westwards from just beyond the junction with St Hilda's Lane. Trench 2 was located opposite Trench 1 on the southern side of the road. Trench 3 was located within the roundabout at the western end of Coronation Street.

2.3 Geology and Topography

2.3.1 Within the vicinity of the investigations Carboniferous Coal Measures and Magnesium Limestone are overlain by thick glacial till deposits (www.bgs.ac.uk). Much of the land in this part of South Shields was formerly occupied by a tidal inlet and pool, the Mill Dam, which is shown on historic maps to the south of St Hilda's churchyard (OAN 2011, 9-10). Infilling of the inlet may have begun in the late 17th century or early 18th century. Between 1816 and 1818 the Corporation of Newcastle funded a programme to infill the Mill Dam with ballast from the nearby ballast mounds; geotechnical investigations to the south and east of Coronation Street have identified such deposits up to 16m thick.

2.3.2 Current ground level lies at around 10.25m OD at the junction of Coronation Street and Station Road and at 7.25m OD close to the junction with St Hilda's Lane; these areas were located within the southern extent of St Hilda's churchyard. This rise in ground level to the west is the result of deposition of material; the underlying natural topography falls to the west to the river. As well as the infilling of the Mill Dam, significant ground raising took place in the churchyard in the early 19th century to allow further burials to be interred within the overcrowded ground, as described below in the historical background. The earlier phases of archaeological work at the site recorded that the ground had been raised in some places by up to 3m (OAN 2011).

2.5 Archaeological and Historical Background

2.5.1 A detailed history of this area is described in the report on the previous phase of work (OAN 2011). A summary of the relevant details from those sources is described below.

2.5.2 St Aiden granted the church and land to Abbess Hild in 648 AD, the "nunnery" may have been positioned in the same location as the modern day church. The church was probably lain waste by the 9th-century Scandinavian raids. The next mention of St Hilda's, as a parish church, is in 1402. In 1631 a plot of land was consecrated to enlarge the cemetery (Fordyce 1857,715) and 1653 saw the first burial records by Robert Chiltern, a Register. Described by Bourne in 1731 as "a pretty little church, going to decay and is about to be rebuilt". At this time the Mill Dam bordered the south of the churchyard and was tidal, with St Hilda's colliery to the south and the gasworks to the east. By 1805 the churchyard as it was then was deemed to be so full that a plan to cover the churchyard in the readily available ships ballast

was devised. This ground raising occurred during the wider infilling of the Mill Dam between 1816 and 1818. The churchyard expanded into the reclaimed land with its southern boundary close to, or on, the former high-tide edge of the Mill Dam and the slightly sinuous route of Old Coronation Street bounding the churchyard followed this line (OAN 2011). The previous archaeological investigations identified a 3m-thick heterogeneous deposit which contained a high proportion of gravel and cinders reflecting its origin as ballast and salt-making waste (*ibid*.). Burials were interred within this ground raising deposit until 1 July 1855, after which burial within the cemetery, with the exception of existing family vaults and brick graves, was prohibited (Salmon 1856, 80 and 82).

2.5.3 Up until the Second World War the churchyard was intact behind large stone walls, but during the war the Market Place to the north of the church and the churchyard itself was bombed, the air raid shelters took direct hits killing many people below and also badly damaging the grave stones and vaults. The gravestones were cleared from the churchyard which was then landscaped with tree planting.

2.5.4 The original route of Coronation Street kinked around the angled southern edge of St Hilda's churchyard. The road was realigned and straightened in the 1970s and the new road ran to the north within the southern part of the former churchyard.

2.5.5 In 2006 a shored trench was excavated ahead of the construction of the northern wall for a supermarket building. This was 17.50m long, 4m wide at the top and 2m wide at the base (OAN 2011). All human remains within the trench were excavated by archaeologists and the remains of 191 burial events (articulated burials and intentionally redeposited groups of human remains) were recorded along with funerary furniture and a large quantity of disarticulated bones.

2.5.6 In 2007 a 2m-wide and 2.2m-deep shored trench for a sewer pipe was excavated along the centre of the carriageway of Coronation Street, running east from the roundabout for 100m (OAN 2011). Another 48 burials were recorded in this trench and several more, including a brick shaft grave, during two subsequent watching briefs in the area.

3. Aims and Objectives

3.1 Project Aims

3.1.1 The aim of the watching brief was to recover any fragments of human bone disturbed during the process of groundworks. Any in-situ inhumations were to be recorded and excavated in single context order. As set out in the NCC Specification, the broad aims of the archaeological project were

3.2 Research Agenda

3.2.1 Within the research agenda and strategy chapters of the NERRF are several key research priorities of direct relevance to the project. Two key research priorities in Chapter 18 'Post-Medieval' are particularly relevant.

3.2.2 'PMi Cultural and Ethnic Identity' states:

It is vital to explore the multiple, cross-cutting and even contradictory identities recognisable in the North-East from the 16th to 19th centuries; these include, but are not limited to, class, gender, religious and political belief' and 'Other identities should also be explored, including those based on profession...and religious belief (for example, Catholic, non-Conformist). Did these lead to the creation of a distinct suite of material culture, architecture or patterns of consumption?'

3.2.3 'PMix Environmental Evidence' states:

There is need for more human osteological studies, including research into basic information relating to stature, diet and pathologies.'

Chapter 20 'Science and Environmental Agenda' notes in its 'Gaps in Knowledge' section that, while there is reasonable survival of human bone from early medieval and medieval sites, far less is known about post-medieval populations, as much due to the limited amount of work on skeletal assemblages of this date for practical reasons, as it is to bone preservation, which is generally poor in the acid soils of North East England.

3.2.4 Also, within the same 'Science and Environmental Agenda', key research priority 'SEv Human Burial' states:

(in academic terms): 'In general, the survival of human bone assemblages in the region is poor. Due to the lack of evidence, there are still many basic research questions to be answered relating to age, sex, stature and pathology from all periods. Where skeleton populations do survive, scientific analysis of bone should be used to investigate dietary and population mobility patterns', and

(in strategic terms): 'Due to the acid soil conditions of much of the region all skeletal assemblages are of the greatest importance. All excavated skeletal material must be fully analysed and published'.

3.2.5 Chapter 29 'Religion and Ritual' contains a sub-section 'Death and Burial' which includes 'Recommendation R7' which states:

Much basic research on human populations from the region is still required, including an improved understanding of patterns of stature, diet, pathology and demography. All opportunities should be taken to ensure that when skeletal populations are uncovered there is provision of adequate funds and time for detailed analysis. All metrical data should be appropriately disseminated'.

4. ARCHAEOLOGICAL METHODOLOGY

4.1 Fieldwork

4.1.1 The archaeological watching brief was carried out intermittently between 11th of July to the 20th of September 2018. All fieldwork was undertaken in compliance with the codes and practice of the Chartered Institute for Archaeologists and the relevant CIfA standard and guidance document (CIfA 2014 a, b & c). PCA is a CIFA Registered Organisation. Guidance within a CIfA technical paper covering excavation of inhumed human remains was also followed (CIfA 2017). All fieldwork and post-excavation were carried out in accordance with the Yorkshire, the Humber & The North East: Regional Statement of Good Practice (SYAS 2011).

4.1.2 Three areas were subject to archaeological monitoring during the groundworks at the site (Figure 2). Trench 1 along the northern side of Coronation Street was *c.* 1m-wide and *c.* 60m long and ground reduction to a depth of at least *c*. 650mm was undertaken. Trench 2 located on the opposite, south, side of the road was *c*. 2m wide and *c*. 60m long. Ground reduction in this area was only required to the depth of the substrate of the road, although two drainage chambers were inserted to a depth of 1.20m. Ground reduction to a maximum depth of 0.80m took place across an irregular shaped area within the roundabout at the western end of Coronation Street (Trench 3).

4.1.3 All ground-breaking tasks including the removal of road surfaces and associated sub-bases by the groundworks team. Trench 1 on the north side of Coronation St was to be excavated to a maximum depth of 650mm, the depth at which the foundation of the new road workings are required. At the base of the Trench 1, towards the centre of the trench, three yellow sandstone slabs were revealed which covered a brick shaft grave. After discussions with all concerned parties, it was decided that even though the depth of the vault was below the required depth of the trench, as there would be a significant void under the road, which could cause a subsidence problem when the new road was completed, the shaft grave would need to be excavated. Before the excavation of the grave could take place, the trench had to be widened slightly to expose the full width of the structures. To the east of the brick shaft grave, several complete inhumations were encountered; where such burials were present the trench also had to be excavated below the required depth of the road so that the human remains could be exhumed. All complete inhumations were recorded with an osteologist on site and exhumed by the osteologist and archaeologist.

4.1.4 Investigations within the trench followed the normal principles of stratigraphic excavation and were conducted in accordance with the methodology set out in the field manual of PCA (PCA 2009) and the Museum of London Site Manual (Museum of London 1994). The north side of the road excavations were surveyed by the Bowmer & Kirkland survey team.

4.1.5 Throughout the exhumation/excavation the 'single context recording' method was employed, with the PCA pro forma 'Context Recording Sheet' used for deposits and 'cuts', while

skeletons and coffins were individually recorded on the PCA pro-forma 'Skeleton Recording Sheet' and 'Coffin Recording Sheet', respectively. Structural remains, comprising a single brick shaft grave and the remains of the churchyard boundary walls, were recorded using the PCA pro-forma 'Masonry Recording Sheet'. Each skeleton was removed from the ground according to the methodologies set out in the aforementioned technical paper and field manuals. All site records were marked with the unique Site Code CSS18. All archaeological features were excavated by hand tools and were using standard single context recording methods. The height of all principle strata and features was calculated in metres above Ordnance Datum (m AOD) and indicated on appropriate plans and sections.

4.1.6 A detailed photographic record of the evaluation using SLR cameras (35mm film black and white prints for archive purposes) and by digital photography. All detailed photographs included a legible graduated metric scale. The photographic record illustrated both in detail and general context archaeological exposures and specific features in all trenches.

4.2 Post-excavation

4.2.1 The stratigraphic data for the project comprises written and photographic records. A total of 45 archaeological contexts were defined (Appendix 3). Post-excavation work involved checking and collating site records, grouping contexts and phasing the stratigraphic data. A written summary of the archaeological sequence was then compiled, as described in Section 5.

4.2.2 All human bone was washed and dried at PCA's Durham Office before full analysis of all complete skeletons was undertaken by an osteologist (Appendix 4). All disarticulated human bone was identified and catalogued by the osteologist.

4.2.3 Specialist analysis of the coffin furniture was undertaken in PCA's London Office (Appendix 5).

4.2.4 The complete Site Archive, in this case comprising the written, drawn and photographic records (including all material generated electronically during post-excavation) and retained elements of the coffin furniture will be packaged for long term curation. In preparing the Site Archive for deposition, all relevant standards and guidelines documents referenced in the Archaeological Archives Forum guidelines document (Brown 2007) will be adhered to, in particular a well-established United Kingdom Institute for Conservation (UKIC) document (Walker, UKIC 1990) and the most recent CIfA publication relating to arching (CIfA 2014c).

4.2.5 The retained element of the site archive will be deposited with the relevant museum, under the site code CSS 18. The depositional requirements of the relevant museum which the Site Archive will be ultimately transferred will be met in full. All human remains will be reburied at Harton Cemetery, South Shields, Tyne and Wear.

5. RESULTS: THE ARCHAEOLOGICAL SEQUENCE

5.1 North side of Coronation Street, Trench 1

St Hilda's Church, eastern cemetery wall

5.1.1 A fragment of NW-SE aligned brick wall [44] was encountered in the eastern end of Trench 1, at the junction between St Hilda's Lane and Coronation Street (Figure 3; Plate 13). This 0.50m-wide mortared red brick wall, exposed for a length of 1m, was in line with the standing eastern wall of St Hilda's churchyard, and represents the below ground remains of the demolished portion of churchyard wall. External to the wall, to the east, was a cobbled surface, abutting the wall and recorded at a height of 6.24m OD, which is the remains of an earlier surface of St Hilda's Lane.

Ground raising dumps

5.1.2 The basal deposit [22] within the central portion of Trench 1 comprised a deposit of clay with frequent inclusions of coal and gravel. This was only exposed in the part of the trench where a brick–lined shaft grave was excavated, at a height of 5.91m OD, and is assumed to be a ground raising dump.

5.1.3 A dark greyish brown gravel, stone and clay deposit [03] was encountered below the modern road make up deposits in the eastern part of Trench 1, at a height of around 6.55m OD. This material is assumed to equate to the extensive ground raising event which occurred between 1816 to 1818 to allow further burial to take place within the crowded ground, the 'upper burial horizon' encountered across the previous investigations within the former churchyard (OAN 2011, 36). This deposit had evidently been disturbed and horizontally truncated when Coronation Street was realigned in the 1970s; disarticulated bone and occasional fragments of articulated bone were recovered from this deposit.

Complete inhumations

5.1.4 As with the earlier phase of investigations, identification of individual grave cuts within deposit [03] was difficult as the fills of the graves were the same as the material through which the graves had been cut. The inhumations were very closely spaced and all aligned NE-SW with heads to the west (Figure 3). All individuals were buried extended, supine and face up.

5.1.5 An indistinct grave cut [41] which measured at least 1.30m x 0.50m was located *c*. 12m to the west of the cemetery wall. This contained the skeleton of a child [26] (Plate 1), encountered at a height of 6.31m OD, and the degraded and fragmentary remains of an embossed iron coffin plate (SF12). Both arms were slightly flexed with hands on the pelvis, and dental eruption indicated an age of 7-10 years old. The right leg had been disturbed by a later burial with most bones not present; the right tibia of this child was displaced and redeposited within the later grave [42].

5.1.6 The eastern end of the grave was truncated by grave [42] which contained the degraded remains of a coffin [34], generally evident as a timber stain with a few fragments of metal indicative of the presence of a coffin plate. Coffin handles were present at each end of the coffin (SF 13 and 14). The grave contained a skeleton [27] recorded at a height of 6.20m OD, which was partially disturbed along the left-hand side; the only arm bone present was the left humerus and the left femur was absent (Plate 2). The skeleton has been identified as an old adult male, aged over 50, with an estimated height of 1.73m. The skull of this individual had been sawn around the circumference, indicative of a post-mortem craniotomy (Plate 3). The skeleton displayed numerous bone changes indicative of a range of diseases and pathologies including osteoarthritis, bunions and Diffuse Idiopathic Skeletal Hyperostosis (DISH), which causes the vertebra to fuse.

5.1.7 The very disturbed grave [40] of an adult of indeterminate sex [25] was situated less than 0.20m to the east of skeleton [26]. Another burial [23] had been placed over this grave leaving little of the earlier skeleton remaining. Both skeletons share the same cut number as separate grave cuts they could not be discerned. There were no remains of a coffin surviving for skeleton [25] apart from fragments of an embossed iron sheet coffin plate (SF11).

5.1.8 The overlying skeleton [23] (Plate 4) was associated with the degraded remains of a coffin [37], visible as a timber stain, with a decayed embossed iron sheet coffin plate (SF10). The skeleton [23], recorded at a height of 6.27m OD, was identified as a young, possibly male, adult. There were signs of new bone formation on some ribs, a symptom of pulmonary infection often associated with tuberculosis. This individual also had indications of bunions and a fractured and healed left clavicle.

5.1.9 Only the northern side of grave [39] was exposed within Trench 1, with the left-hand side of the skeleton recorded at a height of 6.13m OD. There were no remains of a coffin apart from the degraded remnants of an embossed iron sheet coffin plate with some patterns visible from the reverse side (SF9). The skeleton [19], an adult female, displayed signs of various types of dental disease, as well as osteoarthritis and bunions (Plate 5).

5.1.10 A short distance to the east was a complete inhumation [15], a young adult male aged 20-34, recorded at a height of 6.07m OD (Plate 6). Distinctive wear patterns on the maxillary dentition of this individual may have been caused by smoking a clay tobacco pipe. Little survived of the coffin apart from a cast iron coffin grip (SF6), a coffin nail (SF6) and fragments of an embossed iron sheet coffin plate (SF5). A copper-alloy coffin lid hinge (SF7) would have held the top part of the lid open allowing the head of the deceased to be viewed.

Brick shaft grave

5.1.11 Immediately adjacent to inhumation [15], at the base of Trench 3, three yellow sandstone slabs [06] covering a brick shaft grave [07] were exposed at a height of 6.36m OD and covering an area measuring 1.90m in length (Plates 7 and 8). Exhumation of the skeleton

was necessary so that the brick grave could be infilled and consolidated to avoid a void under the road. The brick-lined grave [07] was built within cut [43] and constructed with six courses of mortared brick with a seventh course at the east end of the grave at slab height coated with a limewash. It measured 2.10m long and 0.83m wide at the widest point, built to fit the shape of the coffin, and was 0.50m deep. The base of the grave was built with three sandstone slabs (Plate 12).

5.1.12 The brick grave contained a skeleton [08] identified as a young adult female, aged 15 to 25 (Plates 9-11). Extensive pitting and deep grooves in her teeth indicate a prolonged period of physiological stress lasting from birth to possibly around 4 years old. This skeleton also showed clear signs of childhood rickets and minor deformation of the ribs which may be associated with the wearing of tightly fitting corsets. Fragmentary remains of a timber coffin [10] [SF2] were found and this was evidently lavishly decorated in comparison to the other coffins found at the site. Traces of white-metal coffin lace with underlying green fabric survived along with elaborate coffin fittings; a large shield-shaped coffin plate (SF3) (Plate 10) and two cast-iron grips with a registered design matching the breastplate that provided a very close date for the burial of this young woman of June 1851 to 1855 when the churchyard was closed.

Modern road

5.1.13 Ground raising deposit [03], the upper burial horizon, was overlain by a distinctive red deposit [13], comprising grit, slag, pottery, and glass slag, up to 0.25m thick (see Plate 12). This levelling substrate was overlain by a *c.* 0.20m-thick limestone/clinker make up deposit [12] for the *c.* 0.17m-thick tarmac road surface [11].

5.2 South side of Coronation Street, Trench 2

5.2.1 Trench 2 located on the opposite, south, side of the road was *c*. 2m wide and *c*. 60m long. Ground reduction in this area was only required to the depth of the substrate of the road, so no archaeological deposits associated with the former churchyard were encountered.

5.2.2 Two 0.50m-wide drainage chambers were excavated on the south side of Coronation Street to a total depth of 1.20m. Ballast deposit [03] was encountered, but no human remains were encountered. This deposit was overlain by the distinctive red deposit [13] (Plate 15).

5.3 Roundabout excavation, west end of Coronation Street, Trench 3

5.3.1 A 25m-long trench was cut across the roundabout at the west end of Coronation Street to insert a new power supply. The roundabout lies over the western edge of St Hilda's churchyard. The eastern side of the trench was dug to a depth of 0.80m from a road height of 10.30m OD.

5.3.2 The lowest exposed deposit comprised the ballast material [03]. Contained within this was a small fragment of gravestone. No further evidence of the churchyard was observed.

5.3.3 This deposit was overlain by the red deposit [13] and a road surface [31] representing the line of Coronation Street before the installation of the roundabout, subsoil [29] and topsoil [28] forming the surface of the roundabout.

6. DISCUSSION, SIGNIFICANCE OF DATA AND RECOMMENDATIONS

6.1 Discussion

6.1.1 Human remains were only recovered from Trench 1, located on the north side of Coronation Street. Seven *in-situ* inhumations were encountered within this area, including one within a brick-lined shaft grave, along with disarticulated human bone. Further burials were identified below those excavated, but these were left in situ as they were below the level of disturbance to be caused by the works. As with the earlier phase of investigations, identification of individual grave cuts was difficult as the fills of the graves were the same as the material through which the graves had been cut. This dark greyish brown gravel, stone and clay deposit is assumed to equate to the 'upper burial horizon' encountered across the previous investigations within the former churchyard; in these areas the deposit was fully excavated and a maximum thickness of 3m was recorded (OAN 2011, 36). There is documentary evidence for the raising of the ground level at the cemetery between 1816 and 1818 with imported ballast as the cemetery had reached full capacity with no room for lateral expansion (Hodgson 1903, 140). Following the deposition of this material and the raising of the ground, intensive burial activity took place until the churchyard was closed for burials on 1 July 1855, after which burial within the cemetery, with the exception of existing family vaults and brick graves, was prohibited (Salmon 1856, 80 and 82). All burials recorded during the watching brief thus date from *c.* 1818 to *c*. 1855.

6.1.2 Nearly all the burials excavated during the previous work at the site had also been placed within earth-cut graves. A shaft grave similar to the example recorded during the current work was also encountered in the area of the pumping station, in the carriageway of Coronation Street to the south-west of Trench 1 (OAN 2011, 42). This example was 1.60m long and 0.60m wide and was constructed with unfrogged machine-made brick capped with a large sandstone slab. It was suggested that several wealthier burials may have been interred in this area as it also produced the only example of an ornate coffin which was heavily decorated with copper-alloy studs arranged in diamond patterns, whilst another wall may have represented part of a vault or an integrated row of shaft graves.

6.1.3 Osteological analysis of the *in-situ* burials identified individuals with a range of ages from juvenile to old adult and it was possible to determine sex for two females and three males. Over 230 fragments of disarticulated bone were recovered; the minimum number of individuals present was seven, with six adults and one juvenile identified.

6.1.4 Typical for the period, dental disease was the most common condition affecting these individuals with a range of pathologies identified such as caries, abscesses and tooth loss. Enamel hypoplasia was present in all the individuals. This defect in the developing dentition is thought to be caused by physiological stresses such as localised trauma, nutritional deficiency and illness, often cited as potential causes (Roberts & Manchester 2010).

6.1.5 A case of rickets was observed in the female adolescent-young adult [08] buried in the brick-lined shaft grave. Clear signs of the disease were present as excessive curving of the leg bones caused by a deficiency of vitamin D (Roberts & Manchester 2010). This is usually most notable in the weight bearing bones of the legs and is often associated with other developmental issues such as enamel hypoplasia and this association is present in this individual (Roberts & Manchester 2010). Four cases of rickets were identified in the previous phase of work at St Hilda's, but it was acknowledged that disease was probably underrepresented as it is difficult to identify in skeletal remains alone.

6.1.6 Skeleton [27] had skeletal changes indicative of Diffuse Idiopathic Skeletal Hyperostosis (DISH) affecting at least four vertebrae in the thoracic and lumbar regions. The precise causes of DISH, which can lead to back pain and spinal stiffness, are not known, but it is thought to have some association with high levels of uric acid, obesity and diabetes (Piercarlo & Fabiola 2004, Roberts & Manchester 2010). Another case of DISH affecting five thoracic vertebrae was noted amongst the disarticulated assemblage.

6.1.7 Skeleton [23] showed signs of pulmonary infection on the ribs often associated with tuberculosis (Roberts & Manchester 2010). However, in the absence of more diagnostic pathology of the vertebrae and joints, these lesions can only be considered evidence of a non-specific infection (Roberts & Manchester 2010).

6.1.8 Osteoarthritis was present in the vertebra of a female middle adult [19] and male old adult [27], the latter in several areas including multiple vertebrae, the hand and knee. Symmetrical occurrence of osteoarthritis in the humero-radial joints in this individual is indicative of a repetitive, strenuous activity which involved rotating of the forearms. Spinal osteoarthritis was observed in nearly one third of the individuals excavated during the previous phase of work, most frequently in the lower spine and probably a result of heavy manual labour (OAN 2011, 65).

6.1.9 Examples of trauma were seen in old male adult [27] with a healed, but misaligned, fracture of the right hand. A young adult male [23] had a fractured left clavicle which had not been reset with the two portions overlapping each other leading to a shortening of the bone.

6.1.10 Schmorl's nodes, depressions on the vertebral body surfaces caused by pressure exerted by the intervertebral, were noted on skeletons [15], [23] and [27] (Roberts & Manchester 2010). The precise cause of this phenomenon is not clear, but it often thought to be associated with trauma and degenerative disc disease. Nearly one third of the individuals excavated during the previous phase of work had Schmorl's nodes, most in the lower vertebrae.

6.1.11 All of the adults also displayed some degree of osteophyte formation, bony outgrowths occurring in the margins of a joint surface or on the joint surface itself (Roberts & Manchester 2010). Osteophytes form as a reaction to stress or trauma placed upon the joint and become increasingly common with age (Roberts & Manchester 2010). In most cases

these were small and did not appear to have led to further complications. However, skeleton [27] displayed exceptionally large osteophytes on most of their joints with those on the vertebrae so large that they were overlapping in some places and may have fused.

6.1.12 All of the adults ([15], [19], [23] and [27]) displayed changes in 1st metatarsals and the associated phalanges (big toes); in all cases, the phalanges had curved laterally towards the rest of the toes. These and other symptoms identified are all typical of hallux valgus (bunions) with bone changes most severe in the older individuals. Bunions are thought to largely be the result of wearing ill-fitting footwear for a prolonged period (Robinson & Limbers 2005, Zipfel & Berger 2007). This would correlate to the heightened severity noted in the older individuals who had likely been wearing badly fitted shoes for a longer period. However, there are some genetic factors which are thought to increase the speed of onset and time spent with constricted feet is not the only factor (Robinson & Limbers 2005). This condition thus may have a genetic component but exacerbated by lifestyle. Only a single example of hallux valgus was identified in the skeletal assemblage excavated in the previous phase of work at the site.

6.1.13 Some individuals had skeletal changes that were caused by lifestyle. Two examples of wear to the mandible indicative of clay tobacco pipe smoking were identified in a young adult male [15] and in a disarticulated mandible. Pipe facets are a pattern of smooth circular dental wear which occur when a clay pipe is held in the teeth on a regular basis, slowly wearing away the teeth (Hillson 1996, Roberts & Manchester 2010). Five individuals, all male or unsexed, including a 15-year-old, recovered from the earlier phases of work also displayed evidence of pipe smoking (OAN 2011, 55). The young female [08] buried in the brick shaft grave had some minor deformation of the ribs which involved the flattening of the angle in some rib shafts. This sort of deformation has been potentially associated with the wearing of tightly fitting corsets (McCarthy *et al.* 2012) and was also observed in three female skeletons recovered from the earlier phase of work.

6.1.14 A disarticulated cranium recovered from the site showed evidence of surgical peri-mortem trepanation of the left parietal. Trepanation is the cutting and removal of an area of the cranium, generally performed to relieve pressure cause by bleeding and often after trauma. In this instance, the bone had been cut initially with a saw for a short distance to allow access. The two halves were then likely levered away with a smaller surgical tool inserted into the saw cut. There is no healing evident, so the individual did not live long after the procedure. A child excavated at the Coach Lane burial ground in North Shields had undergone the same procedure and again absence of healing indicated death soon after (Proctor *et al*. 2016, 76).

6.1.15 The skull of skeleton [27], an old adult male, had been sawn around the circumference, indicative of a post-mortem craniotomy. Two puncture marks on the frontal bone marked the starting point for the cut which was neat but not entirely straight and there did appear to be one instance of the saw changing alignment slightly. There was a nodule of bone between

the puncture marks, suggesting this area was snapped off at the end of the sawing process. The skeleton of this individual displayed numerous bone changes indicative of a range of diseases and pathologies; osteoarthritis, exceptionally large osteophytes on most of their joints, DISH, bunions, and a fractured hand. An adult male with post-mortem craniotomy was found during earlier excavations in another part of the cemetery, also within the upper burial horizon. This procedure had evidently not been carried out by a skilled surgeon as the cutting pattern suggests several attempts or episodes of cutting with skip marks and repeated sawing on the frontal bone (OAN 2011, 76). It was suggested that the procedure had taken place to establish cause of death rather than as part of a dissection process as there were no other post-mortem cut marks. Autopsies were increasingly performed during the 19th century to determine cause of death and understand disease processes (Roberts and Cox 2003, 315) and it is feasible that this had been the impetus for the craniotomy performed on skeleton [27]. There are 44 cases in the burial register between 1844-50 with notes 'by coroner's warrant' or 'inquest' and it is possible that autopsies had been performed on many of these individuals (Rowland and Low forthcoming).

6.1.16 All of the individuals interred in the earth cut graves and brick shaft graves had been buried in wooden coffins but in most cases all that survived of these were small fragments of decayed wood. Evidence for coffins was also provided by iron coffin plates and grips in varying states of preservation, but most heavily corroded and indeterminate pieces. The plates would have been attached to the coffin lid, and would have carried information about the identity, date of and age at death of the deceased, either embossed, inscribed or painted. The fragments correspond well to the earlier excavations of burials, where breastplates were the most frequent coffin fitting, associated with 80 of 177 identified coffins (OAN 2011, 86–7). The information was framed by embossed and highly symbolic decoration, including foliage and drapery, and could be surmounted by motifs such as urns, sarcophagi or winged cherubs (cf. Reeve and Adams 1993, 86 and fig. 5.7; Cherryson et al. 2007, fig. 3.14).

6.1.17 Coffin grips were associated with three of seven recorded coffins: the coffin in the brick shaft grave was furnished with two grips, described below; coffin [17], which contained the remains of a young adult male [15], was associated with a single coffin grip of a known form; and coffin [34], old adult male [27] carried two identical grips, one each at the head and feet end. Coffin grips appear to have been rare at the previous work at St Hilda's, with only one or two grips associated with each of only fourteen coffins (OAN 2011, 89). In the 18th and 19th centuries the normal pattern appears to have eight grips on an adult-sized coffin, with three grips on each side and one at each end, while for a child-sized coffin, six were the norm with two grips along each side (Reeve and Adams 1993, 83). Coffin grips were a decorative rather than practical element; although they helped to balance and steer the coffin while in transit they were intended as a means to lift or carry it. The lack or dearth of coffin grips, therefore, may reflect status or lack of means to provide for a funeral, but it could also reflect local trends or fashions (cf. Raynor *et al.* 2011). The Quaker burial ground

at Coach Lane in North Shields, also had a very low number of coffin grips, something that might be explained by the Quaker burial practice with its focus on simplicity and equality and perhaps the choice of following local working-class traditions (Gaimster 2016b, 143–44).

6.1.18 Another interesting parallel to the coffin fittings from Coach Lane is a decorative copper-alloy butterfly hinge (SF7) from coffin [17]. Numerous hinges of this form were found at Coach Lane, and their position on the coffin indicated that their function was to enable the top part of the lid to be open during preparations for the funeral. Lid hinges, including both iron and copper-alloy examples, were present in 108 of the 244 recorded burials (Gaimster 2016a, 89 and 100–2). At St Hilda's, too, hinges of both iron and copper alloy have been previously recorded from three coffins, including one of the same decorative butterfly design, a further example was unstratified (OAN 2011, 86 and 92). Outside of these two cemeteries, lid hinges appear to be unusual, although iron butterfly hinges were recovered from several 18th- and 19th-century burials excavated inside the church of St Peter's at Barton-upon-Humber in Lincolnshire (Mould 2011, 685 and fig. 750.20). Again, the use of coffin lid hinges may reflect local traditions and provide an insight into the mourning rituals in Victorian times.

6.1.19 The coffin fittings from the brick shaft grave are exceptional; the fittings are unusually well preserved and represent an example of the registered designs that came into use from 1839 (Carter -Silk and Lewiston 2012, 28–31). The young woman was buried in a richly decorated coffin in comparison to the other burials encountered in St Hilda's. Traces of green fabric overlain with white-metal coffin lace embossed with raised rings/bosses survived on the remains of the coffin lid. The coffin had a large shield-shaped breastplate surmounted by a tympanum field with a Neoclassical motif of a mourning woman in front of a grave mound surmounted by a cross. The woman, who is dressed in drapery, is shown leaning on her left knee, her head bent in sorrow, her face covered by her left hand and cradling a young, kneeling child. The coffin was fitted with two cast-iron grips, one at the head and one at the foot end, both with large shield-shaped grip plates. Like grip plates also had a tympanum shaped motif, placed at the centre and framed by the grip, of a mourning woman in front of a grave. The motif varies slightly from the breastplate in showing the woman alone, hunched down instead of resting on one knee, and holding a drooping branch or flower in her right hand. The set was registered on 4 June 1851 to Hector Richard Cooksey of 148 High Street, Bordesley, on the outskirts of Birmingham. The burial would have taken place sometime between this date and 1 July 1855 when the churchyard was closed. The burial demonstrates that, also within a relatively modest burial tradition, social status would still be expressed in the funerary context. Coffin fittings with registered designs were more expensive and meant employing manufacturers that were presumably of higher status.

6.2 Significance of the Data and Recommendations for Further Work

6.2.1 The watching brief has provided further significant evidence from the later phase of use of St Hilda's churchyard, *c.* 1818 to *c*. 1855, to add to the results of the previous phases of archaeological work at the site. The results of the work have addressed key research priorities within the research agenda and strategy chapters of the NERRF.

6.2.2 'PMi Cultural and Ethnic Identity'; the project has contributed to an understanding of burial traditions of a 19th-century North-East working-class community. 'PMix Environmental Evidence'; calls for more human osteological studies. Chapter 20 '*Science and Environmental Agenda'* notes in '*Gaps in Knowledge'* section that there has been limited work on skeletal assemblages of post-medieval populations, as much due to the absence of excavation of assemblages of this date for practical reasons, as it is to bone preservation, which is generally poor in the acid soils of North East England. Within the same 'Science and Environmental Agenda', key research priority 'SEv Human Burial' states that survival of human bone assemblages in the region is poor and notes that '*Due to the acid soil conditions of much of the region all skeletal assemblages are of the greatest importance. All excavated skeletal material must be fully analysed and published*'.

6.2.3 With the exception of one skeleton, the preservation and completeness of the assemblage from the watching brief provides a rich source of osteological information to supplement the datasets already provided by earlier archaeological investigations within St Hilda's churchyard. The number and variety of pathologies, both dental and skeletal, as well as the demographic data collected will be of use in helping to identify and define trends relating to society, industry, nutrition, and health both within the local post-medieval community represented in the churchyard itself and in the region at large in future researches.

6.2.4 Full analysis has been undertaken on the skeletal remains recovered from the watching brief and no further work is required. A summary of the findings of this osteological analysis should be included in the publication report of the work.

6.2.5 The coffin fittings from the current excavations at St Hilda's contribute significantly to our understanding of the cemetery and its funerary material culture. No further analysis or research is required on the assemblage but a summary of the findings of the specialist analysis should be included in the publication report of the work.

6.2.6 Further research should be undertaken to examine the burial records for St Hilda's to attempt to identify the young woman buried in the brick shaft grave. It is recommended that a publication text should be submitted for inclusion in *Archaeologia Aeliana,* the journal of the Society of Antiquaries of Newcastle upon Tyne.The finds from the brick shaft grave also merit a standalone publication and a note should be prepared for inclusion in *Post-Medieval Archaeology*. It is recommended that the breastplate and the one complete coffin grip are photographed and that permission is sought to include images of the original registered design from The National Archive.

7. REFERENCES

7.1 Bibliography

Brown, D.H. 2007. *Archaeological Archives. A guide to best practice in creation, compilation, transfer and curation,* Archaeological Archives Forum.

Chartered Institute for Archaeologists (CifA), 2014a. *Code of Conduct*, CifA.

Chartered Institute for Archaeologists (CifA), 2014b. *Standard and guidance for an archaeological watching brief*, CifA.

Chartered Institute for Archaeologists (CifA), 2014d. *Standard and guidance for the creation, compilation, transfer and deposition of archaeological archives*, CifA.

Chartered Institute for Archaeologists (CifA), 2017 *Updated guidelines to the standards for recording human remains* 2014d.

Newham, A., 2018, *A Guide to the Church of St Hilda South Shields*

Oxford Archaeology North, 2011*. Coronation Street, South Shields, Tyne and Wear: Archaeological Excavation and Osteological Analysis Report*

PCA, 2009. *Fieldwork Induction Manual, PCA Operations Manual I.* Unpublished document.

Petts, D. and Gerrard, C., 2006. *Shared Visions: North East Regional Research Framework for the Historical Environment,* English Heritage, Durham County Council and Durham University.

Proctor, J., Gaimster, M. and Young Langthorne, J. 2016. *A Quaker Burial Ground in North Shields: Excavations at Coach Lane, Tyne and Wear*, Pre-Construct Archaeology Limited Monograph 20.

Raynor, C., McCarthy, R. and Clough, S. 2011. *Coronation Street, South Shields, Tyne and Wear: Archaeological Excavation and Osteological Analysis Report,* Oxford Archaeology North unpublished report.

Rowland, S. and Loe, L. forthcoming. *Excavations at St Hildas's Churchyard, Coronation Street, South Shields, Tyne and Wear*.

Salmon, T. 1856. *South Shields: its past, present and future!*, South Shields: Henry Hewison, Market Place

SYAS 2011. *Yorkshire, the Humber & The North East: A Regional Statement of Good Practice for Archaeology in the Development Process.*

Thomas, H.*,* 2013 S*t Hilda's church research papers*

7.2 Online Sources

South Tyneside Council online archive.

8. ACKNOWLEDGEMENTS AND CREDITS

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PCA Credits

Fieldwork: Fred Garrett (Supervisor) and John Kemp (Osteologist)

Report: Jennifer Proctor and Fred Garrett

Project Manager: Jennifer Proctor

Coffin Furniture: Marit Gaimster

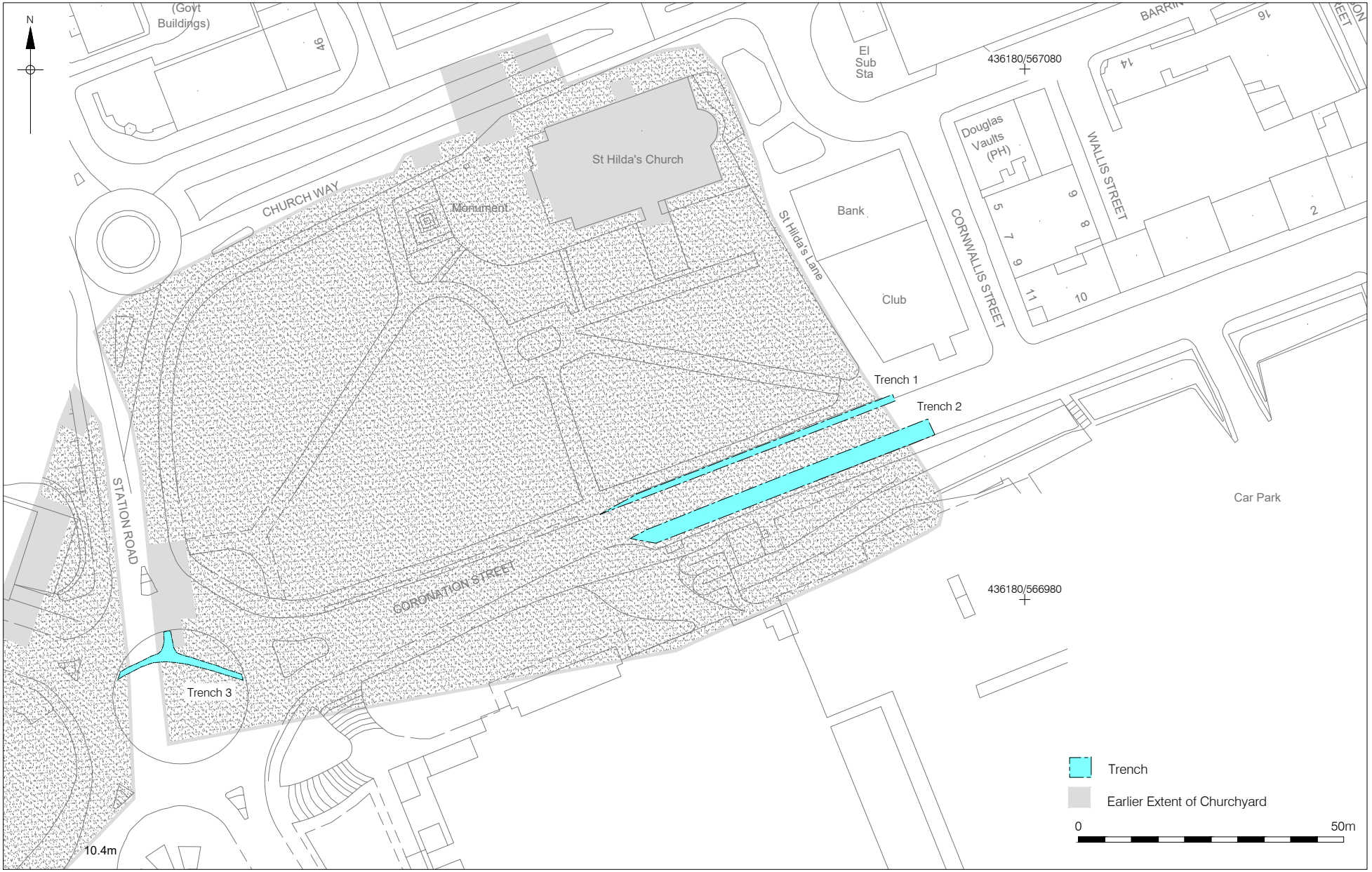
Osteology: John Kemp

CAD: Anna Tonelli

APPENDIX 1: FIGURES

08/10/18 DV

Figure 1
Site Location
1:2,000,000, 1:250,000, 1:25,000 at A4

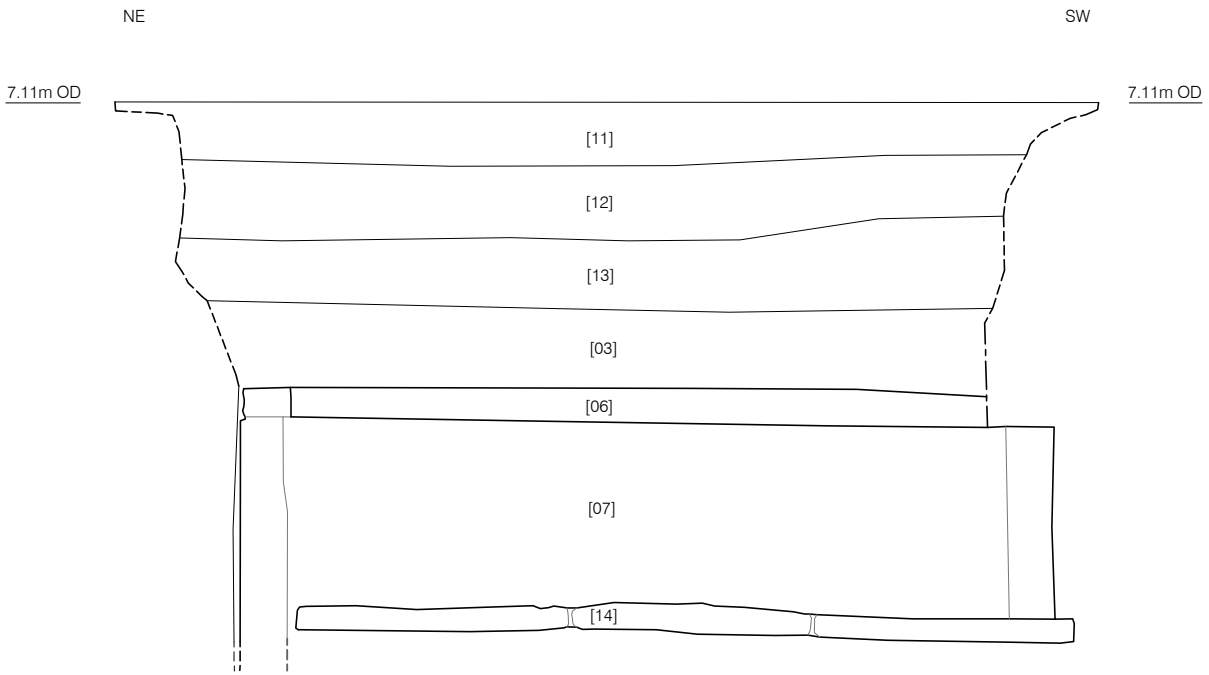


08/10/18 DV

Figure 2
Detailed Site Location Showing Earlier Extent of Churchyard
1:1000 at A4

08/10/18 DV

Figure 3
Detail of Archaeological Features Within Trench 1
1:100 at A4



Section 1
Northwest Facing
Trench 1

0 1m

15/11/19 DV

Figure 4
Section 1
1:20 at A4

APPENDIX 2 PLATES

Plate 1 Child skeleton [26], looking north (scale 1m)

Plate 2 Adult male skeleton [27], looking north (scale 1m)

Plate 3 Detail of craniotomy skeleton [27], looking south-west (scale 0.1m)

Plate 4 Adult male skeleton [23], looking north (scale 1m)

Plate 5 Adult female skeleton [19], looking north (scale 1m)

Plate 6 Adult male skeleton [15], looking north (scale 1m)

Plate 7 Stone cover of brick shaft grave [07], looking south (scale 0.50m)

Plate 8 Stone cover of brick shaft grave [07], looking south (scale 1m)

Plate 9 Skeleton [08] in brick shaft grave [07] with breastplate SF3, looking north (scale 1m)

Plate 10 Detail of breastplate SF3, skeleton [08] looking north (scale 0.1m)

Plate 11 Skeleton [08] in brick shaft grave [07] after removal of breastplate, looking south (scale 1m)

Plate 12 Brick shaft grave [07] after exhumation of skeleton looking south (scale 0.m)

Plate 12 Cemetery wall [44], looking east (scale 1m)

Plate 13 Working shot, Trench 1, looking south-east

Plate 14 Working shot, Trench 2, looking east

Plate 15 Working shot, Trench 2 drainage chamber

APPENDIX 3 CONTEXT INDEX

Context	***Type 1***	***Type 2***	***Fill of***	***Interpretation***
Trench 1 North Side of Coronation Street				
01	Layer	Concrete slabs	-	Footpath
02	Deposit	Sand	-	Under footpath (01)
03	Deposit	Layer	-	Ballast
04	Layer		-	Buried soil
06	Structure		-	Sandstone shaft grave slabs
07	Structure		-	Brick walls of shaft grave
08	Skeleton		-	Within shaft grave
09	Deposit	Fill		Within shaft grave
10	Structure	Wood		Coffin within shaft grave
11	Layer	Tarmac	-	Modern road surface
12	Layer	Clinker		Road make up under (11)
13	Layer	Deposit		Industrial waste (red coloured)
14	Structure	Sandstone		Sandstone slabs under the first shaft grave
15	Skeleton			Abutting east of the shaft grave
16	Deposit			Soil associated with skeleton (15)
17	Structure	Wood		Coffin for skeleton (15)
18	Layer			Below coffin (17), = (22)
19	Skeleton			Located east of skeleton (15)
20	Structure	Wood		Coffin for skeleton (19)
21	Fill		(20)	Within coffin (20)
22	Layer			Ground surface below ballast (03)
23	Skeleton			Located east of skeleton (19)
24	Fill		(37)	Within coffin (37)
25	Skeleton			Associated with skeleton (23)
26	Skeleton			
27	Skeleton			
32	Structure	Wood		Coffin for skeleton (25)
33	Structure	Wood		Coffin for skeleton (26)
34	Structure	Wood		Coffin for skeleton (27)
35	Fill		(33)	Fill of coffin (33)
36	Fill		(34)	Fill of coffin (33)
37	Structure	Wood		Coffin for skeleton (23)
38	Cut			Skeleton (15)
39	Cut			Skeleton (19)
40	Cut			Skeletons (23 and 25)
41	Cut			Skeleton (26)
42	Cut			Skeleton (27)
43	Cut			Cut for shaft grave (07)
44	Structure	Brick		Cemetery wall (eastern)
45	Layer	Cobbles		Yard or lane surface
Roundabout west side of Coronation Street				
28	Layer	Deposit		Topsoil over roundabout

29	Layer			Subsoil
30	Layer	Deposit		Ballast = (03)
31	Structure	Concrete		Old road surface
List of disarticulated bone found within Trench 1				
A				Adult leg bones
B				Adult assemblage from same adult
C				A single human bone
D				Adult bone
E				Adult male skull with many fragments and skeleton fragments
F				Adult and juvenile mixed fragments
G				Fragments of unsexed adult bone
H				Assemblage of adult unsexed bone
I				Adult tibia
J				Adult assemblage
K				Adult male skull
L				Adult rib bone
M				Adult tibia
N				Assemblage of unsexed adult bone
O				Assemblage of adult and juvenile bone

APPENDIX 4 OSTEOLOGICAL ANALYSIS

By John Kemp

Introduction

Archaeological investigations during road widening works on Coronation Street, South Shields, revealed a small number of *in-situ* burials, including one in a brick-line shaft grave. Seven individuals were located in the trench on the northern side of the road. These burials were located within the former boundaries of the churchyard of St Hilda's church and were interred between *c*. 1818 and 1855. A large quantity of disarticulated human bone was also found in the disturbed burial horizon in the trench. All burials were found to have some associated coffin remains.

The cemetery at St Hilda's was partially excavated, prior to development, in 2006 on the southern side of Coronation Street by Oxford Archaeology North (Raynor *et al* 2011). This excavation revealed the *in-situ* remains of over 200 individuals, plus the disarticulated remains of many more (Raynor *et al* 2010).

Osteological analysis of the recovered individuals was carried out to provide demographic information and to describe pathological changes to the skeletons. Where notable pathology was found amongst the disarticulated bone, this is also described and discussed.

Methodology

Articulated human bone

The articulated skeletons were recorded using the visual recording forms published by Roksandic (2003). Each skeleton was assessed for completeness, preservation, pathological lesions, age and sex. Preservation level was assessed using the grading system in McKinley (2004) described below. Completeness was estimated visually as a percentage. The dentition was recorded using the FDI system as illustrated in Hillson (1996) and labelled based on the system proposed by Brothwell (1981).

- Grade 0 – Very good
  Surface morphology clearly visible with fresh appearance to the bone and no modifications.
- Grade 1 – Good
  Slight erosion and patchy surface.
- Grade 2 – Good-moderate
  More extensive surface erosion than grade 1 with deeper surface penetration.
- Grade 3 – Moderate
  Most of bone surface affected by some degree of erosion; general morphology maintained but details of parts of surface masked by erosive activity.
- Grade 4 – Moderate-poor
  All of bone surface affected by erosive action; general profile maintained, and depth of modification not uniform across whole surface.
- Grade 5 – Poor
  Heavy erosion across whole surface, completely masking normal surface morphology, with some modification of profile.
- Grade 5+ - Very poor
  As grade 5 but with extensive penetrating erosion resulting in modification of profile.

Age assessment

All the adult individuals were assessed using the transition analysis (TA) method (Bolsden *et al* 2002). Where applicable, this was supplemented with dental eruption data, developmental fusion data and analysis of the auricular surface (AlQahtani *et al* 2010, Buckberry & Chamberlain 2002, Schaefer *et al* 2009). These methods were chosen to guarantee that at least two age appropriate methods could be applied to each skeleton. The individuals were then placed into categories based on guidelines in Buikstra & Ubelaker (1994). The categories used are shown in table 1.

Category	**Age range**
Neonate	Birth
Infant	Birth-1 year
Juvenile	1-11 years
Adolescent	12-20 years
Young Adult	20-34 years
Middle Adult	35-49 years
Old Adult	50+ years
Unspecified adult	20+ years

Table 1: Age categories for skeletal remains. Adapted from Buikstra & Ubelaker (1994)

Sex assessment

Morphology of the cranium and pelvis were used to assess biological sex. The guidelines in Brothwell (1981) and Ubelaker (1989) were used to assess these traits. The pelvis was favoured for this as it is the most reliably sexually dimorphic area of the human skeleton (Brothwell 1981).

Biometrics, Stature Estimation and Non-Metric analysis

Where possible, measurements of the bones from undisturbed contexts were measured according to the standards in Buikstra & Ubelaker (1994). Estimates of each individual's stature were made using the formulae developed by Trotter (1970). All skeletons were assessed for non-metric traits listed in Brothwell (1981) & Buikstra & Ubelaker (1994).

Recording of Pathology

Pathological changes identified on the skeletons were split into separate sections for ease of reading. A description of the type and location of the changes is given for each individual exhibiting that particular pathology. This is followed by a differential diagnosis and archaeological interpretation where possible. Descriptions and classifications were based largely on Roberts & Manchester (2010). Other relevant sources were consulted when necessary. Photographs of notable pathology are presented in appendix A and the plates are referred to throughout the text.

Disarticulated Human Bone

Disarticulated bone from the redeposited soil above the in-situ burials was sorted roughly according to where in the trench it was found. Each element recovered was identified and sided where possible. A minimum number of individuals (MNI) was established based on the most commonly reoccurring element and any pathological changes were recorded. Skeleton [25] is also disarticulated but has been given a skeleton number as the bones were found together, beneath an in-situ burial, with the remains of a degraded coffin plate.

Results

Disarticulated MNI

The minimum number of individuals from the disarticulated bone was calculated as six adults based on the recurrence of the left femur. Additionally, there was at least one juvenile present, taking the total MNI to seven.

Completeness & Condition

The completeness and preservation of the skeletal remains is shown in table 2.

Skeleton	Completeness	Preservation
8	>90%	Grade 1
15	60-70%	Grade 3
19	50-60%	Grade 2
23	60-70%	Grade 1
25	<10%	Grade 2
26	60-70%	Grade 3
27	70-80%	Grade 2

Table 2: Estimated completeness and grade of preservation (McKinley 2004) for the excavated individuals.

Age assessment

With the exception of fragmented skeleton [25], there was sufficient bone survival to carry out at least two methods of age assessment on each skeleton. The results of this assessment are shown in table 3. Based on these results, the skeletons have been placed in broad categories also shown in table 3.

As TA was developed exclusively for adult human remains, juvenile skeleton [26] could not be analysed using this method. Additionally, skeleton [23] was too badly fragmented for any pelvic traits to be observed. This means that the TA result for this individual is based on cranial traits only and may not be a reliable estimate. However, dental eruption and developmental fusion of this individual suggest an age in the mid-20s is most likely.

Skeleton	Transition analysis	Dental eruption	Fusion analysis	Auricular Surface	Age category
08	15-28	15.5 ±1	17-25	21-38	Adolescent-young adult
15	15-37	23.5+	25+	16-65	Young adult
19	44-89	N/A	25+	39-91	Middle adult
23	15-33	23.5+	17-25+	N/A	Young adult
25	N/A	N/A	Adult	N/A	Unspecified adult
26	N/A	9.5 ±1	4-12	N/A	Juvenile
27	47-91	N/A	N/A	53-92	Old adult

Table 3: Age analysis for the excavated individuals.

Sex assessment

Skeleton [26] could not be assessed as the biological sex of juvenile skeletons is difficult to accurately establish as their skeletal traits are far more ambiguous. Skeleton [25] was also not assessed as not enough of the individual survived for assessment. For all other in situ skeletons, biological sex was assessed with a high degree of certainty. The results of the assessment are shown in table 4. Additionally, the crania of two adults in the disarticulated assemblage were positively identified as male.

Skeleton	Biological sex
08	Female
15	Male
19	Female
23	Male
25	Indeterminate
26	Indeterminate
27	Male

Table 4: Sex assessment of excavated individuals.

Biometrics and non-metrics

Stature was calculated for all individuals and the results are shown in table 5. Stature could not be calculated for skeleton [08] due to pathological interference. Additionally, the left femur of skeleton [19] could not be used for the same reason. Skeleton [25] was not calculated as sex could not be determined. Skeleton [26] was not calculated as the individual was a juvenile and the equations were not applicable. Table 6 shows the non-metric trait assessment for the excavated individuals.

Skeleton	Bone used	Stature (cm)
15	Femur	169.46 ±3.27
19	Tibia	161.79 ±4.45
23	Femur	165.17 ±3.27
27	Femur	172.79 ±3.27

Table 5: Stature estimation for excavated individuals.

Trait	SK 08	SK15	SK19	SK 23	SK 25	SK26	SK 27
Cranial							
Metopic Suture	0	0	0	0	UO	1	0
Supraorbital notch	1/0	1/0	1/UO	UO	UO	UO	1/1
Supraorbital foramen	0/0	0/1	0/UO	UO	UO	UO	0/0
Infraorbital suture	0/0	UO	0/UO	UO	UO	UO	UO
Multiple infraorbital foramina	0/0	UO	0/UO	UO	UO	UO	UO
Zygomatico-facial foramina	1/1	UO	1/UO	1/UO	UO	UO	1/1
Parietal Foramen	0/0	0/0	1/1	1/1	UO	UO	0/0
Epipteric bone	0/0	0/0	0/UO	UO	UO	UO	0/0
Coronal ossicle	0/0	0/0	0/UO	UO	UO	UO	0/0
Bregmatic bone	0	0	0	0	UO	UO	0
Sagittal Ossicle	0	0	0	0	UO	UO	0
Apical bone	0	0	0	0	UO	UO	0
Lambdoid ossicle	0	0	0	0	UO	UO	0
Asterionic bone	1/1	0/0	1/UO	0/1	UO	UO	0/0
Ossicle in Occipito-mastoid suture	0/0	0/0	0/UO	0/0	UO	UO	0/0
Parietal notch bone	0/0	0/0	0/UO	UO	UO	UO	0/0
Inca bone	0	0	0	0	UO	UO	0
Condylar canal	1/0	UO/0	1/1	1/0	UO	UO	0/0
Divided hypoglossal canal	0/0	UO/0	0/0	0/1	UO	0/0	0/0
Flexure of superior sagittal sulcus	0	0	0	0	UO	UO	0
Foramen ovale incomplete	0	0/0	0/UO	0	UO	UO	0
Foramen spinosum incomplete	0	0/0	0/UO	0	UO	UO	0
Pterygo-spinous bridge	0/0	UO	0/UO	UO	UO	UO	UO
Pterygo-alar bridge	0/0	UO	0/UO	UO	UO	UO	UO
Tympanic dehiscence	0/0	0/UO	0/UO	0/0	UO	0/0	0/0
Auditory exostosis	0/0	0/UO	0/UO	0/0	UO	0/0	0/0
Mastoid foramen	0/0	0/UO	0/UO	0/1	UO	UO	0/0

Multiple mental foramen	0/0	0/0	0/0	0/0	UO	0/0	0/0
Mandibular torus	0	0	0	0	UO	0	0
Mylohyoid bridge	0	0	0	0	UO	0	0
Bridging of jugular foramen	0/0	UO/0	0/UO	0/0	UO	UO	0/0
Double occipital condylar facet	1	0	0	0	UO	UO	0
Frontal grooves	0/0	0/0	0/0	0/0	UO	0/0	0/0
Ethmoidal foramina	0	UO	UO	UO	UO	UO	UO
Paracondylar process	0/0	0/0	1/0	0/0	UO	0/0	0/0
Maxillary torus	0	0	0	0	UO	0	0
Pharyngeal tubercle	1	0	0	1	UO	0	1
Clinoid bridge or spurs	UO	0	0	0	UO	UO	0
Accessory lesser palatine foramina	0/0	0/0	UO	1/1	UO	UO	0/0
Palatine torus	0	0	UO	0	UO	UO	0
Suprameatal pit or spine	0/0	UO/0	0/0	0/0	UO	0/0	0/0
Divided parietal bone	0/0	0/0	0/0	0/0	UO	0/0	0/0
Os japonicum	0/0	0/0	0/UO	0/UO	UO	0/0	0/0
Marginal tubercle	0/0	0/0	0/UO	1/0	UO	UO	0/0
Trochlear spine	0/0	UO	UO	UO	UO	UO	0/0
Supratrochlear notch/foramen	1/1	UO	UO	UO	UO	UO	1/1
Trochlear notch form	0/0	UO	UO	UO	UO	UO	0/0
Supratrochlear spur	0/0	UO	UO	UO	UO	UO	0/0
Retroauricular bridge	0/0	0/0	0/UO	0/0	UO	UO	0/0
Rocker mandible	0	0	0	0	UO	0	0
Postcranial							
Atlas double facets	0/0	UO	0/0	0/0	UO	0/0	0/1
Atlas bridging	0/0	UO	0/0	0/0	UO	UO	0/0
Accessory transverse foramen (atlas)	0/0	UO	0/0	0/0	UO	UO	0/0
Accessory transverse foramen in cervical vertebrae	0	UO	UO	UO	UO	UO	UO
sternal foramen	UO	UO	UO	UO	UO	0	0
Preauricular sulcus	UO	0/0	1/1	1/1	UO	UO	UO/0
Accessory sacroiliac articulation	UO	0/0	UO	0/0	UO	UO	UO/0
Acetabular crease	0/UO	0/0	0/0	0/0	UO	UO	UO/0
Upper limbs							
Suprascapular foramen or notch	1/1	UO	UO	UO	UO	UO	UO
Accessory acromial articular facet	UO	UO	UO	0/UO	UO	UO	UO
unfused acromial epiphysis	0/0	UO	0/UO	0/0	UO	UO	0/0
Glenoid fossa extension	0/0	0/UO	UO	UO/0	UO	UO	0/0
Circumflex sulcus	0/0	UO	UO	UO	UO	UO	UO
Supracondylid process	0/0	0/0	0/UO	0/0	UO/0	UO	0/0
Septal aperture	0/0	UO	1/UO	0/0	UO/0	UO	0/0

Lower limbs							
Exostosis in trochanteric fossa	0/0	0/UO	0/UO	0/0	0/UO	UO	UO/1
Allen's fossa	0/0	0/0	0/UO	0/0	0/UO	UO	UO/0
Poirer's facet or extension	0/0	0/0	0/UO	0/1	0/UO	UO	UO/0
Femoral head plaque formation	0/0	0/0	0/UO	0/0	0/UO	UO	UO/0
Third trochanter	0/0	0/0	0/UO	0/0	0/UO	UO	UO/0
Vastus notch	0/0	UO	UO	UO	UO	UO	UO/0
Emarginate patella	0/0	UO	UO	UO	UO	UO	UO/0
Tibial squatting facets	0/0	0/0	1/UO	0/0	UO	UO	0/0
Talus squatting facets	0/0	0/0	1/UO	0/0	UO	UO	0/0
Lateral talar extension	0/0	0/UO	0/UO	0/UO	UO	UO	0/0
Inferior articular surface extension	UO/0	0/UO	0/UO	1/UO	UO	UO	0/0
Anterior calcaneal facet double	1/0	0/0	1/UO	0/UO	UO	UO	0/0
Anterior calcaneal facet absent	0/0	0/0	0/UO	0/UO	UO	UO	0/0
Peroneal tubercle	0/0	0/0	UO	1/UO	UO	UO	0/0

Table 6: Assessment of non-metric traits for the excavated individuals.

Skeletal Pathology

Dental Pathology

Dental diseases were the most common conditions affecting the excavated individuals. Table 7 shows a summary of the major dental conditions and notes their locations within the dentition using the FDI system.

Skeleton	**Caries**	**Tooth loss**	**Periodontitis**
08	No	36,46	No
15	No	No	Yes
19	No	11-18, 21,25-28, 31-38, 41, 42, 46-48	No
23	18, 27, 37, 38, 48	16, 26	Yes
25	N/A	N/A	N/A
26	55	54, 64, 65	No
27	No	11-18, 21-28, 31, 32, 34-38, 41-48	Yes

Table 7: Dental pathology for excavated individuals using the FDI notation system.

Dental caries/abscesses

Caries is a destructive lesion affecting the teeth. It is caused by the fermentation of sugars by bacteria present in dental plaque (Roberts & Manchester 2010). It is arguably the most common form of dental disease affecting human populations past and present (Roberts & Manchester 2010). Caries are thought to potentially elevate the risks of heart disease (Pasqualini *et al* 2012).

Carious lesions were noted on the dentition of skeletons [23] and [26]. Additionally, skeletons [08], [19] and [27] were noted to show evidence of dental destruction likely associated with carious lesions. Most visible lesions were shallow but some more advanced lesions had penetrated deeper into the tooth. Most notably, skeleton [23] has a lesion in the upper left 2nd molar that has destroyed almost 50% of the crown and caused one of the roots to become detached (plate 1). The same tooth also appeared to have a dental abscess, although no root destruction appeared to have taken place. Skeleton [19] also had a possible dental abscess affecting the lower left 2nd premolar. Skeleton [26] had one upper deciduous molar that is affected by a deep lesion and it is likely that caries was the cause of the premature loss of the other deciduous molars in the upper dentition.

Although there are no visible carious lesions in the dentition of skeletons [08], [19] and [27], there is significant tooth loss which may have been associated with caries lesions. Skeleton [19] in particular displays crown destruction on their remaining teeth which are likely the result of caries lesions or excessively high levels of attrition.

Ante mortem tooth loss

All the in-situ skeletons showed evidence of ante mortem tooth loss. This was positively identified by the infilling of the empty tooth sockets (Roberts & Manchester, 2010). The most commonly affected teeth were the molars. In some cases, the loss of teeth had further effects on the dentition of the individuals.

Skeleton [23] showed signs of continuous eruption of tooth 36. This can occur when the opposing teeth become heavily worn or when one of the teeth is lost (Christou & Kiliaridis 2007, Hillson 1996). In this instance, the opposing tooth (26) has been lost. Skeleton [26] had mixed dentition, with their maxillary dentition suggesting an older age than their mandibular dentition. This appears to be due to the early loss of the upper deciduous molars. When this occurs, it can cause the adult premolars to begin erupting much earlier than normal (Posen 1965). Skeleton [27] still had some roots left behind from absent teeth. The maxilla and mandible of this individual showed evidence of new bone formation along the line of the dental arcade (plate 2). This is most likely the result of periostitic inflammation in reaction to the area becoming infected (Roberts & Manchester 2010). It seems likely that poor dentistry was the cause of at least some of the tooth loss and the subsequent infection for this individual. A disarticulated mandible also showed evidence of severe bone destruction in the alveolar bone which is likely the result of infection following the loss of teeth (plate 3).

Periodontal disease and calculus

Periodontal disease is the loss of alveolar bone resulting in exposure of tooth roots (Hillson 1996). It is caused by the build up of calculus deposits around the teeth and, if left untreated, can lead to tooth

loss (Roberts & Manchester 2010). It has also been shown to potentially increase the risk of heart disease through secondary infection and enforced dietary changes (Bahekar *et al* 2007). It is difficult to positively identify in archaeological remains as teeth continuously erupt throughout adult life which could have the same appearance (Roberts & Manchester 2010). It is also worth noting that archaeological material tends display high levels of taphonomic damage which could be mistaken for bone loss. Pitting and new bone formation around the teeth would be the most indicative signs of the disease (Roberts & Manchester 2010).

Possible periodontal disease was identified in the dentition of skeletons [15], [19], [23] and [27]. There does appear to be some pitting around the remaining teeth of these individuals but its association with periodontal disease is not clear. In all cases there is evidence of calculus formation on the tooth roots, which does indicate that the roots were exposed at some point during the individual's life. Calculus was observed on the dentition of the same individuals noted to have possible periodontal disease. In all cases, the deposits ranked as slight according to the scoring system in Hillson (1996).

Enamel hypoplasia

Enamel hypoplasia is a defect in the developing dentition caused by disruption of the formation of the enamel matrix (Hillson 1996). Physiological stresses such as localised trauma, nutritional deficiency and illness are often cited as potential causes (Roberts & Manchester 2010). However, the underlying causes can be much more complex and it is best treated as a non-specific indicator of stress (Kemp 2014).

All individuals displayed some hypoplastic grooves on their remaining teeth. These grooves appear very shallow and discrete, indicating probably very minor periods of physiological stress. The only exception is skeleton [08] whose incisors and canines show extensive pitting and deep grooves (plate 4). The molars are also affected to a lesser extent. This indicates a prolonged period of physiological stress lasting from birth to possibly around 4 years old (Alqhatani *et al* 2012). At this point, the dental formation process appears to have continued as normal.

Cultural modifications

Skeleton [15] appeared to display wear on the maxillary dentition which may have been the result of clay pipe use (plate 5). A disarticulated mandible also displayed three likely instances of pipe wear (plate 6). These pipe facets occur when a clay pipe is held in the teeth on a regular basis, slowly wearing away the teeth (Hillson 1996, Roberts & Manchester 2010).

Agenesis of the third molars

The age of skeleton [08] was originally underestimated due to lack of third molars. Further analysis of the individual revealed them to be slightly older than was originally thought. The most likely explanation would be that this individual has agenesis of the third molars, meaning that they never formed at all (Celikoglu *et al* 2010). This has been noted to occur in around 17% of individuals within a population; with no difference in prevalence between males and females (Celikoglu *et al* 2010).

Cranial Pathology

Autopsy and surgery

Skeleton [27] had a continuous, circumferential cut on the cranial vault, indicative of a post mortem craniotomy (plate 7). There were also two puncture marks on the frontal bone which were likely to mark the starting point for the cut (plate 8). The cut was neat but not entirely straight and there did appear to be one instance of the saw changing alignment slightly. There was a nodule of bone between the puncture marks, suggesting this area was likely snapped off at the end of the sawing process. Another individual exhibiting the same procedure was found during earlier excavations in another part of the cemetery (Raynor *et al* 2011).

A disarticulated cranium recovered from a disturbed deposit showed evidence of surgical peri-mortem trepanation of the left parietal (plate 9). Trepanation is the cutting and removal of an area of the cranium (Roberts & Manchester 2010). In this instance, the bone has been cut initially with a saw for a short distance to allow access. The two halves were then likely levered away with a smaller surgical tool inserted into the saw cut. There is no healing evident, so the individual did not live long after the procedure.

Cribra Orbitalia

Skeleton [15] was noted to have a porous lesion on the roof of the left orbit (plate 10). This may be cribra orbitalia which is commonly associated with anaemia (Walker *et al* 2009). However, the lesion is not distinct, and it is possible that it may be the result of post depositional taphonomic damage.

Post Cranial Pathology

Morphological changes

Skeleton [08] showed clear signs of childhood rickets (plate 11). This is caused by a deficiency of vitamin D leading to delayed or inadequate mineralisation of developing bones (Roberts & Manchester 2010). This causes the bones to appear excessively curved and is usually most notable in the weight bearing bones of the legs (Roberts & Manchester 2010). It is often associated with other developmental issues such as enamel hypoplasia and this association is present in this individual (Roberts & Manchester 2010). This individual also showed some minor deformation of the ribs which involved the flattening of the angle in some rib shafts. This sort of deformation has been potentially associated with the wearing of tightly fitting corsets (McCarthy *et al* 2012).

Skeleton [15] showed possible biomechanical changes to their femora and tibiae. These changes appeared to involve both knees twisting in a medial direction towards each other. The proximal ends of the femora and the distal ends of the tibiae also show evidence of twisting medially. This is unlikely to be the result of rickets as the characteristic bend of the bones is not present. More likely, these changes could be activity or environment related but there is also a chance that the individual may have been more prone to these changes due to genetic factors (Roberts & Manchester 2010). It is not clear how this would have affected the individual's gait but as the changes are not extreme and no

further pathological changes (such as osteoarthritis) are present, it may have had little noticeable effect at all.

All the adults excavated showed changes to their 1st metatarsals and the associated phalanges. In all cases, the phalanges had curved laterally towards the rest of the toes (plate 12). This had caused dramatic changes in the orientation of the joint between the 1st metatarsal and the first phalanx, expansion of joint surfaces to accommodate this new alignment, osteophyte development and, in some cases, osteoarthritis. The biomechanical changes and associated complications were noted to be much more severe in older individuals.

These symptoms are all typical of a condition known as Hallux Valgus; more commonly known as bunions (Zipfel & Berger 2007). It is thought to largely be the result of wearing ill fitting footwear for a prolonged period (Robinson & Limbers 2005, Zipfel & Berger 2007). This would correlate to the heightened severity noted in the older individuals who had likely been wearing badly fitted shoes for a longer period. However, it is worth noting that there are some genetic factors which are thought to increase the speed of onset and time spent with constricted feet is not the only factor (Robinson & Limbers 2005).

Schmorl's nodes

Possible schmorl's nodes were noted on skeletons [15], [23] and [27]. Schmorl's nodes are depressions on the vertebral body surfaces caused by pressure exerted by the intervertebral discs (Roberts & Manchester 2010). The precise cause of this phenomenon is not clear, but it often thought to be associated with trauma and degenerative disc disease (Roberts & Manchester 2010, Williams *et al* 2007). It is also thought that some individuals may be genetically predisposed towards the condition (Williams *et al* 2007).

Osteophytes

Osteophytes are bony outgrowths occurring in the margins of a joint surface or on the joint surface itself (Roberts & Manchester 2010). They form as a reaction to stress or trauma placed upon the joint and become increasingly common as an individual ages (Roberts & Manchester 2010). In extreme cases, osteophytes on the vertebral bodies can overlap and fuse together. This is known as osteophytosis (Roberts & Manchester 2010).

All adult individuals displayed some degree of osteophyte formation. In most cases the osteophytes were small and did not appear to have led to further complications. However, skeleton [27] displayed exceptionally large osteophytes on most of their joints. The osteophytes on the vertebrae of this individual were so large that they were overlapping in some places and may have fused. These connections were broken post deposition and it is not clear that fusion occurred.

Osteoarthritis

Osteoarthritis is the most commonly identified condition in archaeological assemblages of human remains (Jurmain 1999). It is identified by the presence of osteophytes, porosity of the joint surface and eburnation (polishing) of the joint surface (Roberts & Manchester 2010). The presence of two of

these three factors is usually considered enough for a positive diagnosis (Roberts & Manchester 2010). The location of osteoarthritis is often used to attempt interpretation of potential repetitive activity patterns in past populations (Jurmain 1999).

Skeletons [19] and [27] both showed signs of osteoarthritis. Skeleton [19] had at least one articular facet of the lumbar vertebrae and the distal ends of the 1st metatarsals affected by the condition. Skeleton [27] was affected in several articular facets of multiple vertebrae, both humero-radial joints, one interphalangeal joint in the right hand, the right knee (left knee absent), and the distal ends of both 1st metatarsals (plate 13).

The presence of osteoarthritis in the 1st metatarsals of the two oldest individuals appears to suggest a link with the development of hallux valgus. Additionally, the symmetrical occurrence of osteoarthritis in the humero-radial joints of skeleton [27] may be indicative of a repetitive, strenuous activity which involves rotating of the forearms. However, it is not clear exactly what this activity may have been.

Fracture and non-specific infection

Fractures and potential fractures were identified on three individuals. Skeleton [27] displayed an abnormal curvature of the 1st metacarpal of the right hand. This is likely the result of a healed, but misaligned fracture. Skeleton [23] had a fractured left clavicle at midshaft. The bone had not been reset and the two portions have healed well, overlapping each other. This has led to a shortening of the bone which can lead to further complications such as poor alignment and osteoarthritis (Roberts & Manchester 2010). However, these complications do not appear to have manifested in this individual. Skeleton [19] appeared to have a well-healed fracture of the left femur (plate 14). There was evidence for new bone formation at the suspected site of the break and a disturbance of the linea aspera. No further complications in the form of osteoarthritic or misalignment changes were noted. Due to the excellent alignment and the advanced healing observed, it is difficult to ascertain whether this truly is the result of a fracture or a non-specific periosteal infection. Both would result in the formation of new bone causing a swollen appearance during healing (Roberts & Manchester 2010).

Pulmonary infection

Skeleton [23] showed signs of new bone formation on the visceral surface of some ribs (plate 15). This is considered to be a symptom of pulmonary infection (Roberts & Manchester 2010). This type of lesion is often associated with tuberculosis, but this is not always the case (Mays *et al* 2002). Without the presence of more diagnostic pathology of the vertebrae and joints, these lesions can only be considered evidence of a non-specific infection (Roberts & Manchester 2010).

Diffuse Idiopathic Skeletal Hyperostosis (DISH)

Skeleton [27] had DISH affecting at least four vertebrae in the thoracic and lumbar regions (plate 16). More vertebrae may have been affected but may have become detached post deposition. However, due to the large osteophytes on the vertebrae, it is not clear if the vertebrae above and below were affected. DISH is identified by the ossification of the anterior ligament of the spine on the right side (Roberts & Manchester 2010). It is most commonly associated with the thoracic vertebrae but can potentially affect the whole spine (Roberts & Manchester 2010). The condition most commonly occurs

in men and the age of onset is usually 50+ (Piercarlo & Fabiola 2004, Roberts & Manchester 2010). The precise causes of DISH are not known, but it is thought to have some association with high levels of uric acid, obesity and diabetes (Piercarlo & Fabiola 2004, Roberts & Manchester 2010).

Another case of DISH affecting five thoracic vertebrae was noted amongst the disarticulated assemblage (plate 17).

Recommendations for further work

The burial assemblage recovered from this project represents a very small portion of the overall cemetery population. Full analysis has been undertaken on the skeletal remains recovered from the watching brief and no further work is required. A summary of the findings of this osteological analysis should be included in the publication report of the work.

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Bibliography

AlQhatani, S.J., Hector, M.P. & Liversidge, H.M. 2010. Brief Communication: The London Atlas of human Tooth Development and Eruption. *American journal of Physical Anthropology.* 142: 481-490

Bahekar, A.A., Singh, S., Saha, S., Molnar, J. & Arora, R. 2007. The Prevelance and Incidence of Coronary Heart Disease is Significantly Increased in Periodontitis: A Meta-Analysis. *American Heart Journal.* 154(5): 830-837

Boldsen, J.L., Milner, G.R., Konigsberg, L.W. and Wood, J.W. 2002. Transition Analysis: A New Method for Estimating Age from Skeletons. In Hoppa, R.D. and Vaupel, J.W. (eds). 2002 *Paleodemography.* Cambridge university Press. Cambridge.

Brothwell, D.R. 1981. *Digging up Bones.* 3rd ed. Oxford University Press. Oxford

Buikstra, J.E. & Ubelaker, D.H. 1994. *Standards for Data Collection from Human Skeletal Remains.* Arkansas Archaeological Research Series. 44.

Buckberry, J.L. & Chamberlain, A.T. 2002. Age Estimation from the Auricular Surface of the Ilium: A Revised Method. *American Journal of Anthropology.* 119: 231-239

Celikoglu, M., Miloglu, O, & Kazanci, F. 2010. Frequency of Agenesis, Impaction, Angulation and Related Pathologic Changes of Third Molar Teeth in Orthodontic Patients. *Journal of Oral and Maxillofacial Surgery.* 68(5): 990-995

Christou, P. & Kiliaridis, S. 2007. Three-Dimensional Changes in the Position of Unopposed Molars in Adults. *European Journal of Orthodontics.* 29(6): 543-549

Trotter, M. & Gleser, G.C. 1958. A Re-evaluation of Estimation of Stature based on Measurements of Stature taken during Life and of Long Bones after Death. *American Journal of Physical Anthropology.* 16: 79-123

Hillson, S. 1996. *Dental Anthropology.* Cambridge University Press. Cambridge.

Jurmain, R.D. 1999. *Stories from the Skeleton: Behavioural Reconstruction in Human Osteology.* Gordon & Breach Publishers. Amsterdam.

Kemp, J. 2014. *A Histological and Isotopic Study of the Correlation between Enamel Hypoplasia and Dentine Collagen Profiles.* MSc dissertation. University of Bradford

Mays, S., Fysh, E. & Taylor, G.M. 2002. Investigation of the Link Between Visceral Surface Rib Lesions and Tuberculosis in a Medieval Skeleton Series from England using Ancient DNA. *American Journal of Physical Anthropology.* 119: 27-36

McCarthy, R., Clough, S., Boyle, A. & Norton A. 2012. The Baptist Chapel Burial Ground, Littlemore, Oxford. *Post Medieval Archaeology.* 46(2): 281-290

McKinley, J. 2004. Compiling a Skeletal Inventory: Disarticulated and Co-mingled Remains. In Brickley, M. & McKinley, J. 2004. *Guidelines to the Standards for Recording Human Remains. IFA Paper No.7.* 14-17

Pasqualini, D., Bergandi, L., Palumbo, L., Borraccino, A., Dambra, V., Alovisi, M., Migliaretti, G., Ferraro, G., Ghigo, D., Bergerone, S., Scotti, N., Aimetti, M. and Berutti, E. 2012. Association Among Oral Health, Apical Periodontitis, CD14 Polymorphisms, and Coronary Heart Disease in Middle-Age Adults. *Journal of Endodontics.* 38(12): 1570-1577

Posen, A.L. 1965. The Effect of Premature Loss of Deciduous Molars on Premolar Eruption. *The Angle Orthodontist.* 35(3): 249-252

Raynor, C., McCarthy, R. & Clough, S. 2011. *Coronation Street, South Shields, Tyne and Wear: Archaeological Excavation and Osteological Analysis Report.* Oxford Archaeology North unpublished report.

Roberts, C. & Manchester, K. 2010. *The Archaeology of Disease.* 3rd ed. The History Press. Stroud.

Robinson, A.H.N. & Limbers, J.P. 2005. Modern Concepts in the Treatment of Hallux Valgus. *The Journal of Bone & Joint Surgery.* 87: 1038-1045

Roksandic, M. 2003. New Standardised Visual Forms for Recording the Presence of Human Skeletal Elements in Archaeological and Forensic Contexts. *Internet Archaeology.* 13

Schaefer, M., Black, S. & Scheuer, L. 2009. *Juvenile Osteology: A Laboratory and Field Manual.* Elsevier. New York

Trotter, M. 1970. Estimation of Stature from Intact Long Limb Bones. In Stewart, T.D. (ed) 1970. *Personal Identification in Mass Disasters.* National Museum of Natural History. Washington DC.

Ubelaker, J.E. 1989. *Human Skeletal Remains: Excavation, Analysis, Interpretation.* 2nd ed. Taraxacum Press. Washington D.C.

Walker, P.L., Bathurst, R.R., Richman, R., Gjerdrum, T. & Andrushko, V.A. 2009. The causes of Porotic Hyperostosis and Cribra Oribitalia: A Reappraisal of the Iron Deficiency-Anemia Hypothesis. *American Journal of Physical Anthropology.* 139(2): 109-125

White, T.D. and Folkens, P.A. 2005. *The Human Bone Manual.* Elsevier. New York.

Williams, F.M.K., Manek, N.J., Sambrook, P.N., Spector, T.D. & Macgregor, A.J. 2007. Schmorl's Nodes: Common, Highly Heritable, and Related to Lumbar Disc Disease. *Arthritis Care & Research.* 57(5): 855-860

Zipfel, B. & Berger, L.R. 2007. Shod Versus Unshod: The Emergence of Forefoot Pathology in Modern Humans? *The Foot.* 17: 205-213

Appendix A

Pathology photographs

Plate 1: Upper left maxilla of skeleton [23] showing severe caries destruction.

Plate 2: Maxilla and mandible of skeleton [27] showing vestigial roots and possible post extraction infection.

Plate 3: Disarticulated mandible showing severe infection of the dental arcade.

Plate 4: Mandible of skeleton [08] showing severe enamel hypoplasia.

Plate 5:Left maxilla of skeleton [15] showing part of a possible pipe facet.

Plate 6: Disarticulated mandible showing multiple pipe facets.

Plate 7: Cranium of skeleton [27] showing the separation of the upper and lower cranium caused by post mortem craniotomy.

Plate 8: The upper portion of the cranium of skeleton [27] showing puncture wounds on the frontal bone in line with the craniotomy cut.

Plate 9: Disarticulated cranium showing a peri mortem trepanation of the left parietal.

Plate 10: Cranium of skeleton [15] showing a possible cribra orbitalia lesion.

Plate 11: Femora of skeleton [08] showing abnormal curvature relating to rickets.

Plate 12:1st metatarsals and phalanges of skeletons [27] (left) and [19] (right) showing severe hallux valgus.

Plate 13. 1st metatarsals, phalanges and 1 sesamoid of skeleton [27] showing severe osteophytes and osteoarthritis.

Plate 14: Left femur of skeleton [19] showing possible well healed fracture or non-specific periosteal infection. Anterior view (above) and posterior view (below).

Plate 15:Head end of a rib from skeleton 23 showing new bone formation.

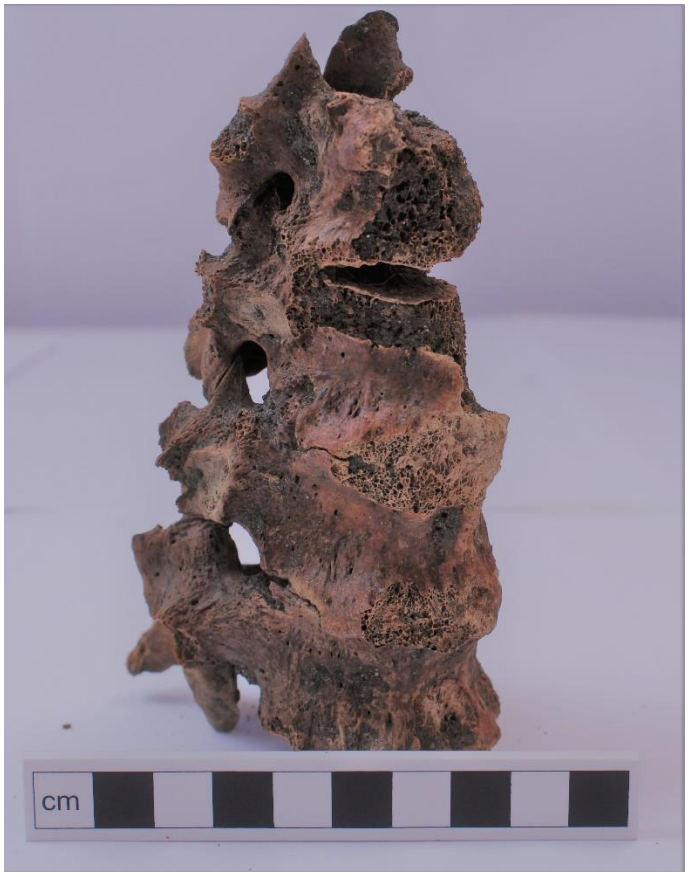


Plate 16: Vertebrae of skeleton [27] affected by DISH.

Plate 17:Disarticulated vertebrae affected by DISH.

Appendix B

CSS18 Burial catalogue

Skeleton 08
Age: Adolescent – Young adult
Sex: Female
Stature: N/A due to pathological changes
Preservation: Good (McKinley 2004)
Completeness: >90%
Pathology: Rickets, sever enamel hypoplasia, antemortem tooth loss, agenesis of third molars, morphological changes to ribs.

Skeleton 15
Age: Young adult
Sex: Male
Stature: 169.46cm ±3.27. Femur (Trotter 1970)
Preservation: Moderate (McKinley 2004)
Completeness: 60-70%
Pathology: Possible cribra orbitalia (may be taphonomic), periodontal disease, probable dental pipe facet, calculus, vertebral osteophytes, possible Schomrl's nodes, biomechanical changes in knee structures, osteophytes on 1st metatarsals, hallux valgus.

Skeleton 19
Age: Middle adult
Sex: Female
Stature: 161.79cm ±4.45. Tibia (Trotter 1970)
Preservation: Good-moderate (McKinley 2004)
Completeness: 50-60%
Pathology: Ante mortem tooth loss, tooth crown destruction, possible dental abscess on tooth 35, vertebral osteophytes, osteoarthritis of vertebral lumbar articular facets, possible fracture/non-specific infection of left femur (well healed), Osteophytes on left distal femur, osteophytes on left 1st metatarsal, hallux valgus.

Skeleton 23
Age: Young adult
Sex: Male
Stature: 165.17cm ±3.27 (Trotter 1970)
Preservation: Good (McKinley 2004)
Completeness: 60-70%
Pathology: Severe caries lesion on tooth 27, small caries lesions on teeth18, 38, 47 & 48, dental abscess on tooth 27, calculus, continuous eruption of tooth 36 multiple enamel hypoplasia, possible Schmorl's nodes, vertebral osteophytes, new bones formation on visceral surface of ribs, osteophytes on proximal ulnae, fractured and healed left clavicle, osteophytes on distal femora, hallux valgus.

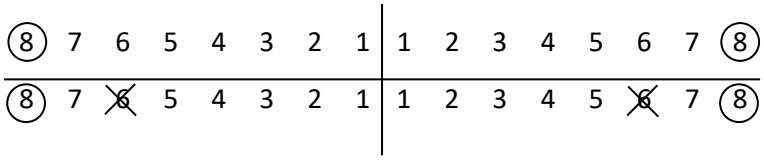
Skeleton 25
Age: Unspecified adult
Sex: Indeterminate
Stature: N/A
Preservation: Good-moderate (McKinley 2004)
Completeness: <10%
Pathology: None noted.

Skeleton 26
Age: Juvenile
Sex: Indeterminate
Stature: N/A
Preservation: Moderate (McKinley 2004)
Completeness: 60-70%
Pathology: Caries lesion on tooth 64, premature deciduous tooth loss, premature adult premolar eruption.

Skeleton 27
Age: Old adult
Sex: Male
Stature: 172.79cm ±3.27 (Trotter 1970)
Preservation: Good-moderate (McKinley 2004)
Completeness: 70-80%
Pathology: Ante mortem tooth loss, vestigial roots visible in places, non-specific infection of dental arcade, likely periodontal disease, enamel hypoplasia, calculus, severe vertebral osteophytes, possible vertebral osteophytosis, DISH (T10-L1), osteoarthritis of some vertebral articular facets, possible Schmorl's nodes, right 1st rib fused to sternum, some ribs fused to vertebrae, minor ossification of spinal posterior longitudinal ligament, osteophytes on acetabulum, osteophytes on proximal and distal right femur, osteoarthritis of right distal femur/patella, Severe osteophytes of distal metatarsals, severe hallux valgus, osteoarthritis of distal 1st metatarsals, osteophytes of glenoid fossae/proximal humeri, osteophytes of right distal humerus/distal ulna, osteoarthritis of both humero-radial joints, fractured and healed right 1st metacarpal, osteophytes on distal metacarpals and phalanges, osteoarthritis in 1 interphalangeal joint.

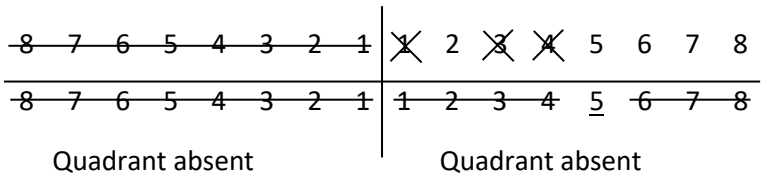
CSS 18 dental recording forms

SK08



SK15

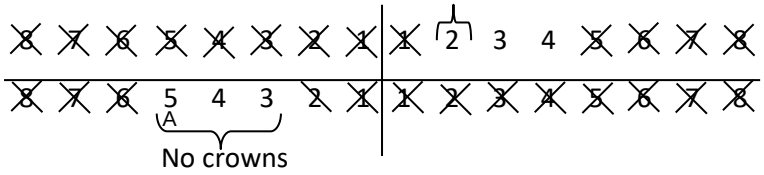
Quadrant absent



Quadrant absent Quadrant absent

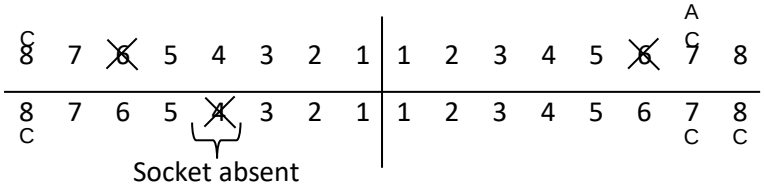
SK19

No crown



No crowns

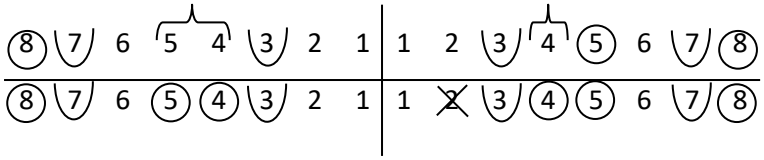
SK23

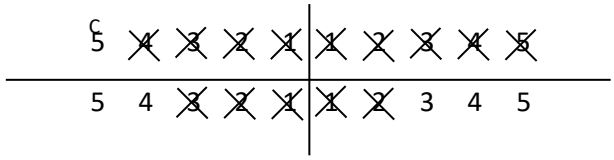


Socket absent

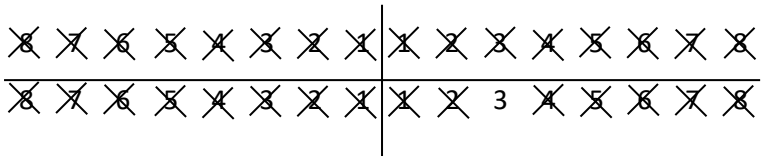
SK26

Premature Premature





SK27



KEY

1 = Present

1 = Absent

1 = Tooth absent, socket present

1 = Tooth present, socket absent

1 = Tooth erupting

(1) = Tooth not yet erupted

C 1 = Caries lesion present

A 1 = Dental abscess present

FDI notation used.

Based on the labelling system proposed in Brothwell, DR. 1981. *Digging up Bones.* Oxford. Oxford University Press.

Appendix C

Disarticulated bone catalogue

Context	Element	Side	Age	Sex	Notes
A	Tibia	R	Adult	UO	Post mortem break of shaft. 2 fragments
A	Tibia	R	Adult	UO	Nothing noted
B	DISH vertebrae	N/A	Likely 50+	UO	3 fused + 4 individual/detached vertebrae + 1 fragment from the same spine.
B	Corpus sterni	N/A	Adult	UO	Fragment of superior portion
B	Rib fragments	UO	Adult	UO	7 rib fragments
B	Clavicle	L	Adult	UO	Lateral end absent. Medial end damaged.
B	Unidentified fragments	N/A	N/A	N/A	2 fragments. Possible scapula and unidentified long bone.
D	Pubis	R	Middle adult?	Male?	Symphyseal face slightly damaged.
E	Cranium	N/A	Middle adult	Male	Vault only. Badly damaged
E	Mandible	N/A	Adult	Male	Ante mortem tooth loss. Pipe facet wear.
E	Temporal	L	Adult	UO	Badly damaged. Part of occipital still attached
E	Temporal	R	Adult	UO	Badly damaged.
E	Temporal	L	Adult	UO	Petrous portion only.
E	Temporal	R	Adult	UO	Petrous portion only.
E	Occipital	N/A	Adult	UO	Fragment. Occipital condyle present.
E	Cranial fragments	N/A	Adult	UO	23 fragments. Not clear if they are associated with other cranial elements from this context.
E	Unidentified fragments	N/A	N/A	N/A	13 fragments.
E	Femur	L	Adult	UO	Femoral head only.
E	Femur	L	Adult	UO	Proximal shaft.
E	Auricular surface	R	Adult	UO	Badly damaged
E	Acetabulum fragments	UO	Adult	UO	Badly damaged. 3 fragments
E	Pubis	L	Young-middle adult?	Male?	Badly damaged.
E	Ischium	L	Adult	UO	Fragment with portions of acetabulum + ischial tuberosity.
E	Sacrum fragment	N/A	Adult	UO	Likely S1.
E	Pelvic fragments	N/A	Adult	UO	9 unidentified pelvic fragments
E	Humerus	N/A	Adult	UO	Fragment of humeral head.
E	Humerus	L	Adult	UO	Distal shaft fragment.
E	Ulna	L	Adult	UO	Nothing noted

E	Radius	L	Adult	UO	Proximal end and proxima shaft.
E	Tibia	L	Juvenile	UO	Proximal end damaged.
E	2nd metacarpal	L	Adult	UO	Nothing noted
E	Humerus	R	Adult	UO	Distal joint surface only
E	Atlas + axis	N/A	Adult	UO	Articualtion appears to match.
E	Axis	N/A	Adult	UO	Badly damaged
E	Vertebrae	N/A	Adult	UO	5 fragmented, but distinct vertebrae. 1 lumbar, 2 cervical, 1 sacral, 1 indeterminate.
E	Vertebral fragments	N/A	Adult	UO	8 unidentified fragments.
E	Maxilla	N/A	Adult	UO	Ante mortem tooth loss.
E	Phalanx	N/A	Adult	UO	2nd phalanx of a finger
E	Mandible	L	Adult	UO	Fragment of ascending ramus.
E	Rib fragments	N/A	Adult	UO	9 fragments.
E	Scapula	R	Juvenile	UO	Badly damaged
E	Scapula	UO	Adult	UO	Fragment
E	Unidentified fragments	N/A	N/A	N/A	35 fragments
F	Maxilla	L	3-5 years	UO	Contains deciduous 1st molar and unerupted adult 1st incisor.
F	Temporal	L	UO	UO	Petrous portion. Likely matches with the other temporal from this context.
F	Temporal	R	UO	UO	Petrous portion. Likely matches with the other temporal from this context.
F	Occipital	N/A	UO	UO	Cruciform eminence present. Fragment only.
F	Occipital	N/A	UO	UO	Cruciform eminence present. Fragment only.
F	Occipital	N/A	Juvenile	UO	Fragment only. Unfused occipital condye present.
F	Cranial fragments	N/A	N/A	N/A	8 unidientified fragments.
G	Femur	L	Adult	UO	Proximal end absent. Distal end damaged.
G	Femur	R	Adult	UO	Proximal end only. Badly damaged.
G	Femur	L	Adult	UO	Proximal shaft only. Badly damaged. 2 fragments.
G	Tibia	L	Adult	UO	Shaft only. 2 fragments
G	Tibia	R	Adult	UO	Proximal end and shaft only. 2 fragments
G	Tibia	L	Adult	UO	Distal end fragment.
G	Fibula	R	Adult	UO	Distal end and distal shaft.
G	1st metatarsal	L	Adult	UO	Nothing noted
G	Acetabulum	R	Adult	UO	Fragment only.
G	Fibula	UO	Adult	UO	mid shaft fragment.

G	Long bone fragments	N/A	Adult	UO	9 fragments of mostly tibia + femur.
H	Femur	L	Adult	UO	Proximal end absent.
H	Femur	R	Adult	UO	Proximal and distal ends absent.
H	Femur	R	Adult	UO	Bad taphonomic erosion.
H	Femur	L	Adult	UO	Bad taphonomic damage.
H	Femur	R	Juvenile	UO	Nothing noted
H	Tibia	R	Juvenile	UO	Distal end absent.
H	Ulna	L	Adult	UO	Distal end absent. Proximal end badly damaged.
H	Humerus	R	Adult	UO	Distal end + distal shaft only.
I	Tibia	R	Adult	UO	Distal end absent.
J	Femur	L	Adult	UO	Distal end absent. Proximal end damaged.
J	Tibia	L	Adult	UO	Shaft only.
J	Humerus	L	Adult	UO	Shaft only.
J	Humerus	R	Adult	UO	Shaft only. Bad taphonomic damage.
J	3rd metatarsal	L	Adult	UO	Nothing noted
K	Cranium	N/A	Young-middle adult?	Male	Trepanation on left parietal. Cranial vault only.
L	Rib fragment	N/A	N/A	N/A	1 fragment.
M	Tibia	L	Adult	UO	Distal end + distal shaft absent.
N	Calcaneous	L	Adult	UO	Posterior damaged.
N	Thoracic vertebrae	N/A	Adult	UO	Likely mid thoracic.
N	Pubis	L	Young adult?	Male?	Nothing noted
N	Rib fragments	N/A	N/A	N/A	8 fragments.
N	Cranial fragment	N/A	Adult	UO	1 fragment.
N	Pubis	R	Young-middle adult?	Female?	Badly damaged. Part of ischio-pubic ramus still attached.
O	Humerus	R	Adult	UO	Distal shaft only.
O	Ulna	R	Adult	UO	Distal end absent. Proximal end damaged.
O	Pubis	R	Adult	Female?	Part of ischio-pubic ramus still attached.
O	Vertebrae	N/A	Adult	UO	2 lumbar vertebrae. Articular facets and spinous process damaged. Some osteophytes on vertebral surfaces.
O	Rib fragments	N/A	Adult	UO	3 rib fragments.
O	4th metatarsal	L	Adult	UO	Nothing noted
O	4th metacarpal	L	Adult	UO	Nothing noted
O	2nd metacarpal	L	Adult	UO	Nothing noted
O	Fibula	UO	Juvenile	UO	Nothing noted
O	Femur	UO	Adult	UO	Shaft fragment only.

09	3rd metacarpal	R	Adult	UO	Distal end absent.
09	Rib fragment	UO	Adult	UO	1 fragment.
21	1st phalanx	UO	Adult	UO	Of the hand.
24	1st metacarpal	L	Adult	UO	Distal end only

APPENDIX 5 THE COFFIN FITTINGS

By Märit Gaimster with documentary information by Murray Andrews

Introduction

Coffin fittings were retrieved from all excavated burials; they are listed in the table below. The fittings will be discussed here in terms of their function and meaning and will be related to burial data from previous excavations at St Hilda's and other relevant finds.

Coffin Plates

The vast majority of the finds consisted of heavily corroded and indeterminate pieces and fragments of embossed coffin plate of iron sheet. Presumably from breast- or depositum plates, these fragments correspond well to earlier excavations of burials at St Hilda's Church, where breastplates were the most frequent coffin fitting, associated with 80 of 177 identified coffins (Raynor *et al.* 2011, 86–7). The plates would have been attached to the coffin lid, and would have carried information about the identity, date of and age at death of the deceased, either embossed, inscribed or painted. The information was framed by embossed and highly symbolic decoration, including foliage and drapery, and could be surmounted by motifs such as urns, sarcophagi or winged cherubs (cf. Reeve and Adams 1993, 86 and fig. 5.7; Cherryson et al. 2007, fig. 3.14).

Coffin Grips

In contrast, coffin grips appear to have been rare at St Hilda's, with only one or two grips associated with each of only fourteen coffins (Raynor *et al.* 2011, 89). This is reflected to some extent also in the current investigations, where coffin grips were associated with three of seven recorded coffins. Besides the coffin in brick shaft grave [07], furnished with two grips and discussed in detail below, Coffin [17] was associated with a single coffin grip of a known form (Reeve and Adams 199, microfiche M3 Type 7; cf. Cherryson et al. 2007, fig. 3.17 top), while Coffin [34] carried two identical grips, one recorded at the head end and the other at the feet. In the 18th and 19th centuries the normal pattern appears to have eight grips on an adult-sized coffin, with three grips on each side and one at each end, while for a child-sized coffin, six were sufficient with only two grips along each side (Reeve and Adams 1993, 83). However, as coffin grips mainly served to help balance and steer the coffin while in transit, not as a means to actually lift or carry it, they provided above all a decorative rather than practical element. The lack or dearth of coffin grips, therefore, may reflect status or lack of means to provide for a funeral, but it could also correspond to local trends or fashions (cf. Raynor *et al.* 2011, 89). In this context, it is interesting to make a comparison with the evidence from the Quaker burial ground at Coach Lane in North Shields, on the other side of The Tyne. Here, too, the rate of coffin grips was very low, something that might be explained by the Quaker burial practice with its focus on simplicity and equality and perhaps the choice of following local working-class traditions (Gaimster 2016b, 143–44).

Coffin Lid Hinges

A further interesting parallel to the coffin fittings from Coach Lane is represented by a decorative butterfly hinge of copper alloy (SF 7) from Coffin [17], containing the remains of a young adult male. Numerous hinges of this form were recorded at Coach Lane, and their position on the coffin indicated

that their function was to enable the top part of the lid to be open during preparations for the funeral. Lid hinges, including both iron and copper-alloy examples, were present in 108 of the 244 recorded burials (Gaimster 2016a, 89 and 100–2). At St Hilda's, too, hinges of both iron and copper alloy have been previously recorded from three coffins, including one of the same decorative butterfly design; a further example was unstratified (Raynor *et al.* 2011, 86 and 92). Outside of these two cemeteries, lid hinges appear to be unusual, although iron butterfly hinges were recovered from several 18th- and 19th-century burials excavated inside the church of St Peter's at Barton-upon-Humber in Lincolnshire (Mould 2011, 685 and fig. 750.20). Again, coffin lid hinges may be a reflection of local traditions, but in addition also give a vivid insight into the mourning rituals in Victorian times.

Coffin furniture from brick grave [07]

Of outstanding interest are the coffin fittings from the brick-built grave [07]. Not only are the fittings unusually well preserved, but they also represent an example of the registered designs that came into use from 1839 (Carter -Silk and Lewiston 2012, 28–31). The use of registered designs was more restricted; as they were more expensive they tend to be associated with funerals of the better off, but unlike the previous unregistered designs, which were widely used under a long period of time, if the motif can be identified it is possible to establish a *terminus post quem* for the burial. As luck would have it, and with the help of Dr Hilda Maclean from the University of Queensland in Australia, it has been possible to do just that. Dr Maclean has researched a vast material of coffin fittings from North Brisbane Burial Grounds, studying the trade in coffin furniture between Birmingham and Brisbane. An important source for this has been the records of registered designs held at The National Archive at Kew (https://blog.nationalarchives.gov.uk/coffin-handles-cricket-belts-registered-designs/). Photographs of the fittings were supplied to Dr Maclean and she was able to identify the original designs, an example of the power of global research communities. A further example of this registered design can be seen in a coffin grip held in the Okasha Museum in Ontario, Canada (https://oshawa.pastperfectonline.com/webobject/A8894954-F145-4FD4-80F8-150778772378).

The fittings from Coffin [10], the final resting place for an adolescent to young adult female, included a large shield-shaped breastplate (SF3) surmounted by a tympanum field with a Neoclassical motif of a mourning woman in front of a grave mound surmounted by a cross. The woman, who is dressed in drapery, is shown leaning on her left knee, her head bent in sorrow, her face covered by her left hand and cradling a young, kneeling child. The coffin was fitted with two cast-iron grips, one at the head and one at the foot end, both with large shield-shaped grip plates (SF 4 and 8). Like the breastplate, the grip plates carry a tympanum shaped motif, placed at the centre and framed by the grip, of a mourning woman in front of a grave. The motif varies slightly from the breastplate in showing the woman alone, hunched down instead of resting on one knee, and holding a drooping branch or flower in her right hand. The set can be identified as TNA Design 79110, which was registered on 4 June 1851 to Hector Richard Cooksey of 148 High Street, Bordesley, on the outskirts of Birmingham. The burial would have taken place sometime between this date and 1 July 1855, after which burial within

the cemetery, with the exception of existing family vaults and brick graves, was prohibited (Salmon 1856, 80 and 82).

The burial in brick grave [07] demonstrates that, also within a relatively modest burial tradition, social status would still be expressed in the funerary context. Coffin fittings with registered designs were more expensive and meant employing manufacturers that were presumably considered a snap above the ordinary providers. Mr Cooksey himself was described as 'manufacturer of registered and other coffin furniture, in brass, plated, and Britannia metal' in the General Commercial Directory of Birmingham 1858 (Dix 1858, 98). Born in 1808, Hector Richard Cooksey made no fewer than twenty-three successful applications to produce registered designs for coffin furniture under the terms of the Ornamental Design Act 1842; a sample presented at the 1851 Great Exhibition were considered of sufficient quality to merit an honourable mention in the national and regional press (*Aris's Birmingham Gazette*, 20 October 1851, 3). At the time of the 1851 census Cooksey was resident at Heathfield House, a '*splendid Grecian villa residence...erected under the direction of an Architect of great taste and practical experience*' and situated on the Coventry Road, Aston (Aris's Birmingham Gazette, 31 January 1853, 2); subsequent residences at The Rilands, Aston, and Oak Mount, Edgbaston, were of similar stature, the latter a ten bedroom residence *'situated in one of the most favoured positions in the parish of Edgbaston...with most extensive and charming views of the surrounding countryside'* (*Birmingham Journal* 29 July 1865, 4). Although his involvement in the coffin furniture industry seems to have declined over the course of the 1870s, by the time of his death on 24 January 1883 he had amassed a personal estate worth an exceptional £87754 2*s.* 11*d.* (National Probate Calendar).

Further elements of status can also be elicited from the deceptive simplicity in the design of the breastplate and grips from this burial. While utilising simple borders and a limited number of stylised floral designs, at the same time, the solid iron grips are cast with elaborate acanthus like arms. Unfortunately, we have no biographical data for the young girl or woman who was buried in the vault, something that would have been recorded within the central shield of the now heavily corroded breastplate. This may have been incised or, perhaps more likely, written in white on a background that would have been painted black (Raynor *et al.* 2011, table 14). This was the case for one of the previously recorded coffins at St Hilda's, that of Anne Purvis who died at the age of 56, possibly in 1840 (*Idem.*, 87 and plate 26). Like Ann Purvis, the girl or woman in Vault [07] was buried in a coffin where the lid was outlined with strips of tin alloy, embossed with simple concentric rings or bosses, a simple form of the often more elaborately decorated so-called coffin lace (cf. Mould 2011, 694–98). Coffin lace was one of several metal elements that served to fix and decorate the upholstery that covered the outside coffin. This includes most commonly domed coffin pins of iron or copper-alloy, sometimes in elaborate patterns, but also a variety of embossed decorative metal pieces known as lid motifs or escutcheons (cf. Reeve and Adams 1993, 83 and figs 5.5 and 5.8). None of these features were well represented at St Hilda's, where simple upholstery pins seem to have been used restrictively and in a purely functional manner; only few examples of lid motifs are recorded (Raynor *et al.* 2011, 88). The general rarity of coffin lace from cemeteries at this time, however, and their

association with ornate coffins from vaults and graves, suggest that even the simple examples from Vault [07] and the coffin of Anne Purvis, represented an element of status. This is particularly well demonstrated in the only other excavated brick vault from St Hilda's, where the otherwise simply upholstered coffin was decorated with more elaborate and substantial coffin lace (*Ibidem*.).

Significance and Recommendations for Further Work

The coffin fittings from the current excavations at St Hilda's contribute significantly to our understanding of the cemetery and its funerary material culture. The furnishing of the coffin in the brick-built Vault [07] provides an example of the registered designs that came into use in the funerary industry after 1839; this material remains unusual in publications of post-medieval cemeteries (Sarah Hoile pers. comm. 21 May 2019). The breastplate and coffin grips from this burial are all the more important as it has been possible to identify the registered design and the manufacturer who applied for it in The National Archives in Kew. The design was register in 1851; this gives a *terminus post quem* for the burial, which would have taken place before the cemetery was closed for interments in 1855. In addition to its local significance, the identification of a registered design has wider, global relevance in the context of the trade in coffin furniture within the British Empire at the time, as evidenced in a further example of the St Hilda design recorded in Ontario, Canada. The finds from Vault [07], therefore, merits further publication. For this purpose, it is recommended that the breastplate and the one complete coffin grip are photographed and that permission is sought to include images of the original registered design from The National Archive.

References

Carter-Silk, A. and Lewiston, M. 2012. *The Development of Design Law Past and Future: From History to Policy*, Independent report commissioned by the Intellectual Property Office.

Cherryson, A., Crossland, Z. and Tarlow, S. 2007. *A fine and private place: the archaeology of death and burial in post-medieval Britain and Ireland*, Leicester Archaeological Monograph 22.

Dix, W.H. 1858. *General and commercial directory of the Borough of Birmingham*, Birmingham: W.H. Dix and Co.

Gaimster, M. 2016a. 'Coffin Furniture and Small Finds', 89–117 in J. Proctor, M. Gaimster and J. Young Langthorne.

Gaimster, M. 2016b. 'Quaker funeral practise, coffin furniture and other material evidence from Coach Lane', 143–45 in J. Proctor, M. Gaimster and J. Young Langthorne.

Mould, Q. 2011. 'Coffin furniture', 682–700 in W. Rodwell, *St Peter's, Barton-upon-Humber, Lincolnshire: A Parish Church and its Community. Volume 1: History, Archaeology and Architecture Part 2*. Oxford: Oxbow Books.

Proctor, J., Gaimster, M. and Young Langthorne, J. 2016. *A Quaker Burial Ground in North Shields:*

Excavations at Coach Lane, Tyne and Wear, Pre-Construct Archaeology Limited Monograph 20.

Raynor, C., McCarthy, R. and Clough, S. 2011. *Coronation Street, South Shields, Tyne and Wear: Archaeological Excavation and Osteological Analysis Report*, Oxford Archaeology North unpublished report.

Reeve, J. and Adams, M. 1993. *The Spitalfields Project. Volume 1: The Archaeology – Across the Styx*, CBA Research Report No 85.

Salmon, T. 1856. *South Shields: its past, present and future!*, South Shields: Henry Hewison, Market Place

context	SF	description
10	2	Splintered remains of wooden coffin; the largest piece retains fragmentary remains of white-metal coffin lace, embossed with raised rings/bosses irregularly covering the surface; W at least 30mm; surviving corner with the lace at both side and front indicate the remains of the coffin lid; remains of fine but loosely woven green fabric under the lace
	3	Breastplate of iron sheet, likely tin-dipped; shield-shaped below a semi-circular tympanon field embossed with a Neoclassical motif of a mourrning woman embracing a kneeling child in front of a grave mound surmounted with a cross; near-complete but in several pieces
	4	Complete cast-iron coffin grip; angled form with raised band across centre and acanthus-shaped arms fitted to globular-headed fixing pins; W 153mm; ht. 75mm; attached to complete grip plate of iron sheet, likely tin-dipped; shield-shaped, incorporating a tympanon field framed by the handle and embossed with a Neoclassical motif of a mourning woman hunched before a grave mound surmounted by a cross; W 223mm; ht. 165mm
	8	Identical grip and grip plate as SF 4 but incomplete with fractured grip plate
17	5	Coffin plate of embossed iron sheet; seven heavily corroded and undiagnostic pieces
	6	Complete cast-iron coffin grip; Christ Church Spitalfields type 7; well-preserved with ?traces of black coating; W 150mm
	7	Copper-alloy butterfly hinge with decoratively shaped and perforated plates; W 55mm; ht. 68mm
20	9	Coffin plate of embossed iron sheet; seven heavily corroded and undiagnostic pieces; some patterns visible from the reverse side
32	11	Coffin plate of embossed iron sheet; a dozen heavily corroded and undiagnostic pieces and fragments
33	12	Coffin plate of embossed iron sheet; a dozen heavily corroded and undiagnostic fragments
34	13	Complete cast-iron coffin grip; same form as Christ Church Spitalfields Type 7 but with more elaborate foliate decoration at centre and terminals, similar to CCS type 8; well-preserved with ?traces of black coating; W 135mm
	14	Complete cast-iron coffin grip; identical to SF 13
37	10	Coffin plate of embossed iron sheet; at least twenty heavily corroded and undiagnostic pieces and fragments

CSS18: coffin fittings

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