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Luas Cross City Utilities Works: Final Report on Archaeological Excavation of a series of burials at College Green, Dublin 2

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EXECUTIVE SUMMARY

This report presents the final results of an archaeological excavation undertaken at College Green, Dublin 2 between 16 and 25 July 2014 in accordance with Licence No. 14E0003. These works were undertaken by Rubicon Heritage Services Ltd. for GMC (Ireland) Ltd on behalf of the Railway Procurement Agency (RPA), now Transport Infrastructure Ireland (TII).

Archaeological monitoring and excavation for Utilities Works was carried out along the route of the planned Luas Cross City (LCC) light rail system at College Green, Westmoreland Street and Hawkins Street under Licence No. 14E0003. This licence was in force from January 2014 until it was superseded at the start of October 2014 by Licence No. 14E0405 (granted to James Hession) for archaeological monitoring and excavation of the same section of Luas Utilities Works. This monitoring/excavation programme is the subject of a separate final report (Gilligan et al. 2016). During the course of the monitoring programme at College Green, an inhumation burial was identified within a utilities trench located slightly to the north of the main entrance to Trinity College Dublin (TCD) and positioned parallel to the pavement running around the perimeter of TCD. As this burial would be directly impacted by the Utilities Works programme, a full archaeological excavation was undertaken in order to ensure appropriate preservation by record. Due to the significance of this discovery it is the subject of this separate standalone report.

Full archaeological excavation was undertaken of the affected section of the utilities trench. During the course of the excavation a further four burials were identified. One of these burials was also fully excavated, while three of the burials were only partially excavated as they extended beyond the limits of the utilities trench. It is possible that further associated burials could be located within this part of College Green. This is supported by the presence of disarticulated human bone—representing the remains at least one further adult individual—in addition to the five *in situ* burials. It should be noted that archaeological monitoring of construction groundworks as a component of LCC Main Infrastructure Works contract is ongoing and, to date has not uncovered any indications of further burials in the College Green area. Excavations in this area generally did not exceed 1 m—works are indeed deeper elsewhere for Overhead Conductor System (OCS) foundations, but not for the trackbed at this location.

The burials form two groups:

- Phase Ia—the only conventional west-east burial in the assemblage (**SK5)** dating to the mid 15th century
- Phase 1b—the other four burials (**SK1**, **SK2**, **SK3** and **SK4**), all aligned southwest-northeast and dating from the mid 15th to early 17th centuries.

The radiocarbon dates and the presence of disarticulated remains in the grave fills indicates that burials at the site occurred on at least two separate occasions. Four of the five burials (**SK1**, **SK3**, **SK4** and **SK 5**) were of adolescents and one—**SK2**—was an adult male. All indications are that these individuals came for the lower end of socio-economic spectrum. It was possible to determine a broad location of birth and early childhood for three individuals; two (**SK2** and **SK5**) were most likely from Dublin, while one (**SK1**) was from either north-east Ireland or Wales/south-west England.

The location of the burials, though closely clustered, does not seem to have been within the bounds of a formal cemetery as might conventionally be associated with a church, monastery or similar institution. The orientation and disposition of the burials suggests, perhaps, that the burials were hurried and the location adventitious. A cluster of similarly 'informal' burials were found during excavations at Smithfield, Dublin 7 also within the bounds of a medieval commonage—Oxmantown Green.

It is unlikely that the burials relate to executions as Hoggen Green was not the normal location for such activities. A small number of executions are recorded there, but they are clearly unusual and atypical rather than standard criminal executions. It is more probable that—given their likely social background—these were individuals on the margins of society who could not afford or would not have otherwise warranted burial in a formal cemetery.

It is possible that this location may have been sufficiently removed from the most heavily trafficked areas of the green that it was deemed a suitable location for informal burials during the 15th to early 17th centuries. Such burial activity, while perhaps tolerated by those in authority may not have been officially sanctioned—as would be the case with a more formal cemetery—and so, of necessity may have been carried out surreptitiously, in a rushed or hasty fashion.

1.0 INTRODUCTION

This report presents the results of a programme of archaeological excavation undertaken at College Green, Dublin 2, in association with the Luas Cross City Utilities Works (Figure 1). These works were undertaken by Rubicon Heritage Services Ltd for GMC (Ireland) Ltd on behalf of the Railway Procurement Agency (RPA)—now Transport Infrastructure Ireland (TII)—from 16–25 July 2014. They were carried out under Excavation Licence No. 14E0003—the overall licence for archaeological monitoring and excavation of Luas Utilities Works on College Green, Hawkins Street and Westmoreland Street—which was granted to Nikolah Gilligan. This licence was in force from January 2014 until it was superseded at the start of October 2014 by Licence No. 14E0405 (granted to James Hession) for archaeological monitoring and excavation of the same section of Luas Utilities Works.

1.1 Project background

Luas Cross City (formerly Luas Broombridge) will be a twin track light rail system, which will serve a 5.6km long corridor from the Luas Green Line at its current terminus (St. Stephen's Green) to the Iarnród Éireann Broombridge Station on the Maynooth railway line. The scheme will link Dublin city centre to Phibsborough and Cabra via Broadstone and Grangegorman. Interchange with the Luas Red Line will be at the Abbey Street Stop. A total of 13 new stops are planned as part of the scheme.

1.2 Utilities Works Monitoring Programme

A programme of Utilities Works has been undertaken in advance of the construction phase for Luas Cross City. These works have allowed the diversion of existing utility services out of the path of the Luas Cross City alignment to facilitate the subsequent construction of Luas track infrastructure. Utilities Works involved the diversion, protection or replacement of existing utility services located in the area of the new Luas trackbed and adjacent footpaths. Works for this package also included the installation of Overhead Conductor System (OCS) foundations and track drainage.

The Utilities Works programme was confined to the on-street section of the LCC alignment—Area 29, extending from St Stephen's Green northwards to Constitution Hill. This section of the alignment was divided into 14 workfronts and five licence areas (Table 1). The works area also incorporated the constraints of three National Monuments—William Smith O'Brien Monument (RMP018-424----; RPS 5997), O'Connell Monument (RMP 018-423----; RPS 5990) and Parnell Monument (RMP DU018-425----; RPS 6020). Works at these locations were undertaken in accordance with the relevant Ministerial Consents (C593; C594; C592 respectively).

Licence Area	Licence No.	Streets	Workfronts
1	14E0002	St. Stephen's Green; Dawson Street; Nassau Street	1a–c; 2
2	14E0003/ 14E0405	College Green; College Street; Hawkins Street; Westmoreland Street	3; 4; 5
3	14E0004	O'Connell Street Upper & Lower; Marlborough Street	6; 7; 8; 9
4	14E0006	Parnell Street	10; 11
5	14E0005	Dominick Street Upper & Lower; Constitution Hill	12; 13; 14

Table 1—Correspondence of Licence Areas and Workfronts

The Utilities Works involved the removal of existing hard and soft landscaping and excavation of trenches or pits using mechanical excavators, the installation of temporary trench supports, the installation of the new utility infrastructure, the testing of the new infrastructure, the re-instatement of the excavated area and demobilisation. The trenches were excavated to a depth of up to 2 m, except within areas where existing drainage manholes needed to be modified. Excavations at these locations extended to a maximum depth of 4.5 m. The majority of excavations are located within RMP DU018-020----, the 'Zone of Archaeological Potential' ('ZAP') for 'Historic Dublin' and also incorporated the constraint areas of sites and areas of archaeological potential that were identified within the Luas Broombridge (now Luas Cross City) Environmental Impact Statement (EIS, RPA 2010).

Archaeological monitoring was undertaken of all ground-breaking works, commencing in January 2014. The purpose of the archaeological monitoring was to determine the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts along the route which may be affected by the works. Archaeological monitoring of Utilities Works at College Green, Westmoreland Street, Hawkins Street and O'Connell Bridge (Work Fronts 3, 4, 5a-c) was undertaken in accordance with Licence No. 14E0003. Any archaeological features or deposits encountered were recorded. Where possible such features or deposits were preserved *in situ*. When this was not possible the affected features or deposits were archaeologically excavated to facilitate the completion of the necessary Utilities Works. The overall monitoring and excavation programme is the subject of a separate final report (Gilligan *et al*. 2016).

During the course of the monitoring programme at College Green, an inhumation burial was identified within a utilities trench. As this burial would be directly impacted by the Utilities Works

programme, a full archaeological excavation was undertaken in order to ensure appropriate preservation by record. Due to the significance of this discovery it is the subject of this separate standalone report.

This archaeological excavation was undertaken by licence holder Nikolah Gilligan with the assistance of Mr Ivan Pawle, Mr Rob Hanbidge, Mr Stephen Hickey, Ms Melanie McQuade, Ms Carmelita Troy and Mr James Hession between 16 July and 25 July 2014. The works were undertaken in accordance with Excavation Licence No. 14E0003, which was in force from January 2014 until early October 2014.

2.0 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1 Historical Background (after RPA 2013)

During medieval times, this area was known as "Hoggen Green", deriving its name from nearby burials of former kings and important figures (Clarke 1995, 89). Within Hoggen Green was the "*Thingmote*". This feature comprised an artificial earthen mound that was used for conducting legal and political affairs during the Viking period. This mound was removed in 1685; no above-ground evidence remains. Haliday (1884, 162) describes the "*Thingmote*" as having been located on Hoggen Green in the Parish of St. Andrew's, within an angle between Church Street and Suffolk Street; and nearly opposite to St. Andrew's Church. This surmise is based on a survey plan of 1682 which depicts the mound's location. Throughout the later medieval period, "Hoggen Green" was an open commonage for livestock and recreation (De Courcy 1996, 20–21). It was bounded on the west by Blind Gate, the most easterly gate of the city, and on the southeast by the Arrosian convent of St. Mary de Hogges (Casey 2005, 377), which was founded by Diarmait Mac Murchada, King of Leinster, *c*. 1146. This convent was situated in the vicinity of the present-day St. Andrew's Church. On the east side of the Green was the Augustinian Priory of All Hallows, which was dissolved in 1538, and in which the College of Holy Trinity was later founded by Elizabeth I in 1592. With the establishment of the College, the Green changed its name from "Hoggen Green" to "College Green" (Somerville-Large 1996, 86).

On the northern side of the Green a hospital, known as "Carew's Hospital", was built by Sir George Carey for maimed soldiers in 1602 (De Courcy 1996, 20–21). This building is shown on Speed's Map of 1610 as "The Hospitall". Its purpose as a hospital was short-lived and it subsequently served a number of varying functions. The first parliament was held in this building in 1661 and in 1728 the new parliament building, later used as the Bank of Ireland (1813), was built on this site.

Speed's Map of 1610 illustrates that the area comprising present-day College Green consisted of undeveloped land, bounded by "The Hospitall" to the north and the College of the Holy Trinity to the east, at the beginning of the 17th century. The River Steine is shown on this map extending from the west, front of the college southwards, parallel to Grafton Street on its western side towards St. Stephen's Green area.

College Green was laid out in its current form in the mid-17th century and is mapped and annotated as "Colledg Green" on de Gomme's Map of 1673. This map depicts College Green as being roughly triangular with its apex to the west and its base along the western frontage of "Trinity Colledg". Parliament House (formerly "The Hospitall") is shown to its north and St. Andrew's Church and associated church yard is shown to its south.

Brooking's Map (1728) and Rocque's Map (1756) show development on both sides of College Green. Given that the street was widened in the mid-1780s by the WSC to align it with the newly widened Dame Street, it is possible that subsurface remains of those structures represented on the aforementioned maps survive beneath the current streetscape.

Evidence of this street widening can be observed on Duncan's Map of 1821 and historic OS maps dating to 1843 and 1911. Examination of historic OS maps dating to 1843, 1911, 1925 and 1948, indicate that no major redevelopment was undertaken on College Green throughout the later 19th and early 20th century apart from the construction of the St. Stephen's Green to Nelson's Pillar tramline, part of which extended along College Green. This tramline operated from 1874–1938.

2.2 Previous investigations (after RPA 2013)

A programme of archaeological monitoring was undertaken in 2002 to facilitate ground works at the western (front) end of Trinity College Dublin (TCD) in July and August 2002 (Simpson 2002a; Licence No. 98E0150). The programme identified post-medieval features comprising domestic brick houses in the area from the late 17th century (built almost against the front west facade of TCD by Flemish and Dutch refugees) and a late 17th century wall that was demolished in the first half of the 18th century, probably associated with the outer precinct of TCD.

The recent archaeological monitoring of two utility slit trenches (as part of the LCC—then Luas Broombridge—Utility Slit Trench Contract), excavated on the footpath to the fore of TCD identified significant deposits of post-medieval fill at a depth of 0.28 m below current ground level. The fill layers primarily comprised clay with inclusions of gravel, rubble, redbrick and oyster shells and was consistent to the base of the trench which was 1.50 m deep (Bolger 2012; Licence Ref. 11E0280).

No finds are recorded from College Green in the topographic files of the National Museum of Ireland (NMI). However, a range of finds from within the grounds of TCD have been recovered comprising an antler tine (NMI 1973:215), human skeletal remains (NMI 1A/119/96), a flat bronze axe-head (NMI 1905:270), a wooden seat portion (NMI 3291: Wk 426) and a bronze palstave (NMI 1A/48/79). The presence of human remains is liable to relate to activities associated with the Anatomy department of TCD located along the eastern limits of the original college grounds.

3.0 OBJECTIVES AND METHODOLOGY

3.1 Objectives

The objective of this discrete programme of excavation on College Green was to investigate and preserve by record:

- human remains identified during archaeological monitoring of Utilities Works
- any potential associated archaeological features or deposits, so as to mitigate the impact of the Utilities Works programme on this archaeological material.

3.2 Methodology

The utilities trench in Work Front 3 was orientated north-south and ran parallel to the western boundary of TCD. Utility diversions in this area entailed the excavation of both a utility trench and manhole, with the depth of excavation ranging from 0.90 m in the north to 3 m in the south at the site of the proposed manhole.

Within the section of the works where the presence of human remains were confirmed, the utilities trench was mechanically excavated, using a toothless or grading bucket, under the direction of an archaeologist, to a depth of 1.20 m or to the top of the deposit layer within which human remains were identified (whichever was higher). Appropriate trench supports were installed, as necessary, so as to ensure safe ingress and egress to the works area. Excavation then continued by hand, by the archaeological team until base of formation for the trench was reached.

The human remains and all associated archaeological features were fully excavated by hand, with appropriate recording using pro forma record sheets, appropriate scaled plans, photography and geo-survey. To facilitate recording each skeleton was assigned a unique skeleton number as indicated by the prefix ‘SK’, with unique context numbers given to grave cuts and grave fills. Registers are provided in the appendices (Appendices 1–4). All archaeological features identified were related to Ordnance Datum and the Irish National Grid in accordance with TII Project Control.

At any locations where human remains were found, hand excavation continued to a minimum depth of 300 mm below base of formation for the Utilities Works. On completion of the archaeological excavation the trench was lined with terram and reinstated to the appropriate formation level prior to the installation of the new utilities. This ensured that there was a minimum of 300 mm vertical buffer between the new utilities and any potential underlying burials or archaeological features that are left *in situ.*

Environmental samples, including soil and animal bone samples were taken from any deposit suitable for analysis or dating as per Rubicon Heritage Services Ltd environmental guidelines in accordance with the approved Method Statement for this Licence. In addition, inhumations were recovered in line with the approved Method Statement and following consultation with osteoarchaeologist Carmelita Troy. Artefacts recovered during the excavation were assigned unique numbers and treated in accordance with NMI guidelines.

As part of the post-excavation works artefacts, soil, faunal remains, human remains, metalworking debris and building material samples were analysed by the appropriate specialists and reports produced on the findings for incorporation into this final excavation report (see Appendices 6–15). Also, as part of the post-excavation analysis of the results of the investigations, a stratigraphic matrix has been prepared for the burial excavation (see Appendix 5). This corresponds to the stratigraphic narrative account of the excavation results presented in Section 4 of this document.

4.0 RESULTS OF ARCHAEOLOGICAL EXCAVATION

The archaeological features identified at the site were uncovered during the excavation of a 1 m wide trench, which ran to the north of the gates of TCD within the carriageway at College Green (Figures 3–4).

This trench extended for a minimum of 40 m running parallel to the kerbline of the perimeter pavement around TCD, north of the main entrance to the college. The burials were clustered closely together, so the archaeological excavation was limited to a 10 m long section of the trench encompassing all the burials and sufficient to investigate and record the full extent of the burial activity within the trench. LCC Utilities Works within the remainder of the trench were undertaken within the scope of the main programme of archaeological monitoring and excavation. The broad stratigraphy of the trench was consistent with the stratigraphic sequence outlined below—Sections 4.1 to 4.3—absent any further burials. The results of the main monitoring and excavation programme are the subject of a separate report (Gilligan et al. 2016).

Intersecting limestone masonry walls were noted and recorded within the section of the trench excavated to investigate the burial remains at 0.6–0.9 m below PGL. Excavations below the level of the walls revealed human skeletal remains. Trench supports were inserted and all required ground reduction below the level of the walls (required for LCC Utilities Works) was carried out by hand.

A series of burials were uncovered and were recorded and excavated within the extent of the trench. On completion of the excavation, the ground level was reduced to sterile natural subsoil, which consisted of a light greyish yellow sandy silt.

On the basis of stratigraphic and post-excavation analysis, the overall findings from the excavation can be divided into three phases which are described from earliest to latest in Sections 4.1–4.3.

4.1 Phase I

A series of articulated human remains were found buried within grave cuts. These were orientated southwest-northeast (**SK1**, **SK3** and **SK4**) and south-southwest–north-northeast (**SK2**), while one (**SK5**) was orientated on a different axis at west-northwest–east-southeast. The graves were at a depth of approximately 1.5–1.6 m below the road surface. All five burials appear to have had a terrestrial diet (Appendix 12).

Plate 1—SK1, facing south, College Green

The most northerly of the burials, and the first to be identified was almost completely uncovered within the trench (Figure 4). The grave cut **(349)** (Plate 2) was oblong/sub-rectangular in shape, with rounded corners. It had a maximum length of 1.8 m, a maximum width of 0.5 m and a maximum depth of 0.23 m. It had a gentle break of slope at the top of the

cut and a gradual/imperceptible break of slope at the base, which was uneven. The grave contained **SK1**, a flexed inhumation lying on its left side (Plate 1). **SK1** was identified as an adolescent (Appendix 8), deemed not to be from the Dublin area originally (Appendix 12) and radiocarbon dated to cal. AD 1431–1620, 2σ (SUERC-66878) (Appendix 14). The skull was partially within the baulk but the complete skeleton was recovered. The grave fill **(347)** was a loose mid greyish brown silty clay with inclusions of small rounded stones. The orientation of the burial was southwest-northeast, with the head located to the southwest. Two soil samples (#1 and #2) were taken from grave fill **(347)** in association with **SK1**, which contained a minute fragment of charcoal identified as *Salix* spp. (willow), cinder remains and fragments of mineral-replacement material of indeterminate identification (Appendix 6); sheep radius, a large-mammal vertebral fragment and a fragment of unidentified burnt bone (Appendix 7); disarticulated human bone unidentified to element (Appendix 8); two sherds of 18th–19th century Red Earthenware (14E0003:347:002, 003) and a sherd of 18th century Tin Glazed Earthenware (14E0003:347:004) (Appendix 9).

Plate 2—Grave cut (349) of SK1, facing south, College Green

Grave cut **(351)** lay approximately 0.45 m to the east of **(349)** and slightly further south (Figure 4). Only the southern end of this grave was exposed within the trench, with the rest of it remaining under the baulk. The visible extent measured 0.49 m in length, 0.19 m wide and

0.17 m deep. It had a sharp break of slope at the top. This grave contained **SK2**, which was identified as a younger-middle aged male adult (Appendix 8), from the Dublin area (Appendix 12) and radiocarbon dated to cal. AD 1466–1638, 2σ (SUERC-66879) (Appendix 14). Although only partially uncovered, it could be determined that this skeleton lay on its right side (Plate 3). Only the skull (see facial reconstruction – Appendix 15) and part of the upper body could be recovered. The grave fill **(350)** was a damp, dark greyish brown silty clay with inclusions of small rounded stones and occasional charcoal flecks. The orientation of the burial was south-southwest–north-northeast, with the head located to the south-southwest. Soil sample (#4) was taken from grave fill **(350)** in association with **SK2**, which contained eight fragments of unidentified animal bone and three fragments of unidentified burnt bone (Appendix 7); disarticulated human bone unidentified to element (Appendix 8); and a sherd of 13th–14th century possible Dublin-type ware (14E0003:350:002) (Appendix 9).

Plate 3: SK2 in grave cut (351), facing east, College Green

Grave cut **(353)** lay 0.67 m to the south of **(351)** (Figure 4). Only the northern part of this grave was uncovered, with the rest of it lying underneath the baulk of the trench. The visible extent of the cut was 1.25 m in length, 0.5 m in width and had a maximum depth of 0.23 m. The break of slope was sharp at the top of the cut and gradual at the base, which was flat. The grave contained **SK3** and **SK4**, with only the feet and lower legs visible within the trench. Although

only partially exposed, it appears that these skeletons lay on their sides and facing each other (Plate 4). Both skeletons were identified to be adolescents (Appendix 8). **SK3** was radiocarbon dated to cal. AD 1451–1635, 2σ (SUERC-66880), and **SK4** to cal. AD 1476–1641, 2σ (SUERC-66881) (Appendix 14). The grave fill **(352)** was a loosely compacted, moist, mid grey silty clay with occasional small angular and rounded stones. The orientation of the burial was southwest-northeast, with the heads [not excavated] located to the southwest. Two soil samples (#3 and #5) were taken from grave fill **(352)** in association with **SK3** and **SK4**, which contained a single oat grain (*Avena* spp.), a cereal grain of indeterminate species, cinder remains and fragments of mineral-replacement material of indeterminate identification (Appendix 6); a fragment of unidentified animal bone (Appendix 7); disarticulated human bone (Appendix 8); a very small fragment of tobacco clay pipe stem (14E0003:352:001) (Appendix 10); and a single concretionary lump of coarse sandy sediment around a small corroding nail (Appendix 11).

Plate 4: SK3 (upper and lower legs) and SK4 (right lower leg only) in grave cut (353), facing west, College Green

Further to the south there was a final burial orientated west-northwest – east-southeast, which extended beneath modern utility ducting encased within concrete (Figure 4). The grave cut **(356)** could not be recorded in any detail and the full extent was not determined. The visible extent was 1.36 m in length by c. 0.1 m in depth, with the remaining portion obscured beneath

services. Retrieval of the skeletal remains underlying the *in situ* utilities ducts was possible though careful and cautious vertical hand excavation to create access. Unfortunately this did not facilitate recording of the western extent of the grave cut. The grave contained **SK5**, which was a supine inhumation with the skull lying at the west-northwest (Plate 5). The skeleton was identified to as an adolescent (Appendix 8), from the Dublin area (Appendix 12) and radiocarbon dated to cal. AD 1415–1473, 2σ (SUERC-66882) (Appendix 14). The grave fill **(357)** was a mid-grey silty clay. Four soil samples (#10–13) were taken from grave fill **(357)** associated with **SK5**, which contained minute fragments of charcoal identified as *Salix* spp. (willow) and *Betula* spp. (birch), as well as cinder remains and fragments of mineral-replacement material of indeterminate identification (Appendix 6); duck scapula, six fragments of rib (large and medium sized mammal), one oyster shell and four fragments of unidentified animal bone (Appendix 7); disarticulated human bone (Appendix 8); a sherd of 13th–14th century possible Dublin-type ware (14E0003:357:007) and a sherd of 18th –20th century Blackware (14E0003:357:004) (Appendix 9); a 19th–20th century colourless shard of window glass (14E0003:357:005) and a shard of green glass possibly derived from a bottle (14E0003:357:006) (Appendix 10); and a sample of mortar (Appendix 13). The inclusion of 19th–20th century artefacts perhaps reflects disturbance from the insertion of the modern utility ducts.

Plate 5—SK5, facing south, College Green

The graves were cut into **(355)**, a mid-reddish brown clayey silt, which represents the historic ground level at the time of these burials. It is possible that this was upcast or redeposited material due to its sterility. Below this was a sterile light greyish yellow sandy silt natural.

4.2 Phase II

Overlying the burials was deposit **(348)**, a reddish brown sticky clay containing fragments of brick, unidentified animal bone (Appendix 7); two sherds of 13th–14th century possible Dublin-type ware (14E0003:348:001, 002) (Appendix 9), oyster shells, and flecks of charcoal. This had a depth of 0.3–0.4 m. A series of walls or wall footings cut into this deposit.

Plate 6: Wall (342), facing north, College Green

The first of these, a limestone and mortar wall **(342)**, was orientated east-west at a depth of 0.57 m below the road surface (Figure 4, Plate 6). The visible section of the wall within the

trench was 0.96 m in length, 1 m in width and stood to a height of 0.6 m. It was randomly coursed with limestone blocks which measured 0.45 m x 0.35 m x 0.06 m on average. The blocks were bonded with a brittle yellowish grey lime mortar.

This wall crossed a similar limestone wall **(343)**, which was orientated north-south and lay just outside the kerb of the western footpath within the carriageway of College Green. The visible extent within the trench was 5 m in length, 0.55 m in width and stood to a height of 0.42 m at a depth of 0.9 m below the carriageway level. The wall consisted of random rubble coursing with the blocks measuring 0.32 m x 0.24 m x 0.1 m on average. It was bonded with a brittle tan coloured lime mortar. The east and west faces of the wall were flat. The exact relationship between walls **(342)** and **(343)** was not clear—due to the limitations of the trench extent it was not possible to establish definitively if they were keyed together or merely abutting. However their common statigraphic relationships and perpendicular positioning suggested that they were contemporary and formed part of the same structure (see matrix, Appendix 5). Animal bone identified as sheep/goat, cattle, large and medium sized mammal (Appendix 7); four sherds of 13th–14th century possible Dublin ware (14E0003:343:002, 003, 004, 005), a sherd of 18th–20th century Blackware (14E0003:343:001), a sherd of mid-late 18th century White Stoneware (14E0003:343:006), a sherd of 17th–18th century Tin Glazed Earthenware (14E0003:343:007) (Appendix 9); and three sherds of tobacco clay pipe stem fragments (14E0003:343:008, 009, 010) (Appendix 10) were recovered associated with wall **(343)**.

4.3 Phase III

The Phase II deposits were sealed by a layer of clay (003) containing post-medieval/early modern rubble, which represented phases of demolition, clearance and road surfacing on College Green. Above this was (002), which consisted of sand and 804 development fills approximately 0.3–0.4 m in depth. These represented road foundations and trenches excavated for modern services. Sealing the area was **(001)** tarmac and concrete road surfacing and paving to an approximate depth of 0.1 m.

4.4 The finds and samples

A total of 12 finds, 16 samples (nine soil, six faunal and one disarticulated human bone), and five articulated skeletons were retrieved during the archaeological excavation undertaken at College Green as part of the LCC Utilities Works. An additional nine finds and 11 samples (two faunal, one metalworking debris, seven disarticulated human bone and one mortar) were retrieved during post-excavation soil sample processing (See Appendices 2 and 3).

4.4.1 Ceramic assemblage

There were nine sherds of late medieval/post-medieval/modern pottery and three tobacco clay pipe stem fragment recovered during the course of the excavation programme.

The sherds of pottery were recovered from two contexts. Six sherds of 13th–14th century, possible Dublin-type ware representing possible jugs, were recovered from wall **(343)** and layer **(348)** beneath walls **(342)** and **(343)**. Wall **(343)** also had early modern sherds associated with it –White Stoneware possible jug, a Tin Glazed Earthenware rim sherd of a plate and a sherd of Blackware (Appendix 9). Three fragments of tobacco clay pipe stem were recovered from wall **(343)** (Appendix 10).

Post-excavation processing of soil samples retrieved six sherds of pottery (Appendix 9). Two sherds associated with **SK2** and **SK5** were possible Dublin-type ware, dating to 13th – 14th century. Two sherds were 18th–20th century Red Earthenware and one sherd of 18th century Tin Glazed Earthenware were associated with **SK1**; and one sherd of 18th–20th century Blackware was associated with **SK5**. One very small fragment of a tobacco clay pipe stem was also recovered during post-excavation processing of soil sample associated with **SK3** (Appendix 10).

4.4.2 Glass finds

Two sherds of glass were retrieved during post-excavation processing of soil samples associated with **SK5** – a 19th–20th century shard of colourless window glass and a 18th–19th century shard of green glass possibly derived from a bottle (Appendix 10).

4.4.3 Analysis of the samples

A total of nine soil samples, six animal bone samples were taken during the course of the excavation. All samples were from deposits associated with the graves and grave fills.

Six soil samples contained evidence for archaeobotanical material in the form of charred and uncharred plant remains and charcoal (Appendix 6). A single oat grain (*Avena* spp.) and a cereal grain of indeterminate species were identified from **(352)** (fill of grave associated with Skeleton 3). Grave fills **(347)**, **(352)** and **(357)** of **SK1**, **SK3** and **SK5** respectively, contained cinder remains and fragments of mineral-replacement material of indeterminate identification. Minute fragments of charcoal were recovered from grave fills **(347)** and **(357)** (of **SK1** and **SK5**), which were identified as *Salix* spp. (willow) and *Betula* spp. (birch). Wood taxa, such as willow and birch recorded as charcoal represents the variety of woods potentially used as fuel on site.

The animal bone assemblage included six samples retrieved during excavation associated with skeletons (**SK1**–**SK3** and **SK5**), wall **(343)**, and layer **(354=348)** beneath walls **(342)** and

(343). Two samples of animal bone were also recovered from post-excavation processing of soil sample (#1 and #4) from **SK1** and **SK2** (Appendix 7). This small assemblage of 37 bone fragments shows a surprising diversity with at least three species represented: cattle, sheep/goat and duck. The material associated with the burials included a radius of a sheep aged over 3-10 months, the scapula of a duck and four unidentified fragments of calcinated bone. There were also three large- and three medium-mammal rib fragments and a large-mammal vertebral fragment. The inclusion of animal bone with grave fills is likely to be accidental as there is no evidence of any deliberate placement of particular portions of animals or of particular species.

The animal bone associated with the walls that overlay the graves included a loose third molar of a sheep/goat, aged at least 2 years and the tibia of a sheep/goat aged over 15-24 months. These two bones, which came from a single context **(343)**, could potentially have been from the same individual, as could the two medium mammal rib fragments also recovered from this context. Wall **(343)** also yielded a portion of cattle ulna from an individual aged over 42-48 months and an unfused proximal humerus from a juvenile medium or large mammal.

The industrial waste retrieved from post-excavation soil sample (#3) processing of grave fill **(352)** of **SK3** was examined and catalogued (Appendix 11). The submitted material comprised a single concretionary lump. The piece comprises coarse sand and granules bound by a ferruginous cement. Although the core is not certain, the form suggests that the piece may have formed within a coarse sandy sediment around a small corroding nail. The piece is not an archaeometallurgical residue.

A single mortar sample was recovered from soil sample retent (#10) associated with grave fill **(357)** of **SK5** (Appendix 13). The sample consists of four very small fragments of a grey-coloured lime-based mortar with fine 'lime lumps' and fine sub-angular brick fragments and gritty sub-angular predominantly limestone aggregate. The mortar is more likely to originate from the walls which overlay the burials and should be considered post-medieval in date (Appendix 13).

4.4.4 Analysis of the human remains

A total of five human skeletons (**SK1**–**SK5**) and one sample of disarticulated human remains from wall **(343)** were recovered during the excavation. Post-excavation processing of soil samples (#1, #4, #5, #10-13) also recovered disarticulated human bone associated with **SK1**–**SK3** and **SK5** (Appendix 8).

Radiocarbon dating results have identified that the five articulated skeletons date from the Tudor period (15th–17th century) (Appendix 14). The disarticulated human bone assemblage contained 102 fragments and represented an additional adult individual to the five articulated

inhumations, based on the presence of an adult left clavicle from soil sample #12 **(357)**, associated with **SK5**. Preservation of the burials were good and the form of burials were in a flexed position (**SK1**, **SK3** and **SK4**), lying on left side (**SK1**–**SK4**), and one was extended supine (**SK5**). The excavated remains included a younger-middle male (**SK2**) and adolescents (**SK1**, **SK3**–**SK5**). **SK3** and **SK4** were a possible double internment. Despite the lack of stratigraphic relationship, the results of the post-excavation analysis indicate that the burials appear to be in two phases, **SK5** being earlier than **SK1**–**SK4** based on radiocarbon dating results, burial orientation and body position.

All major types of pathology were noted except infections– these included dental pathologies, degenerative joint disease, trauma as well as metabolic, neoplastic, circulatory and congenital conditions. The only adult present displayed degenerative joint changes which is associated with heavy physical labour and increasing age. The presence of metabolic conditions is suggestive of environmental stressors in the early lives of some individuals, which indicate that they were from a lower socio-economic background. Also, the longbone lengths measured to a younger age to that of the dental eruption age, which points towards malnourishment, despite the fact that the stature of **SK2** was above average when compared to comparative assemblages.

A sample of bone from each of the five burials (**SK1**–**SK5**) underwent carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope analysis as part of the radiocarbon dating process by SUERC (Appendix 14). In addition to the five bone samples, tooth enamel from three of the individuals (**SK1**, **SK2** and **SK5**) was submitted for strontium ($^{87}Sr/^{86}Sr$) and oxygen ($\delta^{18}O$) isotope analysis. The stable isotope ($\delta^{13}C$ and $\delta^{15}N$) analyses on the bone collagen suggest very similar terrestrial diets in all five individuals, which contained almost no protein from marine or freshwater sources. The oxygen and strontium analyses on two individuals (**SK2** – younger-middle male and **SK5** – adolescent) are in complete agreement with expected values for Dublin, based on primary data collected from Viking-age and pre-Viking age burials from other archaeological sites in the city (Appendix 12). The results from **SK1** (adolescent) stand out as different from the other two individuals, which may signify that this individual was born and raised in a different location from the other two, probably either Northern Ireland, Wales or southwest England (Appendix 12).

Facial reconstruction was undertaken by FaceLab, Liverpool John Moores University on **SK2** (younger-middle male). This skull was well-preserved, which made it suitable for such a process (Appendix 15).

5.0 DISCUSSION

The results of the excavation at College Green indicate that five burials **(SK1**–**SK5)** were located within the area affected by the Utilities Works. It is possible that further associated burials could be located within this part of College Green. This is supported by the presence of disarticulated human bone—representing the remains at least one further adult individual—in addition to the five *in situ* burials. It should be noted that archaeological monitoring of construction groundworks as a component of LCC Main Infrastructure Works contract is ongoing and, to date, has not uncovered any indications of further burials in the College Green area (Stephen Johnston, pers. comm.). LCC Main Infrastructure Works do not require the same depth of excavations as Utilities Works did, being in the range of 1 m at this location.

5.1 Phasing and Chronology

Samples from each of the burials were submitted for radiocarbon dating with the following results:

Burial No	Lab Code	Uncalibrated Date	Calibrated Date (2σ)
SK1	SUERC-66878	410 ± 29 BP	cal. AD 1431–1620
SK2	SUERC-66879	344 ± 29 BP	cal. AD 1466–1638
SK3	SUERC-66880	359 ± 29 BP	cal. AD1451–1635
SK4	SUERC-66881	335 ± 29 BP	cal. AD 1476–1641
SK5	SUERC-66882	453 ± 29 BP	cal. AD 1415–1473

Table 2—Results of radiocarbon dating

The Phase I burials had been, initially, provisionally dated to the medieval period and presumed to be most likely Hiberno-Norse in date (Gilligan and Pawle 2016). The results of the radiocarbon dating indicate that this initial assessment does not hold true.

The burials form two clear groups taking both dating and orientation into account. The earliest burial (Phase Ia) appears to be **SK5**, which was also the only conventional west-east burial in the assemblage. The radiocarbon results indicate a tight date range in the mid 15th century, placing it at the very end of the later medieval period. The other four burials (Phase Ib) are most likely later in date and all have a common southwest-northeast alignment. The date range for these burials is much broader spanning the mid 15th to early 17th centuries, extending from the later medieval period into the early post-medieval period and incorporating the whole of the Tudor period (1485–1603). Given their common orientation and closely overlapping date ranges it is plausible to suggest that these four burials were at least broadly

contemporary and probably reflect a common source and purpose to their burial at this location.

The Phase II structural remains overlying the burials have not been scientifically dated but are most likely associated with domestic structures established by Flemish and Dutch refugees along the western façade of TCD in the 17th century or the outer precinct of the college (Simpson 2002a; Gilligan *et al*. 2016). This would fit with the radiocarbon dates which would suggest that any overlying structural remains could be no earlier than the 1640s.

The deposit sequence associated with Phase III must date even later, probably to the 18th and early 19th centuries. It is unlikely that these specific deposits were deliberately imported through land reclamation activity—associated with the culverting of the river Steine—though evidence for such activity has been identified elsewhere in College Green during investigations associated with LCC Main Infrastructure Works (Stephen Johnston, pers. comm.). The buildings constructed by the refugees had definitely been demolished by the early 18th century as they do not appear on any 18th century mapping. The cartographic evidence does show that the boundary or curtilage wall of TCD was altered repeatedly from the late 17th century through to the late 18th century. Evidence for these alterations has been identified both during LCC Utilities Works (Gilligan et al. 2016) and LCC Main Infrastructure Works (Stephen Johnston, pers. comm.). Scalé's map of 1773 [not illustrated] taken in conjunction with the 1784 illustration of College Green [not illustrated] and Malton's 1794 illustration of the Provost's House [not illustrated] suggests that the boundary/curtilage of TCD did not arrive at its modern form until the end of the 18th century. Both the demolition of the 17th century buildings and the alterations of the boundary would have led to the incremental deposition of demolition and levelling deposits, resulting in the formation of the deposit sequence that comprises Phase III.

5.2 The burial evidence

Four of the five burials (**SK1**-**SK4**) shared a common broadly northeast-southwest alignment (with the heads to the southwest). **SK1** was definitely placed in a flexed position and **SK3** and **SK4** appear to have been flexed also, based on the position of the legs. Unfortunately only the head and upper torso of **SK2** were excavated so it is not possible to be certain if this burial was also flexed or not. Grave cuts were also identified for these four burials. All four burials were positioned on their sides. **SK1** and **SK2** had individual grave cuts while **SK3** and **SK4** shared a single grave, suggesting that they were very closely contemporary and may have had some sort of social relationship or connection that would have led to their joint burial. The similarity in orientation and positioning, taken in conjunction with the radiocarbon results, strongly suggests that these four burials form a cohesive phase or grouping (Phase Ib).

The fifth burial **SK5** was on a distinctly different alignment— west-northwest–east-southeast. It was also in supine position (rather than flexed) with the hands placed on the pelvis. The grave cut was poorly preserved and the burial was at a slight remove from the other four, which were clustered close together. As dating evidence indicates this burial most likely occurred before the other four, it is plausible to suggest that it reflects a separate earlier phase of burial (Phase Ia).

One of the burials, **SK2**, was an adult male; the remainder were all adolescents (gender indeterminable). All of the individuals appear to have come from the lower end of the socio-economic spectrum; this was indicated by the presence of significant pathologies and characteristics that reflect poor diet, malnourishment and deprivation. Isotopic analysis of the bone collagen from samples of all five burials indicates very similar terrestrial diets. Again this would support the contention that all the individuals were from broadly similar impoverished backgrounds. The sole adult in the assemblage presented evidence consistent with having engaged in heavy physical labour over a sustained period of his life.

Teeth from three of the burials—**SK1**, **SK2** and **SK5**—were also subject to isotopic analysis. This indicated that while **SK2** and **SK5** were probably born in Dublin, **SK1** was not. It is not possible to ascertain precisely where this individual came from originally. The strontium and oxygen isotope readings for **SK1** were consistent with an origin within the British Isles generally, possible Wales and south-west England or north-east Ireland. This would suggest that this individual had relocated to Dublin sometime in late childhood or shortly before death (since this individual was an adolescent). Evaluations of Dublin during the 15th and 16th centuries suggest that the population of the city was stagnant or declining and there are records of significant outbreaks of plague or similar contagious disease at regular intervals throughout this period (Lennon 1989, 31–2). Analysis of the admissions to the city franchises during this period indicates that the majority of new applicants came from outside the city originally (Lennon 1989, 31). There is a general view that the social and economic fabric of the city was under considerable strain during this period (Simms 2001, 63–5).

The most closely comparable burial assemblage from Dublin are a series of 27 number burials that were uncovered during archaeological excavations at Smithfield, Dublin 7 on the north side of the River Liffey (Myles 2002). The Smithfield site is located within the extent of the former Oxmantown Green and all the burials appear to be pre-1655 in date (so potentially broadly contemporary with the College Green burial assemblage). One of the main sites for public executions in later medieval and early post-medieval Dublin was located towards the western end of Oxmantown Green. The burials could be related to this, though other causes

are possible (Myles 2002). Not all of the Smithfield burials had a conventional west-east orientation and many were double internments (Myles 2002).

5.3 From Hoggen Green to College Green

The area where the burials were located formed the eastern suburb of the walled medieval city down to the 17th century (a period of major redevelopment and urban expansion). Prior to its modern incarnation as College Green, the open space was known as Hoggen Green, so-called because of the presence of at least two Viking *haugr* (burial mounds) here (Ó Floinn 1988; Clarke 1995; see also Figure 5). The *Thingmount/Thingmot/Thingmót*;—the seat of the Viking assembly—has traditionally been located at the junctions of today's College Green, Suffolk Street and Church Lane (Figure 5). It was razed in 1685; three male burials with associated Viking weaponry found to the east are believed to have been associated (Haliday 1884; Duffy 2005). However, debates continue about whether this mound was actually a *haugr* and the *Thingmount* was located elsewhere. Hoggen Green—along with Oxmantown Green and St Stephen's Green—was one of the three main medieval commonages controlled by the municipality of Dublin. Use of these greens was proscribed under various civic ordinances (e.g. Gilbert 1889–1922, vol i, 253–4).

The two main ecclesiastical sites located in the area during the later medieval period were the Priory of All Hallows and the nunnery of St Mary de Hogges. The Priory of All Hallows (RMP DU018-020044-) was located where TCD now stands, directly east of where the burials were found. This was founded by Diarmait Mac Murchada in *c.* 1162 (Duffy and Simpson 2009) and excavations within the grounds of TCD uncovered medieval burials which are believed to have been associated with the priory graveyard (Simpson 2002b). The Abbey of St Mary de Hogges (RMP DU018-020047-) was also located in the vicinity; it is thought to have stood in the south-western corner of Hoggen Green close to the contemporary Dublin Tourism Office (former St. Andrew's Church; RPS 7563) on St. Andrew Street (Clarke 2002). This 12th century abbey was also founded by Mac Murchada and was up to 2 acres in size comprising a church and bell-tower, dormitory and chapter-house among other buildings. The lands of both foundations were confiscated by the Crown in the 1540s during the dissolution of the monasteries. The site of St Mary de Hogges—as with many other similar sites—largely passed into private hands through various royal and municipal grants. The site of the priory of All Hallows, however, passed from the crown to the municipality of Dublin and was used to establish a university at Dublin, under royal charter, in 1591 (Luce 1992, 1–3).

It seems unlikely that the burials can be directly related to either ecclesiastical foundation. TCD incorporates the site of All Hallows and while the boundaries of the college did fluctuate (see Gilligan *et al*. 2016; Mc Quade *et al.* 2016), it seems likely from the available evidence

(Simpson 2002b) that the original footprint of the priory was wholly within the modern college campus. The evidence from excavation suggests that Library Square (located at the centre of TCD, flanked on three sides by the Fellows' Building, the Rubrics and the Old Library—RPS 2004) is the location of the earliest college quadrangle (incorporating some of the building from the medieval priory) and that the original priory cemetery is within that part of TCD (Simpson 2002b).

Executions and hangings in late medieval and early modern Dublin were largely carried out at the established gallows at the west end of the Oxmantown Green north of the River Liffey and at Mount Street/Baggot Street or St. Stephen's Green south of the River Liffey. College Green (or Hoggen Green) was not the normal location for carrying out executions. There are records of specific instances of individuals who were executed at this location, however, in almost all instances these are exceptional examples.

In 1327 Adam Duff O'Toole was executed for heresy and burnt alive at Hoggen Green (Gilbert 1884–6, vol ii, 366; Holinshead 1587, vol. iii, 69). During the events surrounding the crowning of Lambert Simnel as Edward VI—that took place at Christ Church Cathedral on 24 May 1487—the Earl of Kildare ordered a messenger from Waterford to be hanged on Hoggen Green (Martin 1988, 24). Waterford had refused to support the Earl or the alleged Edward VI.

The Baltinglass revolt and Nugent conspiracy of the 1580s (Maginn 2004; Connolly 2009; Murray 2011) reflected the political and religious tensions of the period and led directly to the imprisonment, torture and execution of the Catholic Archbishop of Cashel—Dermot O'Hurley. Contemporary accounts are quite graphic as to the torture of O'Hurley prior to his execution at Hoggen Green in June 1584 (Brady 1868, 72–80; MacNeill 1930, 127). The execution was authorised by Adam Loftus (archbishop of Dublin) and Sir Henry Wallop—both Lord Justices—after his trial under martial law, since his torture had failed to extract sufficient evidence for a normal criminal trial (Brady 1868, 83–4; Connolly 2009, 211). The execution itself was intended to be surreptitious and was not undertaken with a view to public spectacle, despite the public location (Lennon 1989, 157). Contemporary accounts record that that it was archers headed to the butts at Hoggen Green who stumbled upon the execution party (MacNeill 1930, 127).

During the early medieval period the *Thingmount* would have functioned as a place of civic assembly and had an important role in the administrative and political life of the Hiberno-Norse town. This tradition of civic assembly appears to have extended into the later medieval and early post-medieval periods. It is possible that some of these assemblies could have been disorderly and led to outbreaks of violence or rioting. A good example of this would be the

disputed municipal elections of 1613 where assemblies took place both at the Tholsel and Hoggen Green (Lennon 1989, 200; 204-5).

Hoggen Green was also the focus of more sociable activities. As noted above archery butts were located within the green and there are also references to the public performances of plays there (Robinson 1913, 48). However, during the 16th century the green was also designated one the official dumping grounds for dung and cess material from the city, albeit restricted to the 'great hole' adjacent to the former priory (McNally 1992, 66),

5.4 Burial context

The presence of disarticulated human remains in the grave fills indicates that other burials were disturbed during the internment of the individuals excavated. It must be assumed most likely that these other burials belong to the same broad phase of activity as the excavated remains (though, given the evidence for an extensive Hiberno-Norse cemetery in the area (Clarke 1995; Harrison 2001; Simpson 2010), an earlier date cannot be fully excluded). Regardless, the difference in the radio-carbon dating evidence suggests that the burial activity occurred on at least two separate occasions within the later medieval to early post-medieval period. This means that the burials were not an isolated, one-off incident and suggests that this location within Hoggen Green, though not formally designated a cemetery, must have been known (at the time) as a place where bodies could be conveniently buried/disposed of.

The location of the burials within the modern arrangement of College Green is very prominent—immediately outside the entrance to TCD and within the junction of modern College Green, Grafton Street Lower and College Street where east-west and north-south routes through the city converge. However during the later medieval and early post-medieval periods this location would likely have been much less prominent. The entrance to the Priory (and subsequently the earliest iteration of TCD) would have been further east (see above and Simpson 2002b). It is generally speculated that the main medieval routeway east from Damas Gate (west end of modern Dame Street) leading to Lazy Hill (modern Townsend Street) would have run along the north side of Hoggen Green (see Clarke 2002; Lennon 2008). The River Steine curved roughly north-south through the green (the burial site was most likely on the east side of the river). Speed's map of 1610 does show a number of east-west pathways across the green and the bridges or fording points across the River Steine were most likely located at the northern and southern edges of the green (see Speed's map of 1610; Clarke 2002; Lennon 2008). Thus the main flow of traffic through the green during the 15th and 16th century would not have been more towards the periphery rather than centrally located (along the current line of east end of Dame Street through to College Green).

It is difficult to locate precisely features within the green such as the archery butts or the 'great hole' that served as a dunghill, but it is possible that the location of the burials within the green was of no great prominence during the 15th and 16th centuries. As such it might have been an attractive location for the swift disposal of human remains. The flexed position of most of the burials (and the atypical orientation of four of the five) might suggest that they were buried in haste.

The burials from the Smithfield excavation (Myles 2002) demonstrate that there is precedence for similarly informal burials at other medieval commonages around Dublin. In contrast to the Smithfield examples, however, it is unlikely that any of the individuals excavated at College Green might have been formally executed. Hoggen Green was not one of the standard locations for criminal executions, those carried out there were clearly unusual and exceptional; none of the individuals excavated seem to fit the profile for that type of person. The O'Hurley execution, in particular, makes the best case that Hoggen Green was not a normal execution location since one of the key objectives of the English administration in Dublin was that it be carried out secretly, without drawing public attention. Therefore selecting an atypical site for the execution would fit with this.

However it is possible that Hoggen Green could have been the site of outbreaks of violence or rioting, such as were associated with the 1613 municipal elections. Victims of such violence might have been buried hastily close to the sites of their death. It should be noted, though, that none of the individuals excavated show evidence of violent injury immediately before death. **SK1** and **SK5** did have evidence for healed factures, but these injuries would have occurred well before their deaths.

Another possibility, given the evidence for their likely social background, is that this was a convenient location to bury individuals who might not, due to economic or other social circumstances, have been able to afford or be warranted burial within one of the parochial graveyards. Lennon (1989, 31–2) has noted the prevalence of disease outbreaks throughout the 16th century in particular, and such instances could easily have led to the hurried or rushed and adventitious burial of poorer members of society who fell victim. Death from disease might not have left any obvious markers on the skeletal remains of these individuals and disease outbreaks would be expected to have a disproportionate negative effect on the lower levels of the social spectrum.

5.5 Conclusions

The excavation provided evidence for four graves of five articulated skeletons; an additional sixth individual was represented by disarticulated human bone. The burials form two groups—a single (west-east) burial (**SK5**) dating to the mid 15th century (Phase Ia) and four dating to

the mid 15th to early 17th centuries (Phase Ib). Four of the five burials were of adolescents and one—**SK2**—was an adult male. The presence of a disarticulated left clavicle represents a second adult in the assemblage. All indications are that these individuals came for the lower end of socio-economic spectrum. It was possible to determine a broad location of birth and early childhood for three individuals; two (**SK2** and **SK5**) were most likely from Dublin, while one (**SK1**) was from either north-east Ireland or Wales/south-west England.

It is not possible to say definitively whether these individuals died as a result of violence, poverty or ill-health; though any of these is possible. Certainly the location of the burials, though closely clustered, does not seem to have been within the bounds of a formal cemetery. The orientation and disposition of the burials suggests, perhaps, that the burials were hurried and the location adventitious. A cluster of similarly 'informal' burials were found during excavations at Smithfield (Myles 2002).

In contrast to the Smithfield burials, however, it is unlikely that any or all of College Green burials could relate to public executions. Hoggen Green was not a conventional site used for executions during the later medieval or early post-medieval periods, though occasional exceptional examples are recorded.

It is possible that, given their likely social background, these were individuals on the margins of society who could not afford or would not have warranted burial in a formal cemetery. The location of the burials within College Green is unlikely to have been as prominent in its setting as it is today. It is possible that it may have been sufficiently removed from the most heavily trafficked areas of the green that it was deemed a suitable location for informal burials. Such burial activity, while perhaps tolerated by those in authority may not have been officially sanctioned—as would be the case with a more formal cemetery—and so, of necessity may have been carried out surreptitiously, in a rushed or hasty fashion. The radiocarbon dates and the presence of disarticulated remains in the grave fills indicates that burials at the site occurred on at least two separate occasions. While it is possible that the individuals excavated could have died as a result of violence, the frequent outbreaks of disease during the 15th and 16th centuries might also have been a factor in their deaths.

The wall that overlay the burials may either relate to an earlier boundary of TCD or to 17th century buildings located adjacent to the college. The mid to late 17th century was a period of major urban expansion, which included the encroachment of development onto the former Hoggen Green. Examination of historic maps and illustrations indicates that the boundary or curtilage wall of TCD was altered repeatedly from the late 17th century through to the late 18th century. Monitoring and excavation of Utilities Works at locations on Nassau Street, Grafton Street Lower, College Green and College Street (McQuade *et al*. 2016; Gilligan *et al*. 2016)

identified evidence for various earlier iterations of the boundary. Previous investigations in the green space between the current boundary railings and front façade of TCD identified the remains of 17th century domestic buildings as well as an earlier boundary wall (Simpson 2002a). This is consistent with the scientific dating evidence for the burials.

6.0 ARCHIVE QUANTITIES

The site archive is comprised of the following materials:

Item	Quantity
Context Sheets	15
Plans	N/A
Sections	N/A
Photographs	163
Registers	5
Trench Sheets	N/A

Storage of the archive in a suitable format and location is required in order to provide for any future archaeological research. The archive is currently stored in the offices of Rubicon Heritage Services Ltd, Unit 2, Europa Enterprise Park, Midleton, Co. Cork. Following completion of the final report the archive will be deposited with the National Monuments Service Archive facility in Swords.

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Appendix 1 – Context Register

Context No	Type	Area	Length (m)	Width (m)	Depth (m)	Description	Interpretation
001	Layer	All	-	-	0.1	Tarmac or concrete surface	Current road surface
002	Layer	All	-	-	0.3-0.4	Hardcore, stone, 804, sand	Development fills, road foundation
003	Layer	All	-	-	0.1-0.35	Layer of rubble containing post-medieval material	Demolition waste
342	Wall	College Green	0.96+	1	0.6+	E-W limestone wall 0.57 m below the road surface. Randomly coursed with limestone blocks (0.45 m x 0.35 m x 0.06 m). Bonded with a brittle yellowish grey lime mortar	Limestone wall
343	Wall	College Green	5+	0.55	0.42+	N-S limestone wall 0.9 m below the road surface. Random rubble coursing with the blocks (0.32 m x 0.24 m x 0.1 m). Bonded with a brittle tan coloured lime mortar. Flat E and W faces	Limestone wall
347	Fill	College Green	1.8	0.5	0.23	Fill of grave (349), loose mid greyish brown silty clay with inclusions of small rounded stones	Fill of grave (349)
348	Layer	College Green	5+	1+	0.3-0.4	Reddish brown sticky clay containing fragments of brick, oyster shells and flecks of charcoal. Material into which walls (342) and (343) were set. Also overlay the burials.	Clay beneath walls, above burials
349	Cut	College Green	1.8	0.5	0.23	Grave cut containing SK1. Oblong/sub-rectangular with rounded corners. Gentle break of slope at the top of the cut and a gradual/imperceptible break of slope at the base, which was uneven. Filled by (347).	Grave cut for SK1
350	Fill	College Green	0.49+	0.19+	0.17	Fill of grave (351) containing SK2. Damp, dark greyish brown silty clay with inclusions of small rounded stones and occasional charcoal flecks	Fill of grave (351) for SK2
351	Cut	College Green	0.49+	0.19+	0.17	Grave cut containing SK2. Only S end of this grave exposed within trench, with the rest remaining under the baulk. It had a sharp break of slope at the top. Filled by (350).	Grave cut for SK2
352	Fill	College Green	1.25+	0.5+	0.23	Fill of grave (353) containing SK3 and SK4. Loosely compacted, moist, mid grey silty clay	Fill of grave (353) for SK3 and SK4

Context No	Type	Area	Length (m)	Width (m)	Depth (m)	Description	Interpretation
						with occasional small angular and rounded stones	
353	Cut	College Green	1.25+	0.5+	0.23	Grave cut containing SK3 and SK4. Only N part of this grave uncovered, with the rest lying underneath the baulk. Sharp break of slope at the top and gradual at the base, which was flat. Filled by (352).	Grave cut for SK3 and SK4
355	Layer	College Green	5+	1+	0.3	Mound material. Mid-reddish brown clayey silt. Represents historic ground level at the time of the burials. Possible that this was upcast or redeposited material. Not fully excavated as at base of formation.	Mound material into which graves cut
356	Cut	College Green	1.36+	-	-	Grave cut containing SK5. Could not be recorded in any detail, full extent not determined. Visible extent 1.36 m long, with the remaining portion obscured beneath services. Filled by (357).	Grave cut for SK5
357	Fill	College Green	1.36+	-	-	Fill of grave (356) containing SK5. Mid-grey silty clay	Fill of grave (356) for SK5

Appendix 2 – Finds Register

Find No.	Material	Type	Identification	Description
14E0003:343:001	Ceramic	Pottery	18th–20th C	Blackware
14E0003:343:002	Ceramic	Pottery	13th–14th C	?Dublin-type ware. Probable bulbous bodied jug form
14E0003:343:003	Ceramic	Pottery	13th–14th C	?Dublin-type ware. Possibly represents a jug. Refit with 14E0405:343:004, 005
14E0003:343:004	Ceramic	Pottery	13th–14th C	?Dublin-type ware. Possibly represents a jug. Refit with 14E0405:343:003, 005
14E0003:343:005	Ceramic	Pottery	13th–14th C	?Dublin-type ware. Possibly represents a jug. Refit with 14E0405:343:003, 004
14E0003:343:006	Ceramic	Pottery	Mid - late 18th C	White Stoneware. Possibly represents a jug
14E0003:343:007	Ceramic	Pottery	17th–18th C	Tin Glazed Earthenware. Rim sherd of a plate
14E0003:343:008	Kaolin	Clay	-	Tobacco pipe stem
14E0003:343:009	Kaolin	Clay	-	Tobacco pipe stem
14E0003:343:010	Kaolin	Clay	-	Tobacco pipe stem
14E0003:347:002	Ceramic	Pottery	18th–20th C	Unidentifiable Red Earthenware. Retent from soil sample #1 (associated with SK1)
14E0003:347:003	Ceramic	Pottery	18th–20th C	Unidentifiable Red Earthenware. Retent from soil sample #1 (associated with SK1)
14E0003:347:004	Ceramic	Pottery	18th C	Tin Glazed Earthenware. Retent from soil sample #1 (associated with SK1)
14E0003:348:001	Ceramic	Pottery	13th–14th C	?Dublin-type ware. Same vessel as 14E0405:348:002
14E0003:348:002	Ceramic	Pottery	13th–14th C	?Dublin-type ware. Same vessel as 14E0405:348:001
14E0003:350:002	Ceramic	Pottery	13th–14th C	?Dublin-type ware. Retent from soil sample #4 (associated with SK2)
14E0003:352:001	Kaolin	Clay	-	Very small fragment of a tobacco pipe stem. Retent from soil sample #5. (associated with SK3)

Find No.	Material	Type	Identification	Description
14E0003:357:004	Ceramic	Pottery	18th–20th C	Blackware. Retent from soil sample #11. (associated with SK5)
14E0003:357:005	Glass	Window	19th–20th C	Colourless glass. Retent from soil sample #13. (associated with SK5)
14E0003:357:006	Glass	?Bottle	18th–20th C	Green glass, heavily devitrified and possibly derived from a bottle. Retent from soil sample #13. (associated with SK5)
14E0003:357:007	Ceramic	Pottery	13th–14th C	?Dublin-type ware. Retent from soil sample #13. (associated with SK5)

Appendix 3 – Sample Registers

Soil Samples

Sample No.	Context No.	Description
1	347	Grave fill, taken from pelvic area of SK1
2	347	Grave fill, mid brown clay around SK1
3	352	Bulk sample, SK3
4	350	Bulk sample, SK2
5	352	Grave fill, taken from pelvic area of SK3, possibly finger bones present
10	357	General grave fill, SK5
11	357	General grave fill, SK5
12	357	Grave fill, skull area including teeth and possibly vertebrae of SK5
13	357	General grave fill, SK5

Animal Bone Sample

Sample No.	Context No.	Description
1	347	Bone in backfill associated with SK 1
2	350	Animal bone associated with SK 2
3	352	Animal bone associated with SK 3
4	357	Animal bone associated with SK 5
5	343	Animal bone associated with wall (343)
6	354=348	Animal bone associated with clay beneath walls (342), (343), above burials
7	347	Animal bone retent from soil sample #1 (associated with SK1)
8	350	Animal bone retent from soil sample #4 (associated with SK2)

Metalworking Debris Sample

Sample No.	Context No.	Description
3	352	Possible archaeometallurgical residues from retent of soil sample #3 (associated with SK3)

Human Bone Register

SK/ Sample No	Fill No	Cut No	Area	Artic/ Disartic	Description
SK1	347	349	College Green	Articulated	SW-NE orientated simple flexed burial, laying on right-hand side, good condition
SK2	350	351	College Green	Articulated	SSW-NNE orientated simple flexed burial, laying on right-hand side, good condition
SK3	352	353	College Green	Articulated	SW-NE orientated simple flexed burial, laying on right-hand side, good condition
SK4	352	353	College Green	Articulated	Lower leg of SW-NE orientated simple burial, good condition
SK5	357	356	College Green	Articulated	WNW-ESE orientated simple extended supine burial, poor condition
Sample -	343	-	College Green	Disarticulated	Human bone associated with wall (043)
Sample 1	347	349	College Green	Disarticulated	Human bone retent from soil sample #1. Associated with SK1
Sample 4	350	351	College Green	Disarticulated	Human bone retent from soil sample #4. Associated with SK2
Sample 5	352	353	College Green	Disarticulated	Human bone retent from soil sample #5. Associated with SK3
Sample 10	357	356	College Green	Disarticulated	Human bone retent from soil sample #10. Associated with SK5
Sample 11	357	356	College Green	Disarticulated	Human bone retent from soil sample #11. Associated with SK5
Sample 12	357	356	College Green	Disarticulated	Human bone retent from soil sample #12. Associated with SK5
Sample 13	357	356	College Green	Disarticulated	Human bone retent from soil sample #13. Associated with SK5

Building Material Sample

Sample No.	Context No.	Description
10	357	Mortar fragments from retent of soil sample #10 (associated with SK5)

Appendix 4 – Photo Register

Photo No	Camera	Area	Direction Facing	Description
100-977	OLM7	College Green	SW	(343) in trench at Trinity
100-978	OLM7	College Green	SW	(343) in trench at Trinity
100-979	OLM7	College Green	E	(343) in trench at Trinity
100-980	OLM7	College Green	N	(343) in trench at Trinity
100-981	OLM7	College Green	N	(343) in trench at Trinity
100-982	OLM7	College Green	S	(343) in trench at Trinity
100-983	OLM7	College Green	S	(343) in trench at Trinity
100-984	OLM7	College Green		
100-985	OLM7	College Green		
100-986	OLM7	College Green		
100-987	OLM7	College Green		
100-988	OLM7	College Green		
100-989	OLM7	College Green		
100-990	OLM7	College Green		
100-991	OLM7	College Green		
100-992	OLM7	College Green		
100-993	OLM7	College Green		
100-994	OLM7	College Green		
100-995	OLM7	College Green		
100-996	OLM7	College Green		
100-997	OLM7	College Green		
100-998	OLM7	College Green		
100-999	OLM7	College Green		
100-1000	OLM7	College Green		
100-1001	OLM7	College Green		
100-1002	OLM7	College Green		

Photo No	Camera	Area	Direction Facing	Description
100-1003	OLM7	College Green		
100-1004	OLM7	College Green		
100-1005	OLM7	College Green		
100-1006	OLM7	College Green		
100-1007	OLM7	College Green		
100-1008	OLM7	College Green		
IMG-001	Canon 7	College Green	W	N/A
IMG-002	Canon 7	College Green	W	N/A
IMG-003	Canon 7	College Green	SE	N/A
IMG-004	Canon 7	College Green	S	N/A
IMG-005	Canon 7	College Green	NNE	Mid-excavation of SK1 and SK2
IMG-006	Canon 7	College Green	E	Mid-excavation of SK1 and SK2
IMG-007	Canon 7	College Green	E	Mid-excavation of SK1 and SK2
IMG-008	Canon 7	College Green	E	Mid-excavation of SK1 and SK2
IMG-009	Canon 7	College Green	E	Mid-excavation of SK1 and SK2
IMG-010	Canon 7	College Green	E	Mid-excavation of SK1 and SK2
IMG-011	Canon 7	College Green	SSW	Mid-excavation of SK1 and SK2
IMG-012	Canon 7	College Green	SSW	Mid-excavation of SK1 and SK2
IMG-013	Canon 7	College Green	SSW	Mid-excavation of SK1 and SK2
IMG-014	Canon 7	College Green	SSW	Mid-excavation of SK1 and SK2
IMG-015	Canon 7	College Green	SSW	Mid-excavation of SK1 and SK2
IMG-016	Canon 7	College Green	SSW	Mid-excavation of SK1 and SK2
IMG-017	Canon 7	College Green	SSW	Mid-excavation of SK1 and SK2
IMG-018	Canon 7	College Green	WSW	Mid-excavation of grave cut associated with SK1
IMG-019	Canon 7	College Green	WSW	Mid-excavation of grave cut associated with SK1
IMG-020	Canon 7	College Green	WSW	Mid-excavation of grave cut associated with SK1
IMG-021	Canon 7	College Green	ESE	Mid-excavation of SK2

Photo No	Camera	Area	Direction Facing	Description
IMG-022	Canon 7	College Green	ESE	Mid-excavation of SK2
IMG-023	Canon 7	College Green	ESE	Mid-excavation of SK2
IMG-024	Canon 7	College Green	SSW	Pre-excavation of grave cut associated with SK3 and SK4
IMG-025	Canon 7	College Green	SSW	Pre-excavation of grave cut associated with SK3 and SK4
IMG-026	Canon 7	College Green	WSW	Post-excavation of grave cut associated with SK1
IMG-027	Canon 7	College Green	WSW	Post-excavation of grave cut associated with SK1
IMG-028	Canon 7	College Green	WSW	Post-excavation of grave cut associated with SK1
IMG-029	Canon 7	College Green	WSW	Post-excavation of grave cut associated with SK1
IMG-030	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1
IMG-031	Canon 7	College Green	WNW	Post-excavation of grave cut associated with SK1
IMG-032	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1
IMG-033	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1 (rectified photography)
IMG-034	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1 (rectified photography)
IMG-035	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1 (rectified photography)
IMG-036	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1 (rectified photography)
IMG-037	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1 (rectified photography)
IMG-038	Canon 7	College Green	N/A	Post-excavation of grave cut associated with SK1 (rectified photography nails 2–4)
IMG-039	Canon 7	College Green	N/A	Post-excavation of grave cut associated with SK1 (rectified photography nails 2+4)
IMG-040	Canon 7	College Green	N/A	Post-excavation of grave cut associated with SK1 (rectified photography nails 2+5)
IMG-041	Canon 7	College Green	N/A	Post-excavation of grave cut associated with SK1 (rectified photography nails 1+6)
IMG-042	Canon 7	College Green	N/A	Post-excavation of grave cut associated with SK1 (rectified photography nails 1+6)
IMG-043	Canon 7	College Green	N/A	Post-excavation of grave cut associated with SK1 (rectified photography nails)
IMG-044	Canon 7	College Green	N/A	Mid-excavation of SK2 with rectified photography nails
IMG-045	Canon 7	College Green	N/A	Mid-excavation of SK3 and SK4
IMG-046	Canon 7	College Green	N/A	Mid-excavation of SK3 and SK4
IMG-047	Canon 7	College Green	NE	Mid-excavation of SK3 and SK4
IMG-048	Canon 7	College Green	NE	Mid-excavation of SK3 and SK4

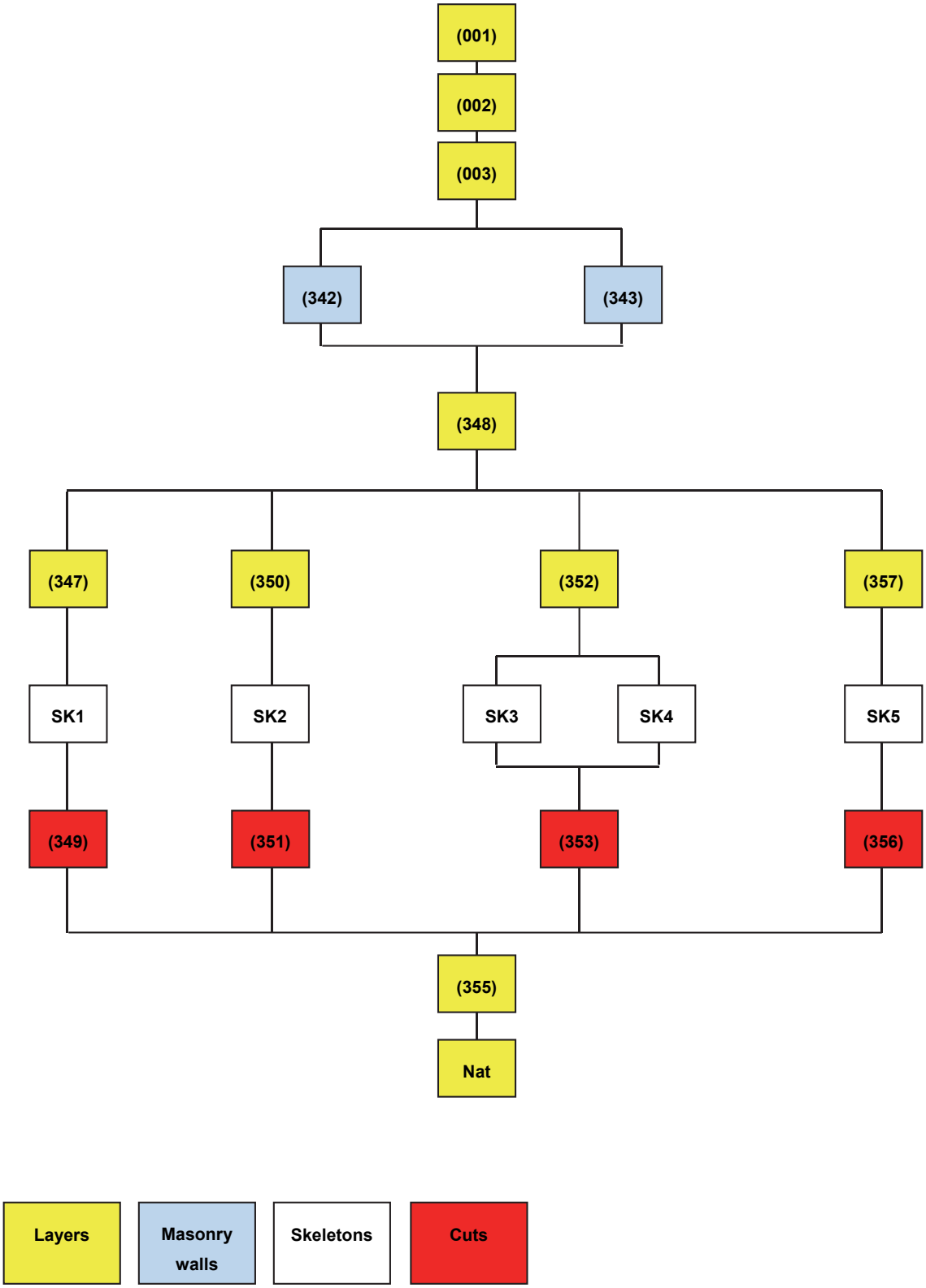
Photo No	Camera	Area	Direction Facing	Description
IMG-049	Canon 7	College Green	NE	Mid-excavation of SK3 and SK4
IMG-050	Canon 7	College Green	ESE	Mid-excavation of SK3 and SK4
IMG-051	Canon 7	College Green	ESE	Mid-excavation of SK3 and SK4
IMG-052	Canon 7	College Green	ESE	Mid-excavation of SK2
IMG-053	Canon 7	College Green	ESE	Mid-excavation of SK2
IMG-054	Canon 7	College Green	N/A	Mid-excavation of SK2 (Close up of skull)
IMG-055	Canon 7	College Green	N/A	Mid-excavation of SK2 (Close up of left arm)
IMG-056	Canon 7	College Green	ESE	Mid-excavation of SK2
IMG-057	Canon 7	College Green	ESE	Mid-excavation of SK2
IMG-058	Canon 7	College Green	ESE	Mid-excavation of SK2
IMG-059	Canon 7	College Green	SSW	Mid-excavation of SK2–SK4
IMG-060	Canon 7	College Green	SSW	Mid-excavation of SK2–SK4
IMG-061	Canon 7	College Green	SSW	Post-excavation of SK1 and Mid-excavation of SK2–SK4
IMG-062	Canon 7	College Green	SSW	Mid-excavation of SK2–SK4
IMG-063	Canon 7	College Green	N/A	Post-excavation of grave cut associated with SK1 (rectified photography nails)
IMG-064	Canon 7	College Green	N/A	Mid-excavation of SK2 rectified nails 6, 8 and 13
IMG-065	Canon 7	College Green	N/A	Mid-excavation of SK2 rectified nails 6, 8 and 13
IMG-066	Canon 7	College Green	N/A	Mid-excavation of SK2 rectified nails 6, 8 and 13
IMG-067	Canon 7	College Green	N/A	Mid-excavation of SK2 rectified nails 6, 8 and 13
IMG-068	Canon 7	College Green	N/A	Mid-excavation of SK2 rectified nails 6, 8 and 13
IMG-069	Canon 7	College Green	N/A	Mid-excavation of SK2 rectified nails 6, 8 and 13
IMG-070	Canon 7	College Green	N/A	Mid-excavation of SK2 rectified nails 6, 8 and 13
IMG-071	Canon 7	College Green	ESE	Mid-excavation of SK2
IMG-072	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1 and Mid-excavation of SK3 and SK4
IMG-073	Canon 7	College Green	SSW	Post-excavation of grave cut associated with SK1 and Mid-excavation of SK3 and SK4
IMG-074	Canon 7	College Green	N/A	Mid-excavation of SK3 and SK4
IMG-075	Canon 7	College Green	N/A	Mid-excavation of SK3 and SK4

Photo No	Camera	Area	Direction Facing	Description
IMG-076	Canon 7	College Green	N/A	Mid-excavation of SK3 and SK4
IMG-077	Canon 7	College Green	N/A	Mid-excavation of SK3 and SK4
IMG-078	Canon 7	College Green	N/A	Mid-excavation of SK3 and SK4
IMG-079	Canon 7	College Green	SSW	Mid-excavation of SK3 and SK4
IMG-080	Canon 7	College Green	WNW	Mid-excavation of SK3 and SK4
IMG-081	Canon 7	College Green	WNW	Mid-excavation of SK3 and SK4
IMG-082	Canon 7	College Green	WNW	Mid-excavation of SK3 and SK4
IMG-083	Canon 7	College Green	N/A	Mid-excavation of pelvis of SK3
IMG-084	Canon 7	College Green	SSW	Mid-excavation of SK3 and SK4
IMG-085	Canon 7	College Green	SSW	Mid-excavation of SK3 and SK4
IMG-086	Canon 7	College Green	SSW	Mid-excavation of SK3 and SK4
IMG-087	Canon 7	College Green	WNW	Mid-excavation of SK3 and SK4
IMG-088	Canon 7	College Green	WNW	Mid-excavation of SK3 and SK4
IMG-089	Canon 7	College Green	WNW	Mid-excavation of SK3 and SK4
IMG-090	Canon 7	College Green	WNW	Mid-excavation of SK3 and SK4
IMG-091	Canon 7	College Green	N/A	Mid-excavation of SK3 and SK4 with rectified photography nails 9–12
IMG-092	Canon 7	College Green	N/A	Rectified photography nails 5–7
IMG-093	Canon 7	College Green	N/A	Rectified photography nails 5–7
IMG-094	Canon 7	College Green	N/A	Rectified photography nails 8, 9 and 13
IMG-095	Canon 7	College Green	N/A	Rectified photography nails 8 and 9
IMG-096	Canon 7	College Green	N/A	Rectified photography nails 9 and 10
IMG-097	Canon 7	College Green	N/A	Rectified photography nails 10–12
IMG-098	Canon 7	College Green	N/A	Rectified photography nails 11 and 12
IMG-099	Canon 7	College Green	N/A	Rectified photography nail 12
IMG-100	Canon 7	College Green	N/A	Rectified photography nails 11 and 12
IMG-101	Canon 7	College Green	N	Mid-excavation of SK3 and SK4
IMG-102	Canon 7	College Green	NNE	Mid-excavation of SK3 and SK4

Photo No	Camera	Area	Direction Facing	Description
IMG-103	Canon 7	College Green	ESE	Post-excavation of SK2
IMG-104	Canon 7	College Green	ESE	Post-excavation of SK1–SK4
IMG-105	Canon 7	College Green	SSW	Post-excavation of SK1–SK4
IMG-106	Canon 7	College Green	SSW	Post-excavation of SK1–SK4
IMG-107	Canon 7	College Green	SSW	Post-excavation of SK1–SK4
IMG-108	Canon 7	College Green	SSW	Post-excavation of SK1–SK4
IMG-109	Canon 7	College Green	SSW	Post-excavation of SK1–SK4
IMG-110	Canon 7	College Green	SSW	Post-excavation of SK1–SK4
IMG-111	Canon 7	College Green	SSW	Post-excavation of SK2–SK4
IMG-112	Canon 7	College Green	SSW	Post-excavation of SK2–SK4
IMG-113	Canon 7	College Green	SSW	Post-excavation of SK2–SK4
IMG-114	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 9–12
IMG-115	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 9–12
IMG-116	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 9–12
IMG-117	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 9–12
IMG-118	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 9–12
IMG-119	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 11–12
IMG-120	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 10–11
IMG-121	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 9–10
IMG-122	Canon 7	College Green	N/A	Post-excavation of SK3–SK4 and rectified nails 9
IMG-123	Canon 7	College Green	N/A	Post-excavation of SK2 and rectified nails 7+13
IMG-124	Canon 7	College Green	N/A	Post-excavation of SK2 and rectified nails 6, 7+13
IMG-125	Canon 7	College Green	N/A	Post-excavation of SK1 and rectified nails 5+6
IMG-126	Canon 7	College Green	N/A	Post-excavation of SK1 and rectified nails 1, 2, 5 + 6
IMG-127	Canon 7	College Green	N/A	Post-excavation of SK1 and rectified nails 2–5
IMG-128	Canon 7	College Green	NNE	Post-excavation of SK1–SK4
IMG-129	Canon 7	College Green	NNE	Post-excavation of SK1–SK4

Photo No	Camera	Area	Direction Facing	Description
IMG-130	Canon 7	College Green	NNE	Post-excavation of SK1–SK4
IMG-131	Canon 7	College Green	NNE	Post-excavation of SK1–SK4

Appendix 5 – Site Matrix



Appendix 6 – Archaebotanical Report

Archaeobotanical Analysis (plant macrofossil and charcoal) from College Green Excavation (14E0003)

Susan Lyons

1 INTRODUCTION

This report presents the results of archaeobotanical remains (plant macrofossil and charcoal) from College Green Excavation (14E0003) associated with archaeological works carried out as part of the Luas Cross City Utilities Works, Dublin by Rubicon Heritage Services Ltd. Sample processing revealed archaeobotanical remains to be present in six samples from College Green. These samples were sent to Susan Lyons for archaeobotanical identification and interpretation.

2 SAMPLE ANALYSIS

Six flot samples from College Green were selected for archaeobotanical analysis (Table 1). This analysis was to determine the archaeological significance of the assemblage in the context of this site.

Licence No.	Context No.	Sample No.	Description
14E0003	347	1	Grave (349) of Skeleton 1
	347	2	Grave (349) of Skeleton 1
	352	3	Grave (353) of Skeleton 3
	357	4	Grave (356) of Skeleton 5
	357	12	Grave (356) of Skeleton 5
	357	13	Grave (356) of Skeleton 5

Table 1—Samples for analysis

3 SIGNIFICANCE OF ARCHAEOBOTANICAL REMAINS

The analysis of charred and uncharred (waterlogged) plant macro-remains are an important component of archaeological excavation and post-excavation works. These remains provide valuable information about explicit activities carried out at a site, including the function and nature of certain features, arable agriculture practices, site economy, diet, food processing and how local natural resources were exploited (Murphy and Whitehouse 2007; McClatchie *et al.* 2015). Cereal grains, nutshells, seeds and fruit-stones represent the most commonly preserved non-wood plant macro-remains. Delicate chaff from arable crops is also frequently recovered. Other plant components can sometimes be preserved, including cereal bran,

leaves, bud-scales and thorns. Vegetative tissues (parenchyma) from roots and tubers, which can be used in a range of activities, may also be recovered.

Woodland resources were of enormous importance in the past. Communities during both the prehistoric and historic periods were dependant on woodland resources for everyday living, including construction materials for buildings, manufacture of most implements, firewood and fuel (Kelly 1988; O'Donnell 2007; Stuijts 2007; O'Carroll 2012). Analysis of charcoal remains can provide functional evidence for various activities at a site, as well as insights into cultural, ecological and economic variables. Certain wood species may have been selected for particular uses, such as structural posts, firewood, pyre material, fuel and wattle.

Charred remains also provide suitable material for the purpose of obtaining radiocarbon dates (C14 dating). Short lived wood species, such as young branch wood or single entity remains (cereal grain and nutshell) are not subject to issues caused by the 'old-wood effect' and can provide a more robust chronological resolution.

4 METHODOLOGY

To extract the archaeobotanical remains, the soil samples were processed.

4.1 Sample processing

Bulk dry soil samples were processed using a system of floatation by Rubicon Heritage Services Ltd. This is where each sample is soaked in water and agitated by hand to loosen any charred remains from the soil particles which allows for this material to be separated and float to the surface. This floating material (flot) is poured off and trapped in a sieve (mesh size 250 µm) and, once dried, scanned for plant remains using a binocular microscope. The larger residual material left behind (retent) is washed through a 1mm, 2mm and 5mm mesh or sieve and air-dried. Once dry, each retent is sorted by eye and any material of archaeological significance removed.

4.2 Plant macrofossil analysis

All flot samples were viewed under a low powered binocular microscope (magnification x0.8 to x5). Where preservation allowed, the charred plant macro-remains were identified to species level and quantified. In the case of very large samples, a sub-sample of approximately 500 individual constituents were randomly identified and removed. Abraded grains were recorded using an abundance scale based on the universal DAFOR system, which is a quantitative definition of frequency for counting plant communities - Dominant (>250) = D,

Abundant (51-250) = ++++, Frequent (21-50) = +++, Occasional (6-20) = ++ and Rare (1-5) = +

This scaling is necessary where abraded grains which are fragmented and where the embryo ends are absent can be more difficult to quantify as being from one or more component.

Plant species are made using reference to the author's seed collection and standard seed atlases and references; *Flora of the British Isles* (Clapham, A.R., Tutin, T.G., Warburg, E.F., 1957), *Zadenatlas der Nederlandsche Flora* (Beijerinck, W. 1976), and *New Flora of the British Isles* 2nd Edition (Stace, C. 1997).

4.3 Charcoal identification analysis

Wood charcoal identifications were undertaken in accordance with Section 25 of the National Monuments Act, 1930, as amended by Section 20 of the National Monuments Amendment Act 1994, to alter an archaeological object. The wood species identifications were conducted under a binocular microscope using incident light and viewed at magnifications of 100x, 200x and 400x where applicable.

Wood species identifications are made using wood reference slides and wood keys devised by Brazier and Franklin (1961), Schweingruber (1978), Hather (2000) and the International Association of Wood Anatomists (IAWA) wood identification manuals and (www.lib.ncsu/edu/insidewood) by Wheeler, Bass and Gasson (1989).

5 RESULTS

The results for this site are presented in Table 2. The mode of preservation was by charring (cereal grains and charcoal) and waterlogging (wild taxa). All samples contained varying concentrations of mineral-replacement material. Mineral-replacement of organic material occurs naturally in deposits containing cess or acid-rich material. In this process, the presence of calcium salts, principally phosphates, replaces organic tissue, making this material resistant to decay. These remains are difficult to identify and will not form any part of the discussion in this report.

5.1 College Green (14E0003)

Six samples contained evidence for archaeobotanical material in the form of charred and uncharred plant remains and charcoal. A single oat grain (*Avena* spp.) and a cereal grain of indeterminate species were identified from grave fill (352) of Skeleton 3. Grave fills (347), (352), and (357) of Skeletons 1, 3 and 5 respectively, contained cinder remains and fragments

of mineral-replacement material of indeterminate identification. Minute fragments of charcoal were recovered from both grave fills (347) and (357) of Skeletons 1 and 5, which were identified as *Salix* spp. (willow) and *Betula* spp. (birch).

6. DISCUSSION

Wood taxa, such as willow and birch recorded as charcoal from gravel fills (347) and (357) of Skeletons 1 and 5 represents the variety of woods potentially used as fuel on site.

7. CONCLUSIONS

The archaeobotanical evidence from College Green provides a snapshot of the plants that were used and brought to the site for a variety of economic means. Definite cultivars include cereal grains, in the form of oat, could potentially represent food plants that may have been growing in urban gardens or collected locally from the rural hinterland. Charcoal remains found are potentially evidence for fuel and firewood, where willow and birch were burnt. Birch may have been growing as tree in this urban area and would have provided a source of local firewood.

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	Feature type	**Grave (349)**		**Grave (353)**	**Grave (356)**		
	Deposit	347	347	352	357	357	357
	Sample number	1	2	3	4	12	13
	% of sample analysed						
Latin name	***Common name***						
CEREALS: CARBONIZED							
Avena spp.	oat	1					
Cerealia	indet.	1					
OTHER:							
Charcoal *Salix* spp.	willow	0.01g	0.03g			0.1g	0.03g
Charcoal *Betula* spp.	birch					0.02g	
Charcoal	indet.	+					
Total counts		**2**					

Table 2—Composition of plant remains/ecofacts (14E0003)

Appendix 7 – Faunal Report

Report on Faunal Material from College Green Excavation (14E0003)

Dr. Fiona Beglane

1 INTRODUCTION

This report details the faunal material recovered from Utilities Works that were carried out along the route of the planned Luas Cross City (LCC) light rail system at College Green, Westmoreland Street and Hawkins Street under Licence No. 14E0003. These works were directed by Nikolah Gilligan and undertaken by Rubicon Heritage Services Ltd for GMC (Ireland) Ltd on behalf of the Railway Procurement Agency (RPA), now Transport Infrastructure Ireland (TII).

Five human burials were identified. Two of these were fully excavated, while three of the burials were only partially excavated as they extended beyond the limits of the utilities trench (Gilligan and Pawle 2016). The burials were dated to 15th – 17th century (Phase 1). Overlying these burials were post-medieval walls and associated features (Phase 2).

2 METHODOLOGY

Contexts were divided on the basis of the stratigraphic sequences supplied by the excavators (Gilligan and Pawle 2016).

Mammalian faunal remains were identified using comparative collections and by reference to Hillson (1992) and Schmid (1972). Remains were quantified using a method modified from that described by Davis (1992), using selected skeletal elements where at least 50% of the diagnostic feature is present. This avoids the possibility of counting the same element on multiple occasions. Ribs and vertebrae apart from the axis and atlas are not included, since these can be difficult to identify to species, however these were quantified as number of fragments in categories of large mammal (LM), medium mammal (MM) and small mammal (SM). Elements quantified were as follows: antlers and horncores where these joined to the cranium and at the distal end, parietal cranium and cranium at the maxilla if at least two teeth were present, mandibular hinge or toothrow if at least one tooth was present, and loose teeth, atlas (VC1) and axis (VC2), scapula at the glenoid process, pelvis at the ilium or ischium of the acetabulum, patella, calcaneus and astragalus, ulna at the articular surface and long bones where at least 50% of the proximal or distal articulation was present. Material from topsoil was scanned for unusual species, worked bone and pathological bone, but was not

fully recorded. The number of identified specimens (NISP) was calculated for each species based on these identifications.

Sheep and goat bones were separated where possible using Boessneck (1969), Kratochvil (1969) and Payne (1969; 1985). Sexing was carried out using the shape of canine of pigs (von den Driesch 1976), presence of developed canines in horses, and the distal breadth (Bd) of the metacarpal of cattle (McCormick 1992). Fusion data was based on Silver (1963) and Reitz and Wing (1999, 76). For cattle and pigs, toothwear was recorded per Grant (1982) and Higham (1967) after Silver (1963). Toothwear in sheep was examined using the method described by Payne (1973; 1987). Equids were aged as described by Levine (1982), dogs were aged using the data shown in Schmid (1972). Measurements were carried out to an accuracy of 0.1mm per von den Driesch (1976), Boessneck (1969), Payne and Bull (1988, Fig. 1), Payne (1973, 296), and Davis (1992, Fig. 2). Estimated withers heights were calculated using Fock (1966) and Matolcsi (1970) for cattle, Vitt (1952) for equids, Teichert for original (*ur*) and early (*früh*) or unimproved sheep, and Teichert (1966/69) for pig, all cited by von den Driesch and Boessneck (1974). The withers height for dogs was calculated from Koudelka cited by von den Driesch and Boessneck (1974) and from Clark (1995). Evidence for chopping, cutting and sawing were recorded, as was gnawing by canids and rodents. Burnt material was classified as singed for bone with only partial blackening, burnt for blackened bones or calcinated for those bones that were predominantly white/blue-grey in colour. For non-countable fragments these aspects were only recorded where obvious on a cursory inspection. Where pathologies, developmental defects and non-metric traits were identified on bones these were examined and recorded in further detail.

Molluscs were identified using Hayward and Ryland (1995) and Morris (1986) as well as by means of a reference collection. Where only non-countable fragments were identified in a feature, an approximate fragment count was recorded, with the proviso ‘NC’.

Throughout the text the common names for species have been used. A translation of common to Latin names is shown in Table 1, based on Schmid (1972) and other sources.

Common Name	**Latin Name**
Cattle	*Bos* sp.
Duck	*Anas* sp.
Oyster	*Ostrea edulis*
Sheep/Goat	*Ovis/Capra*

Table 1—Translation of Latin to common names

3 RESULTS

A total of 37 bone fragments were recorded from six separate contexts and two phases (Table 2). The majority of bones came from the later medieval/early post-medieval Phase 1, and were recovered from the fills of graves. A smaller quantity came from the post-medieval Phase 2, which overlay the graves.

The Phase 1 material included a radius of a sheep aged over 3-10 months that was in two pieces, the scapula of a duck and four unidentified fragments of calcinated bone (Table 3). There were also three large- and three medium-mammal rib fragments and a large-mammal vertebral fragment. With a Bp of 37.2 mm, the sheep radius was relatively large for the medieval period, with results from this period more typically between 24 and 30 mm.

The Phase 2 contexts included a loose third molar of a sheep/goat, aged at least 2 years and the tibia of a sheep/goat aged over 15-24 months (Table 3). These two bones, which came from a single context, could potentially have been from the same individual, as could the two medium mammal rib fragments also recovered from this context. The tibia was typical in size of the post-medieval period, being larger than medieval examples. This phase also yielded a portion of cattle ulna from an individual aged over 42-48 months and an unfused proximal humerus from a juvenile medium or large mammal.

4 CONCLUSION

This small assemblage shows a surprising diversity with at least three species represented: cattle, sheep/goat and duck. The small size of the assemblage makes interpretations difficult since it is not possible to determine the relative importance of the various species. For the Phase 1 elements, their inclusion within Tudor period grave fills is likely to be accidental as there is no evidence of any deliberate placement of particular portions of animals or of particular species. In particular, Skeleton 5 was oriented west-northwest–east-southeast suggesting a Christian burial (Gilligan and Pawle 2016). This contained the largest single number of bones, but as medieval Christian burial rites did not include grave goods (Breen 2010, 41), these are also likely to be incidental.

Given the potential light that this material could shed on modern breed development in the post-medieval period through morphometric, genetic and isotopic studies it is recommended that this material be retained.

Phase	Context	Skeleton No.	Context size	LM rib	MM rib	LM vertebra	Oyster shell
1	347	SK1	3			1	
1	350	SK2	8				
1	352	SK3 and SK4	1				
1	357	SK5	12	3	3		1 frag
2	343		11		3		
2	354=348		2				

Table 2—Summary of results

ID	Phase	Context	Taxa	Element	Side	Portion	Fusion	Burning	Bp	Bd	Comment
5662	1	347	Sheep	Radius	L	Proximal	Fused		32.7		
5661	1	357	Duck	Scapula	R	Proximal					
nc003	1	347	Unid	Unid	U			Calcinated			1 frag, c. 5 x 5 mm
nc004	1	350	Unid	Unid	U			Calcinated			3 frags. c. 10mm, 4mm, 3mm
5659	2	343	Sheep / goat	Loose mand tooth	U						3rd molar
5660	2	343	Sheep / goat	Tibia	L	Distal	Fused			29.2	
nc001	2	343	MM / LM	Humerus	U	Proximal	Unfused epiphysis				
nc002	2	343	Cattle	Ulna	R	Proximal	Fused				

Table 3—Identified bone fragments

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Appendix 8 – Human Remains Report

Osteological Report on Human Remains from College Green Excavation (14E0003)

Carmelita Troy

SUMMARY

This document is submitted as a report on the post-excavation treatment and analysis of articulated and disarticulated human remains retrieved from the archaeological excavation at College Green, Dublin 2 for Utilities Works was carried out along the route of the planned Luas Cross City (LCC) light rail system at College Green, Westmoreland Street and Hawkins Street under Licence No. 14E0003 by Rubicon Heritage Services Ltd. for GMC (Ireland) Ltd on behalf of the Railway Procurement Agency (RPA), now Transport Infrastructure Ireland (TII). The Excavation Licence was granted to Nikolah Gilligan.

During the course of the monitoring programme at College Green, an inhumation burial was identified within a utilities trench located slightly to the north of the main entrance to Trinity College Dublin and positioned parallel to the pavement running around the perimeter of the college. Full archaeological excavation was undertaken of the affected section of the utilities trench. During the course of the excavation a further four burials were identified. One of these burials was also fully excavated, while three of the burials were only partially excavated as they extended beyond the limits of the utilities trench

Osteological analysis has shown that there were five articulated skeletons recovered from College Green dating from the Tudor period (15th–17th century). The disarticulated human bone assemblage contained 102 fragments and represented an additional adult individual to the five articulated inhumations, based on the presence of an adult left clavicle from soil sample #12 (357). Preservation of the burials were good and the form of burials were in a flexed position (Skeletons 1, 3 and 4) lying on their side (Skeletons 1–4), and one was extended supine (Skeleton 5). Skeletons 3 and 4 were a possible double internment. The excavated remains at College Green included a younger-middle male (Skeleton 2) and adolescents (Skeletons 1, 3, 4 and 5). The burials appear to be in two phases, Skeleton 5 being earlier than Skeletons 1–4 based on radiocarbon dating results, burial orientation, and body position.

All major types of pathology were noted except infections– these included dental pathologies, degenerative joint disease, trauma as well as metabolic, neoplastic, circulatory and congenital

conditions. The only adult present displayed degenerative joint changes which is associated with heavy physical labour and increasing age. The presence of metabolic conditions is suggestive of environmental stressors in the early lives of some individuals, which indicate that they were from a lower socio-economic background. Also, the longbone lengths measured to a younger age to that of the dental eruption age, which points towards malnourishment, despite the fact that the stature of Skeleton 2 was above average when compared to comparative assemblages.

1 INTRODUCTION

This document is submitted as a report on the osteological analysis of human remains recovered during archaeological excavations at College Green, Dublin 2 (14E0003), under the direction of Nikolah Gilligan of Rubicon Heritage Services Ltd.

The site was located in the townland of Dublin South City, St. Mark's parish, in the barony of Dublin, County Dublin. Archaeological monitoring and excavation for Utilities Works was carried out along the route of the planned Luas Cross City (LCC) light rail system at College Green, Westmoreland Street and Hawkins Street under Licence No. 14E0003. During the course of the monitoring programme at College Green, an inhumation burial was identified within a utilities trench located slightly to the north of the main entrance to Trinity College Dublin and positioned parallel to the pavement running around the perimeter of the college. As this burial would be directly impacted by the Utilities Works programme, a full archaeological excavation was undertaken in order to ensure appropriate preservation by record.

2 ARTICULATED ASSEMBLAGE

2.1 Methodology

The adult burials were assessed using a range of morphological and metrical analyses, according to internationally agreed standards.

- A visual and written inventory was created for all surviving bone (Brickley 2004)
- Preservation levels were recorded following McKinley (2004)
- The dentition was recorded using Buikstra and Ubelaker (1994) to record presence/absence, attrition and dental pathology

- Cranial and post-cranial metrics were taken at a standard 19 landmarks, (where possible), as described by Buikstra and Ubelaker (1994); post-cranial metrics were also employed in the assessment of sex and stature (Trotter 1970; Trotter and Gleser 1952, 1958)
- Sex was assessed using diagnostic criteria of the cranium and pelvis (Buikstra and Ubelaker 1994)
- Age at death was assessed using morphological changes in the pelvis (Brooks and Suchey 1990; Lovejoy *et al.* 1985), cranial suture closure (Buikstra and Ubelaker 1994) and dental attrition (Brothwell 1981; Miles 1962)
- Cranial and post-cranial non-metric traits as described by Berry and Berry (1967), and Finnegan (1978) were recorded
- Pathology was recorded using guidelines set down by Roberts and Connell (2004).
- Assessments of joint disease followed Rogers *et al.* (1987)

Adult individuals were placed into one of five age categories:

- Younger adult: 18–25 years
- Younger-middle adult: 25–35 years
- Middle adult: 25–45 years (when it is not possible to determine from younger or older middle adult)
- Older-middle adult: 35–45 years
- Older adult: 45+ years

Analysis of the subadult remains followed different criteria for some categories. As with the adult remains, a full inventory of skeletal and dental material was created for each individual (Brickley 2004; McKinley 2004); dental pathology and skeletal measurements were taken using Buikstra and Ubelaker (1994).

It is generally agreed by most authors that the accurate assessment of sex is not possible in subadult remains, as sexual dimorphism of the skeleton only becomes clear after puberty (Scheuer and Black 2000). Assessment of the juvenile remains, therefore, concentrated on the accurate assessment of age at death, using the following techniques:

- diaphysis length (Maresh 1970; Scheuer and Black 2000)

- egression equations of diaphyseal length (Scheuer *et al.* 1980)
- epiphyseal fusion and primary ossification centres (Buikstra and Ubelaker 1994; Scheuer and Black 2000)
- dental eruption and development (Ubelaker 1978; Moorrees *et al.* 1963a, 1963b)

There are several systems used in the categorization of subadult remains. In this case, they were placed into one of seven age categories, as used by skeletal biologists and clinicians (Scheuer and Black 2000).

- Foetus: 3rd foetal month until birth
- Perinate: around the time of birth
- Neonate: Birth–2 months
- Infant: Birth–1 year
- Younger child: 1–6 years
- Older child: 7–12 years
- Adolescent: 13–17 years

The articulated assemblage was recorded using the Irish Association of Professional Osteoarchaeologist (IAPO) recommended skeleton recording sheets and a Microsoft Access database.

2.2 Skeletal sample

A total of five articulated skeletons were recorded in the College Green assemblage (Table 1).

Skeleton no.	Grave fill	Grave cut	Age sheet
1	347	349	Subadult
2	350	351	Adult
3	352	353	Subadult
4	352	353	Subadult
5	357	356	Subadult

Table 1—Contextual information

2.3 Preservation and completeness

Levels of preservation were assessed using three categories, poor, moderate and good. ‘Poor’ preservation is classed as material suffering from heavy erosion and fragmentation, severely

impacting on the amount of retrievable data. Material classed as 'moderate' maintains its general morphology and allows for a detailed level of analysis, but has suffered some erosion and fragmentation. 'Good' preservation refers to material which maintains a fresh appearance and retains all morphological detail, allowing full analysis to take place.

Table 2 displays the condition of bone for all the College Green articulated remains. As the majority of the material was deemed to be in a good state of preservation, this makes it particularly favourable to retrieve vital data for osteological analysis. Soil acidity and bone shape and density can contribute to the bone's preservation.

Each skeleton was assessed and placed into one of the following four categories of completeness: >75%, 75%, 50%, and <25%. Recording the completeness of the individual can allow an insight to be gained into how much post-depositional activity has occurred as well as to assess how much information can potentially be gained from the remains. Table 2 shows that all of the levels of completeness were represented

Skeleton no.	Age sheet	Preservation	Completeness
1	Subadult	Good	>75%
2	Adult	Good	50%
3	Subadult	Good	50%
4	Subadult	Good	<25%
5	Subadult	Moderate	75%

Table 2—Preservation and completeness levels

2.4 Body position and orientation

Extended inhumations lying on their back (supine) were introduced into Ireland shortly after the 2nd/3rd century AD from Roman-Britain (O'Brien 1992, 131–2). Late medieval burials are rarely in a prone (lying on front, face down) or flexed (where the knees are bent)/crouched (where the knees are drawn up to the chest) position, and such occurrences may be a result of a hurried burial or cultural practice (e.g. treatment of marginalized people such as criminals or outlaws).

Three College Green burials were lying on their side (Table 3). Two burials had their legs flexed. It is uncertain whether this was a deliberate part of the burial ritual or as a result of rigour mortis having set in while a body remains in the position in which the person died and is buried while still in that position. It was not possible to determine the body position of Skeleton 4.

West-east orientation (with the head to the west) is the dominant orientation of graves among Christian communities. The strict orientation of the individual burial did not appear to be an

important factor until the 4th century AD (O'Brien 1992, 131–2). According to Rahtz (1978, 11), major influences such as the church, but other factors such as walls and pathways also contributed to the orientation. The best known example of different orientation in a Christian context is that of the priest who had his head to the east, the theory being that when he was resurrected he would rise up facing his flock (Daniell 1996, 149). However, this seems to be a post-medieval custom (possibly after 1600) (Rahtz 1978, 4-5).

At College Green, the majority of the burials (Skeleton 1-4) have the head at the southern aspect and in a flexed/side lying position (Table 3). These four burials appear to be following a consistent burial lay-out. However, Skeleton 5 is on a different axis, with the head at west-northwest, and is laid out in an evident extended supine positon. It is reasonable to suggest that this individual was an earlier burial based on its contrasting burial position and radiocarbon dating (Table 10).

Skeleton no.	Age sheet	Body position	Orientation
1	Subadult	Flexed, lying on left side	Southwest–northeast
2	Adult	Lying on right side	South-southwest–north-northeast
3	Subadult	Flexed, lying on left side, facing Skeleton 4	Southwest–northeast
4	Subadult	Flexed, lying on right side, facing Skeleton 3	Southwest–northeast
5	Subadult	Extended supine	West-northwest–east-southeast

Table 3—Body positions and orientation

2.5 Grave type

All burials appear to be simple pit burials. The only possible evidence of a coffin is a small iron nail in a single concretionary lump from gravel fill (352) of Skeleton 3 (retent from soil sample #3) (Appendix 11). Skeletons 3 and 4 (both adolescents) also appear to be a double interments or perhaps a reused burial plots, as it is difficult to determine due to the limits of excavation.

2.6 Demography

2.6.1 Age-at-death

Age-at-death determination was achieved by using recognised standardised morphological methods (Buikstra and Ubelaker 1994; Brickley and McKinley 2004; Brooks and Suchey 1990). A number of methods used in this analysis provided contrasting age estimates, especially that of Skeleton 1. Because growth and development are programmed more strictly by evolution and

genetics than adult degenerative processes (Crews 1993; Zwaan 1999), skeletal growth characteristics such as longbone lengths, epiphyseal fusion, and dental eruption provide a more precise and accurate indication of age than most adult skeletal traits (i.e. the pubic symphysis, auricular surface, sternal rib ends, and cranial sutures). In particular, dental development has been shown to be less environmentally sensitive, thereby resulting in the most reliable indicators of juvenile chronological age (Scheuer and Black 2000).

Skeleton no.	Longbone length age	Epiphyseal fusion rate age	Dental eruption age	Pubic symphysis age	Estimated age category
1	11-13.5 years	12-19 years	17.5-19.5 years	22-24 years	Adolescent
2	14.5-15 years (male) >18 years (female)	>29 years	25-35 years	n/a	Younger-middle adult
3	12-14.5 years	12-20 years	n/a	n/a	Adolescent
4	11 years	12-19 years	n/a	n/a	Adolescent
5	11.5-12 years	14-16 years	11.4-16.4 years	n/a	Adolescent

Table 4—Age estimations

2.6.2 Sex determination

Sex determination in adults is achieved by using recognised standardised morphological methods (Buikstra and Ubelaker 1994; Brickley and McKinley 2004). There was only one adult among the five College Green burials and it was determined to be male (Skeleton 2 – younger-middle adult).

2.7 Estimation of stature

Stature of adult individuals can be reconstructed from measurements of longbones of the skeleton. Stature is the result of many factors including genetics and environmental influences, such as malnutrition and poor health. Height can be used as an indicator of health and social status. Estimated stature was calculated by taking the measurements of the individual longbones and using the formula provided by Trotter and Gleser (1952, 1958) and Trotter (1970). The analysis of stature is restricted to individuals for whom sex has been allocated, as overall height is known to vary slightly between males and females with the same longbone lengths.

Only one adult inhumation in this assemblage could be estimated for a stature height – Skeleton 2 (younger-middle male) at 172 cm. This male stature appears to be taller than other

contemporary late medieval males, except for the St. Saviour's, Waterford male average at 172.87 cm (Table 5). The average stature of a male in a modern population is 172.30 cm (Halpin and Buckley 1995).

Site	Male mean stature (cm)	*n*	Reference
Ardreigh, Co. Kildare (11th–15th century)	170.07	262	Troy (forthcoming), Troy (2012)
Ballyhanna, Co. Donegal (Late medieval)	167.09	189	McKenzie and Murphy (2011)
St. Peter's Church, Waterford (Mid-13th–16th/early 17th century)	168.23	26	Power (1997)
St. Saviour's Friary, Waterford (13th–16th century)	172.87	13	Troy (2010)
Temple Lane, Dublin (13th–16th century)	169.0	-	Ó Donnabháin and Cosgrave (1994)
St. Mary's of the Isle, Dominican Priory, Cork (15t–16th century)	170	17	Power (1995)
Tintern Abbey, Co. Wexford (14th–16th century)	171.1	38	Ó Donnabháin (2010)
Great Britain (*c*. AD 1050-1550)	171	8,494	Roberts and Cox (2003)
Skeleton 2, College Green, Dublin (cal. AD 1466-1638)	***172***	***1***	**-**

Table 5—Comparison of late medieval adult stature averages

2.8 Dental health and disease

Dental disease is the most immediate form of evidence for diet in the past. The presence of caries, calculus and the level of wear all provide information on the kind of food consumed, as well as levels of hygiene and the overall health of a population. In general, medieval populations tend to have better oral health than later peoples. This is closely linked to the wholesale arrival of sugar in the 18th century, first as a luxury and then as a staple, as import duty was gradually removed during the 19th century (Mays 1998).

2.8.1 Teeth present

Three individuals from College Green had the majority of their dentition present (Table 6), with a total of 92 permanent teeth recorded. These include one male (Skeleton 2 – younger-middle adult) and two adolescents (Skeletons 1 and 5).

Skeleton	Age category	Sex	No. permanent teeth
1	Adolescent	-	30
2	Younger-middle adult	Male	30
5	Adolescent	-	32
		Total	***92***

Table 6—Individuals with dentition

2.8.2 Post-mortem tooth loss

Just 3.2% (3/95) of all permanent teeth (and observable empty sockets) had been lost post-mortem, with only one lost from the maxilla and two from the mandible. The three teeth included a lower canine and first premolar and an upper second premolar.

2.8.3 Calculus

If plaque is not removed from the tooth surface, it can mineralize into calculus (tartar) (Plate 1), either sub- or supra-gingival. Sub-gingival calculus is associated with the development of periodontal disease. Calculus is considered to be extremely common in almost all archaeological populations (Roberts and Manchester 1997) and its presence in quantity is frequently taken as an indicator of poor oral hygiene.

The pH or acidity of the mouth depends upon the amount and type of carbohydrate in the diet. Plaque grows faster on the surfaces of the teeth when sucrose (cane/beet sugar) is added to the diet than when other sugars, such as fructose (fruit sugar) or glucose, are added. Large quantities of sugar lower the pH levels close to the teeth, decalcifying the enamel and leading to caries, but paradoxically give an unfavourable environment for the calcification of thick, mature and highly complex bacterial plaque and the formation of calculus.

All three individuals with dentition showed some evidence of calculus with 72 teeth affected to some degree of calculus deposits (Table 7). It appears that the adult was more severely affected than the adolescents.

Skeleton No.	Age/sex	Not affected		Slight		Moderate		Severe		Total teeth present
		N teeth	*%*	*N teeth*	*%*	*N teeth*	*%*	*N teeth*	*%*	
1	Adolescent	7	23.3	10	33.3	6	33.3	7	23.3	30
2	Younger-middle male	0	0	7	23.3	10	33.3	13	43.3	30
5	Adolescent	13	40.6	4	12.5	6	18.8	9	28.1	32
	Total	*20*	*21.7*	*21*	*22.8*	*22*	*23.9*	*29*	*31.5*	*92*

Table 7—Levels of calculus

Plate 1—Mandibular calculus and periodontal disease (Skeleton 2 – younger-middle male)

2.8.4 Periodontal disease

Periodontal disease is connected to poor oral hygiene, where a build-up of plaque and subsequently calculus causes inflammation of the gums leading to gingivitis and gradual recession of the alveolar bone (Plate 1). Eventually this condition leads to tooth loss. Contributing factors are a soft, carbohydrate diet, dental anomalies such as crowding and malocclusion, and nutritional deficiencies such as scurvy, which cause general problems with epithelial tissues (Hillson 1986). It is a common condition and affects most individuals over the age of 35 years

(Hillson 2005, 306). All individuals with dentition from College Green were affected with moderate/severe periodontal disease. Similarly, to the calculus rate trend, the adult was more severely affected than the two adolescents (Table 8).

A total of 41 individuals were affected, representing 82% of dentitions. Over 8% more male individuals displayed moderate/severe periodontal disease than females (Table 10). Periodontal disease affected 27% of early medieval individuals in Great Britain (Roberts and Cox 2003, 194), and 37.5% of late medieval British individuals (Roberts and Cox 2003, 261).

Skeleton no.	Age/sex	No. affected	Observable teeth in sockets	% affected
1	Adolescent	13	26	50
2	Younger-middle male	27	30	90
5	Adolescent	8	26	30.8
	Total	*48*	*82*	*58.5*

Table 8—Levels of moderate/severe periodontal disease

2.8.5 Dental enamel hypoplasia

Dental enamel hypoplastic (DEH) defects can appear as a depressed line or a series of lines or pits on the surface of the enamel. They occur as a result of a disturbance to the growth of the organic matrix, which is later mineralised to form enamel. The disturbance to the growth is consequently reflected in the enamel (Mays 1998; Hillson 1986). The defects can occur as a result of a number of diseases and/or nutritional deficiencies including diarrhoea, parasitic infestations of the gut, scurvy, rickets, allergic reactions, vitamin deficiencies and general malnutrition (Mays 1998). Once the enamel is formed the growth patterns cannot be altered. Teeth calcify in childhood and therefore, enamel hypoplastic defects are a relation of stresses suffered by an individual in youth. By measuring the location of a lesion on a particular tooth it is possible to determine approximately the age at which the stress occurred, as teeth form at a known rate. However, it is noted that the range of stresses that may cause these defects are considerable and vary greatly in severity.

In this study hypoplasia was simply assessed as being present or absent. Only the two adolescents (Skeleton 1 and 2) with dentition displayed signs of DEH. As would be expected, the most commonly affected teeth were the canines as their crowns took longer to form than any other tooth (Goodman and Rose 1990) and were therefore at greatest risk of having their growth interrupted by bouts of ill health.

2.9 Joint disease

A process of gradual degeneration begins once growth of the bone and joint is complete. Degenerative joint disease (DJD) is indicated by marginal lipping however, the rate at which this occurs varies greatly between individuals and it appears to primarily occur as a result of repeated 'wear and tear' on the joints with degeneration of the articular cartilage (Ortner and Putschar 1981). The disease can be accelerated by occupational activities and may also be brought on by trauma. Osteoarthritis affects the synovial articulations, which include the major joints between the longbones, the small joints in the hands and feet and the facet joints between the vertebral bodies of the spine (Rogers and Waldron 1995). In cases of osteoarthritis, eburnation or polishing of the bone can occur as the bones of the joint rub off each other. The presence of eburnation is a particular characteristic of osteoarthritis. Where changes to the joints are less severe, for example, indicated by slight degrees of osteophytic lipping (additional bone growths) or porosity, degenerative joint disease is the preferred term.

2.9.1 Appendicular joint disease

Only Skeleton 2 (younger-middle adult) could be analysed for appendicular joint disease. This individual displayed bilateral joint degeneration of the shoulder joint (glenoid of the scapula bone). The right shoulder was more severely affected with moderate osteophytic lipping and mild porosity (Plate 2) compared to the mild osteophytic lipping and porosity recorded on the left shoulder. This may indicate that the right shoulder was more heavily involved in physical activities. The affected right glenohumeral joint is also related to the fact that up to 90% of individuals in a population are right-handed (Dangerfield 1994), resulting in increased demands on the right upper body and consequently an increased risk of developing joint disease. As the occurrence of joint disease is influenced by a number of biological as well as social and cultural factors, it is impossible to ascribe a particular condition to a specific activity or profession.

True osteoarthritis (eburnation) of the shoulder is rare, which may be explained by freedom from pressure stresses since it is not a weight-bearing joint (Adam 1981). The glenohumeral joint is most likely to become arthritic in the wake of a traumatic event such as a fracture of the anatomical neck or dislocation. This need not be a complete dislocation since an element of subluxation of the joint can lead to the humeral head impinging on the acromion process of the scapula (DePalma 1983). However, a much more common phenomenon is an injury or tear in the rotator cuff which surrounds the humeral head. This may lead to bone spur formation, porosity and, in serious cases, eburnation (Ogata and Uhthoff 1990).

Plate 2—Right glenohumeral joint disease (Skeleton 2 – younger-middle adult)

2.9.2 Vertebral osteophytosis

Vertebral osteophytes are exostoses of bone projection from the margins of the vertebral bodies (Plate 3). They vary in severity from slight projections to complete ankylosis or fusion of adjacent vertebral bodies. The vertebral bodies of Skeleton 2 (younger-middle male) were affected to varying degrees (mild, moderate and severe). The lower thoracic vertebrae (T8-T12) were particularly involved, corresponding with the maximum curvature of the spine where there is increased stress on the vertebrae (Boylston and Lee 2008). The lower cervical region (C5-C6) were also affected. This is a common pattern found in most archaeological samples (Boylston and Lee 2008). The lumbar vertebrae were not present for analysis.

Plate 3—Vertebral osteophytes (Skeleton 2 – younger-middle male)

Plate 4—Schmorl's nodes (Skeleton 2 – younger-middle male)

2.9.3 Schmorl's nodes

Schmorl's nodes are pits or depressions on the surface of the vertebral bodies (Plate 4). They first occur during adolescence and young adulthood and are caused by the protrusion of the herniated disc into the adjacent body. Their incidence rate has been used to demonstrate the degree to which manual labour was carried out in the past, based upon the suggestion by Schmorl and Junghanns (1971) that they are closely associated with strenuous activity. Unlike the degenerative conditions, Schmorl's nodes do not increase in frequency with age.

Skeleton 2 (younger-middle male) displayed Schmorl's nodes in the lower thoracic spine (T6-T12). It appears that this individual was introduced to manual work at a young age. The obligation to carry severe workloads placed on adolescents and perhaps older children is not surprising in a society where child labour would be considered an important economic factor. Also in the medieval period it was customary for boys, in particular, to be apprenticed to craftsmen from fourteen years of age onwards (Orme 2001).

2.10 Metabolic disease

This is a disease of deficiency and excess of essential vitamins or minerals which produce a reaction in the skeleton, visible as a reduction in bone mass or an increase in bone density.

2.10.1 Non-specific indicator of stress

These are minor metabolic disorders evident by osseous change. They result from the stresses and strains placed on the body during development. They may be due to a variety of causes including nutritional deprivation, disease and parasitic infection. In general, these different aetiologies are difficult to identify due to the general nature of the pathological response. Used in isolation, they mean little but may be used to indicate or highlight the evidence for long-term stress. Dental enamel hypoplasia (DEH) has already been described under 'Dental health and disease' above.

2.10.1.1 Cribra orbitalia

Pitting and porosity on the orbital roof (cribra orbitalia) is among the most frequent pathological lesions seen in ancient human skeletal assemblages. Chronic iron-deficiency anemia has been widely accepted as the probable cause of this condition, therefore the prevalence of this condition has been used to infer living conditions conductive to dietary iron deficiency, iron malabsorption, and iron loss from both diarrheal disease and intestinal parasites in earlier human populations.

However, recent research by Walker *et al.* (2009) proposes that iron-deficiency anaemia cannot logically be considered the cause of the marrow expansion that produces some forms of cribra orbitalia based on haematological evidence. Instead he suggests the cause is from a diet deficient in vitamin B_{12}-rich animal foods combined with nutritional losses from parasite infections spread by poor sanitation. This produces vitamin B_{12} deficiency in mothers who would in turn transmit this deficiency in a heightened form to their nursing infants.

The lesions identified as cribra orbitalia can be attributed to a greater range of causes. Although anemia-induced marrow enlargement is probably a common cause of cribra orbitalia, other pathological processes such as those associated with scurvy, rickets, haemangiomas and traumatic injuries can also produce orbital roof lesions (Griffeth *et al.* 1997) that can appear identical to cribra orbitalia (Schultz 2001; Brickley and Ives 2006). As cribra orbitalia may often be associated with iron-deficiency anaemia, Walker *et al.* (2009) have shown that iron-deficiency anaemia cannot be their cause. Instead a co-deficiency of vitamin C and B_{12} combined explains the presence of this condition in archaeological populations.

Skeleton 1 (adolescent) displayed porosity identified as cribra orbitalia in the left orbit. This individual also had striation on the teeth related to DEH. When the prevalence of cribra orbitalia and enamel hypoplasia in the same individual is considered, it gives a good indication to those who were the poorest and most nutritionally deprived in a society. Individuals with cribra orbitalia were less likely to survive into adulthood.

Plate 5—Left cribra orbitalia (Skeleton 1 – adolescent)

2.11 Trauma

2.11.1 Fractures

A healed fracture, indicating an antemortem trauma, was identified in one individual (Skeleton 1 – adolescent). The left humerus had fused at the midshaft in a clear misalignment, with space where the bone did not fuse and large callus bone formation and were noted around the fracture point (Plate 6). There was no indication of any infection.

Skeleton 5 (adolescent) displayed a possible healed fracture of a left rib (Plate 7). The element was fragmentary therefore it was difficult to be conclusive about the fracture.

Plate 6—Left humerus healed fracture (Skeleton 1 – adolescent)

Plate 7—Possible healed rib fracture (Skeleton 5 – adolescent)

2.12 Neoplasms

Neoplasms cover diseases associated with the formation of tumours, although generally those seen in the bone are benign 'warty' lesions. A neoplasm, or tumour, is an uncontrolled growth of cells. Benign tumours tend to be slow-growing and remain localised. Malignant tumours are rare in archaeological bones but when they do occur they may be faster growing and spread to other parts of the body via the bloodstream or lymphatic system. Neoplasms may be bone forming, lead to bone destruction or cause a combination of both (Mays 1998, 127).

2.12.1 Osteochondromas (exostosis)

Osteochondromas (exostosis) are the most common neoplasm of bone and arise from the metaphysis (the wide portion) of bones. The tumours typically begin to grow before puberty and continue until bone maturation is reached. Tumours of the chest wall represent 2% of all clinical tumours of the body; they may be primary/metastatic, benign or malignant (Cemil and Purut 1997). Only 10% of rib tumors are benign, and osteochondromas, the most common benign bone tumour account for half of these (Pairolero 1994). Skeleton 5 (adolescent) displayed an exostosis on the inferior aspect of a left rib (Plate 8).

Plate 8—Osteochondromas (exostosis) on left rib (Skeleton 5 – adolescent)

2.13 Circulatory disorders

Disorders classified as circulatory involve a disturbance in normal blood circulation to the site or sites of the skeletal pathology, resulting in bone death (osteonecrosis) or disrupted growth.

2.13.1 Aseptic necroses

Aseptic necroses involve the death of a section of bone, generally at an epiphysis, through deficient blood supply. There is often a history of trauma to the joint, but some cases are idiopathic (i.e. have no identifiable cause).

2.13.1.1 Osteochondritis dissecans

Osteochondritis dissecans is a focal necrosis of bone on the articular surface of a synovial joint. The necrotic fragment splits away, leaving in the joint surface a pit with sclerotic (hardening of) margins. In this assemblage, two individuals (Skeleton 1 – adolescent; Skeleton 3 – adolescent) were affected with osteochondritis dissecans of the left proximal phalanx of the first toe at the metatarsophalangeal joint. This condition is characterized by pain, swelling, and tenderness at the joint. This condition may be caused by chronic repetitive overloading of the metatarsophalangeal joint (Kinoshita *et al.* 1998). Skeleton 1 also displayed the condition bilaterally on the navicular bone of the foot on the articular surface for the talus head (Plate 9).

Plate 9—Bilateral osteochondritis dissecans on navicular (foot) bones (Skeleton 1 – adolescent)

2.14 Congenital abnormalities

A typical adult human skeleton consists of 206 bones. Individuals may have more or fewer bones than this owing to anatomical variations. The most common variations include additional (i.e. supernumerary) cervical ribs or lumbar vertebra. Normally in human anatomy, the lumbar vertebrae are the five vertebrae between the rib cage and the pelvis. They are designated L1 to L5, starting at the top. Skeleton 1 (adolescent) however, had six lumbar vertebrae present.

3 DISARTICULATED HUMAN BONE

The term ‘disarticulated bone’ refers to skeletal elements that over time become disassociated from their primary context as a result of a variety of factors, including animal activity, erosion and, not least human behaviour – such as grave digging. It is standard practice to establish a minimum number of individuals (MNI) for a skeletal population. This is deduced on the basis of counting the numbers present of each individual element (e.g. the number present of the left proximal radius). A true MNI count for an assemblage takes into account the bone element, side, age, sex, articulation joint or occlusion in the case of sided teeth.

A small amount of disarticulated human bone (102 fragments) was recovered in association with Skeleton 2 (younger-middle male), Skeleton 3 (adolescent) and Skeleton 5 (adolescent) at College Green. It represents an additional one adult MNI (Table 9) to the five articulated skeletons, based on the presence of a left clavicle from Sample #12 (357).

Context	Sample	Associated skeleton	Code	Side	Age	Sex	Completeness (%)	Notes	Region	Quantity
343	-		IL		Adult		1-25		AXIAL	1
347	1	1	??				1-25	Human	UNKNOWN	1
350	4	2	??				1-25	Human	UNKNOWN	20
352	5	3	??				1-25	Human	UNKNOWN	10
357	12	5	QC	Right	Adult		76-100		AXIAL	1
357	12	5	QC	Left	Adult		76-100		AXIAL	1
357	12	5	SS	Right	Adult	Ambiguous	51-75	Glenoid - 28.03 mm = Ambiguous	AXIAL	1
357	12	5	HP		Subadult		1-25	Proximal humerus & humeral head – fusion = 0	ARM	1
357	12	5	QR	Right	Adult		1-25		AXIAL	6
357	12	5	QR	Left	Adult		1-25		AXIAL	3
357	12	5	QR		Adult		1-25		AXIAL	6
357	12	5	CX		Adult		1-25		CRANIAL	1
357	12	5	MY	Left	Subadult		1-25		CRANIAL	1
357	12	5	M7	Right	Subadult		76-100	Slight calculus	CRANIAL	1
357	12	5	CT		Adult		1-25	Mastoid process	CRANIAL	1
357	12	5	VC	Midline	Adult		76-100	C1 & C2	AXIAL	2
357	12	5	VC	Midline	Subadult		1-25		AXIAL	13
357	12	5	VT	Midline	Subadult		26-50		AXIAL	2
357	12	5	CO	Right	Adult		1-25	Condyle	CRANIAL	1
357	13	5	VC	Midline	Subadult		1-25		AXIAL	1
357	11	5	VT	Midline	Subadult		1-25		AXIAL	2
357	11	5	QR		Adult		1-25		AXIAL	1
357	11	5	YP		Adult		76-100	Distal	HAND	1
357	10	5	QR		Adult		1-25		AXIAL	2
357	10	5	IX		Adult		1-25		AXIAL	1
357	10	5	UD	Right	Subadult		1-25	Distal epiphysis - fusion = 0	ARM	1
357	10	5	??				1-25	Human	UNKNOWN	20

Table 9—Disarticulated human bone (see Appendix 2 for codes)

4 RADIOCARBON DATING

The radiocarbon dates obtained from the human bone are presented in Table 10 and dates to the late medieval/post-medieval period.

Lab Code	Sample ID	Material	$\delta^{13}C$ (‰)	Radiocarbon age BP	Calibrated Age Range (2σ)	Relative probability	Period
SUERC-66878	SK1	Human bone (right fibula)	-20.4	410 ± 29	cal AD 1431–1521 cal AD 1592–1620	84.0% 11.4%	Late medieval/ post-medieval
SUERC-66879	SK3	Human bone (left ulna)	-20.2	344 ± 29	cal AD 1466–1638	95.4%	Late medieval/ post-medieval
SUERC-66880	SK3	Human bone (rib fragment)	-20.4	359 ± 29	cal AD 1451–1530 cal AD 1541–1635	47.3% 48.1%	Late medieval/ post-medieval
SUERC-66881	SK4	Human bone (right fibula)	-20.3	335 ± 29	cal AD 1476–1641	95.4%	Late medieval/ post-medieval
SUERC-66882	SK5	Human bone (right ulna)	-20.4	453 ± 29	cal AD 1415–1473	37.6% 42.7% 15.1%	Late medieval

Table 10—Radiocarbon dating results

5 DISCUSSION

The College Green burials were located directly west-southwest of the gates of Trinity College in a 1 m wide trench, which ran to the north of the gates within the carriageway at College Green. The limestone masonry wall recorded in the trench overlay the burials. The wall may either relate to an earlier boundary of Trinity College or to 17th century buildings located adjacent to the college. Examination of historic maps and illustrations indicates that the boundary or curtilage wall of Trinity College was altered repeatedly from the late 17th century through to the late 18th century (Gilligan *et al.* 2016). Monitoring and excavation of Utilities Works at locations on Nassau Street, Grafton Street Lower, College Green and College Street (McQuade *et al.* 2016; Gilligan *et al.* 2016) identified evidence for various earlier iterations of the boundary. Previous investigations in the green space between the current boundary railings and front façade of Trinity College identified the remains of 17th century domestic buildings as well as an earlier boundary wall (Simpson 2002a, 98E0152ext.). Taken in conjunction with the radiocarbon dates, this would indicate that the wall is post-1640 in date and that the burials are pre-1640 in date (Table 10).

It is not clear as to whether the burials are associated with an ecclesiastical site or hospital. The assemblage may have been part of a larger cemetery, based on their close spacing, that extends beyond the limit of excavation. There are a number of recorded historical sites in close proximity to the excavated skeletons that date from the early medieval period (Hiberno-Norse/Viking) to the 17th century. The College Green burials were radiocarbon dated to the 15th–17th century (Table 10).

Prior to its modern incarnation as College Green, the open space was known as Hoggen Green, so-called because of the presence of at least two Viking *haugr* (burial mounds) here (Ó Floinn 1988; Clarke 1995). One of the mounds, "*Thingmote*" (RMP DU018-020132-) was demolished in 1646.

The Abbey of St. Mary de Hogges (DU018-020047) is thought to have stood in the south-western corner of Hoggen Green close to the contemporary St. Andrew's Church (RMP DU018-020072-) (Clarke 2002). This 12th century abbey was founded by Diarmait Mac Murchada and was up to 2 acres in size comprising a church and bell-tower, dormitory and chapter-house among other buildings. The exact locations of two other medieval religious foundations once located within the eastern suburb are as yet unknown. In 1665 the medieval parish church of St. Andrews was re-

created by an Act of Parliament and a church was built (1670–74) almost on the site of the present church, near the site of the large mound – "*Thingmote*" (RMP DU018-020132-).

The Augustinian Priory (DU018-020044-) of All Hallows was located where Trinity College now stands, directly east of the College Green burials. This was also founded by Diarmait Mac Murchada in c. 1162 (Duffy and Simpson 2009). The priory was dissolved in 1538 and the university established in 1592. In 1998 excavations in Library Square, Trinity College Dublin exposed the remains of five skeletons, orientated east-west and the remains of a medieval wall east of the college quadrangle which are thought to be associated with the priory (Simpson 2002a). On inspection of the pipe-trench the cemetery appears to be bounded on the north and west by the present buildings of Library Square (the Rubrics and the Old Library). The east and south extent is not known.

The 12th century hospital of St. James (RMP DU018-020430-) is thought to have been situated on Townsend Street North, to the northeast of Hoggen Green (Clarke 2002); however, the 1836 edition of the Ordnance Survey marks its location as that of the current day Bank of Ireland on the corner of College Green (Simpson 2010). It was founded for the poor and religious pilgrims. The first parliament was held in this building in 1661 and in 1728 the new parliament building, later used as the Bank of Ireland (1813), was built on this site.

On the northern side of the Green on Townsend Street North, a hospital (RMP DU018-020061-), known as "Carew's Hospital", was built by Sir George Carey for maimed soldiers in 1602 (De Courcy 1996, 20–21). This building is shown on Speed's Map of 1610 as "The Hospitall" (Number 10). Its purpose as a hospital was short-lived and it subsequently served a number of varying functions. The College Gate Apartments are presently located at this site.

St. Clement's Chapel (RMP DU018-020995-), located 100 m northeast of the excavated human remains, has no visible surface remains. According to Archbishop Alen there was formerly a chapel of St. Clement's situated in the vicinity of the River Steine, between the River Liffey and the Augustinian Abbey of All Hallows (Stout 2012). In one of the Deeds in the register of All Hallows it is described as lying 'before the Gate' of All Hallows (Clarke 2002, 20).

Graveyard (RMP DU018-020411-) is also in close vicinity (98 m east-northeast) to the College Green burials, but unfortunately there is no detail description of the site.

Hoggen Green was a site for a number of atypical executions. One such example is the public burning of Wicklow man Adam Dubh ("Black") O'Toole in the 14th century. One of the earliest

recorded executions on the Green, he was executed on 11 April 1327 for his claim that Holy Scriptures were nothing but fables (Independent 2010). Another example of an execution at Hoggen Green is that of Bishop Dermot O'Hurley, where he was tortured and hanged on 20 June 1584 (Catholic Ireland 2012). Religious persecution of Catholics in Ireland began under King Henry VIII (then Lord of Ireland) in 1533. In 1559, Queen Elizabeth I re-established the Church of England's separation from the Catholic Church. Some priests, bishops, and those who continued to pray for the pope were tortured and killed (Knight 2012). Accused of plotting to overthrow the Queen's government in Ireland, O'Hurley was repeatedly questioned and tortured. He persistently protested that his mission was one of peace and he had no information to give his captors. When the report of his execution spread in the city, some devout women carried his body with great respect to the Church of St. Kevin (near Kevin Street) where he was buried. A monument to his memory was erected there in 1992.

5.1 Life in 16th Century Ireland

The population of 16th century Ireland was estimated at about 1 million and the average life expectancy was just 28 years, when infant mortality was factored in (Dorney 2012). In the countryside, the staple crop was corn, which had the considerable disadvantage that it was difficult to grow and easy to destroy. Meat was only eaten on special occasions, except by the elite. The Irish poor's normal diet consisted of oatcakes, milk, curds, butter and cheese. Tillage was more common around the Pale (around Dublin and south County Wexford), where the common people survived on bread and thin soup made from cereals, peas and beans. At this date the potato had yet to be introduced from the New World. It made its appearance in about 1610 but did not become the staple food until the mid-18th century (Lenihan, 2008, 231). Localised food shortages or famines caused by bad weather were regularly noted by the annals. However, the two major famines in Ireland in the Tudor period were primarily manmade events as a military tactic in response to the followers of the Earl of Desmond in Munster (1582–83) and Hugh O'Neill in Ulster (1602-3).

In the late 16th century, Dublin city was a tightly knit place of around 5,000 people. It was also very small in area, an enclave hugging the south side of the Liffey of no more than 2 km² (Dorney 2015). Outside the city walls were suburbs such as the Liberties, on the lands of the Archbishop of Dublin, and Irishtown, where Gaelic Irish were supposed to live, having been expelled from the city proper by a 15th century law (Miller and Power 1979). Although the native Irish were not allowed to live inside the city walls, by 1577 many did so (Dorney 2015).

Dublin during the 16th century was governed by a small group of merchant families such as the Stanihursts, the Fyannes, the Sedgraves, the Fitzsimons, the Cusacks, the Redlows and the Fagans from whose ranks the mayor was usually selected (Dorney 2015). All citizens of Dublin – a coveted status available only to members of guilds, their families and descendants, elected aldermen, who in turn elected the Lord Mayor (Dorney 2015).

In the 16th century Dublin prospered. For the upper and middle classes there was an impressive rise in living standards. A writer said that they lived in houses 'so far exceeding their ancestors that they have thought rather to be another and new people than descendants of the old' (Lambert 2016). Previously most houses simply had a hole in the roof to let out smoke. In the 16th century chimneys became much more common, as did glass windows where previously they were a luxury few people could afford (Lambert 2016).

Although conditions improved for the well-off there were many beggars in Dublin. Many of them drifted in from the surrounding countryside. Furthermore, Dublin was still dirty and unsanitary, like all 16th century towns and it suffered from outbreaks of plague – one outbreak in 1579 killed thousands (Lambert 2016). Another tragedy in 1596 when a gunpowder store in Winetavern Street (800 m west of College Green) exploded, more than 120 people were killed (Lambert 2016).

Demographically the country recovered relatively quickly from the toll taken by both war and famine in the late 16th century. It has been estimated that by the middle of the 17th century, the population of Ireland had doubled from about one million to two million (Dorney 2012).

5.2 Funerary practices

Burial practices of the post-medieval period were established long before the 15th century: the use of coffins and a preference for west-east orientation for example, are all practices common many centuries before the post-medieval period and continued long after (Tarlow 2011, 20). At College Green, contrasting burial position and orientation of Skeletons 1–4 compared to Skeleton 5, indicate that there were two separate phases of burial, with Skeleton 5 being the earlier. This is also supported by the results of the radiocarbon dating analysis (Table 10).

It is unclear, due to the limits of excavation, if the burial of Skeletons 3 and 4 were interred at the same time or if a family plot was perhaps utilised.

5.2.1 Burial position

The dominant burial practice in late medieval Ireland was inhumation, in a supine position (that is, with the corpse placed lying on its back). Burials were also occasionally flexed (the legs drawn slightly upwards) or crouched (hip and knee joints drawn upwards by more than 90˚). Such burials have been interpreted as being contingent on events: hurried inhumations during times of war or disease; or as reflections of specific cultural practices: burials of marginalised people such as criminals or outlaws. There are, however, sometimes osteological reasons for some of the differences, therefore there is always a need to carefully consider the position of the body, the context of the burial and associated pathology in any attempts to ascribe meaning to unusual burial positions.

At College Green, the majority of the burials were placed on their side (Skeletons 1–3). Two flexed burials were identified within this cemetery (Skeletons 1 and 3). Perhaps rigor mortis played part in the burial position or just that less care was taken in the positioning of some individuals within a grave. Skeleton 5 was in the extended supine position.

5.2.2 Grave orientation

West–east orientated, extended, supine inhumations (lying face up with the head to the west; sometimes termed east–west oriented burials in excavation reports) are, however, the predominant form of burial in Ireland from the 4th century AD to the present. Although they are generally termed west–east burials, many such inhumations exhibit variations on this orientation, based around topographical or monumental features of graves.

At College Green, Skeletons 1–4 were orientated on a southwest-northeast axis or that of a slight variation. Notably different was Skeleton 5 which was orientated west-northwest – east-southeast. Excavations at Temple Lane, Dublin (Reid 1993, 93E0139) revealed a main group of early 13th – mid-14th century burials associated with Augustinian Friary of Holy Trinity. These burials were orientated west-east, however in addition to the larger group of skeletons, there was also a large pit or ditch which was found to contain the remains of six skeletons. The ditch was stratigraphically earlier than the larger group of skeletons. Most of the burials were aligned north-south, and several were in a crouched position. There were three adult females and three juveniles.

6 CONCLUSION

In such a small sample it is impossible to discuss demographic or health trends. For those individuals who are present, it is possible to say that they represent a young group, with four out of five individuals under the age of 18 years. Whether this is a product of spatial organisation of the cemetery or a true demographic trend is not possible to say. The burials appear to be in two phases, Skeleton 5 being earlier than Skeletons 1–4 based on radiocarbon dating results (Table 10), burial orientation and body position.

All major types of pathology were noted except infections– these included dental pathologies, degenerative joint disease, trauma as well as metabolic, neoplastic, circulatory and congenital conditions. The only adult present displayed degenerative joint changes which is associated with heavy physical labour and increasing age. The presence of metabolic conditions is suggestive of environmental stressors in the early lives of some individuals, which indicate that they were from a lower socio-economic background. Also, the longbone lengths measured to a younger age to that of the dental eruption age, which points towards malnourishment, despite the fact that the stature of Skeleton 2 was above average when compared to comparative assemblages.

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Appendix 1 – Catalogue of articulated human remains

Appendix 1 - Skeleton Catalogue

Headland Archaeology (Ireland) Ltd

Skele_ID	1	Location	College Green	Box_no	
Age_est	11-19.5	Age_category	Adolescent		
Est_sex		Stature			
Preservation	Good	Completeness	>75%		
Skele_pos	Flexed	Skele_Orien	SW-NE		
Grave_type	Simple				
Assoc_burials	DHB from soil sample #1				
Animal_bone_assoc	Sample #1				
Artefacts_assoc	14E0003:347:002-003 (pottery)				

Dental Inventory (Maxillae)

tooth	quan
11	PO
12	PO
13	PO
14	PO
15	PO
16	PO
17	PO
18	PO
21	PO
22	PO
23	PO
24	PO
25	PO
26	P
27	P

Dent Catalogue (Mandible)

tooth	quan
31	PO
32	PO
33	PO
34	PM
35	PO
36	PO
37	PO
38	PO
41	PO
42	PO
43	PO
44	PO
45	PO
46	PO
47	PO
48	PO

Notes	Lying on L side. Calculus, PD, DEH. L humerus healed fracture. Supernum. lumb. vert. Bilat. navicular necrosis. L necrosis prox foot phal. L mod CO. LB length & epiph. fusion measure younger than dental erupt, pubic sym. & auric. Tooth 27 isotope analysis		
Analysed_by	Carmelita Troy	Analysis_date	17/11/2014

Skele_ID	2	Location	College Green	Box_no	
Age_est	30-35	Age_category	Younger Middle Adult		
Est_sex	M	Stature	172		
Preservation	Good	Completeness	~50%		
Skele_pos	Flexed	Skele_Orien	S-N		
Grave_type	Simple				
Assoc_burials	DHB from soil sample #4				

Animal_bone_assoc	Sample 2
Artefacts_assoc	14E0003:350:002 (pottery)

Dental Inventory (Maxillae)

tooth	quan
11	PO
12	PO
13	PO
14	PO
15	PM
16	PO
17	PO
18	PO
21	PO
22	PO
23	PO
24	PO
25	PO
26	PO
27	PO
28	PO

Dent Catalogue (Mandible)

tooth	quan
31	PO
32	PO
33	PO
34	PO
35	PO
36	PO
37	PO
38	PO
41	PO
42	PO
43	PM
44	PO
45	PO
46	PO
47	PO
48	PO

Notes	Lying on R side. SSW-NNE. Calculus, PD. Bilateral shoulder DJD. Cervical & thoracic DJD (OP), Thoracic Schmorl's nodes. Costal DJD. Tooth 37 sampled for isotope analysis		
Analysed_by	Carmelita Troy	Analysis_date	18/11/2014

Skele_ID	3	Location	College Green	Box_no	
Age_est		Age_category	Adolescent		
Est_sex		Stature			
Preservation	Good	Completeness	~50%		
Skele_pos	Flexed	Skele_Orien	SW-NE		
Grave_type	Multiple				
Assoc_burials	SK 4 & DHB from soil sample #5				
Animal_bone_assoc	Sample 3				
Artefacts_assoc	14E0003:352:001 (clay pipe stem)				
Dental Inventory (Maxillae)		Dent Catalogue (Mandible)			
Notes	Lying on left site. Facing SK4. Left proximal foot phalanx (of MT1) - necrosis of proximal aspect. MWD sample #3				
Analysed_by	Carmelita Troy	Analysis_date	17/11/2014		

Skele_ID	4	Location	College Green	Box_no	
Age_est	11-19	Age_category	Adolescent		

Est_sex		Stature	
Preservation	Good	Completeness	<25%
Skele_pos	Flexed	Skele_Orien	SW-NE
Grave_type	Multiple		
Assoc_burials	SK3		
Animal_bone_assoc			
Artefacts_assoc			
Dental Inventory (Maxillae)		Dent Catalogue (Mandible)	
Notes	Lying on R side. Facing SK 3. Faint proximal epiphyseal line on right tibia. Tibia longbone length = 11 years old. 163.54 +/- 3.37 cm (5'4.4")		
Analysed_by	Carmelita Troy	Analysis_date	17/11/2014

Skele_ID	5	Location	College Green	Box_no	
Age_est	11.5-16.4	Age_category	Adolescent		
Est_sex		Stature			
Preservation	Moderate	Completeness	~75%		
Skele_pos	Extended Surpine	Skele_Orien	W-E		
Grave_type	Simple				
Assoc_burials	DHB from soil sample 10-13				
Animal_bone_assoc	Sample 4				
Artefacts_assoc	14E0003:357:004, 007 (pottery); 14E0003:357:005-006 (glass)				

Dental Inventory (Maxillae)

tooth	quan
11	PO
12	PO
13	PO
14	PO
15	PO
16	PO
17	PO
18	P
21	PO
22	PO
23	PO
24	PO
25	PO
26	PO
27	PO
28	PO

Dent Catalogue (Mandible)

tooth	quan
31	PO
32	PO
33	PO
34	PO
35	PO
36	PO
37	PO
38	PO
41	PO
42	PO
43	PO
44	PO
45	PO
46	PO
47	PO
48	P

Notes	WNW-ESE. Left rib inferior exostosis. Possible left rib healed fracture.

	Calculus, periodontal disease, DEH. Tooth 47 sampled for isotope analysis. Mortar sample #10.		
Analysed_by	Carmelita Troy	Analysis_date	17/11/2014

Appendix 2 – Disarticulated human bone codes (Chamberlain and Witkin 2000)

??	Unknown	X7	Upper M2	UP	Ulna-proximal
GB	Burnt bone	X8	Upper M3	UM	Ulna-midshaft
GC	Calcified soft tissue	MC	Mandibular body	UD	Ulna-distal
GT	Soft tissue	MM	Mandible	YC	Carpal
KK	Skeleton	MR	Mandibular ramus	YY	Handbone
WW	Unknown (faunal)	MS	Mandib. Symphsis	YS	Scaphoid
AI	Auditory: Incus	MY	Mandibular condyle	YL	Lunate
AM	Auditory: Malleus	XD	Demimaxilla	YQ	Triquetral
AS	Auditory: Stapes	XP	Premaxilla	YI	Pisiform
CC	Cranium	XX	Maxilla	YZ	Trapezium
CE	Endocast	PP	Permanent tooth	YD	Trapezoid
CF	Frontal	PR	Perm. Tooth root	YA	Capitate
CH	Ethmoid	PX	Tooth crown frag.	YH	Hamate
CL	Lacrimal	QM	Manubrium	YM	Metacarpal
CN	Nasal	QS	Sternum	YP	Phalanx (hand)
CO	Occipital	QX	Sternum frag.	LS	Sesamoid
CP	Parietal	QC	Clavicle	F?	? Femur
CS	Sphenoid	S?	? Scapula	FF	Femur
CT	Temporal	SA	Acromion	FP	Femur-proximal
CV	Calvaria	SB	Scapula blade	FM	Femur-midshaft
CX	Vault fragment	SC	Coracoid	FD	Femur-distal
CZ	Zygomatic	SG	Scap. glenoid cavity	LL	Patella
QH	Hyoid	SS	Scapula	T?	? Tibia
D1	Upper dI1	SX	Scapula frag.	TT	Tibia
D2	Upper dI2	QR	Rib	TP	Tibia-proximal
D3	Upper dC	VC	Cervical vertebra	TM	Tibia-midshaft
D4	Upper dM1	VT	Thoracic vertebra	TD	Tibia-distal
D5	Upper dM2	VL	Lumbar vertebra	B?	? Fibula
E1	Lower dI1	VS	Sacrum	BB	Fibula
E2	Lower dI2	VY	Coccyx	BP	Fibula-proximal
E3	Lower dC	VV	Vertebra	BM	Fibula-midshaft
E4	Lower dM1	VX	Vertebra fragment	BD	Fibula-distal
E5	Lower dM2	I?	? Hip bone	ZT	Tarsal bone
D?	? Deciduous tooth	IA	Acetabulum	ZZ	Footbone
DD	Deciduous tooth	II	Hip bone	ZA	Talus
DR	Decid. tooth root	IL	Ilium	ZC	Calcaneus
DX	Decid. crown frag.	IP	Pubis	ZN	Navicular
M1	Lower I1	IS	Ischium	ZE	Medial cuneiform
M2	Lower I2	IX	Hip bone frag.	ZI	Intermed. cuneiform
M3	Lower C	H?	? Humerus	ZL	Lateral cuneiform
M4	Lower P1	HH	Humerus	ZU	Cuboid
M5	Lower P2	HP	Humerus-proximal	ZM	Metatarsal
M6	Lower M1	HM	Humerus-midshaft	ZP	Phalanx (foot)
M7	Lower M2	HD	Humerus-distal		
M8	Lower M3	R?	? Radius		
X1	Upper I1	RR	Radius		
X2	Upper I2	RP	Radius-proximal		
X3	Upper C	RM	Radius-midshaft		
X4	Upper P1	RD	Radius-distal		
X5	Upper P2	U?	? Ulna		
X6	Upper M1	UU	Ulna		

Appendix 9 – Pottery Report

Analysis of the Pottery Recovered from the Luas Cross City Project: College Green Excavation (14E0003)

Alison Kyle

1 INTRODUCTION

1.1 The Assemblage

A total of 15 sherds of pottery were recovered during excavations at College Green (14E0003). Eight sherds have been identified as medieval in date, with the rest being post-medieval to modern. These have been analysed and are discussed in turn below according to category; each sherd has been recorded and catalogued in Table 3.

1.2 Methodology

With regards the pottery, analysis was carried out in hand-specimen with use of a hand-lens to identify inclusions present where relevant. Relevant parameters were recorded on a sherd-by-sherd basis to create a catalogue of the assemblage using Microsoft Excel. This catalogue is based on the National Museum of Ireland's requirement that each individual find have an individual find number. Where sherds were found to refit this information has been recorded. A summary of pottery types present is summarized in Table 1, Tables 2 summarises the contextual information for the pottery. Finally, the pottery catalogue is presented in Tables 3.

Pottery Type	**14E0003**
Dublin-type Medieval	343, 348, 350, 357
Tin Glazed Earthenware	343, 347
White Stoneware	343
Blackware	343, 357
Glazed Red Earthenware	347

Table 1—Summary of the pottery types present by context (14E0003)

2 ANALYSIS

2.1 Medieval Pottery

Of the pottery recovered from this site, eight sherds have been identified as medieval in date.

2.1.1 ?Dublin-type ware

14E0003:343:002, 003, 004, 005, 14E0003:350:002, 14E0003:348:001, 002, 14E0003:357:007

The eight sherds of medieval pottery are all suggested to derive from Dublin-type ware vessels. Three sherds refit (14E0003:343:003, 004 and 005) to form a body section seemingly approaching the base of a jug. Splashes of a patchy green glaze are present.

A second vessel is represented by (14E0003:343:002), this is a hard, well-fired fabric with oxidised external surface and reduced internal surface. The base is flat with a slight foot with walls splaying to a probable bulbous bodied jug form. Small splashes of green glaze are present on the internal surface.

A third vessel is represented by two sherds (14E0003:348:001, 002) representing a vessel of uncertain form with a soft red earthenware fabric with a sandy texture; firing is incompletely oxidised with a grey core. Visible inclusions include abundant quartz, occasional red iron ore, and possible sandstone.

Plate 1—?Dublin-type ware (14E0003:348:001, 002 and 14E0003:343:003)

The remaining two sherds were particularly diminutive fragments of which little may be said.

These sherds are suggested to derive from vessels dating from the mid 13th–14th centuries.

2.2 The Post Medieval Pottery

A total of seven sherds of pottery were identified as post-medieval to modern in date.

2.2.1 Tin Glazed Earthenware

14E0003:343:007, 14E0003:347:004

Two sherds of Tin Glazed Earthenware are present in this assemblage; this ware is also colloquially known as ‘delft’. Of these, one (14E0003:347:004) represents the rim sherd of a plate with a soft, buff-coloured earthenware fabric overlain by a thick opaque bluish-tinged tin glaze. The other (14E0003:343:007) also represents the rim sherd of a plate with a soft, buff-coloured earthenware fabric overlain by a thick opaque bluish-tinged tin glaze. The rim of this vessel is decorated with hand-painted cobalt blue - motif uncertain.

The colour and opacity of the glaze is achieved by the addition of tin to the lead glaze, this obscured the off-white fabric, making the vessel appear white in what was an attempt by European potters to imitate Chinese porcelain (Draper 2001, 25). Tin from Cornwall is known to have been used for these glazes (*ibid*. 25).

Tin Glazed Earthenware was predominantly used as tableware, with British production commencing in the late 16th century with the arrival in Norwich of migrant potters from Antwerp (Hume 1969, 105) and continuing in Britain and Ireland through the 17th and 18th centuries (McCutcheon 2003, 229). Production centres are known to have existed in Dublin and Youghal (Gahan and Twohig 1997, 145). It is difficult to determine the origin of production for Tin Glazed Earthenwares found in Ireland, as natively produced vessels were in use alongside both British and Dutch imports.

2.2.2 Red Earthenwares

2.2.2.1 Blackwares

14E0003:343:001, 14E0003:357:004

Two undiagnostic sherds of Blackware are present in this assemblage, one of these (14E0003:357:004) was a very small, fine rim sherd recovered from retents during post-excavation soil sample processing. Decoration present is restricted to the application of black glaze; this was a lead glaze which was given its colour by the addition of iron.

The provenance of the vessels represented remains uncertain; it is generally difficult to determine the provenance of Blackwares, hindered in part by the shared range of forms and lack of distinct inclusions. Blackware was produced in both Britain and Ireland from the 18th century, with imports to Ireland from the Buckley potteries commonplace. The vessels represented are suggested to date between the 18th–20th centuries.

2.2.2.2 Glazed Red Earthenware

14E0003:347:002, 003

Two minute sherds of undiagnostic red earthenware vessels were recovered from retents during post-excavation soil sample processing. No glaze is present on these small sherds, but that is not to say the entire vessel was unglazed.

While the forms of the vessel/s represented could not be determined, Glazed Red Earthenwares were typically utilised in a domestic context, serving the function of storage and cooking vessels. The sherds present are suggested to derive from vessels which date between the 18th–20th centuries. These domestic wares were produced in both England and Ireland, with English examples frequently imported into Ireland.

2.2.3 White Stoneware

14E0003:343:006

A single sherd represents the White Stoneware assemblage from this site; the vessel form represented is a possible cup with applied floral sprig moulding. White Stoneware was the dominant tableware of the mid - late 18th century, gradually replaced by the newly developed creamware from the mid 18th century onwards.

3 DISCUSSION

The three sherds present in this assemblage were all recovered during the post-excavation processing of soil samples #1, #4, #11 and #13. Unfortunately, their diminutive scale hinders their contribution to the interpretation of the contexts from which they were removed. This is particularly unfortunate given the nature of these contexts – all being fills of Tudor period burials. What these finds do serve to illustrate, however, is that some level of contamination of these Tudor contexts did occur.

The pottery types present, although limited in number, are typical of Dublin assemblages of this period.

Context	Ceramic Types Present	Date Range
343	?Dublin-type Ware, Tin Glazed Earthware, White Stoneware, Blackware	13th–20th C
347	Tin Glazed Earthenware, Glazed Red Earthenware	17th–20th C
348	?Dublin-type Ware	13th–14th C
350	?Dublin-type Ware	13th–14th C
357	?Dublin-type Ware, Blackware	13th–20th C

Table 2—Summary of pottery types present in each context and the date range (14E0003)

4 RECOMMENDATIONS

It is recommended that no further analysis of this assemblage is required. It is recommended that the following are photographed: ?Dublin-type ware 14E0003:348:001, 002 and 14E0003:343:003

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Site	Context	Find Number	Type	Vessel Form	Description	Date Range
14E0003	343	001	Blackware	?	Reduced coarse earthenware fabric with a purplish appearance and abundant quartz inclusions. Fabric imparts a pimply appearance through a thin glaze on both internal and external surfaces.	18th–20th C
14E0003	343	002	?Dublin-type ware	?Jug	Hard, well-fired fabric with oxidised external surface and reduced internal surface. Base is flat with a slight foot with walls splaying to a probable bulbous bodied jug form. Small splashes of green glaze on internal surface	13th–14th C
14E0003	343	003	?Dublin-type ware	?Jug	Refit with 14E0405:343:004 and 005; completely oxidised fabric with abundant quartz inclusions, occasional limestone and possible occasional sandstone. Splashes of green glaze are present on external surface. Possibly represents a jug.	13th–14th C
14E0003	343	004	?Dublin-type ware	-	Refit with 14E0405:343:003 and 005	13th–14th C
14E0003	343	005	?Dublin-type ware	-	Refit with 14E0405:343:003 and 004	13th–14th C
14E0003	343	006	White Stoneware	?Cup	Small sherd of a white stoneware fabric. Vessel is fine-walled and possesses applied floral sprig moulding (not coloured).	mid - late 18th C
14E0003	343	007	Tin Glazed Earthenware	Plate	Rim sherd of a plate with a soft, buff-coloured earthenware fabric overlain by a thick opaque bluish-tinged tin glaze. The rim is decorated with hand-painted cobalt blue - motif uncertain.	17th–18th C
14E0003	347 (soil sample #1)	002	Unidentifiable Red Earthenware	?	Minute fragment recovered during post-excavation soil processing.	18th–20th C
14E0003	347 (soil sample #1)	003	Unidentifiable Red Earthenware	?	Minute fragment recovered during post-excavation soil processing.	18th–20th C

14E0003	347 (soil sample #1)	004	Tin Glazed Earthenware	?	Minute fragment recovered during post-excavation soil processing.	18th C
14E0003	348	001	?Dublin-type ware	?	Small, heavily abraded sherd of a soft red earthenware fabric with a sandy texture; firing is incompletely oxidised with a grey core. Visible inclusions include abundant quartz, occasional red iron ore, and possible sandstone. Vessel form uncertain, same vessel as 14E0405:348:002.	13th–14th C
14E0003	348	002	?Dublin-type ware	?	Small, heavily abraded sherd of a soft red earthenware fabric with a sandy texture; firing is incompletely oxidised with a grey core. Visible inclusions include abundant quartz, occasional red iron ore, and possible sandstone. Vessel form uncertain, same vessel as 14E0405:348:001.	13th–14th C
14E0003	350 (soil sample #4)	002	?Dublin-type ware	?	Minute fragment recovered during post-excavation soil processing.	13th–14th C
14E0003	357 (soil sample #11)	004	Blackware	?	Very small fine rim sherd recovered during post-excavation soil processing.	18th–20th C
14E0003	357 (soil sample #13)	007	?Dublin-type ware	?	Minute fragment recovered during post-excavation soil processing.	13th–14th C

Table 3—Catalogue of the pottery from 14E0003

Appendix 10 –Small Finds Report

Analysis of the Finds Recovered from the Luas Cross City Project: College Green Excavation (14E0003)

Alison Kyle

1 INTRODUCTION

1.1 The Assemblage

A total of six small finds were recovered from this site excavated, recovered at College Green (14E0003) and excavated in advance of the Luas Cross City project. These finds have been analysed, catalogued and are discussed in this report. The finds are all of post-medieval/modern date from three contexts (Table 1), and are discussed in turn below, and catalogued in Table 2.

Context	Finds Present	Date Range	Context Description
343	CTP	17th–20th century	Wall
352	CTP	17th–20th century	Fill of grave containing Skeleton 3
357	Window glass	18th–20th century	Fill of grave containing Skeleton 5

Table 1—Summary of small finds present in each context and the suggested date range (14E0003)

2 GLASS

A total of two shards of glass were recovered from a single context during these excavations; both were retrieved from during the post-excavation processing of soil sample #13. These have been analysed and are discussed in turn below according to category; each sherd has been recorded and catalogued in Table 2.

2.1 ?Bottle Glass

14E0003:357:006

A particularly small shard of glass was recovered during the post-excavation processing of soil sample #13. This glass is green and heavily devitrified, and is suggested to derive from a bottle. Due to the diminutive scale it is not possible to elucidate the method of manufacture, which in turn would allow the dating of the bottle to be more closely refined.

2.2 Window Glass

14E0003:357:005

A single small shard of flat glass has been identified as window glass. This shard is particularly diminutive, having been recovered during the post-excavation processing of soil sample #13.

Due to the diminutive nature of the objects it is difficult to interpret beyond the general identification.

2.3 Discussion

These glass finds were recovered from the fill of a grave (357), where associated pottery bore a broad date range of 13th–20th century.

3 CLAY TOBACCO PIPE

14E0003:343:008, 009, 010, 14E0003:352:001

Four stem fragments were recovered during excavations with a particularly diminutive fragment recovered from the post-excavation soil processing of sample #5 (14E0003:352:001). Little can be said of these stem fragments due to their size.

4 RECOMMENDATIONS

It is recommended that no further analysis of this assemblage is required.

Site	Context	Find Number	Material	Form/Type	Description	Date Range
14E0003	357 (soil sample #13)	005	Glass	Window glass	Minute shard of colourless window glass.	19th–20th C
14E0003	357 (soil sample #13)	006	Glass	?Bottle glass	Minute shard of green glass, heavily devitrified and possibly derived from a bottle.	18th–20th C
14E0003	343	008	Kaolin	Stem	Stem fragment, slightly oval in cross-section due to mould seams.	-
14E0003	343	009	Kaolin	Stem	Stem fragment with slight traces of seam line remaining.	-
14E0003	343	010	Kaolin	Stem	Small stem fragment	-
14E0003	352 (soil sample #5)	001	Kaolin	Stem	Very small fragment of a stem, recovered from post-excavation soil processing.	-

Table 2—Catalogue of the small finds from 14E0003

Appendix 11 – Metalworking Debris Report

Assessment of possible archaeometallurgical residues from College Green Excavation (14E0003)

Dr. Tim P. Young

ABSTRACT

The submitted material comprised a single concretionary lump from grave fill (352) of Skeleton 3 (retent from soil sample #3). The piece comprises coarse sand and granules bound by a ferruginous cement. Although the core is not certain, the form suggests that the piece may have formed within a coarse sandy sediment around a small corroding nail. The piece is not an archaeometallurgical residue.

1 METHODS

All materials were examined visually with a low-powered binocular microscope where required. As an evaluation, the materials were not subjected to any high-magnification optical inspection, not to any form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

This project was commissioned by Carmelita Troy of Rubicon Heritage Services Ltd.

2 RESULTS

The single piece of submitted material is a concretion formed of coarse sand/granules bound by a ferruginous cement. The piece is not an archaeometallurgical residue.

Although concretions form by various mechanisms during sediment diagenesis, this concretion is magnetic, suggesting that it formed on an iron core. The overall form of the concretion is suggestive of a small hand-made nail with a square-sectioned shank and asymmetric head. Confirmation of the nature of the core could be sought by means of an X-radiograph.

3 INTERPRETATION

The piece is a small concretion formed by corrosion of iron with a coarse sandy host sediment. The core may have been a small iron nail.

4 CONCLUSION

It is likely that the piece would probably not yield further useful information on detailed analysis, so no further analysis is recommended, although X-radiography might be employed to confirm it is a corroded nail.

Appendix 12 – Isotope Report

Isotopic analyses of College Green, Dublin (14E0003)

Dr. Derek Hamilton, Dr. Kerry Sayle and Dr. Elaine Dunbar (SUERC)

1 INTRODUCTION

Five samples of human bone from five individuals buried in College Green, Dublin, were submitted to the Scottish Universities Environmental Research Centre (SUERC) for radiocarbon dating by accelerator mass spectrometry (AMS). As part of this procedure, the purified bone collagen routinely undergoes carbon and nitrogen stable isotope analysis to examine both the quality of the bone collagen being dated and to determine whether an individual may have consumed protein from the marine environment, which would offset the radiocarbon age and require a form of correction. In addition to the five bone samples, tooth enamel from three of the individuals was submitted for strontium and oxygen isotope analysis, which can be useful for determining the area where an individual was born, thus identifying individual migration between childhood and death/interment.

2 $\delta^{13}C$ AND $\delta^{15}N$ STABLE ISOTOPE METHODS

The five bone samples were all pre-treated following Dunbar *et al*. (2016). Carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) were analysed using a Thermo Scientific Delta V Advantage continuous-flow isotope ratio mass spectrometer (CF-IRMS) coupled via a Thermo Scientific ConfloIV to a Costech ECS 4010 elemental analyser (EA) fitted with a pneumatic auto sampler. Bone collagen samples were weighed into tin capsules (~600 *μ*g) and combusted in the presence of oxygen in a single reactor containing tungstic oxide and copper wires at 1020°C to produce N_2 and CO_2. A magnesium perchlorate trap was used to eliminate water produced during the combustion process and the gases were separated in a 2 m stainless steel Porapak QS 50–80 mesh GC column heated to 70°C. Helium (100 ml/min) was used as a carrier gas throughout the procedure. N_2 and CO_2 enter the mass spectrometer via an open split arrangement within the ConfloIV and are analysed against their corresponding reference gases. For every ten unknown $\delta^{13}C$ and $\delta^{15}N$ samples, in-house gelatine standards, which are calibrated to the International Atomic Energy Agency (IAEA) reference materials USGS40 (L-glutamic acid, $\delta^{13}C_{V\text{-}PDB} = -26.39‰$), USGS41 (L-glutamic acid, $\delta^{13}C_{V\text{-}PDB} = +37.63‰$), IAEA-CH-6 (sucrose, $\delta^{13}C_{V\text{-}PDB} = -10.45‰$), USGS25 (ammonium sulphate, $\delta^{15}N_{AIR} = -30.41‰$), IAEA-N-1 (ammonium sulphate, $\delta^{15}N_{AIR} = +0.43‰$)

and IAEA-N-2 (ammonium sulphate, $\delta^{15}N_{AIR}$ = +20.41‰), are run in duplicate. Results are reported (Table 1) as per mil (‰) relative to the internationally accepted standards VPDB and AIR, with 1σ precisions of ±0.2‰ and ±0.3‰, for $\delta^{13}C$ and $\delta^{15}N$ respectively (Sayle *et al*. 2013).

3 $\delta^{18}O$ AND $^{87}Sr/^{86}Sr$ ISOTOPE METHODS

Oxygen and strontium isotope analyses were made on tooth enamel from three burials (Table 1). To extract the enamel from teeth the crowns were detached from the roots, placed in a 10 M NaOH solution and heated to approx. 80°C for 8 hrs and then allowed to cool. The dentine was scraped from the enamel using a dissecting needle and the procedure repeated until all the dentine had been removed. The samples were then repeatedly rinsed with 0.5 M HCl to remove all traces of the NaOH and finally rinsed with ultra-pure water. The isolated enamel samples were then oven dried overnight and transferred to labelled glass vials to await analyses.

Strontium was separated from the enamel samples using conventional cation exchange methods and loaded onto single Re filaments using a Ta_2O_5 activator for mass spectrometry. The total procedural blank was <200 pg. The samples were analysed on a VG Sector 54–30 mass spectrometer operated in dynamic (3 cycle) multi-collection mode. Instrumental mass fractionation was corrected to $^{86}Sr/^{88}Sr$ = 0.1196 using an exponential fractionation law. Data were collected as 12 blocks of 10 ratios. NIST SRM-987 was used as a quality control monitor.

To analyse the biogenic carbonate ($\delta^{18}O_{carb}$) in tooth samples, the enamel was dissolved completely in '103%' phosphoric acid overnight at 25°C in sealed, evacuated tubes. The CO_2 evolved was isolated, cryogenically purified and analysed by mass spectrometry. The relative abundances of masses 44, 45 and 46 in the gases were obtained using a VG Optima Series dual inlet Isotope Ratio Mass Spectrometer. The relative isotopic abundances were compared with those of a working standard reference gas of known stable isotope composition. In practice, this was achieved by automatic valve switching and data collection whereby reference gas and sample gas are alternately bled into the mass spectrometer, switching ten times over a period of several minutes, thus obtaining a mean delta value for the sample with respect to the reference gas. The reference gas was calibrated to the international standard using reference materials of known isotope composition (NBS-19, IAEA-CO1 and IAEA CO-8), and the delta (δ) values of the samples were calculated with respect to these international standards. All $\delta^{18}O_{V\text{-}PDB}$ values were

then converted into the V-SMOW scale using the published conversion equation of Chenery *et al*. (2012).

4 RESULTS

The $\delta^{13}C$ and $\delta^{15}N$ values from the samples of bone collagen indicate that all five individuals had very similar diets that contained almost no protein from marine or freshwater sources (Figure 1). The results of the $\delta^{18}O$ and $^{87}Sr/^{86}Sr$ analyses are not as homogenous. The $^{87}Sr/^{86}Sr$ values for Skeletons 2 and 5 (Figure 2) are within the range produced on tooth enamel from 17 humans and two pigs from primarily Viking deposits in Dublin (Knudson *et al*. 2012; Montgomery *et al*. 2014). The value for Skeleton 1 is slightly enriched in comparison, providing the suggestion that this individual was not born and raised in the Dublin area. This is further demonstrated in the difference between the $\delta^{18}O_{phos}$ value for Skeleton 1 and those for the other two individuals (Figure 3). When converted to values equivalent to drinking water (Table 1; $\delta^{18}O_{dw}$), the values for Skeletons 2 and 5 fall at the upper end of the range of −6.5‰ to −7.0‰ suggested by Montgomery *et al*. (2014) for the Dublin area, while the value for Skeleton 1 falls well outside this range.

5 DISCUSSION

The stable isotope ($\delta^{13}C$ and $\delta^{15}N$) analyses on the bone collagen suggest homogeneity in the diets of the five individuals. The $\delta^{18}O$ and $^{87}Sr/^{86}Sr$ analyses on two individuals (Skeletons 2 and 5) are in complete agreement with expected values for Dublin, based on primary data collected from Viking-age and pre-Viking-age burials from other archaeological sites in the city. The results from Skeleton 1 stand out as different from the other two individuals, which may signify that this individual was born and raised in a different location from the other two. While the $\delta^{18}O_{dw}$ value (−7.9‰) is slightly lower than the other individuals or the expected range for Dublin, it is not outside the range for the British Isles, and within expectation for most of north-east Ireland. The $^{87}Sr/^{86}Sr$ value (0.7120) is slightly higher than known values from the other archaeological tooth enamel measured from Dublin, and outside the range provided by Knudson *et al*. (2012) for archaeological enamel and bone from Dublin (0.70836–0.71114; 2σ; n = 22), thus suggesting this individual came from outside the local area. Within the British Isles, strontium values as high as 0.7120 are noted in published data from human and animal remains from Wales and south-west England (Knudson *et al*. 2012, fig. 1), which could suggest that this individual was born in Britain. However, Snoeck *et al*. (2016) have recently published values this high for modern plant samples from Northern Ireland, and so this too is a plausible location for their birth.

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Sample ID	Material	Lab ID	Radiocarbon age (BP)	$\delta^{13}C_{gas}$ (‰)	$\delta^{13}C_{cf}$ (‰)	%C	$\delta^{15}N$ (‰)	%N	C:N	$^{87}Sr/^{86}Sr$	$\delta^{18}O_{carb}$ (‰)	$\delta^{18}O_{phos}$ (‰)	$\delta^{18}O_{dw}$ (‰)
Skeleton 1	right fibula	SUERC-66878	410 ±29	−20.4	−20.7	24.8	10.2	9.1	3.2				
	tooth enamel	GU-41529								0.712 ±0.0014	25.61 ±0.1	16.7	−7.9
Skeleton 2	left ulna	SUERC-66879	344 ±29	−20.2	−20.6	35.4	9.3	12.7	3.3				
	tooth enamel	GU-41530								0.7107 ±0.0013	26.24 ±0.1	17.4	−6.9
Skeleton 3	rib fragment	SUERC-66880	359 ±29	−20.4	−21.0	35.9	9.4	12.9	3.2				
Skeleton 4	right fibula	SUERC-66881	335 ±29	−20.3	−20.4	37.2	10.0	13.5	3.2				
Skeleton 5	right ulna	SUERC-66882	453 ±29	−20.4	−21.0	34.7	10.0	12.5	3.2				
	tooth enamel	GU-41531								0.7095 ±0.0016	26.12 ±0.1	17.3	−7.1

Table 1—Isotopic results from human bone and tooth enamel from College Green, Dublin

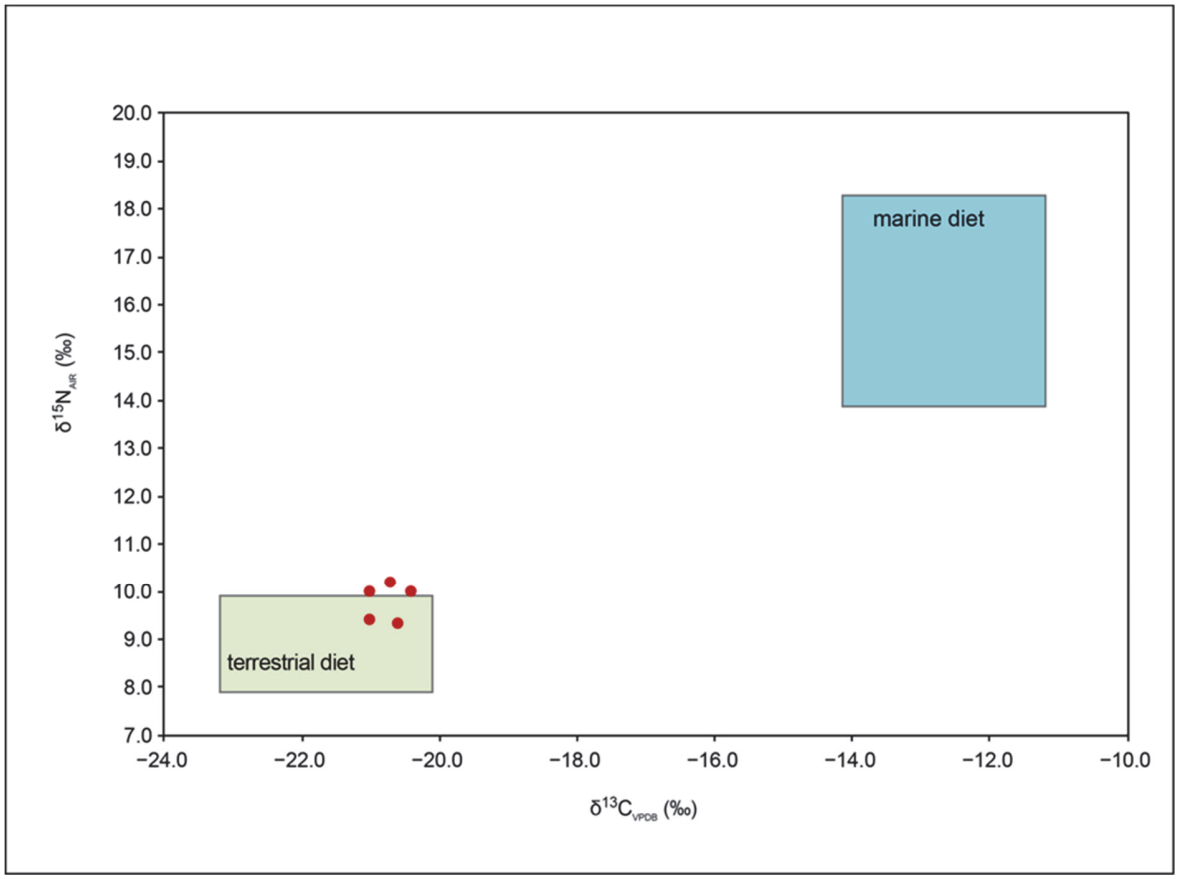


Figure 1—Plot of $\delta^{13}C$ and $\delta^{15}N$ values for the bone samples from College Green, Dublin. The boxes for the expected values of fully terrestrial versus fully marine values are based on the data of Mays (1998, fig 9.2)

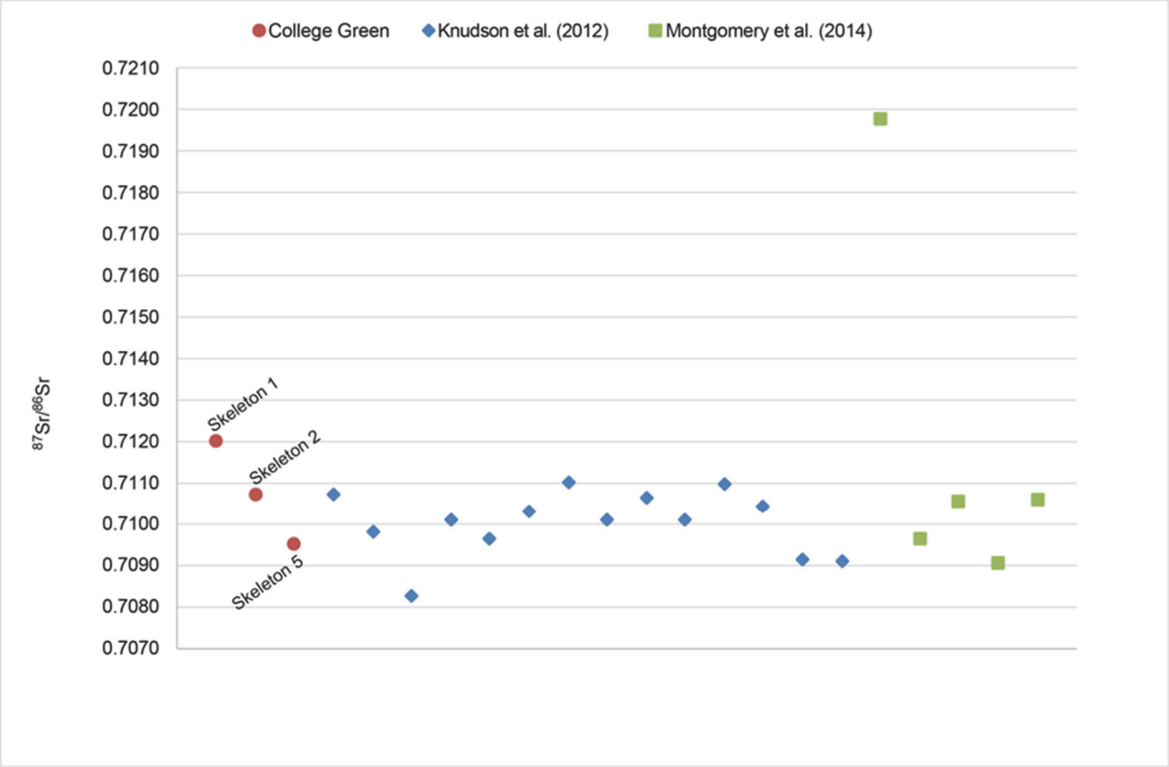


Figure 2—Plot of $^{87}Sr/^{86}Sr$ values from the tooth enamel of the burials from College Green, Dublin (red) with comparative data from tooth enamel from archaeological sites in Dublin: Fishamble Street, John's Lane, and Wood Quay (Knudson *et al*. 2012) and South Great Georges Street and Ratoath (Montgomery *et al*. 2014). The two furthest right data points from Knudson's dataset are pigs.

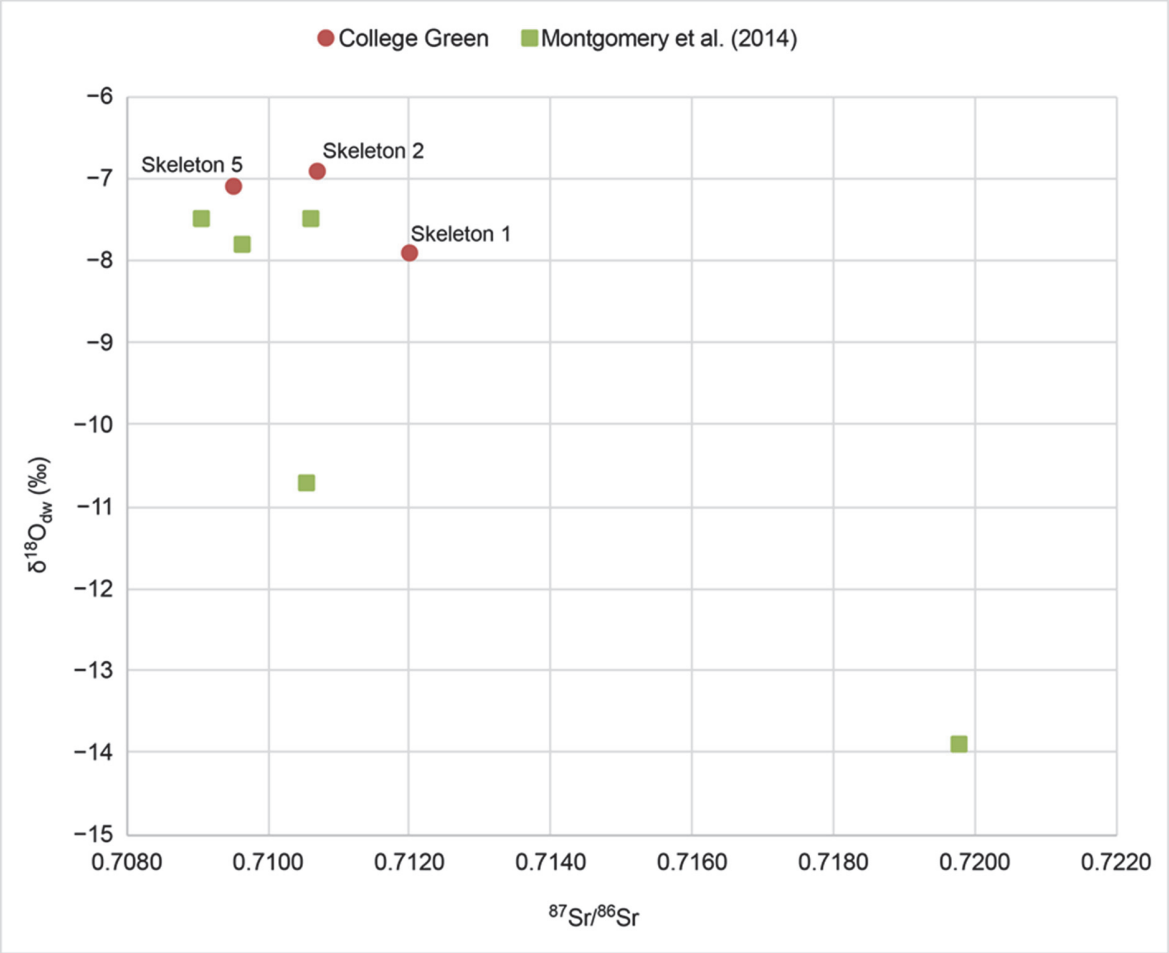


Figure 3: Plot of $\delta^{18}O_{dw}$ and $^{87}Sr/^{86}Sr$ values from the tooth enamel of the burials from College Green, Dublin (red). Comparative data (green) are from tooth enamel from archaeological sites in Dublin: South Great Georges Street and Ratoath (Montgomery *et al*. 2014).

Appendix 13 – Building Material Report

Brick and Mortar Report for College Green Excavation (14E0003)

Dr. Jason Bolton

1 INTRODUCTION AND PURPOSE OF THE REPORT

The aim of this report is to examine a sample of mortar recovered during archaeological excavations (14E0003) and monitoring accompanying the utilities works of the Luas Cross City project (Rubicon Project Code LBMM13) undertaken for GMC (Ireland) Ltd on behalf of Transport Infrastructure Ireland (TII), formerly the Railway Procurement Agency (RPA). This report was prepared at the request of Rubicon Heritage Services Ltd, and comprised building material (possible mortar) from soil sample (#10) retent (Table 1).

Site Number	Context Number	Sample Number	Sample Vol (l)	Retent Vol (l)	CBM	Quantity	Mortar	Quantity	*My Ref*
Site14E0003	357	10	2.5	1			+	2.5 ml	*Lbmm4*

Table 1—Sample of mortar provided for analysis by Rubicon Heritage Services Ltd

No.	Material	Rubicon Reference	Notes
1	Mortar	14E0003 Context (357) Sample #10	Mortar fragments

Table 2—Sample sorted by material type

2 METHODOLOGY AND LIMITATIONS OF INSPECTION

The sample was provided by Rubicon Heritage, and was taken from the College Green Burial excavations (14E0003) along the Luas Cross City line. The historical and archaeological background of the excavations is set out in the preliminary report which accompanied the excavation (Gilligan and Pawle 2016[1]; Pawle *et al.* 2016[2]), and the archaeological context of the sample (where cited in the preliminary archaeological reports) is summarised alongside the description of the sample to facilitate a better understanding of its potential archaeological significance. The sample was dried until constant weight. The mortar sample was too poorly deteriorated to accurately determine original mix composition or other relevant archaeological data, and is included for record purposes only. The mortar fragments were examined using visual microscopy, but were too fragile to be mounted on thin sections for more detailed petrographic analysis.

3. FINDINGS

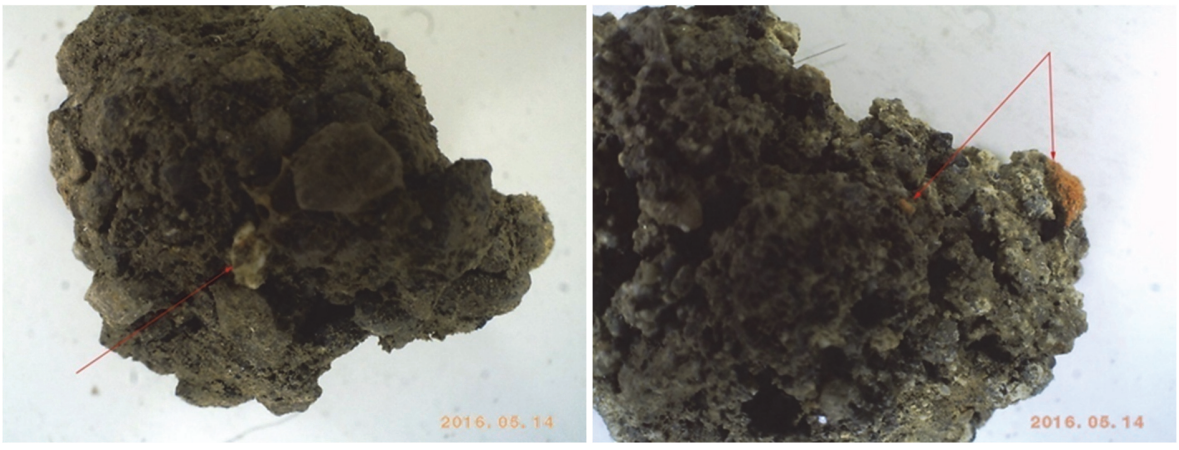
3.1 Sample 1 – 14E0003 Context (357) Sample #10

The mortar sample was recovered from soil retent associated with the archaeological excavation of a Tudor burial (Skeleton 5) from the 15th century (cal. AD 1415–1473, 2σ, SUERC-66882) found beneath later mortared limestone walls (14E0003, Context (357), Sample #10). The sample consists of four very small fragments of a grey-coloured lime-based mortar with fine 'lime lumps' and fine sub-angular brick fragments and gritty sub-angular predominantly limestone aggregate.

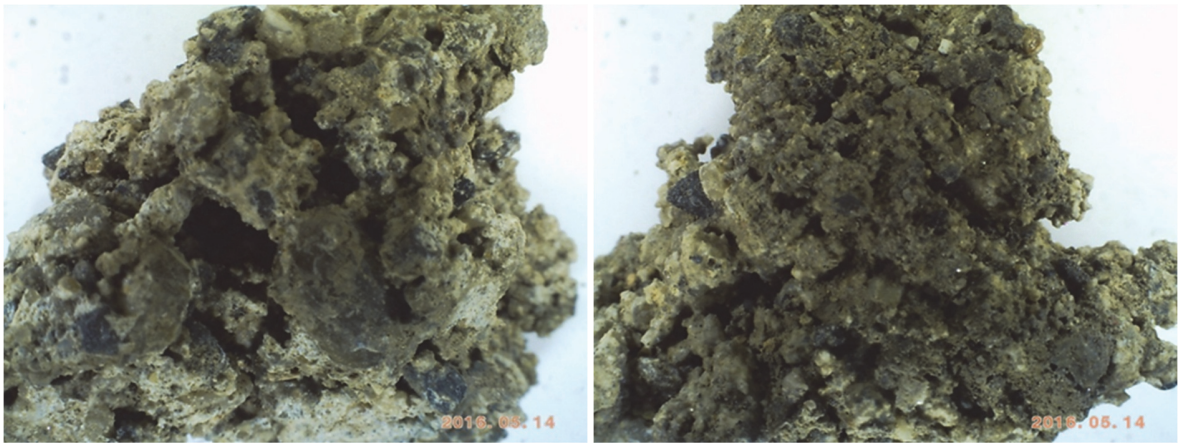
Interpretation: The mortar is dissimilar from early and late medieval mortars from Ireland examined by the report author - the fineness of the lime lumps and the presence of brick (which is first recorded in this area (Hoggen Green) in 1615[3]) suggests that the mortar is more likely to originate from the walls which overlay the burials and should be considered post-medieval in date.

Key Properties			
Colour	Off-white	**Size**	Not applicable
Dry Weight (gm)	66	**Porosity (%)**	Not established[4]
Aggregate	Sub-angular poorly sorted predominantly limestone aggregate, sized <2mm, also containing fine brick fragments and lime lumps (<1mmø) in the aggregate fraction		
Porosity	Visible open macro-pores (probably due to weathering processes)		
Inclusions	No hair or other additions noted		
Condition	Enlarged pores (probably due to dissolution)		

Table 3—Sample 1



Above—The mortar fragment is gritty, containing lime lumps (left, arrowed) <1mm in maximum dimension; The mortar contains fine brick dust (right, arrowed) and shows large macro-pores, likely to result from weathering processes.



Above—The weathered mortar contains sub-angular limestone and quartz aggregate as well as fine lime lumps in a poorly-sorted grain-supported fabric showing significant loss of binder

Endnotes

[1] Gilligan, N. and Pawle, I. 2016 *Luas Cross City Utilities Works: Preliminary Report on Archaeological Excavation on a series of burials at College Green, Dublin 2 14E0003*. Unpublished report by Rubicon Heritage Services Ltd.

[2] Pawle, I., Andrews, M., Gilligan, N. and Hession, J. 2016 *Report on Archaeological Monitoring of Utilities Works Luas Cross City: College Green, Westmoreland Street, Hawkins Street and O'Connell Bridge 14E0003 & 14E0405*. Unpublished report by Rubicon Heritage Services Ltd.

[3] Gilbert, J.T. 1894 Calendar of Ancient Records of Dublin, in the Possession of the Municipal Corporation of that City, IV (Dublin: Joseph Dollard), Vol.3, p.62.

[4] The fragment was too small to allow a reasonable estimation of porosity

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RADIOCARBON DATING CERTIFICATE

22 April 2016

Laboratory Code	SUERC-66878 (GU40596)
Submitter	Carmelita Troy Rubicon Heritage Services Ltd Unit 2, Europa Enterprise Park Middleton, Co. Cork Ireland
Site Reference	College Green (14E0003)
Context Reference	n/a
Sample Reference	Skeleton 1
Material	Human bone : (right fibula)
$\delta^{13}C$ relative to VPDB	-20.4 ‰
$\delta^{15}N$ relative to air	10.2 ‰
C/N ratio (Molar)	3.2
Radiocarbon Age BP	410 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

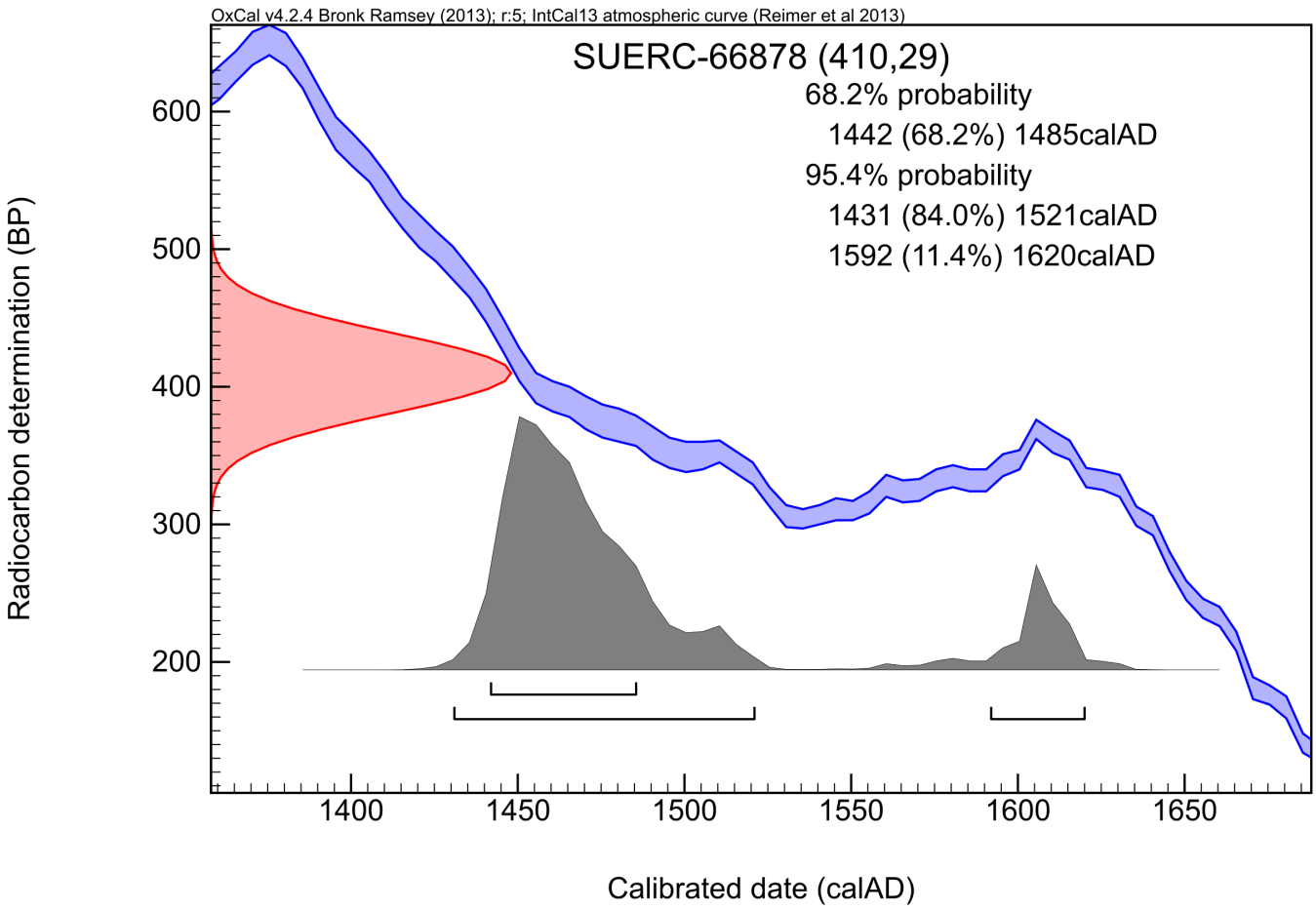
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E. Dunbar Date :- 22/04/2016

Checked and signed off by :- P. Naysmith Date :- 22/04/2016

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

22 April 2016

Laboratory Code	SUERC-66879 (GU40597)
Submitter	Carmelita Troy Rubicon Heritage Services Ltd Unit 2, Europa Enterprise Park Middleton, Co. Cork Ireland
Site Reference	College Green (14E0003)
Context Reference	n/a
Sample Reference	Skeleton 2
Material	Human bone : (left ulna)
$\delta^{13}C$ relative to VPDB	-20.2 ‰
$\delta^{15}N$ relative to air	9.3 ‰
C/N ratio (Molar)	3.3
Radiocarbon Age BP	344 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

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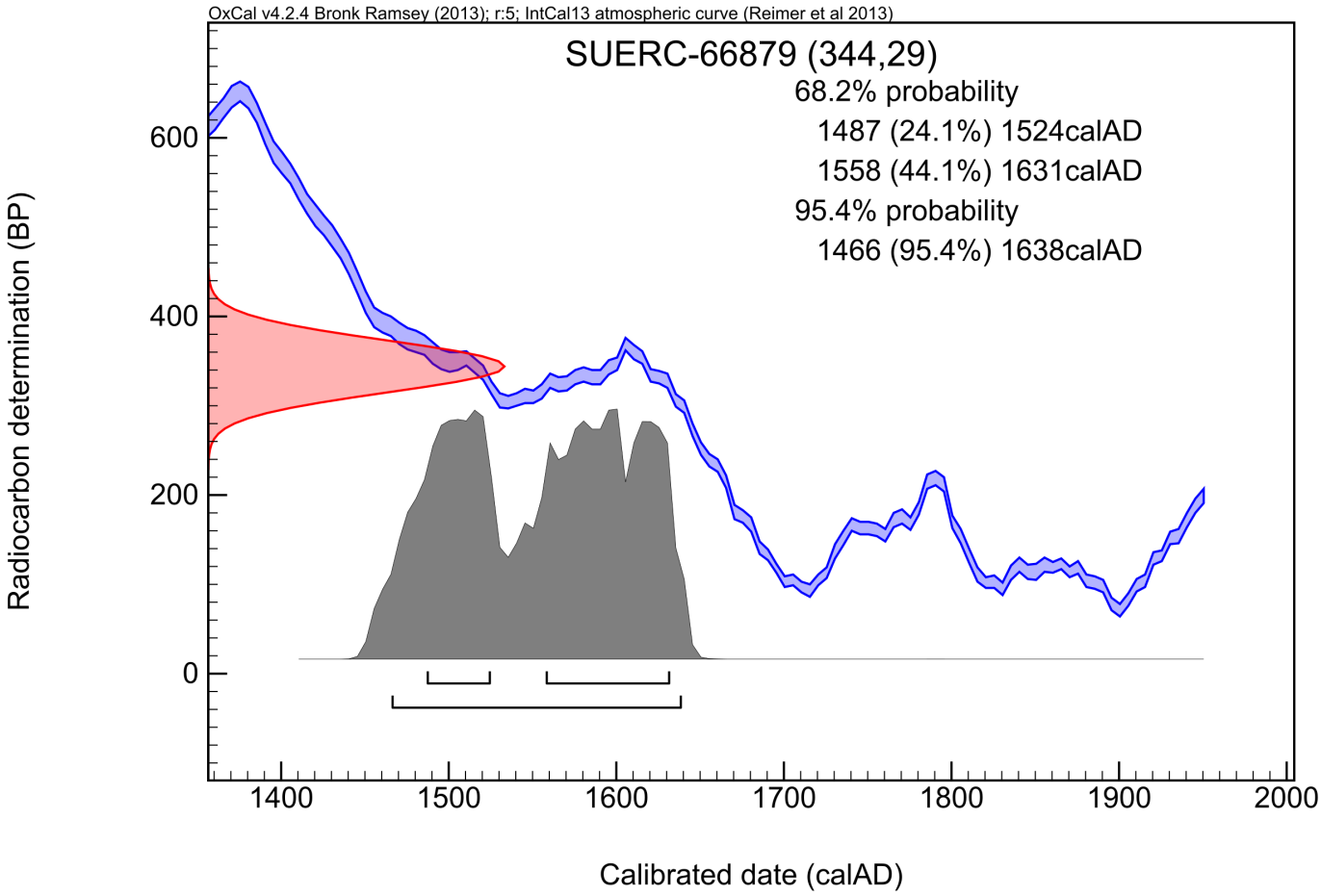
Conventional age and calibration age ranges calculated by :- E. Dunbar Date :- 22/04/2016

Checked and signed off by :- P. Naysmith Date :- 22/04/2016

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

22 April 2016

Laboratory Code	SUERC-66880 (GU40598)
Submitter	Carmelita Troy Rubicon Heritage Services Ltd Unit 2, Europa Enterprise Park Middleton, Co. Cork Ireland
Site Reference	College Green (14E0003)
Context Reference	n/a
Sample Reference	Skeleton 3
Material	Human bone : (rib fragment)
$\delta^{13}C$ relative to VPDB	-20.4 ‰
$\delta^{15}N$ relative to air	9.4 ‰
C/N ratio (Molar)	3.2
Radiocarbon Age BP	359 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

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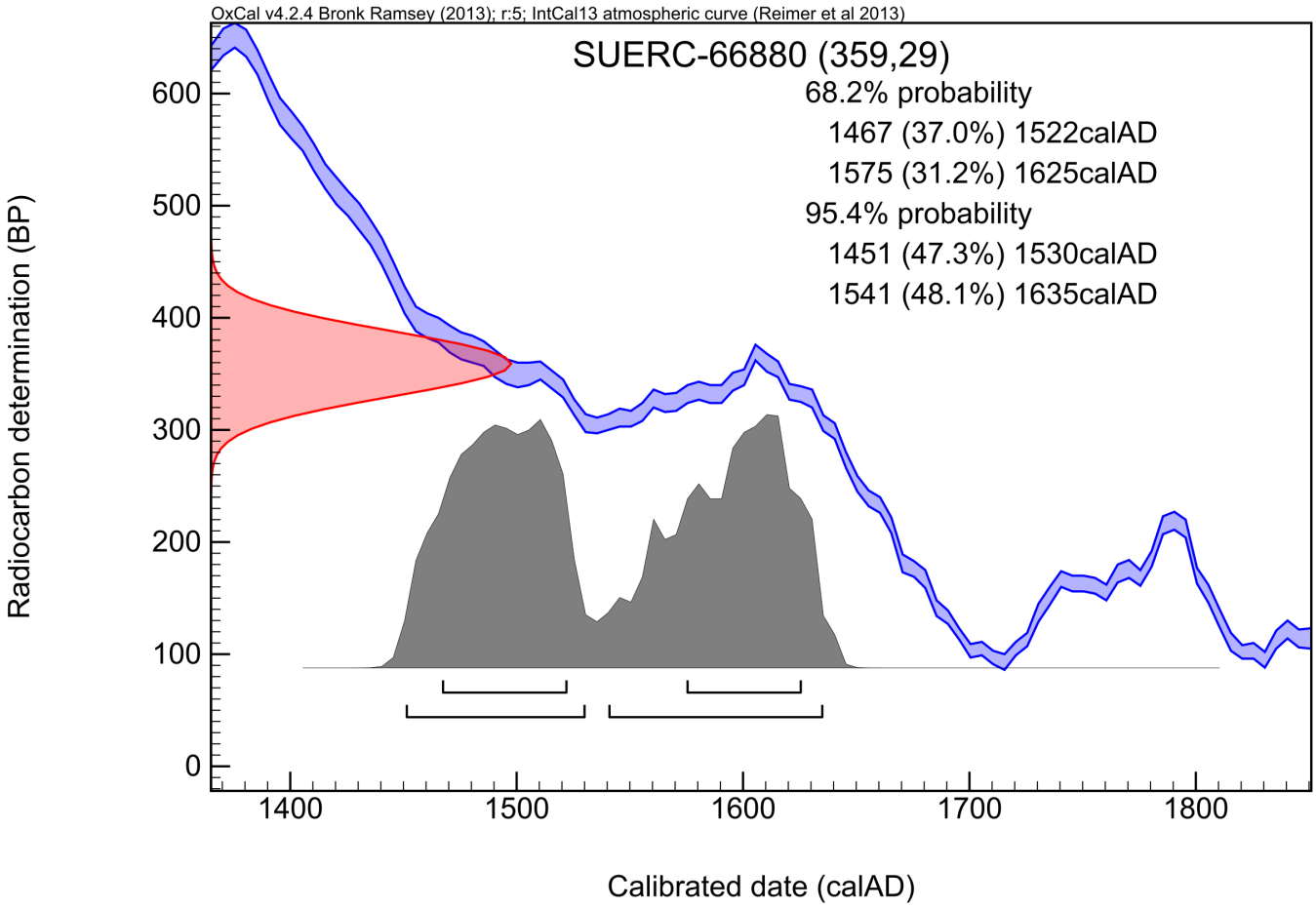
Conventional age and calibration age ranges calculated by :- E. Dunbar Date :- 22/04/2016

Checked and signed off by :- P. Naysmith Date :- 22/04/2016

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

22 April 2016

Laboratory Code	SUERC-66881 (GU40599)
Submitter	Carmelita Troy Rubicon Heritage Services Ltd Unit 2, Europa Enterprise Park Middleton, Co. Cork Ireland
Site Reference	College Green (14E0003)
Context Reference	n/a
Sample Reference	Skeleton 4
Material	Human bone : (right fibula)
$\delta^{13}C$ relative to VPDB	-20.3 ‰
$\delta^{15}N$ relative to air	10.0 ‰
C/N ratio (Molar)	3.2
Radiocarbon Age BP	335 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

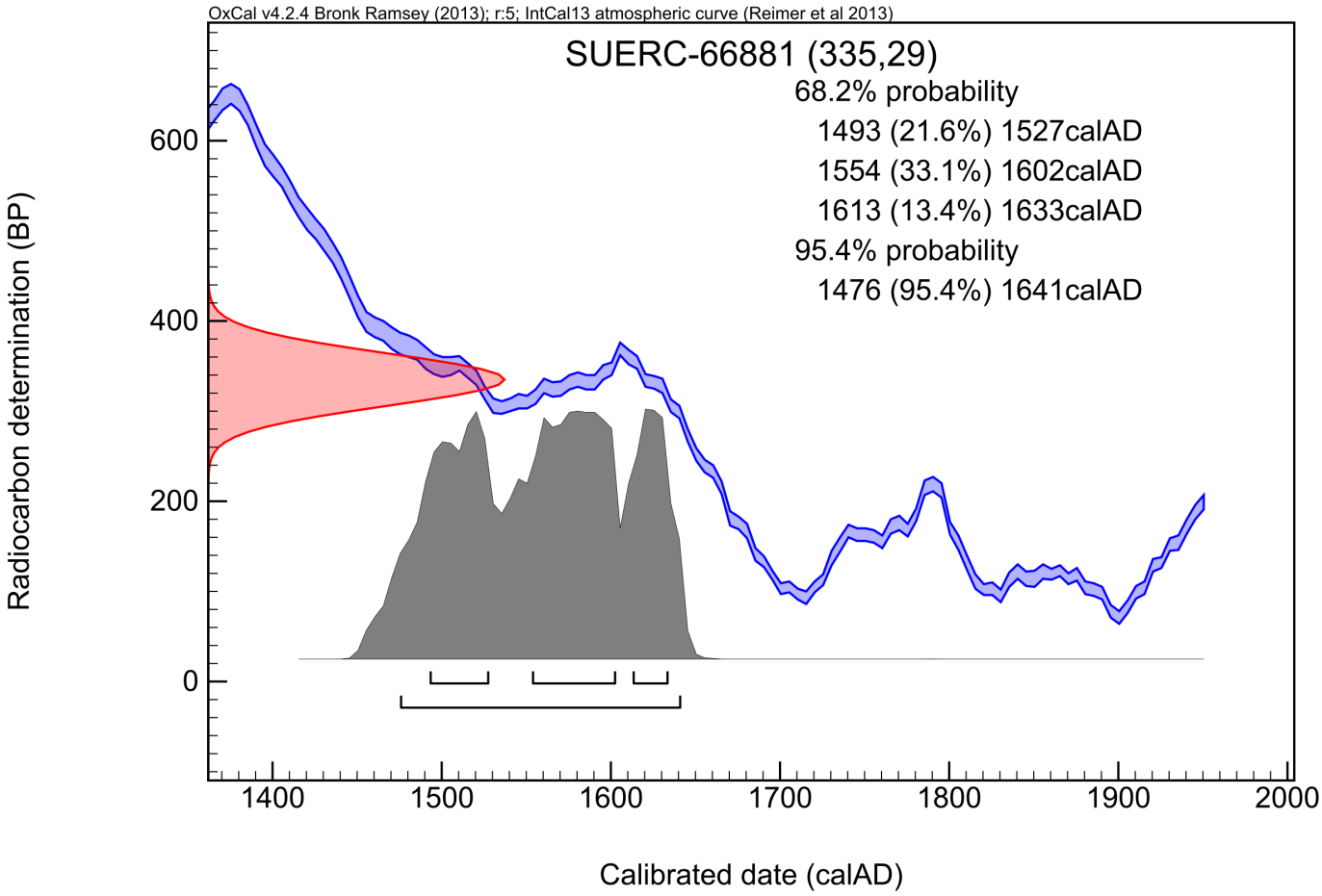
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E. Dunbar Date :- 22/04/2016

Checked and signed off by :- P. Naysmith Date :- 22/04/2016

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

22 April 2016

Laboratory Code	SUERC-66882 (GU40600)
Submitter	Carmelita Troy Rubicon Heritage Services Ltd Unit 2, Europa Enterprise Park Middleton, Co. Cork Ireland
Site Reference	College Green (14E0003)
Context Reference	n/a
Sample Reference	Skeleton 5
Material	Human bone : (right ulna)
$\delta^{13}C$ relative to VPDB	-20.4 ‰
$\delta^{15}N$ relative to air	10.0 ‰
C/N ratio (Molar)	3.2
Radiocarbon Age BP	453 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

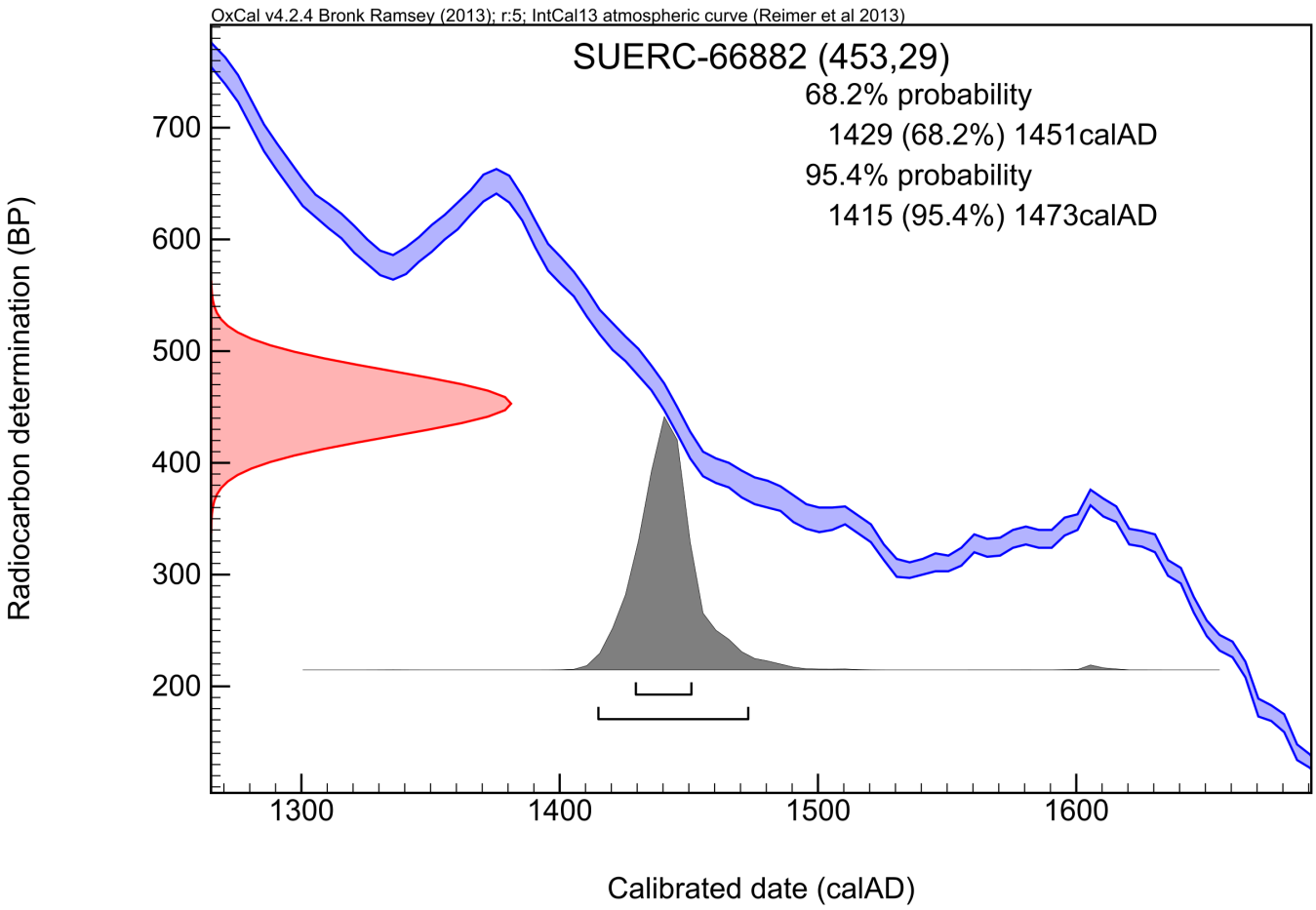
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E. Dunbar Date :- 22/04/2016

Checked and signed off by :- P. Naysmith Date :- 22/04/2016

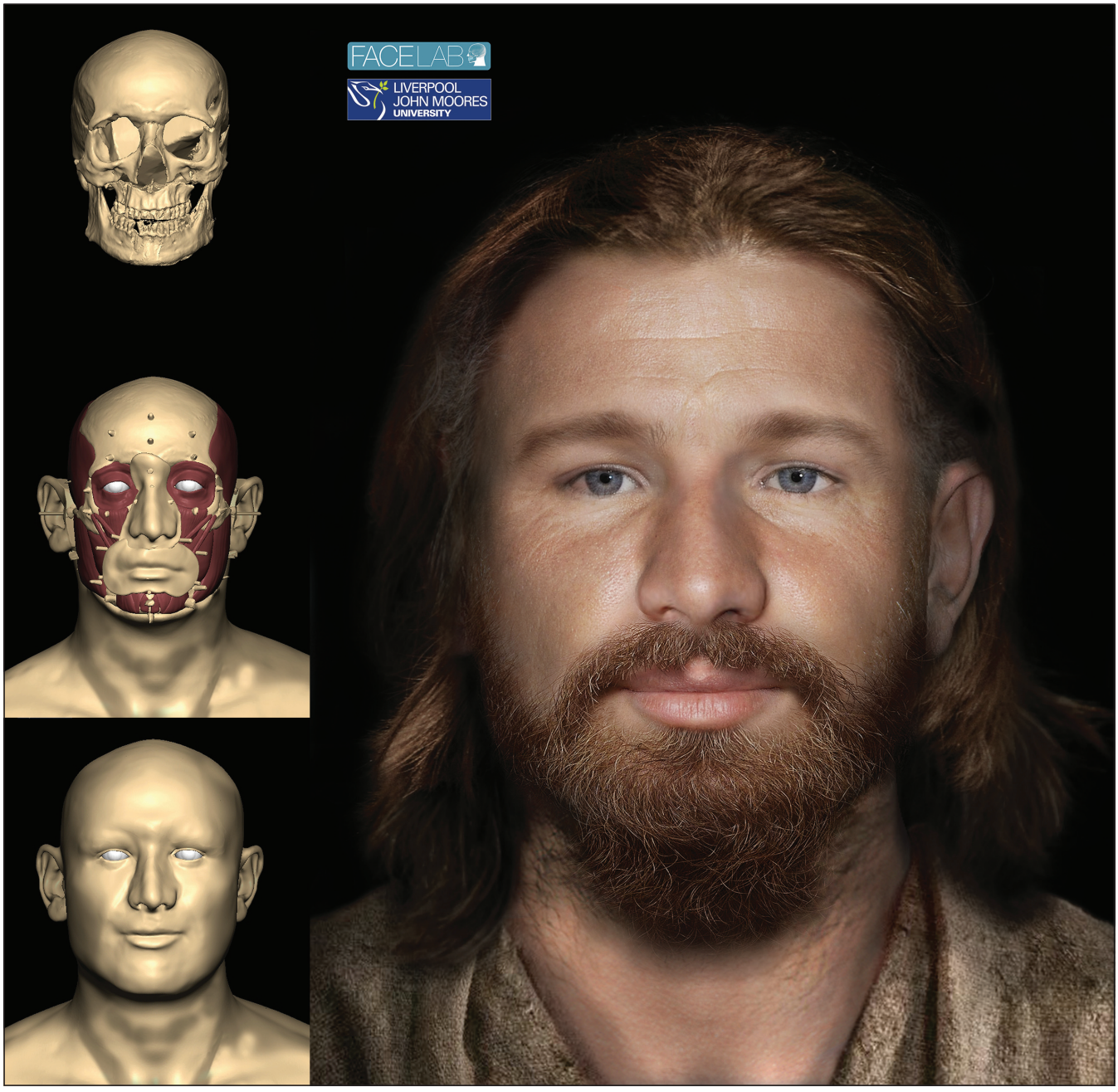
Calibration Plot



Appendix 15 – Facial Reconstruction

Skeleton 2 (younger-middle male) (14E0003)

Image: Facelab



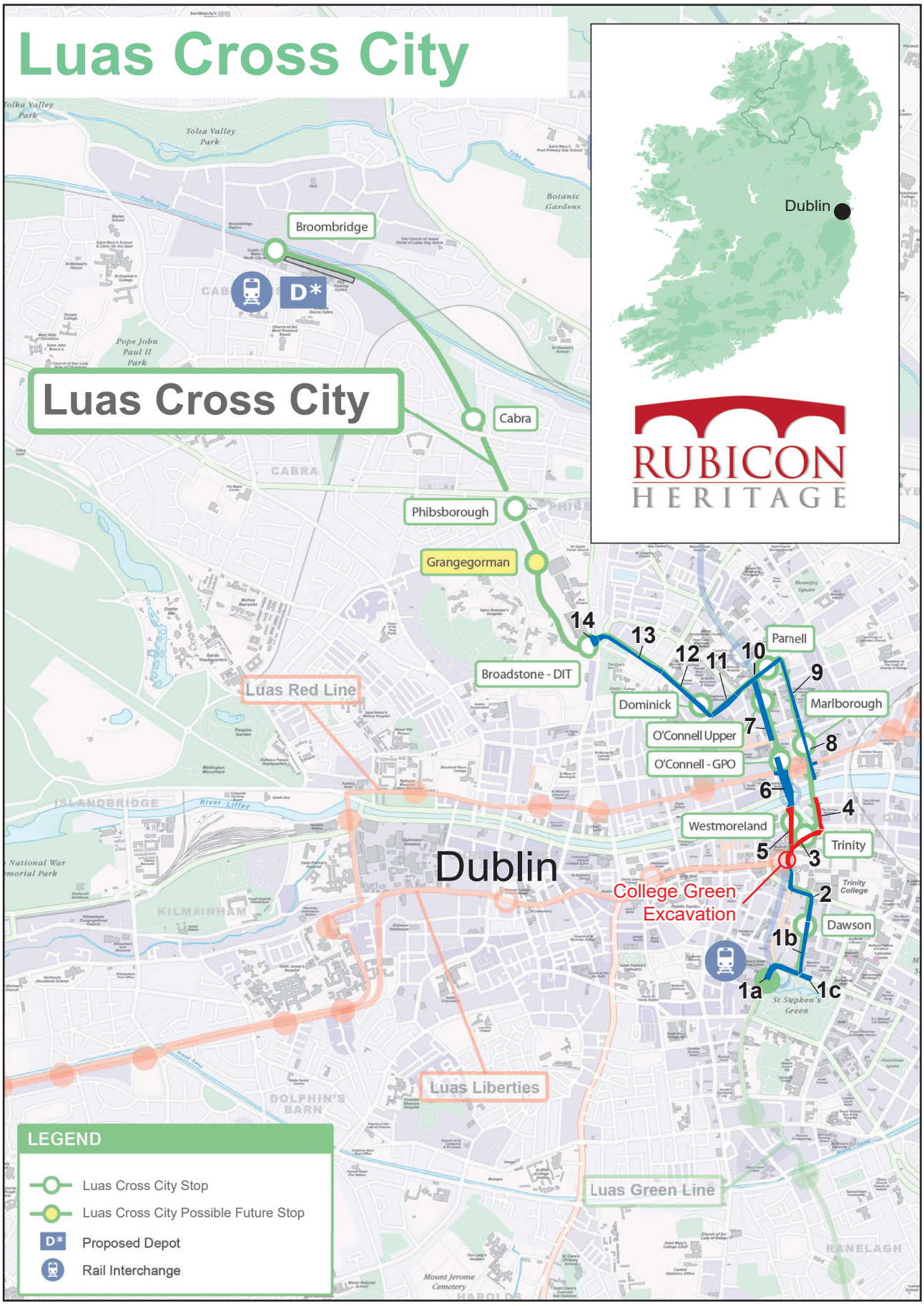


Figure 1 - Location map showing route of Luas Cross City: Workfront 3, 4 and 5 location in red.

DU018-020464-
DU018-020161-
DU018-020508-
DU018-020419-
DU018-020500-
DU018-020180-
DU018-020129-
DU018-020461-
DU018-020044-
DU018-020391-
DU018-020411-
DU018-020060-
DU018-020995-
DU018-020487-
DU018-020154-
DU018-020385-
DU018-020099-
DU018-020401-
DU018-020430-
DU018-020386-
DU018-020132-
DU018-020047-
DU018-020072-
DU018-020387-
DU018-020428-

4
8
3
2
5c
5ab
6

0 12.5 25 50 75 100 125 Meters

Alignment
Stops
Watercourse
Zone of Archaeological Potential (ZAP) - DU018-020 (AC1)
RMP Sites

RPA Railway Procurement Agency
Gníomhaireacht Um Fháil Iamród
Parkgate Business Centre, Parkgate Street, Dublin 8, Ireland.
Phone +353 1 646 3400
Fax +353 1 646 3401
www.rpa.ie

LUAS

RUBICON HERITAGE

PREPARED: JMM	REVIEWED: TB	APPROVED: xx	
	CHECKED: xx	DATE: November 2013	
		SCALE: 1:2000	

LOCATION:
Workfronts 3, 4, 5a, 5b and 5c
Sheet 1 of 1

SPECIALIST TOPIC:

Figure 2 - Workfronts 3, 4 and 5 and adjacent RMP sites

AREA NO.	PLAN NO.	SUBJECT.
Area 29	Figure 2	WORKFRONT LOCATION

N

2

3

BURKE

TRINITY COLLEGE

GOLDSMITH

BANK OF IRELAND

COLLEGE GREEN

GRATTAN ISLAND

Limestone wall (338)

Limestone wall (339)

Limestone wall (339)

Red brick wall (344)

Cobbles (345)

Cobbles (330)

Mortar-rich deposit (331)

Granite plinth (340)

Limestone wall (341)

Skele (349)

Skele (353)

Skele (351)

Limestone wall (342)

Limestone wall (343)

Skele 5

Limestone wall (328)

Granite plinth (327)

Wall (362)

Wall (109)

Wall (073)

Column base (096)

Wall (096)

Wall (095)

Wall (098)

(376) Granite lintel over yellow brick drain

Culvert/Pre-Victorian sewer
(074) = Limestone
(069) = Red brick arch

Photo 033 (inside)

Photo 016 (inside)

Photo 014 (inside)

Lintelled drain identifiable in photo

Culvert (030)

0 1.5 3 6 9 12 15 Meters

KEY

- Wall (Masonry)
- Wall (Brick)
- Drainage
- Deposit/Layer
- Grave
- Work-front outline

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LUAS

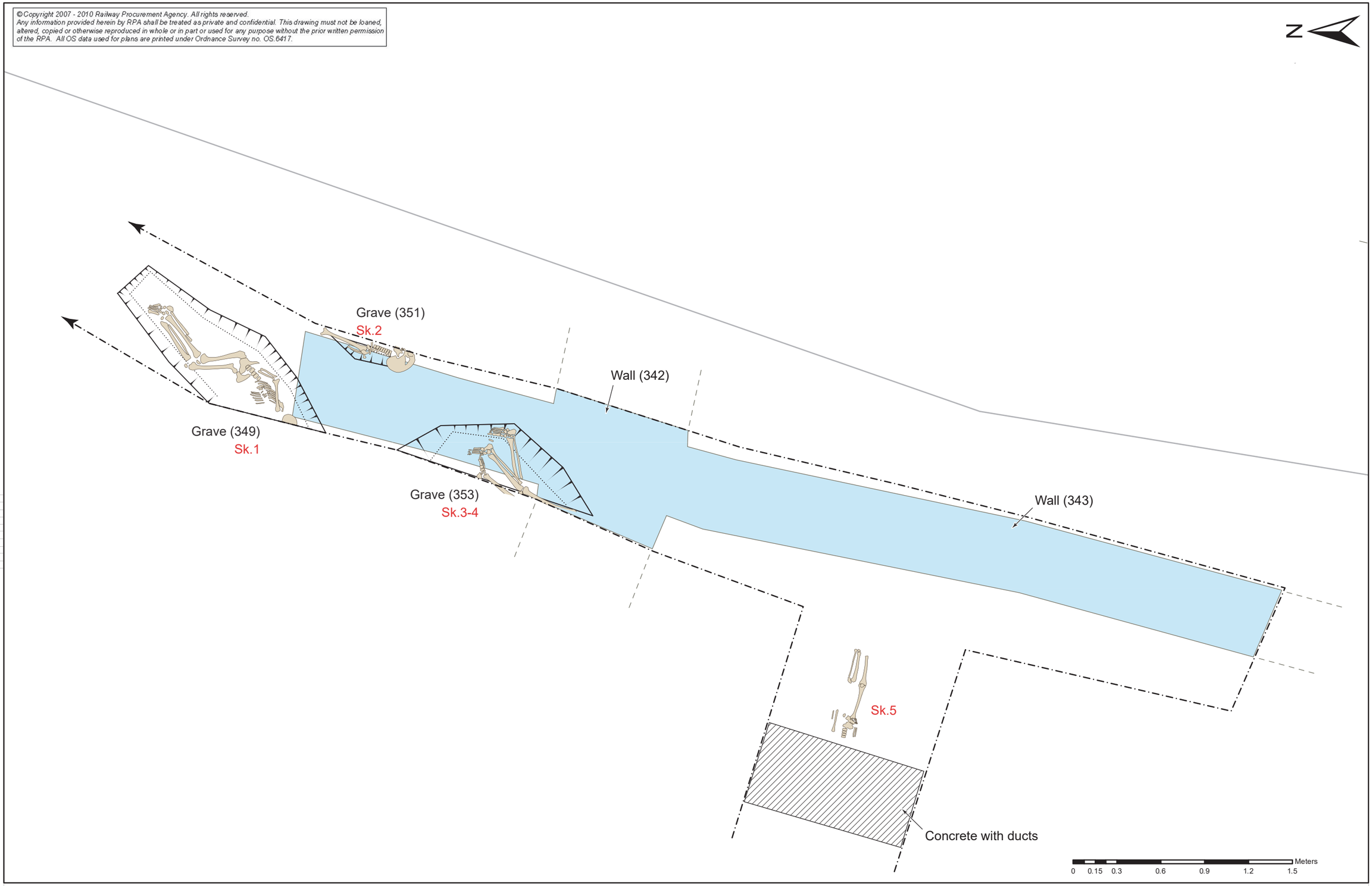
RUBICON HERITAGE

PREPARED: JMM	REVIEWED: TB	APPROVED: xx
	CHECKED: xx	DATE: July 2015
		SCALE: 1:2000

LOCATION:
Work-front 3

SPECIALIST TOPIC:
Plan of archaeological features in Workfront 3: College Green

AREA NO.	FIGURE NO.	SUBJECT.
Area 29	Figure 3	Archaeological Monitoring



KEY

- Wall (Masonry)
- Bone

Railway Procurement Agency
Gníomhaireacht Um Fháil Iarnród
Parkgate Business Centre, Parkgate Street, Dublin 8, Ireland.
Phone +353 1 646 3400
Fax +353 1 646 3401
www.rpa.ie

LUAS

RUBICON HERITAGE

PREPARED: JMM	REVIEWED: TB	APPROVED: xx	
	CHECKED: xx	DATE: July 2015	
		SCALE: 1:2000	

LOCATION:
Work-front 3

SPECIALIST TOPIC:
Plan of the excavation at College Green

AREA NO.	FIGURE NO.	SUBJECT.
Area 29	Figure 4	Archaeological Monitoring

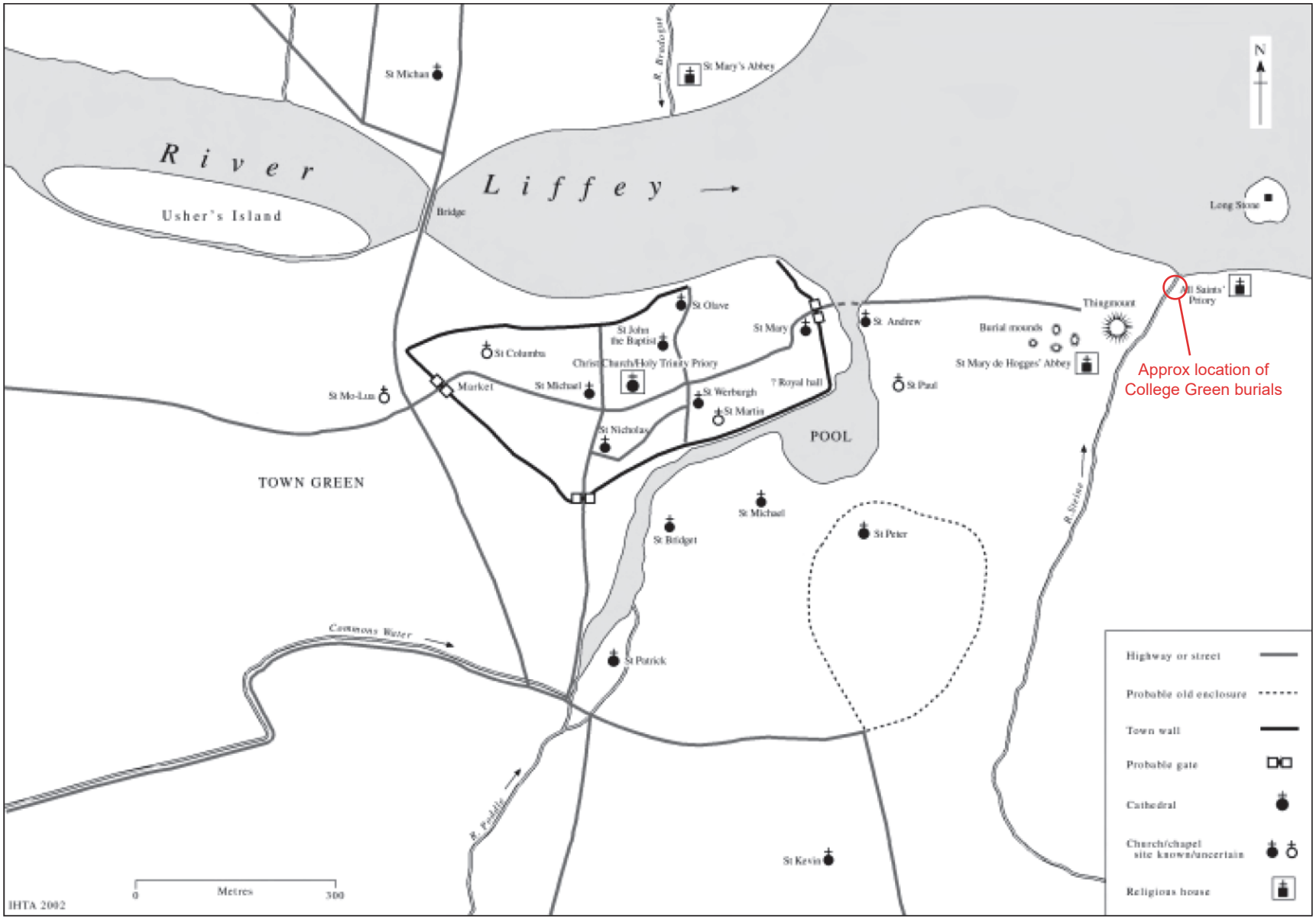


Figure 5 - Reconstructed map of Dublin c. AD1000, showing *haugr* mounds, *thingmot*, All Saints Priory and St Mary de Hogges' Abbey to east of walled town.