



C138 – Liverpool Street Station
Archaeology Site-Specific Written Scheme of Investigation

Document Number: C138-MMD-T1-RST-C101-00001

Document History:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|-----------|----------|--------------|-------------|--------------|---|
| 3.1 | 08-03-11 | [REDACTED] | [REDACTED] | [REDACTED] | Design deliverables issued to C501 at award |
| | | [REDACTED] | [REDACTED] | [REDACTED] | |

| CROSSRAIL CENTRAL (PDP) REVIEW AND ACCEPTANCE STATUS | |
|---|--|
| This decal is to be used for submitted documents requiring acceptance by Crossrail Central. | |
| <input checked="" type="checkbox"/> | Code 1. Accepted. Work May Proceed |
| <input type="checkbox"/> | Code 2. Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated |
| <input type="checkbox"/> | Code 3. Not Accepted. Revise and resubmit. Work may not proceed |
| <input type="checkbox"/> | Code 4. Received for information only. Receipt is confirmed |
| Reviewed/Accepted by:(signature) | [REDACTED] |
| Print Name: | [REDACTED] Date: 18/11/11 |
| Acceptance by Crossrail Central does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail Central approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier. | |

This document contains proprietary information. No part of this document may be reproduced without prior written consent from the chief executive of Crossrail Ltd.



Document Title: Archaeology Site-Specific Written Scheme of Investigation

Document number: C138-MMD-T1-RST-C101-00001

Mott MacDonald Issue and Revision Record

Design Team

| Rev | Date | Originator | Checker | Approver | Description |
|-----|----------|------------|------------|------------|---|
| 1 | 11-12-09 | [REDACTED] | [REDACTED] | [REDACTED] | RIBA D Submission Advance Station Works |
| 2 | 29-04-10 | [REDACTED] | [REDACTED] | [REDACTED] | RIBA D Submission |
| 3 | 08-03-11 | [REDACTED] | [REDACTED] | [REDACTED] | C502 RIBA E For Approval |
| 3.1 | 08-03-11 | [REDACTED] | [REDACTED] | [REDACTED] | Design deliverables issued to C501 at award |

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited:

This document is issued for the party which commissioned it and for specific purposes connected with the Crossrail project only;

It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract, or used for any other purpose;

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose;

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it, Crossrail Limited or Crossrail Central



Contents

| | | |
|----------|---|-----------|
| 1 | Executive Summary | 6 |
| 2 | Project Background | 9 |
| 2.1 | Introduction | 9 |
| 2.2 | Site Description | 9 |
| 2.3 | Summary of Previous Crossrail Studies | 10 |
| 2.4 | Geology and Topography | 11 |
| 2.5 | Archaeological and Historical Development of the Site | 12 |
| 3 | Construction Impacts | 18 |
| 3.1 | Summary | 18 |
| 3.2 | Enabling Works & Main Works | 19 |
| 4 | Aims and Objectives | 23 |
| 4.1 | Research Aims | 23 |
| 4.2 | Objectives of the Investigation | 24 |
| 5 | Scope of the Investigation | 25 |
| 5.2 | Archaeological Investigations at the Liverpool Street worksites | 25 |
| 5.3 | Non-Listed Built Heritage Assessment and Recording | 27 |
| 6 | Programme | 32 |
| 6.1 | Introduction | 32 |
| 6.2 | Archaeological Investigation - Moorgate worksite | 32 |
| 6.3 | Archaeological Investigation Finsbury Circus worksite | 33 |
| 6.4 | Archaeological Investigation – Blomfield Street worksite | 34 |
| 6.5 | Archaeological Investigation – Liverpool Street worksite (including utilities corridor) | 34 |
| 7 | Specification for Evaluation & Mitigation (including Watching Brief) | 37 |
| 7.1 | Generic Standards | 37 |
| 7.2 | Potentially nationally important remains | 37 |
| 7.3 | Human Remains | 38 |
| 7.4 | Treasure Act | 39 |
| 7.5 | Health and safety | 39 |
| 7.6 | Location and ground elevation of interventions and survey grids | 40 |
| 7.7 | Specification for watching brief | 41 |
| 7.8 | Specific Requirements for the excavation of trial trenches or pits | 48 |
| 7.9 | Archaeological science | 49 |



| | | |
|-----------|--|-----------|
| 7.10 | Generic specification for Environmental Sampling..... | 51 |
| 8 | Deliverables | 53 |
| 8.1 | Archaeological Contractors Method Statement..... | 53 |
| 8.2 | Site Archives | 54 |
| 8.3 | Digital Data | 54 |
| 8.4 | Interim Statement..... | 56 |
| 8.5 | Survey Report..... | 56 |
| 8.6 | Fieldwork Report..... | 56 |
| 8.7 | SMR/HER Summary Sheet | 59 |
| 8.8 | Summary Report | 59 |
| 8.9 | Post excavation assessment | 59 |
| 9 | Site Monitoring & Progress Reports..... | 60 |
| 10 | Personnel requirements | 61 |
| 11 | References and glossary of terms..... | 62 |
| | Annex 1 Archaeological Research Agenda..... | 65 |
| | Annex 2 Site Information | 66 |
| | Annex 3 Plans and other illustrations | 67 |
| | Annex 4 Health and Safety Requirements..... | 73 |
| | Annex 5 Environmental Protection Requirements | 74 |
| | Annex 6 Programme and Order of Work | 75 |
| | Annex 7 Enabling and Temporary Works Design Requirements | 76 |
| | Annex 8 Security Requirements..... | 77 |
| | Annex 9 Need for Screening or other protective works | 78 |
| | Annex 10 Procedure for the notification of the Discovery of Human Remains | 79 |
| | Annex 11 Procedure for notification of the Discovery of material falling under the Treasure Act 1996..... | 80 |
| | Annex 12 Procedure for notification of major unexpected discoveries | 81 |
| | Appendix 1 – ADDENDUM TO WSI: TRIAL TRENCH EVALUATION, WATCHING BRIEF & DETAILED EXCAVATION - MOORGATE (XSJ10)..... | 82 |
| | Appendix 2 – ADDENDUM TO WSI: TRIAL TRENCH EVALUATION, WATCHING BRIEF & DETAILED EXCAVATION – FINSBURY CIRCUS (XRZ10) | 83 |
| | Appendix 3 – ADDENDUM TO WSI: TRIAL TRENCH EVALUATION, WATCHING BRIEF & DETAILED EXCAVATION – BLOMFIELD BOX (XSL10)..... | 84 |
| | Appendix 4 – ADDENDUM TO WSI: TRIAL TRENCH EVALUATION – BROADGATE TICKET HALL (XSM10)..... | 85 |
| | Appendix 5 – Addendum to WSI: Factual Reports - Archaeology | 86 |



| | |
|---|----|
| Table 1 Outline archaeological investigations at the Liverpool Street worksites | 27 |
| Table 2 Results of the Non Listed Built Heritage survey at the Liverpool Street Station worksites | 30 |
| Table 3 Non Listed Street Furniture within the Liverpool Street Station worksites..... | 31 |
| Table 4 Outline programme - Moorgate worksite | 33 |
| Table 5 Outline programme - Finsbury Circus worksite | 33 |
| Table 6 Outline programme - Blomfield Street worksite | 34 |
| Table 7 Outline programme - Liverpool Street worksite | 36 |
| | |
| Figure 1 Crossrail worksites at Liverpool Street Station, including utilities, shaded green (Crossrail 2005)..... | 19 |

1 Executive Summary

The Crossrail Specialist Technical Reports, Assessment of Archaeological impacts (Part 1-6) published in February 2005 in support of the Crossrail Environmental Statement, identified the archaeological potential of the Liverpool Street Station area and the potential impacts of the Crossrail Scheme.

Detailed Desk-Based Assessment (DDBA) has subsequently been undertaken for the construction elements and associated worksites outlined in the Scheme Design for Liverpool Street Station (DDBA document number: CR-SD-LIV-EN-SR-00001).

There are four Crossrail worksites for Liverpool Street Station:

- Moorgate worksite – 17-31 Moorfields, Moorgate LU station and 91-109 Moorgate will be used for construction of the Western Ticket Hall which includes the combined ticket hall, the Moorgate Shaft, provision of a replacement access to the Highwalk, an escalator to Crossrail platforms, the northern line link subway and works to the Moor House draught relief shaft. Diversion of the Moorgate Station Sewer will take place within the worksite;
- Finsbury Circus worksite – will occupy the eastern part of Finsbury Circus gardens and will be used as site offices and for the construction of the platform tunnels and the crossover between Liverpool Street and Farringdon stations;
- Blomfield Street worksite- for construction of a ventilation and emergency escape shaft. The Powerlink substation and access shaft and cable tunnel will be built within the northern part of the worksite; and
- Liverpool Street worksite - for construction of the sub-surface Broadgate ticket hall and escalators and subways connecting with the Crossrail platforms and the existing London Underground ticket hall. Works at this location also include a cut and cover utilities corridor to be constructed on the southern side of Liverpool Street.

In addition, there will be utilities diversions and protective works in the streets around the worksites. These sites each have the potential to affect archaeological deposits. The Crossrail works also include the excavation of compensation grout shafts to mitigate the effects of settlement. Two grout shafts will be located in the street in the south-west and south-east of Finsbury Circus, with further grouting work carried out from a basement in the worksite at Blomfield Street and at Moorgate (in front of Moor House).

The Crossrail worksites for Liverpool Street Station all exhibit the potential for archaeological deposits ranging in date from the prehistoric to the post-medieval periods, although there is limited potential for prehistoric activity, which is likely to be limited to stray finds and sporadic truncated features.

Geotechnical boreholes and the interim results from the archaeological evaluations that have taken place to date demonstrate a high potential for Roman remains underlying Moorfields Marsh deposits across all of the worksites. The presence of Moorfields Marsh in the area during the Saxon and medieval periods implies a limited potential for encountering archaeology from these periods. Moorfields Marsh was gradually reclaimed from the late medieval period onwards and remains of the post-medieval urbanisation of the area can be expected across the whole area.

Within Finsbury Circus there is a potential for Post-medieval remains relating to former layouts of the park, while at the Liverpool Street worksite evaluation has demonstrated the survival of Post-medieval burials relating to the burial ground (BG208).

The following archaeological investigation is required at the Crossrail worksites for Liverpool Street Station, the details for which are set out in Appendices 1-4 of this document.

Moorgate worksite

- Trial trench evaluation at 91-109 Moorgate and 17-31 Moorfields (8 trenches in total, one of which has been completed);
- Targeted watching brief (during excavation of 4 Moorgate Station Sewer diversion manholes). General watching brief during sewer diversion;
- General watching brief at ground reduction by 0.3m in basement of 8 Moorfields;
- General watching brief (Moorgate utility diversions including the London Wall heading);
- General watching brief (diaphragm wall guide trench excavation);
- Power auger survey (during mitigation works within the diaphragm wall);
- General watching brief (ground reduction to 110m ATD in Moorgate worksite (both inside and outside the diaphragm walled shaft); and
- Targeted watching brief (ground reduction to 107.5m ATD in Moorgate worksite (outside diaphragm walled shaft).

Finsbury Circus worksite

- Trial trench evaluation and power auger survey (in footprint of access shaft);
- General watching brief (utility diversions in the street); and
- Targeted watching brief (grout shaft excavations).

Blomfield Street worksite

- Trial trench evaluation (6 trenches) and power auger survey in the basement of 11-12 Blomfield Street;
- General watching brief on utility diversions in Blomfield Street, New Broad Street, Old Broad Street and Broad Street Avenue; and
- General watching brief at the excavation of the Powerlink Cable shaft.

Liverpool Street worksite

- English Heritage Level 2 survey of the Broad Street Station ticket hall and Queen Victoria Tunnel;
- Trial trench evaluation (12 trenches) in Liverpool Street within the burial ground BG208;
- General watching brief on shallow exploratory trenches to the front of 100 Liverpool Street and a single test pit in the basement of the Railway Tavern;
- General and targeted watching brief on secondary utilities diversions in Liverpool Street;

To date the following archaeological evaluation and mitigation activities have taken place. The results of these works will be reported by the C257 Archaeology Contractor (MoLA), however, the interim results were used to design the archaeological works set out in this WSI:

- Archaeological general watching brief at worksite establishment at Finsbury Circus;
- Level 2 English Heritage survey of 11-12 Blomfield Street;
- General watching brief on exploratory trenches in the footprint of Finsbury Circus grout shafts;
- One 2m x 2m trial pit (Trench 6) in the basement of 91-109 Moorgate;
- One 2m x 2m trial pit (Trench 9) in Liverpool Street; and
- Archaeological general watching brief during ground investigations.

The results of the field evaluations and early mitigation works will inform a mitigation design, which will comprise *preservation-by-record* (e.g. archaeological excavation and/or watching brief) of archaeological deposits.

Archaeological investigations are for the most part taking place alongside enabling works in order to inform the mitigation strategy that will be implemented during the main works phase. Trial trench evaluation in Liverpool Street is a critical activity taking place in advance of enabling works at that location.

2 Project Background

2.1 Introduction

2.1.1 The overall framework within which archaeological work will be undertaken is set out in the Environmental Minimum Requirements (EMR) for Crossrail (<http://www.crossrail.co.uk/the-railway/getting-approval/parliamentary-bill/environmental-minimum-requirements-including-crossrail-construction-code>). The requirements being progressed follow the principles of Planning Policy Statement 5: Planning for the Historic Environment (2010). Accordingly the nominated undertaker or any contractors will be required to implement certain control measures in relation to archaeology before construction work begins.

2.1.2 The strategy for archaeological works has been set out in the Crossrail Generic Written Scheme of Investigation (WSI) - document number CR-PN-LWS-EN-SY-00001. The Generic WSI presents the strategy for archaeology design, evaluation, mitigation, analysis, dissemination and archive deposition that will be adopted for the design and construction of Crossrail and provides a general statement of objectives, standards and structure for the planning and implementation of archaeological works.

2.1.3 This site specific WSI (SS-WSI) addresses the works required for Liverpool Street Station. A further revision of this SS-WSI will be produced once the results of the remaining trial trench investigations are available.

2.2 Site Description

2.2.1 There are four Crossrail worksites for Liverpool Street Station located within the City of London:

- Moorgate worksite – 17-31 Moorfields, Moorgate LU station and 91-109 Moorgate will be used for construction of the Western Ticket Hall which includes the combined ticket hall, the Moorgate Shaft, provision of a replacement access to the Highwalk, an escalator to Crossrail platforms, the northern line link subway and works to the Moor House draught relief shaft. Diversion of the Moorgate Station Sewer will take place within the worksite;
- Finsbury Circus worksite – will occupy the eastern part of Finsbury Circus gardens and will be used for construction of the platform tunnels and the crossover between Liverpool Street and Farringdon stations;
- Blomfield Street worksite- for construction of a ventilation and emergency escape shaft. The Powerlink substation and access shaft and cable tunnel will be built within the northern part of the worksite; and
- Liverpool Street worksite - for construction of the sub-surface Broadgate ticket hall and escalator shafts and subways connecting with the Crossrail platforms and the existing London Underground ticket hall. Works at this location also include a cut and cover utilities corridor to be constructed on the southern side of Liverpool Street

2.2.2 In addition, there will be utilities diversions and protective works in the streets around the worksites, notably including a public utilities corridor located in the road and pavement of Liverpool Street, immediately south of the Broadgate Ticket Hall and Link Tunnel.

2.2.3 The Crossrail worksites at Liverpool Street Station will also include compensation grout shafts to mitigate for the effects of settlement. Two grout shafts will be located in the street on the southern side of Finsbury Circus, and grouting will also take place from a basement in each of the Moorgate and Blomfield sub-sites.

2.2.4 The location of the worksites are shown on drawing number P30103-C1M12-E00-D-50001 (Annex 3). Also refer to the WSI Addenda documents located in Appendices 1-4.

2.3 Summary of Previous Crossrail Studies

2.3.1 The general archaeological potential in the area of the Crossrail worksites for Liverpool Street Station is described in the Crossrail Archaeological Impact Assessment and the Specialist Technical Reports: Assessment of Archaeological impacts (Part 1-6), published in February 2005, which form supporting documents of the Crossrail ES, and the subsequent Updated Baseline Assessment. In 2006 an Archaeology Programming Assessment outlined the scope and approximate timings of potential archaeological works across the entire Crossrail route. This has been superseded by a Detailed Desk Based Assessment (CR-SD-LIV-EN-SR-00001) of the site, which informed this SS-WSI and four subsequent WSI Addenda (see appendices 1-4) as follows:

- Addendum to WSI: Trial Trench Evaluation, Watching Brief & Detailed Excavation – Moorgate Shaft (XSP10) C138-MMD-T1-TCP-C101-00001;
- Addendum to WSI: Trial Trench Evaluation, Watching Brief & Detailed Excavation – Finsbury Circus (XRZ10) C138-MMD-T1-RST-C101-00006;
- Addendum to WSI: Trial Trench Evaluation, Watching Brief & Detailed Excavation – Blomfield Box (XSL10) C138-MMD-T1-RST-C101-00005; and
- Addendum to WSI: Trial Trench Evaluation – Broadgate Ticket Hall (XSM10) C138-MMD-T1-RST-C101-00004.

2.3.2 The following documentary information has also been used in the preparation of the archaeological strategy in this WSI and the WSI Addenda:

C257 Archaeological Contractor – Summary of LSS85 Archive – Broadgate Excavations. C257-MLA-T1-XTC-C101_WS102-00001.

2.3.3 In 2010, the C257 Archaeological Contractor carried out a review of the archive material from the archaeological investigations which took place in the 1980s prior to the construction of 100 Liverpool Street (LSS85). The archive was fragmented, as many archives are from that time. However, C257 produced some useful information and location plan of the works. Refer to section 2.5 for a summary of the findings of this report and see also drawing C138-MMD-T1-DDA-C101_1-10070 at the end of Appendix 4.

Museum of London Archaeology. Museum of London Archaeology Service, 2007. Broadgate, London EC2, A Summary of Archaeological Survival – document number tbc.

2.3.4 Museum of London prepared a review of the archaeological survival at 100 Liverpool Street for British Land. This desk study focussed on the Broadgate Estate immediately north of the Liverpool Street worksite. The report concluded that there is minimal archaeological survival in the Broadgate Estate and that those surviving deposits beneath

the Broadgate slab principally relate to the silting up of the Walbrook channel. The report also concluded that the area to the south of the Estate, (within the Crossrail worksite) would encounter human remains.

XRF09 - Archaeological Watching Brief and Evaluation, Utilities trial trenches, Liverpool Street and London Wall – document number tbc.

2.3.5 In 2009, a number of EWMA (Enabling Works Managing Agent) test trenches were excavated under archaeological supervision in the area around Liverpool Street and London Wall to locate utilities. The trench locations are shown in Annex 3.

2.3.6 Trenches LIV 5, 6, 8, 12, and 29 were located in the burial ground BG208 on Liverpool Street. No in situ human remains were encountered (due to modern disturbance and limited depths of excavations), but stray disarticulated bones were encountered in Trenches LIV 5 and 29.

2.3.7 The trenches within Liverpool Street identified large areas of modern concrete and dense services, although archaeological soils were notably encountered at 1.3m below ground level in Trench LIV 5.

2.3.8 Trenches LIV 19, 26 and MOR 18, 19 were excavated under archaeological supervision due to being located within the Scheduled Monument – London Wall. The London Wall was encountered, recorded, protected and reburied in trenches MOR 18, LIV 16 and 26.

XSP10 – Archaeological trial trench 6, basement 91-109 Moorgate – document number tbc.

2.3.9 A single trial trench measuring 2m x 2m x 1.84m deep was excavated in the basement of 91-109 Moorgate in advance of the main evaluation. The trench was partially truncated by a concrete pile cap; however, beneath a thin layer of surviving Moorfield Marsh deposits (109.5 to 108.5m ATD) the C257 Archaeology Contractor identified a layer of redeposited brickearth dating to the Roman period (109 to 108.65m ATD), overlying the natural brickearth deposits.

Geotechnical Investigations – Liverpool Street worksites – document numbers tbc

2.3.10 Investigations continue to be monitored by Museum of London Archaeology in the Liverpool Street area. A number of weekly progress reports have been produced by MoLA outlining the results. The investigations have confirmed the general sequence at the site comprising made ground – Moorfields Marsh deposits - redeposited brickearth – natural brickearth/gravels. The survival of these deposits varies across the site depending on the depths of basements and the extent of modern truncation.

XSM10 – Archaeological trial trench 9, Liverpool Street – fieldwork commenced Feb 2011

2.3.11 A single trial trench (T9) has been excavated by 4 March 2011. The 2m x 2m trench was located in the carriageway of Liverpool Street (see appendix 4 for a location plan), and identified *in situ* human burials at a depth of 1.7m BGL. These were overlain by approximately 0.5m of mixed material containing disarticulated human remains.

2.4 Geology and Topography

2.4.1 The quaternary geology of the area around Liverpool Street Station comprises Made Ground, Brickearths and Alluvium overlying river terrace gravels which in turn overlie the

London Clay. The surface of the river terrace gravel across the site is generally at a level of 108m Above Tunnel Datum (ATD). The river terrace deposits are overlaid by a layer of alluvium associated with the River Walbrook and the formation of Moorfields Marsh. Sporadic deposits of brickearth occur in areas of the site, as recorded at site LNA99 and in Trench 6 in the basement of 91-109 Moorgate (XSP10), overlying the river terrace gravels and sealed by marsh deposits (the location of archaeological sites is shown in drawing number P30103-C1M12-E00-D-50001 – Annex 3). The alluvium also seals stream channels of tributaries of the River Walbrook.

2.4.2 Refer to drawing numbers 1D0101-G0G00-G00-P-03020 and 1D0101-G0G00-G00-P-03520 (Annex 3) for geological cross-sections and the locations of the boreholes mentioned in the text.

2.5 Archaeological and Historical Development of the Site

2.5.1 Moorgate Ticket Hall

2.5.2 Ground investigation data indicates a general sequence of deposits across the site with ground level at approximately 113.25m ATD, made ground up to 110.5m ATD (where there are no basements), Moorfields Marsh to c.108.5m ATD overlying a layer of redeposited Brickearths dating to the Roman period to approximately 108m ATD. Beneath this lie natural Brickearths and terrace gravels. This corresponds with observations at Moor House (site MRL98) where terrace gravels were recorded at 108.6m ATD cut by stream channels.

2.5.3 Moorfields Marsh deposits were identified in boreholes L3, L21, L23, L24 and L25 and confirmed in Trench 6 in the basement of 91-109 Moorfields. Re-deposited and natural brickearth was noted at site MRL98 overlying the terrace gravels. This sequence was also identified in T6 in the basement of 91-109 Moorgate (XSJ10).

2.5.4 The 1865 construction of the cut and cover Metropolitan Line to Moorgate Station and the 1875 extension of the Metropolitan Line eastwards across Moorfields through the block of buildings opposite the station will have completely removed all archaeological remains along its route including 20-24 Moorfields and 103-109 Moorgate. Due to uncertainty regarding the extent of the cut and cover Metropolitan Line during construction, the assumption is made that truncation extended only 1m either side of the width of the existing tunnel retaining walls. Prior to the construction of the Metropolitan Line the sub-site was occupied by a terrace row from the mid 18th century onwards.

2.5.5 Roman and City Ditch deposits have been recorded to the southwest of the sub-site at Moor House (MRL 98). These factors demonstrate the potential for Roman remains to survive across the site. The presence of made ground containing concrete fragments immediately above the Moorfields Marsh deposits to the south and basements to the north of the sub-site indicates that there is little potential for medieval and Post-medieval deposits. In addition no medieval and Post-medieval deposits, aside from the City Ditch, have been recorded in neighbouring interventions (MRL 98). This may be due to later truncation or the fact that the site remained marsh followed by undeveloped reclaimed land through to the mid-18th century.

2.5.6 A breakdown of predicted archaeological survival at each property is set out below.

91-109 Moorgate

2.5.7 A single level basement is present below 91-109 Moorgate with the surface of the basement slab at 110m ATD. The slab is 0.7m thick overlying a 0.4m construction layer. The building is piled with 0.9m and 1.5m bored piles. Archaeological deposits will be completely removed to the depths of the underside of the basement base slab and construction layer and further disturbed at the locations of the piles and pilecaps. Archaeological evaluation trench 6 (refer to drawing C138-MMD-T1-DDA-C101_Z-10066 in appendix 1) in the southern area of the basement of 91-109 Moorgate identified modern disturbance to 109.25m ATD beneath which were Marsh Deposits to c.109m ATD overlying a layer of redeposited brickearth dating to the Roman Period to a depth of 108.65m ATD. These archaeological layers overlaid natural Brickearths. The results of C257 monitoring of geotechnical investigations (TP4, 5, 413, 415, 417 and 418) in the basement of 91-109 Moorgate also identified a similar sequence of deposits.

2.5.8 These interim results show that there is a survival of archaeological deposits beneath 91-109 Moorgate. The extent of survival across the whole site area is uncertain.

87 Moorgate/8 Moorfields

2.5.9 It is anticipated that the construction of the basements at 87 Moorgate/8 Moorfields will have disturbed archaeological deposits to at least 110m ATD. Based on geotechnical data and TP6 in 91-109 Moorgate (see section above), it is predicted that Moorfield Marsh deposits will underlie the basement slab and construction layer down to approximately 108.5m ATD, below which earlier archaeological deposits dating to the Roman period are expected down to approximately 108m ATD, beneath which are natural Brickearths.

17-31 Moorfields

2.5.10 Observations at 17-31 Moorfields indicate that modern disturbance may have truncated terrace gravels and therefore removed archaeological deposits. However, the existing basement is at a depth of c.109.2m ATD and therefore there is a potential for the truncated remains of deep cut archaeological features to survive in alluvial deposits and River Terrace Deposits (RTDs). 17-31 Moorfields also has piled foundations, which will have removed archaeological remains at those locations. Archaeological deposits of deep cut archaeological features may survive in pockets between piles/pilecaps.

Moorfields and Fore Street Avenue

2.5.11 A similar sequence of deposits is expected beneath the streets in Moorfields and Fore Street Avenue as is predicted at 91-109 Moorgate. Utilities in the road are expected to have truncated archaeological deposits to 1.5-2m BGL (cut and cover sections of the Moorgate Station Sewer are deeper), beneath which a sequence of made ground, Moorfields Marsh, redeposited brickearth dating to the Roman period and natural Brickearths. No archaeological remains are anticipated beyond 108m ATD except for occasional deep cut features such as wells.

2.5.12 Finsbury Circus Worksite

2.5.13 Archaeological sites just to the north of the worksite (RIV87; FIB88; and ENS03) and boreholes in the street (BHs L6; L7; and L8) identified Marsh deposits around Finsbury Circus. These deposits were generally encountered at c.3m below ground level, and some contained Roman material (RIV87 and FIB88). Within the worksite the C257 Archaeological Contractor monitored boreholes within and immediately adjacent to the

footprint of the Access Shaft (L32R, L35 and L36) and identified made ground up to 1.5m BGL and archaeological deposits including Marsh and Roman deposits to 6m BGL.

- 2.5.14 The Metropolitan line cut and cover tunnel was constructed east-west through Finsbury Circus and will have removed archaeological deposits along its length. The width of the cutting at this point is unknown, however, it is assumed for the purposes of this report that truncation caused by the cut and cover construction extends 1m either side of the existing tunnel.
- 2.5.15 A series of small structures appears to have stood on the site from the mid-20th century. These were probably light with shallow foundations that have had limited impact on any surviving archaeological deposits. The former pavilion in Finsbury Circus has a basement between 2-3 metres in depth, which will have removed all archaeological deposits to at least the depth of the basement.
- 2.5.16 As at the Broadgate Ticket Hall and Blomfield Box, Post-medieval deposits were observed overlying the Moorfields Marsh layers (RIV87). Drainage channels and late Medieval dumps associated with the reclamation of the marsh have also been recorded to the north (FIB88).
- 2.5.17 With the exception of the Metropolitan Line, Finsbury Circus has not experienced major development. In the mid 17th century New Bethlehem Hospital was built in the area. It is uncertain from historic mapping whether the hospital was on the site of the modern Finsbury Circus Gardens or to the south. The east wing of the hospital was gone by Horwood's map of 1799 and the remaining section was demolished in the early 19th century and replaced by the gardens and surrounding buildings extant today. There is a potential for archaeological remains within the site. These could comprise fragmented Prehistoric evidence, Roman and Medieval activity, and later Post-medieval remains relating to former layouts of the park and potentially to the hospital. The absence of substantial buildings within the green space at Finsbury Circus means that truncation of any surviving archaeological sequence is likely to be minimal in areas not truncated by the Metropolitan Line, with the exception of the existing pavilion which has a basement. However, given that 4-5m of deposits have been recorded in the surrounding area, it is likely that archaeological deposits may survive beneath the depth of the basement.

2.5.18 Blomfield Box and Broadgate Ticket Hall

- 2.5.19 Information from borehole records and the levels of deposit survival recorded at sites in the area (BSP91; BDC03; LSS85; VLT85; LVB05 & NEB87) indicate that brickearth and terrace gravels have been truncated by activity during the Roman period. In support of this no brickearth deposits were noted in the boreholes around the sub-site. Generally the terrace gravels slope down from c. 109.25m ATD in the east to c. 107.0m ATD in the west. The presence of dark sandy clay overlying the terrace gravels was observed in the majority of the boreholes and variously contained fragments of shell; wood; and organic matter, probably representing Moorfields Marsh deposits. This suggests that deposits relating to Moorfields Marsh exist at these sub-sites, if they haven't been truncated by basements. These deposits were generally encountered at c. 3m below ground level and were between 0.5m and 2m in thickness. Waterlain deposits were observed within BH L11 from 110.2m ATD, roughly corresponding with the upper limit of the probable Moorfields Marsh layer. A similar deposit with a quantity of brick fragments, bone, flint, clinker and slag was recorded above this. The presence of a significant quantity of possible waste material indicates dumping, probably from the late medieval and Post-medieval periods. This may have been associated with the reclamation of the marsh at this time.

Blomfield Box

- 2.5.20 The site of the Blomfield Box has been developed from the early 18th century. The extent and consistency of cellaring associated with any of these earlier buildings is uncertain. In addition, the Metropolitan Line passes immediately to the north and it is likely that construction of the railway cutting and retaining walls has truncated archaeological remains in the northern extent of the Blomfield Box; the extent of such truncation is unknown. No archaeological remains will survive within the footprint of the cut and cover Metropolitan Line.
- 2.5.21 The site of the Blomfield Box was developed from the Post-medieval period onwards; however, the exact extent of disturbance caused by the buildings on the site is uncertain. Post-medieval and modern development is likely to have truncated archaeological deposits of Medieval and Post-medieval date. The apparent survival of Moorfields Marsh deposits across the area would indicate that this truncation has generally not extended to Roman and earlier layers, and previous investigations to the south of New Broad Street (BLM87; CAP86 and BRO90) have identified Roman, Medieval and Post-medieval remains.
- 2.5.22 The Blomfield Box is located over 11-12 Blomfield Street, which extend to the rear, backing on to Broad Street Avenue. 11-12 Blomfield Street has a single level basement across its footprint (surface of slab: c.109 to 109.6m ATD) with a sub-basement to the rear, at approximately 107m ATD. Where basements are deeper than 108m ATD it is not expected that archaeological deposits will survive.
- 2.5.23 Blomfield Street runs approximately on the route of the former River Walbrook. Therefore it is expected that a greater depth of archaeological deposits will be present in the western parts of the footprint of 11-12 Blomfield Street.

Broadgate Ticket Hall, Link Tunnel and Utilities Corridor

The Burial Ground (BG208)

- 2.5.24 The Liverpool Street site was a burial ground (BG208) founded in 1569 known as *New Churchyard*, related to the St Mary (of) Bethlehem hospital. The burial ground was in use until the mid 19th century, at which point Liverpool Street was widened to incorporate the southern part of the burial ground. The alignment of Liverpool Street remained the same from this point despite the large scale change to the area that came with the construction of the Metropolitan Line and Broad Street Station. Broad Street Station was demolished in 1985/1986 in advance of the construction of 100 Liverpool Street. All that now remains of that station is a below ground ticket hall (now used as an EDF sub-station) which lies adjacent to the Queen Victoria Tunnel at the eastern end of the Liverpool Street site. The southern side of the Liverpool Street site, partially within the footprint of the utilities corridor has also experienced some deep truncation by basement vaults extending beneath the pavement to the front of 1 and 15 Liverpool Street. The depth of the (filled in) basements is unknown.
- 2.5.25 A programme of archaeological excavation (LSS85) took place within BG208 immediately north of the Broadgate Ticket Hall prior to the construction of 100 Liverpool Street. Refer to the drawing C138-MMD-T1-DDA-C101_1-10070 in Appendix 4 for a location plan of the LSS85 excavations. The following key points are relevant to the Crossrail site:
- Over 400 burials were identified.

- The base of the burials was noted at 2m BGL (c.106m ATD) overlying 0.5m of dumping.
- An average of 8 burials per cubic metre was encountered.
- Some survival of coffins was encountered with associated coffin decoration and breast plates surviving to varying degrees.
- Large areas of disarticulated disturbed human remains were encountered during a watching brief as part of LSS85, representing disturbance and backfill during the construction of Broad Street Station.
- Reburial occurred in 8 specially constructed skips of 8 cubic meters each at the site of TP7 (see the drawing C138-MMD-T1-DDA-C101_1-10070 in Appendix 4).

2.5.26 Further works to have taken place within BG208 comprise:

- XRD92 (Liverpool Street south carriageway junction with Blomfield Street) – Borehole L11, burial deposits interpreted to approximately 2.8m BGL.
- FWD04 (west end of Liverpool Street) – A single articulated skeleton at 1.22m BGL and disarticulated remains to 1.1m BGL.
- LVB06 (see C138-MMD-T1-DDA-C101_1-10070 in Appendix 4 for location plan) identified human remains to a depth of 3.2m BGL.
- XSM10. Trench 9. By 04 March 2011, one trench from the trial trench evaluation described in this document has been carried out. The trench identified *in situ* human burials at a depth of 1700mm BGL in the carriageway of Liverpool Street.

2.5.27 The construction of the disused Broad Street Station ticket hall and Queen Victoria Tunnel beneath the carriageway of Liverpool Street will have disturbed archaeological remains at those locations. Utilities within the carriageway of Liverpool Street will also have disturbed archaeological deposits up to 1300mm to 1500mm BGL, however, utilities works, unrelated to Crossrail are known to have encountered human remains in the carriageway of Liverpool Street immediately in front of 100 Liverpool Street. EWMA utilities trenches (Section 2.3.3) in Liverpool Street identified disturbance by large areas of modern concrete and dense services, although archaeological soils were notably encountered at 1300mm below ground level in utilities Trench LIV 5. Furthermore, disarticulated human remains were encountered in two of the trenches. It is highly likely that beyond the depth of utilities (c.1500mm BGL) that articulated human remains will survive at Liverpool Street. Early results from trench 9 of the XSM10 trial trench evaluation in Liverpool street identified *in situ* human remains at a depth of 1700mm BGL. Currently the thickness of burial ground deposits is uncertain but they are estimated to extend upwards to 109m ATD.

Earlier Archaeological Deposits

2.5.28 The Walbrook River ran approximately north-south on the route of Blomfield Street. The River formed a shallow valley into which other tributaries ran. During excavations at the construction of 100 Liverpool Street (LSS85), the Walbrook channel was identified, in cutting down to 106m ATD (MoLA 2007). Therefore at the western end of the Liverpool Street site there is the potential for deposits relating to the Walbrook including evidence for Roman control of the waterway such as brickearth and clay dumping and revetments.



Evidence for Roman activity was revealed at sites NEB87 and BDC03 and included land-reclamation activity and burials.

2.5.29 Deposits relating to Moorfields Marsh, which built up in the area from the late Roman to the medieval period are also expected at the Liverpool Street site.



3 Construction Impacts

3.1 Summary

3.1.1 There is potential for archaeological remains to survive (until disturbed or removed by excavations for Crossrail works) at the four Crossrail worksites for Liverpool Street Station (Figure 1) and at utilities diversions and protective works in the streets around the worksites. As described in Annex 3, the worksites include some areas of utility diversions outside the LLAU in the London Borough of Islington and the City of London. However, as required by the Crossrail Environmental Minimum Requirements (refer to Crossrail Act 2008 supporting documents) this SSWSI will apply to all Crossrail works.

- Moorgate worksite – Combined Ticket Hall, Moorgate shaft, Moorgate Station Sewer diversion, grouting works and nearby utilities diversions including the London Wall Heading;
- Finsbury Circus worksite – Finsbury Circus access shaft, worksite, two grout shafts and nearby utilities diversions;
- Blomfield Street worksite - Blomfield Box and grouting basement, nearby utilities diversions and the Powerlink cable shaft; and
- Liverpool Street worksite - Broadgate Ticket Hall, link passage, utilities corridor and associated secondary utilities diversions.

3.1.2 Figure 1 below shows the Crossrail worksites including utilities diversions as shown in the Crossrail Environmental Statement (2005). The precise locations of utilities works are subject to minor changes, please refer to Annex 3 for drawings of utility diversions outside LLAU in the London Borough of Islington and the City of London.

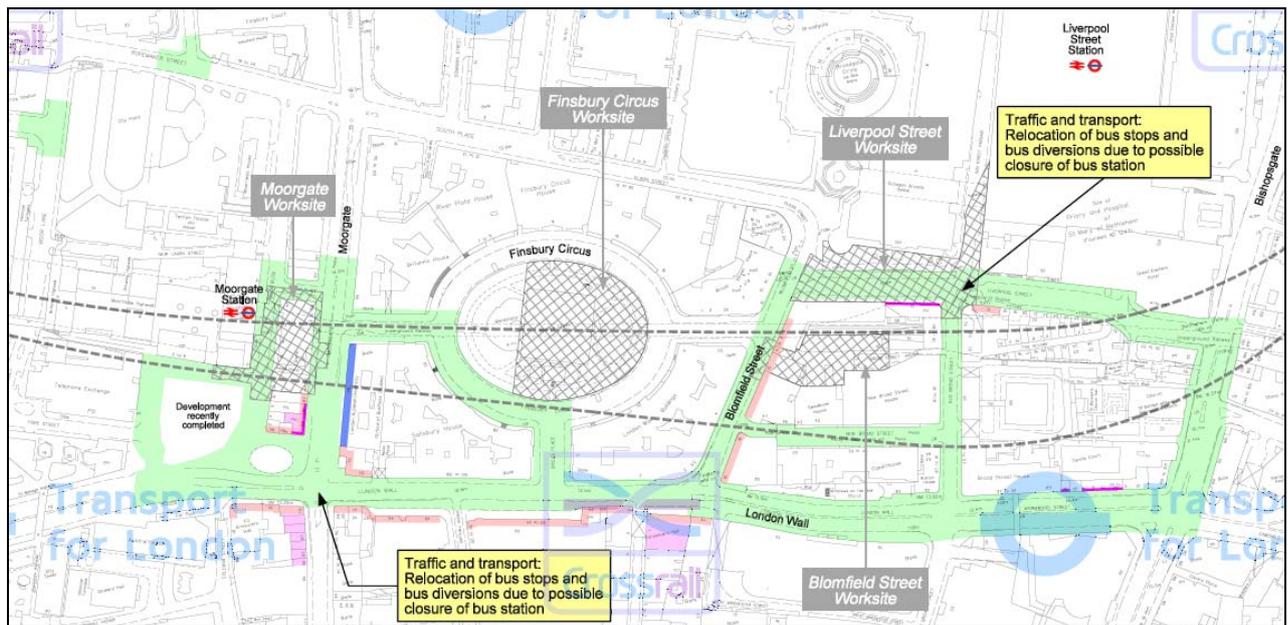


Figure 1 Crossrail worksites at Liverpool Street Station, including utilities, shaded green (Crossrail 2005)

3.2 Enabling Works & Main Works

3.2.1 The Crossrail works are divided into Enabling Works and Main Works. Enabling Works are defined as those works that are required to facilitate the Main Works, and as such are required prior to the start of the Main Works programme. Enabling Works and Main Works which will result in an impact to the archaeological resource at the Liverpool Street Station sub-sites comprise:

3.2.2 Moorgate Worksite – Enabling Works

- Demolition of 91 to 109 Moorgate to basement level. This activity will not affect archaeological deposits. 91 to 109 Moorgate adjoins Grade II Listed Buildings at 87 Moorgate and 8 Moorfields for which protection works will be subject to approval under the Heritage Agreement with the City of London. The protective works may include small diameter piles inserted from the basement of 91-109 Moorgate and a limited amount of permeation grouting passing through the footings of 87 Moorgate/8 Moorfields. These will remove a small quantity of archaeological deposits at the pile locations. Targeted ground reduction of up to 300mm to level the basement in 8 Moorfields is unlikely to affect archaeological deposits. Protective works under the Heritage Agreement are not dealt with further in this document.
- Demolition of 17-31 Moorfields to the ground floor slab either side of the existing LU ticket hall and to the roof slab of the existing LU Moorgate Ticket Hall.
- Diversion of Thames Water's Moorgate Station Sewer beneath Moorfields will completely remove archaeological deposits within the footprint of the four manholes and may disturb Moorfields Marsh deposits along the route of the diversion.
- Utility diversions in nearby streets will partially or completely remove archaeological remains (if present) within the ground and possibly disturb

Moorfields Marsh deposits. The diversions include the London Wall heading which is located outside of the scheduled monument in an area previously heavily disturbed by the construction of a subterranean car park under London Wall, the basement of Moor House and associated previous utility diversions.

3.2.3 Moorgate Worksite – Main Works

- Installation of 1.2m thick diaphragm wall panels and 2.8m by 1.2m barrettes will completely or partially remove archaeological remains at those locations. The guide trenches for the panels will disturb the upper layers of Moorfields Marsh deposits.
- Ground reduction outside of the diaphragm wall in Moorfields and Fore Street Avenue to the general site level of 110.00m ATD (existing basement at 91-109 Moorgate) will completely remove all archaeological remains within the Made Ground and upper layers of Moorfields Marsh deposits.
- Further ground reduction outside of the diaphragm wall in Moorfields and Fore Street Avenue to the general site level of 107.50m ATD will completely remove all archaeological deposits.
- Excavation within Moorgate shaft to approximately 72m ATD will completely remove archaeological deposits.

3.2.4 Finsbury Circus Worksite – Enabling Works

- Topsoil stripping to level the area for worksite establishment was subject to a general watching brief by the C257 Archaeological Contractor – no archaeological deposits were encountered.
- Utilities diversions in the carriageway and footpath of Finsbury Circus and Circus Place may disturb archaeological remains within the made ground and upper layers of Moorfields Marsh deposits.
- The demolition and reinstatement of the Finsbury Circus Grade II Registered Park and Garden (GD2274).
- The temporary removal and reinstatement of the Grade II listed Gazebo. In accordance with the Generic WSI (Document Number: CR-PN-LWS-EN-SY-00001), this listed building is excluded from the scope of the site-specific WSI since it is subject to a separate agreement with the City of London /English Heritage. Mitigation for the impacts on the Grade II listed Gazebo is set out in an agreement with the City of London and is not dealt with further in this SSWSI document.
- Exploratory trenches in the street to identify the location of utilities in advance of the construction of grout shafts were subject to a general watching brief by the C257 Archaeological Contractor – no archaeological deposits were encountered.

3.2.5 Finsbury Circus Worksite – Main Works

- Construction of two grout shafts, located within the street at the southern half of Finsbury Circus will completely remove all archaeological deposits within their footprint.
- Construction of the access shaft, located within Finsbury Circus gardens, will completely remove all archaeological deposits within its footprint.

3.2.6 Blomfield Street Worksite – Enabling Works

- Demolition of 11-12 Blomfield Street and wall to rear. 11-12 Blomfield Street was subject to an English Heritage Level 2 building recording by the C257 Archaeological Contractor.
- Utilities diversions in Blomfield Street, Old Broad Street, New Broad Street and Broad Street Avenue may disturb archaeological remains within the made ground. Archaeological deposits will not be affected by utility diversion works in Blomfield Street in the location of the cut and cover Metropolitan Line.
- The relocation of the Powerlink substation currently situated within the former Broad Street Ticket Hall will not affect archaeological deposits as it will be relocated within the Metropolitan Line railway cutting, immediately to the north of Broad Street Avenue, however, construction of the Sprayed Concrete Lining (SCL) Powerlink shaft will pass through the River Terrace Deposits into the London Clay and will completely remove any surviving archaeological deposits.

3.2.7 Blomfield Street Worksite – Main Works

- Temporary works for first stage excavation of the Blomfield Box, including piling will completely remove archaeological deposits at those locations.
- Excavation of basement to underside of slab level 106.5m ATD, then locally to underside of pile capping beams will completely remove archaeological deposits within its footprint.
- Initial stages of the further excavation of the Blomfield Box to c.100.40m ATD from basement slab level will completely remove archaeological remains within its footprint to a depth of c.106.00±1m ATD.
- Excavation of the grouting basement of 11-12 Blomfield Street will completely remove archaeological deposits in its footprint.

3.2.8 Liverpool Street Worksite – Enabling Works

- Demolition of the former Broad Street Station ticket hall and partial demolition of the Queen Victoria Tunnel, both of which are located beneath the eastern end of the Liverpool Street worksite.
- Exploratory trenches to locate utilities in front of 100 Liverpool Street will possibly impact archaeological deposits in the made ground, potentially including disarticulated human remains.
- Secondary utilities diversions, to remove existing utilities in Liverpool Street from the footprint of the proposed utilities corridor and divert utility connections from 100 Liverpool St will affect archaeological remains in the made ground, including disarticulated human remains.
- 0.45m and 1.25m piles and guide walls for the utilities corridor will completely remove all archaeological deposits in their footprint including human remains.
- Construction of the utilities corridor will completely remove archaeological deposits in its footprint, including human remains.
- Diversion of utilities into the utility corridor will possibly impact archaeological deposits in the made ground, potentially including disarticulated human remains in Liverpool St. Diversion of the Liverpool St Sewer to an alignment below the

utilities corridor will require construction of new manholes and trenches through all strata and archaeological deposits above the London Clay.

3.2.9 Liverpool Street Worksite – Main Works

- Demolition of sections of the existing sub-station and part of the Queen Victoria Tunnel will disturb archaeological deposits (potentially including human remains) and features of non-listed built heritage value.
- 1.25m piles and guide walls for the Broadgate Ticket Hall will completely remove archaeological deposits, including human remains.
- Excavation for construction of the Broadgate Ticket Hall will completely remove archaeological deposits within its footprint including human remains.

4 Aims and Objectives

4.1 Research Aims

4.1.1 Selected research themes derived from *A Research Framework for London Archaeology 2002* (Nixon et al, 2003) are included in the *Assessment of Archaeology Impacts Technical Report* (Crossrail 2005). Archaeological investigation and mitigation within the Crossrail worksites for Liverpool Street Station have the potential to contribute to the research themes set out below.

4.1.2 Evidence relating to the Walbrook, its tributaries and Moorfields Marsh deposits may provide data relevant to the following themes:

- Understanding London's hydrology, river systems and tributaries and the relationship between rivers and floodplains;
- Understanding how water supply and drainage provision were installed and managed;
- Refining our understanding of the chronology and function of the landward and riverside defences and extramural evidence of defensive or military structures in the Roman period;
- Understanding the relationships between urban settlements and royal villas or religious estates;
- Examining the proposal that there was an ideological polarity between town and anti-town systems: Roman towns did not so much fail as were discarded;
- The end of the Roman occupation: developing explanatory models to explain socio-political change and considering the influence of surviving Roman structures on Saxon development; and
- Examining the use in any one period of materials from an earlier period (e.g. Saxon use of surviving Roman fabric) and the influence on craftsmanship, manufacture and building techniques.

4.1.3 Evidence relating to the medieval Bethlehem Hospital precinct and burial ground (BG208), bisected by Liverpool Street, may provide data relevant to the following themes:

- Understanding the differences, if any, between burial practices in the city and outlying cemeteries;
- Understanding life expectancy, origins and belief, seen through studying health, diet and disease, and preparing models for future research;
- Considering the relationship between cemeteries and major or minor roads, in terms of symbolism, status, privacy and convenience; and
- Synthesising data on known religious sites and buildings, their chronology, use and influence locally, regionally and nationally.

4.1.4 Should sections of the London Wall be uncovered, the following research themes may be relevant and will be dealt with under the Scheduled Monument Agreement:

- Understanding the cultural and symbolic roles played by London's defences through the ages as reflections of power and political security or imposition and dominance.

4.2 Objectives of the Investigation

4.2.1 The overall objectives of the trial trench evaluation are to establish the nature, extent and state of preservation of any surviving archaeological remains that will be impacted upon by the development. At the Liverpool Street worksite, evaluation is also required to determine the geographical extent, depth and concentration of human remains surviving in BG208 to inform the scope of mitigation works.

4.2.2 Archaeological investigations at the Liverpool Street and Blomfield Street sites have the potential to recover:

- Medieval remains associated with St Mary Bethlehem Hospital;
- Archaeological remains of Roman date relating to extra-mural activity, including burials;
- Post-medieval rubbish dumps and remains associated with the urbanisation of the area;
- Burials within the known burial ground (BG208) that lies beneath the carriage way of Liverpool Street in the Broadgate Ticket Hall area;
- Waterlain deposits with the potential for organic preservation and palaeo-environmental remains.

4.2.3 Archaeological investigations within Finsbury Circus worksite have the potential to recover:

- Medieval remains associated with St Mary Bethlehem Hospital;
- Archaeological remains of Roman date relating to extra-mural activity, including burials and roadside development;
- Late medieval and post-medieval rubbish dumps and remains associated with the reclamation of Moorfields Marsh; and
- Waterlain deposits with the potential for organic preservation and palaeoenvironmental remains.

4.2.4 Archaeological investigations at the Moorgate worksite have the potential to recover:

- Archaeological remains of Roman date relating to extra-mural activity, including burials; and
- Waterlain deposits with the potential for organic preservation and palaeoenvironmental remains.



5 Scope of the Investigation

5.1 Details of Archaeological Investigations at the Liverpool Street worksites

5.1.1 Refer to appendices 1-4 for WSI Addenda for each worksite. The WSI addenda set out in detail the archaeological evaluation and mitigation works for each site.

5.2 Summary of Archaeological Investigations

5.2.1 The table below sets out archaeological evaluation and mitigation measures at the Liverpool Street worksites. Also included in the table below is an outline of the mitigation strategies for the Main Works. These mitigation measures have been included to enable programming decisions to be made, however, the strategies are subject to change based on the results of the trial trench evaluations at each worksite.

| Worksite | Crossrail Activities | Evaluation/Mitigation | Site Code | Principal Contractor |
|---------------------------------|--|--|-----------|----------------------|
| Moorgate worksite | Shaft Construction | Trial trench evaluation (8 trenches) | XSP10 | C212 |
| | Ground reduction by 0.3m in basement of 87 Moorgate | General watching brief | XSP10 | Tbc |
| | Diaphragm Walling guide trenches | General watching brief | XSP10 | C501 |
| | Diversion of Moorgate Station Sewer (4 sewer manholes and sewer route) | Targeted watching brief (4 manholes); general watching brief (sewer route) | XSP10 | C501 |
| | Utility diversions & London Wall heading | General watching brief | XSP10 | C216 |
| | Ground reduction to 110m ATD (outside D-Wall) | General watching brief | XSP10 | C501 |
| | Ground reduction to 107.5m ATD (outside D-Wall) | Targeted watching brief | XSP10 | C502 |
| | Shaft Construction | <i>Excavation and/or watching brief and power auger survey</i> | XSP10 | C501 |
| Finsbury Circus worksite | Access shaft construction | Power Auger Survey | XRZ10 | JB Riney |
| | | Trial trench evaluation (1 trench) | XRZ10 | JB Riney |
| | Utilities diversions in the street | General watching brief | XRZ10 | C216 |
| | Grout shaft construction | Targeted watching brief | XRZ10 | C510 |
| | Access shaft construction | <i>Excavation and/or watching</i> | XRZ10 | C510 |



| Worksite | Crossrail Activities | Evaluation/Mitigation | Site Code | Principal Contractor |
|---|---|--|--------------|----------------------|
| | | <i>brief</i> | | |
| Liverpool Street worksite (including utilities corridor) | Demolition of QVT and Broad St Station ticket hall | Level 2 English Heritage Survey | XSB10 | C502 |
| | Box construction | Phase 2: Trial trench evaluation in the street (4 trenches) | XSM10 | JB Riney |
| | Box construction | Phase 3: Trial trench evaluation in the street and pavement (4 trenches) | XSM10 | JB Riney |
| | Utilities Corridor | Phase 4: Trial trench evaluation in utilities corridor footprint (4 trenches) | XSM10 | JB Riney |
| | Exploratory trenches on British Land to front of 100 Liverpool Street | General watching brief | XSM10 | JB Riney |
| | Test pit and core in basement of Railway Tavern | General watching brief | XSM10 | JB Riney |
| | Secondary utilities diversions | General watching brief and targeted watching brief | XSM10 | C503 |
| | <i>1.25m piles and guide walls for utilities corridor</i> | <i>Sample excavation by the C257 Archaeological Contractor & rapid removal by a licensed burial contractor</i> | <i>XSM10</i> | <i>C503</i> |
| | <i>Utilities corridor excavation</i> | <i>Sample excavation by the C257 Archaeological Contractor & rapid removal by a licensed burial contractor</i> | <i>XSM10</i> | <i>C503</i> |
| | <i>1.25m piles and guide walls for main box</i> | <i>Sample excavation by the C257 Archaeological Contractor & rapid removal by a licensed burial contractor</i> | <i>XSM10</i> | <i>C502</i> |
| | <i>Box construction</i> | <i>Sample excavation by the C257 Archaeological Contractor & rapid removal by a licensed burial contractor</i> | <i>XSM10</i> | <i>C502</i> |
| 1.25m piling (arisings monitoring) | General watching brief | XSM10 | C503 & C502 | |
| Blomfield Street worksite | Demolition of 11-12 Blomfield Street | Level 2 English Heritage Survey | XSB10 | C212 |
| | Box construction | Trial trench evaluation (6 trenches) | XSL10 | C212 |
| | | Power auger survey | XSL10 | C212 |

| Worksite | Crossrail Activities | Evaluation/Mitigation | Site Code | Principal Contractor |
|----------|--|---|--------------|----------------------|
| | Utilities diversions (Blomfield St, New Broad St, Old Broad St, Broad St Av) | General watching brief | XSL10 | C216 |
| | Powerlink cable shaft | General watching brief | XSL10 | C503 |
| | <i>Box construction</i> | <i>Excavation and/or watching brief</i> | <i>XSL10</i> | <i>C502</i> |

Nb. Items in italics are predicted archaeological mitigation works that may be required during the main works phase. The final mitigation design will be informed by the trial trench evaluations being carried out at each worksite

Table 1 Outline archaeological investigations at the Liverpool Street worksites

5.2.2 The following archaeological evaluation and mitigation activities have already taken place:

- General watching brief on worksite establishment at Finsbury Circus;
- General watching brief on exploratory trenches at grout shaft locations;
- General watching brief on ground investigation boreholes;
- English Heritage Level 2 survey of 11-12 Blomfield street;
- Trench 6 of the Moorgate trial trench evaluation (XSP10); and
- Trench 9 of the Liverpool Street trial trench evaluation (XSM10).

5.3 Non-Listed Built Heritage Assessment and Recording

5.3.1 Non-listed built heritage assessment and recording forms part of the archaeological mitigation strategy for Crossrail. The definition of non-listed built heritage adopted follows Information Paper D22 Archaeology and encompasses above ground historic features and structural elements of historical interest.

5.3.2 Two main groups are:

- Non-listed buildings proposed for demolition in conservation areas; and
- Historic street furniture and materials falling within a worksite and being temporarily or permanently impacted upon by the works.

5.3.3 The detailed scope for this element of works includes:

- Important non-listed buildings of historic interest proposed for demolition in conservation areas (as set out in Information paper D18, Listed Buildings and Conservation Areas);
- Important non-listed historic street furniture and materials;
- Other important non-listed buildings and structures of historic interest outside conservation areas (i.e. the standing walls at Stepney Green), locally listed station buildings and railway structures and any industrial and defence archaeology of significance.

5.3.4 The Crossrail Environmental Statement and supporting Specialist Technical Reports define the baseline built heritage resources (both statutorily protected and non-listed)

across the route, the potential significant impacts, mitigation and any residual impacts after that mitigation is employed (Crossrail 2005).

5.3.5 Non-listed built heritage assets to be demolished were identified during Scheme Design and inspected internally during the RIDA D phase. The surveys identified the specification of mitigation works in advance of demolition. The results of the survey are set out in Tables 1 and 2. The locations of the NLBH assets in the tables below are shown on drawing number P30103-C1M12-E00-D-60004 (Annex 3).

| Name [Figure Ref] | Image | Description | Significance | Impact | Mitigation/ Further Investigation |
|--|--|---|--|------------|---|
| 11 & 12 Blomfield Street [1 and wall to rear.] |  | <p>5 storeys plus attic and basement, constructed from stone with glazed tile return and red brick rear. The Neo-classical façade has a large commercial frontage to the ground floor, with glazed panels separated by thin pilasters under a plain frieze. Architectural emphasis is placed on the first floor with rusticated piers under frieze adorned with cartouches and scrolled pediments. Access is located via a single arched entrance in ashlar with polished pink and grey granite dressings, above which is a Doric frieze below a dentilated pediment. Internal features of interest include ornate tiling to hallways, original doors and sash windows, housekeeper's lodge and detail to stairs including banisters, panelling and decorative brackets.</p> <p>Mid to late 19th century rear wall linking 11 & 12 Blomfield Street to 76-80 Old Broad Street is a surviving railway heritage feature.</p> | Unlisted building which makes a positive contribution to the New Broad Street Conservation Area. | Demolished | English Heritage Level II survey was carried out prior to demolition by the C257 Archaeology Contractor |

| Name [Figure Ref] | Image | Description | Significance | Impact | Mitigation/ Further Investigation |
|--|---|--|---|--|--|
| Finsbury Circus Gardens [3] |  | Urban park laid out to the designs of Charles Dance in 1815. The gardens were partially remodelled in the early 20 th century, but the structure of Dance's design survives. The garden includes a central bowling green, surrounded by manicured lawns and established flower beds. The oval park is encompassed by iron railings with four entrance gates. Within the park is a grade II listed gazebo and undesignated pavilion and bandstand. | Grade II Registered Historic Park and Garden | To be removed during works. The park will be reinstated upon completion. | No mitigation required. |
| Broad Street Station Ticket Hall and access tunnel[11] |  | Former underground ticket hall, now used as a sub-station. The structure is a surviving part of Broad Street Station constructed in 1865 and demolished in 1986. Good survival of historic fabric including glazed tiles, blocked up archways, numerous stanchions, stairs, handrails and glazed tiles surrounding advertising hoardings | The structure is significant as a sole surviving section of the now demolished Broad Street station. | To be demolished | English Heritage Grade II survey is to be carried out by the C257 Archaeological Contractor. |
| Queen Victoria Tunnel [12] |  | Branching from Metropolitan Line the QVT is an early element of the London Underground dating to the late 19th century when the Metropolitan Line was extended from Moorgate. Much historic fabric is lost with the insertion of modern fixtures, fittings and plastering - only outline of the tunnel being extant. | Part of the historic development of the London Underground network. | To be partially demolished | English Heritage Grade II survey is to be carried out by the C257 Archaeological Contractor. |
| 1960s cafeteria - proposed CER room [13] |  | Mid 20 th century cafeteria located within Liverpool Street station. | The cafeteria is a surviving example of part of the development of the station in the mid 20 th century. | To be stripped | No mitigation required. |

| Name [Figure Ref] | Image | Description | Significance | Impact | Mitigation/ Further Investigation |
|----------------------------------|---|--|---|------------------|-----------------------------------|
| 91-109 Moorgate (the AMRO Bank); |  | Constructed 1975-81 by Trehearne & Norman, Preston and Partners. A long slab in Sardinian beige granite with recessed windows in a chamfered matrix. The central recess to its eastern elevation was for an un built section intended to provide views to the central atrium | Unlisted building which makes a neutral contribution to the surrounding streetscape | Demolished | No mitigation required. |
| 17-31 Moorgate |  | Constructed 1973 by Leo Hannen Associates. Seven storeys in height with grey floor panels and jagged relief pattern and strong horizontal fenestration pattern | Unlisted building which makes a neutral contribution to the surrounding streetscape | To be demolished | No mitigation required. |

Table 2 Results of the Non Listed Built Heritage survey at the Liverpool Street Station worksites

5.3.6 Street furniture surveys were carried out by EWMA identifying all elements of street furniture at Liverpool Street Station. The results of the EWMA survey were reviewed to identify street furniture of historic significance.

| Name [Figure Ref] | Image | Description | Significance | Impact | Mitigation/Further Investigation |
|--|---|--|---|---|---|
| Pair of K6 telephone boxes outside 118 London Wall [4] |  | Pair of red K6 telephone boxes located outside 118 London Wall. | The K6 telephone box represents an important piece of iconic street furniture contributing to the streetscape of this area. | No impact | Remain in situ but will be protected from plant. Method statement/details of protection will be provided by C216. |
| Pillar box outside 101-109 Moorgate [5] |  | Red, type 'C' pillar box with the royal insignia of George V, dating it to between 1910 – 1936 | An early example of the Type 'C' pillar box which makes a positive contribution to the streetscape. | Will be temporarily removed and stored for the duration of the works. | No mitigation required, agreed with the Post Office. |

| Name [Figure Ref] | Image | Description | Significance | Impact | Mitigation/Further Investigation |
|---|---|--|---|------------|---|
| Pair of K6 telephone boxes outside 84 Moorgate [7] |  | Pair of red K6 telephone boxes located outside 84 Moorgate. | The K6 telephone box represents an important piece of iconic street furniture contributing to the streetscape of the Finsbury Circus Conservation Area. | No impact | Remain in situ but will be protected from plant. Method statement/details of protection will be provided by C216. |
| Pillar box outside 28 Finsbury Circus [8] |  | Red, type 'C' pillar box bearing the royal insignia of Edward VII, dating it to between 1901 and 1910. | An early example of the Type 'C' pillar box which makes a positive contribution to the Finsbury Circus Conservation Area. | No impact | No mitigation required. |
| Pair of K6 telephone boxes outside 100 Liverpool Street [9] |  | Pair of red K6 telephone boxes located outside 100 Liverpool Street. | The K6 telephone box represents an important piece of iconic street furniture which contributes to the streetscape of this area. | No impact. | No mitigation required. |
| K6 telephone box outside 47 New Broad Street [10] |  | Red K6 telephone boxes located outside 47 New Broad Street. | The K6 telephone box represents an important piece of iconic street furniture contributing to streetscape of the New Broad Street Conservation Area. | No impact | Remain in situ but will be protected from plant. Method statement/details of protection will be provided by C503. |

Table 3 Non Listed Street Furniture within the Liverpool Street Station worksites

6 Programme

6.1 Introduction

Site-specific evaluation and mitigation measures are presented using the following phasing:

- CRITICAL phase advanced archaeological works which need to be undertaken prior to the Enabling Works (this may apply to very significant archaeological remains where complex mitigation is required and where early site access is required)
- Phase 1 archaeological works to be undertaken commensurate with the programme of Enabling Works
- Phase 2 archaeological works to be undertaken commensurate with the Main Works
- Phase 3 archaeological works to be undertaken after the Main Works phase (e.g. post excavation assessment, analysis, publication and dissemination).

Time (ideally a minimum of 8 weeks) is required between the end of evaluation fieldwork and start of mitigation work. This incorporates the 4 weeks of reporting by the C257 Archaeological Contractor and preparation of a WSI for mitigation works. However, programme constraints are such that the time allowed for this will be taken on a site by site basis. Preparation of the mitigation strategy for each site will begin during the evaluation process.

For further information regarding specific programming activities at each of the worksites refer to the WSI Addenda in appendices 1-4. All programme dates are provided for information only since they are subject to change as the works develop.

Refer to sections 8 and 9 of this document for details regarding deliverables for each worksite.

6.2 Archaeological Investigation - Moorgate worksite

| Phase | Crossrail Activity | Evaluation/ Mitigation | Date from | Date to | Duration (weeks) |
|-------|---|---|----------------|---------------|-------------------------|
| 1 | Shaft Construction (91-109 Moorgate) | Trial trench evaluation (5 trenches – one trench already complete) | May 2011 | June 2011 | 5 |
| 1 | Shaft Construction (17-31 Moorfields) | Trial trench evaluation (2 trenches) | Tbc | Tbc | 2 |
| 1 | Ground reduction in basement of 87 Moorgate | General watching brief | May/June 2011 | May/June 2011 | 2 |
| 2 | Diaphragm Walling guide trenches | General watching brief | November 2011 | March 2012 | Throughout construction |
| 1 | Moorgate Station Sewer | Targeted watching brief at 4 manholes and general watching brief during sewer | September 2011 | August 2012 | 2 per manhole |

| Phase | Crossrail Activity | Evaluation/ Mitigation | Date from | Date to | Duration (weeks) |
|-------|--|--|----------------------|-------------------|---|
| | | route excavation | | | |
| 1 | Utility diversions & London Wall heading | General watching brief | March 2011 | January 2012 | n/a |
| 2 | Ground reduction to 110m ATD (inside and outside D-Wall) | General watching brief | January 2012 | April 2012 | as required. |
| 2 | Ground reduction to 107.5m ATD (outside D-Wall) | Targeted watching brief | tbc | 2014 | tbc |
| 2 | <i>Shaft Construction</i> | <i>Excavation and/or watching brief and power auger survey</i> | <i>November 2011</i> | <i>March 2012</i> | <i>Alongside Main Works – details to be confirmed, 8 weeks allowed.</i> |

Nb. Items in italics are potential mitigation measures. The final mitigation design will be informed by the trial trench evaluations being carried out at each worksite

Table 4 Outline programme - Moorgate worksite

6.2.1 Work completed to 28 February 2011

- A single trial trench (Trench 6) has been excavated in the basement of 91-109 Moorgate in advance of the main evaluation phase.

6.3 Archaeological Investigation Finsbury Circus worksite

| Phase | Crossrail Activity | Evaluation/ Mitigation | Date from | Date to | Duration |
|-------|----------------------------------|---|-------------------|-------------------|--------------------------------------|
| 1 | Access shaft construction | Power Auger Survey | March 2011 | March 2011 | 2 days |
| 1 | | Trial trench evaluation (1 trench) | March 2011 | March 2011 | 2 weeks (archaeology only) |
| 1 | Utilities diversions | General watching brief | March 2011 | August 2011 | n/a |
| 2 | Grout shaft construction | Targeted watching brief | March 2011 | May 2011 | 1 to 2 weeks per shaft (archaeology) |
| 2 | <i>Access shaft construction</i> | <i>Excavation and/or watching brief</i> | <i>March 2011</i> | <i>April 2011</i> | <i>4 weeks</i> |

Nb. Items in italics are potential mitigation measures. The final mitigation design will be informed by the trial trench evaluations being carried out at each worksite

Table 5 Outline programme - Finsbury Circus worksite

6.3.1 Work completed as at 28 February 2011

- General watching brief on ground reduction in advance of worksite establishment at Finsbury Circus Gardens.

- General watching brief on exploratory trenches at grout shaft locations.

6.4 Archaeological Investigation – Blomfield Street worksite

| Phase | Crossrail Activity | Evaluation/Mitigation | Date from | Date to | Duration |
|-------|--|---|--------------------|-----------------------|--------------------------------------|
| 1 | Box construction | Trial trench evaluation (6 trenches) | June 2011 | July 2011 | 1 week per trench (archaeology only) |
| 1 | | Power auger survey | June 2011 | July 2011 | 1 week |
| 1 | Utilities diversions (Blomfield St, New Broad St, Old Broad St, Broad St Av) | General watching brief | March 2011 | January 2012 | n/a |
| 1 | Powerlink cable shaft | General watching brief | December 2011 | May 2012 | 1 week |
| 2 | <i>Box construction</i> | <i>Excavation and/or watching brief</i> | <i>August 2011</i> | <i>September 2012</i> | <i>2 months</i> |

Nb. Items in italics are potential mitigation measures. The final mitigation design will be informed by the trial trench evaluations being carried out at each worksite

Table 6 Outline programme - Blomfield Street worksite

6.4.1 Work completed as at 28 February 2011

- Level 2 English Heritage survey of 11-12 Blomfield Street.

6.5 Archaeological Investigation – Liverpool Street worksite (including utilities corridor)

| Phase | Crossrail Activity | Evaluation/Mitigation | Date from | Date to | Duration |
|----------|--|--------------------------------------|------------|------------|--|
| 2 | Demolition of QVT and Broad St Station ticket hall | Level 2 English Heritage Survey | May 2013 | June 2013 | 2 days |
| Critical | Phase 2: Box construction | Trial trench evaluation (4 trenches) | Feb 2011 | March 2011 | 1 week per trench for evaluation and 3-4 weeks per trench for deep excavations |
| Critical | Phase 3: Box construction | Trial trench evaluation (4 trenches) | March 2011 | March 2011 | 1 week per trench for evaluation and 3-4 weeks per trench for deep excavations |

| | | | | | |
|----------|---|--|---------------------|-----------------------|--|
| Critical | Phase 4: Utilities Corridor | Trial trench evaluation (4 trenches) | March 2011 | April 2011 | 1 week per trench for evaluation and 3-4 weeks per trench for deep excavations |
| 1 | Exploratory trenches on British Land to front of 100 Liverpool Street | General watching brief | April 2011 | April 2011 | 2 days |
| 1 | Test pit and core in basement of Railway Tavern | General watching brief | March 2011 | April 2011 | 1 day |
| 1 | Secondary utilities diversions | General watching brief and targeted watching brief | August 2011 | March 2012 | During diversion works |
| 2 | <i>1.25m piles and guide walls for utilities corridor</i> | <i>Sample excavation by the C257 Archaeological Contractor & rapid removal by a licensed burial contractor</i> | <i>October 2011</i> | <i>November 2011</i> | <i>6 weeks</i> |
| 2 | <i>Utilities corridor excavation</i> | <i>Sample excavation by the C257 Archaeological Contractor & rapid removal by a licensed burial contractor</i> | <i>tbc</i> | <i>tbc</i> | <i>3 months</i> |
| 2 | <i>1.25m piles and guide walls for main box</i> | <i>Sample excavation by the C257 Archaeological Contractor & rapid removal by a licensed burial contractor</i> | <i>August 2013</i> | <i>September 2013</i> | <i>Tbc</i> |

| | | | | | |
|---|------------------------------------|--|--------------|----------------|---------------------|
| 2 | <i>Box construction</i> | <i>Sample excavation by the C257 Archaeological Contractor & rapid removal by a licensed burial contractor</i> | 2013 | 2013 | 5 months |
| 2 | 1.25m piling (arisings monitoring) | General watching brief | October 2011 | September 2013 | During piling works |

Nb. Items in italics are potential mitigation measures. The final mitigation design will be informed by the trial trench evaluations being carried out at each worksite

Table 7 Outline programme - Liverpool Street worksite

6.5.1 Work completed as at 04 March 2011

- Trial trench evaluation in Liverpool Street commenced on the week beginning 22 February 2011. By 04 March, a single archaeological trench has been excavated (Trench 9). *In situ* human burials were encountered at 1.7m BGL.



7 Specification for Evaluation & Mitigation (including Watching Brief)

7.1 Generic Standards

7.1.1 The archaeological evaluation and mitigation works and scope of any archaeological scientific methods shall be designed and undertaken in accordance with the Generic WSI and relevant best practise guidance (and any subsequent revisions) i.e.:

- Crossrail standards and specifications;
- Institute for Archaeologists – Standard and Guidance for archaeological field evaluation, 2008 (revised);
- Institute for Archaeologists – Standard and Guidance for archaeological excavation, 2008 (revised);
- Institute for Archaeologists – Standard and Guidance for an archaeological watching brief, 2008 (revised);
- Museum of London collections and archive policies and guidance;
- English Heritage – Geoarchaeology, 2007;
- English Heritage - Archaeological Science at PPG16 interventions: Best Practice Guidance for Curators and Commissioning Archaeologists, 2003;
- GLAAS Archaeological Guidance Papers 1999;
- Corporation of London archaeology guidance – Planning Advice Note 3, 2004;
- Museum of London Archaeology Service site recording manual (MOLAS 1994);
- English Heritage – Guidance for best practice for treatment of human remains excavated from Christian burial grounds in England, 2005; and
- English Heritage – Understanding Historic Buildings – A guide to good recording practice, 2006.

7.2 Potentially nationally important remains

7.2.1 Where unexpected, potentially nationally important archaeological remains (as defined in the Crossrail Environmental Minimum Requirements and Generic WSI) are identified during the works, the C257 Archaeology Contractor shall undertake works in accordance with the Environmental Requirements (archaeology) section of the relevant package Works Information and shall adhere to procedures as set out in the SS-WSI.

7.2.2 The C257 Archaeology Contractor shall submit details of their procedure for excavating and recording potentially nationally important remains in the C257 Archaeology Contractor's Method Statement.

7.2.3 Details shall be in accordance with Crossrail procedures and include how relevant parties are to be informed of such discoveries, the criteria to be utilised by the C257 Archaeology Contractor in the assessment of the significance of such discoveries and the timescales to be adhered to.

7.2.4 As a result of the discovery of unexpected, potentially nationally important archaeological remains, the SS-WSI will be updated by the Design Archaeologist and reissued by the Project Archaeologist to incorporate any additional specific primary fieldwork event aims.

7.3 Human Remains

7.3.1 Certain aspects of the normal legal procedure for the removal of human remains (and associated monuments) from burial grounds has been modified by Schedule 15 to the Crossrail Act 2008. However for other aspects, normal legislation applies.

7.3.2 Where human remains are identified, all subsequent works must be undertaken in accordance with relevant legislative and environmental health requirements as set out in the Environmental Requirements (archaeology) section of the relevant package Works Information.

7.3.3 Crossrail procedures for dealing with discoveries of human remains shall identify any specific individual roles or actions that are relevant to the works. Details shall include how relevant parties are to be informed of such discoveries, the criteria to be utilised in the assessment of the significance of such discoveries, the application process for licences and the timescales to be adhered to.

7.3.4 The C257 Archaeology Contractor shall confirm how the requirements set out in the SS-WSI will be implemented as part of their procedure for excavating and recording human remains in the C257 Archaeology Contractor's Method Statement. This should incorporate best practice guidance e.g. Council for the Care of Churches (1999) and English Heritage (2002, 2002a and 2005).

7.3.5 At sites known in advance to have a high risk of encountering human remains, in this case at the Liverpool Street worksite, provision shall be made by the C257 Archaeology Contractor for site inspection by a recognised specialist.

7.3.6 Should human remains be discovered unexpectedly, the C257 Archaeology Contractor shall notify the Project Archaeologist immediately so that these procedures can be implemented. This notification may be initially made personally or by telephone but shall be confirmed in writing within 24 hours of discovery.

7.3.7 The Principal Contractor will be required to cease all works at that location until further instruction is provided by the Project Archaeologist. The C257 Archaeology Contractor shall undertake an initial in situ observation and assessment of the remains and shall advise the Project Archaeologist of the course of action required.

7.3.8 Lifting of human skeletal remains shall be kept to the minimum which is compatible with an adequate evaluation or excavation. Notwithstanding this, the Archaeological Contractor shall ensure that all burials are planned/photographed in-situ and that appropriate samples have been recovered prior to any lifting. At the Liverpool Street worksite it will be necessary for selected trenches to be excavated through burial deposits to determine the depth and density of human remains so that the programme can be accurately predicted during the Main Works

7.3.9 Visible grave goods and other obvious artefacts shall be recorded and lifted before the end of the working day to avoid the risk of vandalism and theft. Where this is not feasible or appropriate, the C257 Archaeology Contractor shall ensure, on liaison with the

Project Archaeologist that adequate site security is provided by the Principal Contractor. As a minimum, this will require a 24 hour comprehensive security regime until sensitive remains have been recorded and lifted.

7.3.10 As a result of the discovery of unexpected, potentially nationally important archaeological remains, the SS-WSI will be updated by the Project Archaeologist to incorporate any additional specific primary fieldwork event aims.

7.4 Treasure Act

7.4.1 The Treasure Act 1996 defines 'Treasure' as:

- Any object at least 300 years old when found which is: not a coin, but has metallic content of which at least 10% is precious metal; or
- One of at least two coins with at least 10% precious metal content;
- One of at least 10 coins;
- Any object at least 200 years old designated as treasure by the Secretary of State;
- Any object which would have been 'Treasure Trove';
- Any object found with any of the above.

7.4.2 The Treasure (Designation) Order 2002 extends the definition of treasure to include:

- Finds of at least two base metal objects (other than coins) of prehistoric date; and
- Any object (other than a coin) of prehistoric date with any precious metal content.

7.4.3 All finds falling within the definitions of treasure shall be reported immediately to the Project Archaeologist and all subsequent works must be undertaken in accordance with the relevant legislative requirements as set out in the Environmental Requirements (archaeology) section of the relevant package Works Information.

7.4.4 Crossrail procedures for dealing with Treasure finds shall identify any specific individual roles or actions that are relevant to the works. Details shall include how relevant parties are to be informed of such discoveries, the criteria to be utilised in the assessment of the significance of such discoveries and the timescales to be adhered to.

7.4.5 To protect the finds from theft, the C257 Archaeology Contractor shall record the finds and remove them to a safe place. Where recording and removal is not feasible or appropriate on the day of discovery, the C257 Archaeology Contractor shall ensure, on liaison with the Project Archaeologist that adequate site security is provided by the Principal Contractor.

7.4.6 Subject to the Provisions of the Treasure Act 1996, all material that is defined as Treasure is vested in the franchisee or, if none, the Crown.

7.4.7 With respect to Treasure finds, a reward may be payable to the finder, the landowner and/or the occupier. The Crown usually offers finds to a museum.

7.5 Health and safety

7.5.1 The C257 Archaeology Contractor shall undertake the works in accordance with the Employer's Health and Safety requirements and the Principal Contractor's Health and

Safety Plan. Where specific health and safety constraints or requirements for the C257 Archaeology Contractor's method of work are required, these are set out below and shall be addressed in the C257 Archaeology Contractor's Method Statement (in the Health and Safety Plan)

- 7.5.2 No ground intervention or other survey shall be made prior to approval of the C257 Archaeology Contractor's Health and Safety Plan, Method Statement and Risk Assessment by the CDM co-ordinator and/or Principal Contractor responsible for the works.
- 7.5.3 Hand excavation or other remote sensing method may be required prior to any mechanical excavation in the first instance to locate any known or suspected below ground hazards. The C257 Archaeology Contractor's Method Statement and Risk Assessment shall take account of any design information (including the Designer's and Principal Contractor's Risk Assessment) pertaining to above ground hazards such as buildings and other structures or public rights of way and below ground hazards such as services, utilities and infrastructure and shall contain a site specific Risk Assessment for unknown below ground hazards such as contaminants including unexploded ordnance. All appropriate mitigation measures shall be in place prior to commencement of any ground intervention or other survey.
- 7.5.4 Trial trench excavation method and earthworks support design, shall conform to Health and Safety legislation and safety standards as well as incorporating current engineering best practice, where appropriate.

7.6 Location and ground elevation of interventions and survey grids

- 7.6.1 The spatial extent of the investigation(s) shall be set out by the Principal Contractor or Archaeological Contractor (as required by works information) in accordance with the setting out co-ordinates supplied by the Project Archaeologist. All spatial setting out and recording shall be in accordance with The London Survey Grid Standard (formerly Crossrail Survey Grid). See Crossrail standard CR-STD-010.
- 7.6.2 Interventions shall be located to a horizontal accuracy of +/-500mm in relation to the detail illustrated in the contract drawing(s). The corner points of each excavation or the centre point of each soil core location shall be set out with a Total Station Theodolite or other suitable automated equipment referenced from approved Permanent Ground Marker (PGM) data supplied to the C257 Archaeology Contractor by the Project Archaeologist. The positions of the trenches and survey points shall be verified by the C257 Archaeology Contractor taking additional check measurements to additional known-location points of detail.
- 7.6.3 Surface heights shall be recorded and related to PGMs or approved Ordnance Survey Bench Marks (OSBM) .The full descriptions and locations of PGMs and OSBMs known to the Employer will be supplied to the C257 Archaeology Contractor by the Project Archaeologist. Levelling accuracy between OSBMs/PGMs and site TBMs shall be within $10 \text{ mm}/\sqrt{k}$: where 'k' is the total distance levelled in kilometres. Each TBM shall be levelled as part of a closed loop starting and finishing on approved OSBMs or Crossrail PGMs. Where more than one TBM is required per site the C257 Archaeology Contractor shall establish the TBMs as part of the same closed loop.
- 7.6.4 Survey information to also be provided in mATD.

7.6.5 The C257 Archaeology Contractor shall include details of their surveying methodology within their Method Statement (see Section 8), including the setting out of the grid and how they intend to provide the project grid co-ordinates to the Project Archaeologist with the Survey Report.

7.6.6 The C257 Archaeology Contractor shall ensure that all trench or excavation limits, and significant archaeology detail are surveyed 'as dug' in relation to the project grid before leaving the site. Ground level height data shall be recorded for each intervention. Survey methodology and a detailed survey record shall be provided to the Project Archaeologist within the Survey Report.

7.7 Specification for watching brief

7.7.1 Scope of Watching Brief

7.7.2 Watching brief, as defined in the Generic WSI, is a programme of archaeological monitoring (i.e. observation, investigation and recording) which is carried out by a suitably qualified archaeologist during site investigations (e.g. geotechnical test pits, boreholes and utilities trial trenches) and construction works. The purpose of a watching brief is to identify the potential of any archaeological remains that are uncovered in the course of the works and record them appropriately (as far as is reasonably practicable). The watching brief shall result in the preparation of an ordered archive which will be incorporated into the post-excavation works and into publication of the project results.

7.7.3 The C257 Archaeology Contractor shall undertake the watching brief for all areas of ground disturbance which may potentially contain archaeological remains as set out in the SS-WSI. This shall include any activities (including those associated with site set-up and demolition) undertaken by the Principal Contractor that involve the removal of modern material, made ground and topsoil, subsoils, and superficial geological deposits such as alluvium and colluvium.

7.7.4 Areas that have been previously subject to archaeological excavation and which are known not to contain significant deposits (for example tunnels, cuttings, and areas of known large-scale modern disturbance) shall be excluded from the scope of the watching brief, unless stated otherwise in the SS-WSI. Areas that have been subject to previous assessment and evaluation (e.g. geophysical survey, surface artefact collection, geotechnical survey, trial trenching etc.) shall be included within the watching brief, as appropriate.

7.7.5 Two classes of watching brief are set out in the Generic WSI:

7.7.6 A general watching brief shall comprise observation and recording of the Principal Contractor's works without constraint on their working methods.

7.7.7 A targeted watching brief shall comprise observation and recording of the Principal Contractor's works with specific operations carried out under the supervision of the C257 Archaeology Contractor.

7.7.8 Under targeted watching brief, the C257 Archaeology Contractor may impose constraints on, or require changes to, the Principal Contractors' or his sub-contractor's method of working to enable the archaeological investigation to take place alongside construction works.

7.7.9 Targeted watching brief shall be used for areas of known occasional, dispersed features which are either not considered to be of sufficient significance to warrant archaeological investigation in advance of construction, or where access prior to construction has not been possible and where, as a result, there is a possibility of unexpected discoveries

7.7.10 Except in cases where unexpected, potentially nationally important, archaeological remains are discovered, the targeted watching brief shall be designed and implemented so as to avoid adverse impact on the construction programme, wherever practicable.

7.7.11 The Principal Contractor shall make allowance in their activity programme for the completion of any targeted or general watching briefs as set out in the SS-WSIs.

7.7.12 The specifications for watching briefs (general and targeted) are set out below:

7.7.13 Scope of Targeted Watching Brief - Constraints on Principal Contractor's Methodology

7.7.14 In archaeologically sensitive areas, where the need for a targeted watching brief has been identified in the SS-WSI, the Principal Contractor will strip soils (which may include modern made ground, topsoil, subsoil, alluvium and colluvium) using appropriate plant with a toothless ditching bucket under the supervision of the C257 Archaeology Contractor. The Principal Contractor will limit their tracking of vehicles and plant within areas specified in the SS-WSI and/or as instructed by the Project Archaeologist. The Principal Contractor will facilitate mapping and sampling of deposits by the C257 Archaeology Contractor through use of agreed plant, a site share agreement and careful liaison between the C257 Archaeology Contractor's supervising archaeologist and the Principal Contractor's site supervisor.

7.7.15 Specification for watching brief

7.7.16 Refer to section 5.1 for a list of construction activities at which the C257 Archaeology Contractor is required to undertake general and targeted watching brief.

7.7.17 The Works to be carried out by the C257 Archaeology Contractor shall consist of two parts:

- a) Watching brief ('observation') following, and without interruption to, the progress of the Principal Contractor by a core team of archaeologists.
- b) Investigation of archaeology and remains of quaternary geological importance undertaken either:
 - by the core team, following the progress of the Principal Contractor; or
 - by additional archaeologists (the 'support team'), to be deployed to investigate unanticipated archaeological remains, where appropriate.

7.7.18 The C257 Archaeology Contractor's core team shall consist of the C257 Archaeology Contractor's key person (the field director) and other appropriately experienced archaeologists commensurate with the scale and nature of the Principal Contractor's works.

7.7.19 The core team shall undertake the observation and any required investigation such as they may reasonably be able to undertake.

7.7.20 The C257 Archaeology Contractor's support team shall consist of additional experienced archaeologist. The size of the support team shall be commensurate with the scale and programme of the Principal Contractor's works. The C257 Archaeology Contractor shall be required to supply teams of 5 and 10 persons within 24 and 48 hours notice respectively.

7.7.21 The C257 Archaeology Contractor's core and support teams shall be advised where necessary by specialists, as appropriate and as agreed with the Project Archaeologist.

7.7.22 The C257 Archaeology Contractor shall record the following observations on a daily basis. The record shall consist of, as a minimum:

- The Event Code and chainage/location of the area observed;
- The date(s) of the observation;
- Personnel employed on site;
- A description of the construction works observed;
- The works (sub) contractor and personnel undertaking and supervising the construction activity;
- Depths and extents of excavation works observed;
- Measure of confidence that any archaeological remains would have been observed and reasons;
- The areas and horizons (both those containing archaeological or remains of quaternary geological importance and those which do not) unaffected by construction activity (with special reference to archaeological sites identified for preservation in situ);
- The reasons why any particular area of the works was not observed, and noting those areas not subject to disturbance from construction;
- Location, depths (in mATD and mOD) and description of any archaeological remains; and
- Location, depths (in mATD and mOD) and description of any modern remains.

7.7.23 Investigation undertaken during watching brief

7.7.24 An appropriate sample shall be excavated from cut features and other archaeological remains of importance. Sampling of cut features shall include feature inter-sections to establish relative chronologies. The extent of sampling shall be determined by the C257 Archaeology Contractor in liaison with the Project Archaeologist (and as discussed with the relevant local authority and English Heritage, and a quaternary specialist, if necessary) but may, for instance, include the sample excavation of a selected number of deposits (both layers and negative, cut features), recording of structural remains, drawn sections and profiles, and/or be aimed at recovering sufficient information to determine function, form, and date. Any specific variations from this specification shall be indicated in The C257 Archaeology Contractor's Method Statement.

7.7.25 Heights for all deposits shall be related to approved Permanent Ground Markers (PGMs) or approved Ordnance Survey Bench Marks (OSBM), where reasonably accessible. Levelling accuracy between OSBMs/PGMs and site Temporary Bench Marks (TBMs) shall be within 10 mm/k: where 'k' is the total distance levelled in kilometres. Each TBM shall be levelled as part of a closed loop starting and finishing on approved

OSBMs or URL PGMs. Where more than one TBM is required per site, the C257 Archaeology Contractor shall establish the TBMs as part of the same closed loop. The C257 Archaeology Contractor shall prepare a record of their surveying methodology for inclusion in the archive.

7.7.26 It may not be possible to clean and record the archaeological profile of geotechnical test pits, due to health and safety or access constraints. Every effort shall be made to establish the presence or absence of archaeological deposits by establishing the absolute ordnance datum (AOD) for the height of significant deposits, including the depth of modern intrusions, key stratigraphic components and natural deposits. These data are also to be provided in mATD.

7.7.27 Recording standards

7.7.28 The archaeological remains shall be recorded to best practice standards, recognising the special circumstances of a watching brief which demand flexibility in order to achieve archaeological objectives and requirements within the construction environment.

7.7.29 The recording is to include as a minimum:

- The written record of individual context descriptions on appropriate pro-forma.
- The drawn record shall normally include, plans and section drawings of appropriate features, structures and individual contexts (1:50 1:20 or 1:10). Isolated archaeological remains (artefacts) may be spot located in plan and a height provided where possible. Deposits which are regular in plan (pits and ditches) may be located though co-ordinates, annotated with dimensions, and may be recorded digitally.
- Other appropriate drawn and written records shall also be produced (for environmental sampling etc.).
- The photographic record shall consist of monochrome prints/negatives and colour transparencies. A 35mm format (film or digital) SLR camera is acceptable for all site photography. The C257 Archaeology Contractor shall maintain a minimum of two 35mm SLR cameras on site at all times during working hours. The photographic record shall include photographs and transparencies of archaeological features, appropriate groups of features, structures, and quaternary deposits. Each photograph and transparency shall clearly show details of the above. Each photograph and transparency shall include an appropriate graduated scale, a north arrow, and a header board detailing (as a minimum) the event code and context/feature number. In addition, the C257 Archaeology Contractor shall take appropriate record photographs to illustrate work in progress.

7.7.30 Specification for archaeological investigation

7.7.31 A sufficient sample of the archaeological features and deposits revealed must be sampled/or fully excavated to allow the resolution of the aims and objectives of the work. Structures, features, or finds which might reasonably be considered to merit preservation in-situ shall not be unduly damaged.

7.7.32 Where modern foundations are likely to be present, the SS-WSI shall identify whether they should be left in-situ for the purposes of the evaluation or removed. Where it is clear that modern foundations have truncated certain archaeological levels they should be removed to assess lower archaeological levels. The C257 Archaeology Contractor shall take all reasonable care to ensure that any damage is limited as far as practicable. If

significant damage is likely to occur the work shall be suspended and the Project Archaeologist informed so that a technical solution can be agreed with the Project Manager.

- 7.7.33 The location and objectives of the trial excavations set out in Section 5 of the SS-WSIs and in the WSI Addenda (Appendices 1-4) have been established in consultation with the City of London Archaeologist.
- 7.7.34 Each trial excavation has been assigned a unique ID number by the Project Archaeologist (refer to table 1). The C257 Archaeology Contractor shall not vary this number unless agreed by the Project Archaeologist in writing.
- 7.7.35 The dimensions of each trial excavation in plan, inclusive of the trench support system employed (if required) to secure personnel entry to the excavation, shall be set out in the WSI Addenda. Design of trench support systems to be provided by the Principal Contractor. Trial excavations shall be excavated to the base of the alluvial sequence or to a depth specified in the SS-WSI (Section 5) and WSI Addenda. This shall be dependent on the agreed objectives of the excavation.
- 7.7.36 Temporary works and any required hand investigation to address below ground hazards shall be carried out by the Principal Contractor under supervision by the C257 Archaeology Contractor in accordance with their approved Method Statement and Risk Assessment. All subsequent trial excavations shall be excavated by the Principal Contractor under supervision by the C257 Archaeology Contractor using a mechanical excavator with toothless ditching bucket, except where the nature of the made ground or surface of the pits is such that an alternative bucket or means of breaking out prior to excavation is required (and the Project Archaeologist has agreed an alternative method).
- 7.7.37 All machine work and demolition of below-ground obstructions (e.g. removal of basement slabs) shall be carried out by the Principal Contractor under supervision by the C257 Archaeology Contractor. The Principal Contractor shall cease work when archaeological evidence is revealed and allow the C257 Archaeology Contractor to undertake investigation, as appropriate. An excavator shall not be used to cut arbitrary trial trenches down to natural deposits without regard to the archaeological stratification.
- 7.7.38 All undifferentiated topsoil, or overburden of recent origin, shall be removed down to the first archaeological layer. An exception to this would be where a focused soil-sampling strategy is proposed to record and collect data from reworked soil contexts above recognisable stratified archaeological contexts. If a mechanical excavator is to be used to remove modern overburden, such as floor slabs or recent levelling layers, this shall be undertaken in spits of 0.20m-0.5m depth (dependant on specific site conditions), moving along the length of the trench or area. The C257 Archaeology Contractor's supervising archaeologist shall use their professional judgement to determine the appropriate depth of each spit and will advise the Principal Contractor accordingly. Any variations to the excavation methodology shall be at the discretion of the supervising archaeologist and recorded in writing for inclusion in the final report to the Project Archaeologist.
- 7.7.39 Each spit shall be examined carefully to assist the recovery of any archaeologically significant artefacts and thus to determine when to cease machining.
- 7.7.40 The archaeological level shall be cleaned in plan by the Principal Contractor using a wide blade, ditching bucket or similar, with no teeth. If the machine has to re-enter the trench care will need to be taken to ensure that it does not damage underlying remains.

- 7.7.41 The C257 Archaeology Contractor shall undertake hand excavation and cleaning of any archaeologically significant horizons, to fulfil the aims of the work. Within alluvial sequences the C257 Archaeology Contractor shall pay particular attention to establishing the vertical extent of layers of archaeological potential and shall be aware that horizons of cultural activity may be interdigitated with horizons of sterile alluvium. The C257 Archaeology Contractor shall supervise the excavation of each test pit in such a manner so as to allow a cumulative or continuous section to be recorded.
- 7.7.42 The C257 Archaeology Contractor's excavation, sampling and recording policy shall be included in the C257 Archaeology Contractor's Method Statement. This is to include, as a minimum:
- The recording of individual contexts on appropriate pro-formas;
 - Excavation plans at 1:50 scale; planning and section drawing of appropriate single contexts and features (usually at 1:20 scale for plans and 1:10 scale for inhumations and sections);
 - Photographs; and other appropriate drawn and written records; and
 - Permanent Ground Markers (PGM's), any temporary benchmarks and approved OS benchmarks shall be indicated on the relevant plans.
 - The C257 Archaeology Contractor's survey and recording policy shall meet the following requirements:
 - All levels shall be recorded to London Grid standards and reduced to OS datum;
 - All trial pit locations shall be electronically surveyed with reference to the London Grid and Crossrail PGM's upon the completion of fieldwork by the C257 Archaeology Contractor;
 - The locations of trial pits shall be plotted on appropriate scale plans related to the London Grid and labelled with six figure eastings and northings; and
 - The electronic survey record shall be retained with the project archive.
- 7.7.43 In alluvial sequences, each trial excavation shall be excavated to the base of the alluvial sequence, and shall be appropriately shored and kept free of water by the Principal Contractor to allow 'person entry' to the excavations i.e. to allow the C257 Archaeology Contractor to undertake investigation and recording to fulfil the aims of the work.
- 7.7.44 The C257 Archaeology Contractor shall identify any temporary works and dewatering requirements associated with the archaeological investigation in the C257 Archaeology Contractor's Method Statement and shall agree the detailed arrangements for such with the Principal Contractor. The C257 Archaeology Contractor will be required to undertake works in accordance with the Principal Contractor's arrangements for matters such as off site-spoil disposal or storage, on-site facilities and services. Relevant requirements shall be incorporated in the C257 Archaeology Contractor's Method Statement.
- 7.7.45 Where areas of extensive archaeological stratification are encountered, trial trenches shall not be fully excavated. However, the horizontal and vertical extent of archaeological stratification shall be assessed by the C257 Archaeology Contractor through implementation of an appropriate strategy including, either the excavation of features cut into horizontal stratification, limited test pitting or auguring. The aim shall be to recover suitable stratigraphic, finds and environmental samples from the full, intended depth of the

trench, as far as is practicable. The exact methodology may need to be determined by the C257 Archaeology Contractor during the excavation of individual trenches and agreed with the Project Archaeologist.

7.7.46 A sufficient sample shall be excavated from cut features and other archaeological deposits to fulfil the aims of the work. Sampling of cut features shall include feature intersections to establish relative chronologies.

7.7.47 Recording systems

7.7.48 The trial excavations shall be recorded by the Archaeological Contractor to the standards of current best practice. The recording systems adopted during the investigations must be fully compatible with those published by the Museum of London Archaeology Service (MoLA 1994 3rd ED) and Museum of London (MoLA 1998).

7.7.49 The recording is to include, as a minimum:

- At least one representative section at (1:10 or 1:20 scale) of each trial excavation from ground level to the base of the excavation;
- The written record of individual context descriptions on appropriate pro-forma;
- Plans at appropriate scales (1:10 or 1:20);
- Single context planning if appropriate; and
- Photographs and other appropriate drawn and written records.
- Other sections, including the half-sections of individual layers or features shall be drawn as appropriate to 1:10 or 1:20.

7.7.50 Site plans shall identify both London Grid and OS co-ordinates. A 'site location plan', indicating site north shall be prepared at 1:1250. Individual 'trench plans' or 'excavation area plans' at 1:200 (or 1:100) shall be prepared which show the location of archaeology investigated in relation to the investigation area. Section drawings to include the levels of each context in mOD and mATD.

7.7.51 Section drawings shall be located on the relevant plan and both London Grid and OS co-ordinates recorded. The locations of the OSBM or PGM bench markers used and any site TBM shall also be indicated.

7.7.52 A record of the full extent in plan of all archaeological deposits as revealed in the investigation shall be made; these plans shall be on polyester based drawing film, and be at a scale of 1:10 or 1:20 unless otherwise agreed with the Project Archaeologist. 'Single context planning' shall be used on deeply stratified sites. Drawing information shall be digitised for eventual CAD applications. The GLSMR will accept Autocad DXF or .DWG format of extent of site and location of major features with the completed Sites and Monuments Report Form.

7.7.53 A 'Harris matrix' stratification diagram shall be employed to record stratigraphic relationships (Harris 1993). This record shall be compiled and fully checked by the Archaeological Contractor during the course of the excavations. Spot dating shall be incorporated onto this diagram during the course of excavations.

7.7.54 Recording of structural evidence revealed below ground level will vary according to the level of special interest of the structure and its relationship to below-ground

archaeology. Structures of little or no significance shall be noted on a site plan. Detailed element detail drawings of important features revealed in investigations may be required in accordance with the aims and objectives of the investigation.

- 7.7.55 The C257 Archaeology Contractor shall agree the appropriate level of recording and analysis for discovered standing structures with the Project Archaeologist, in accordance with the Crossrail procedure for non-listed built heritage recording (Document CR-PN-PRW-EN-PD-00010). The C257 Archaeology Contractor shall revise the Archaeological Contractor's Method Statement to reflect any additional requirements for built heritage recording.
- 7.7.56 The photographic record shall consist of monochrome prints/negatives and colour transparencies. A 35mm format SLR camera (film or digital) is acceptable for all site photography. The C257 Archaeology Contractor shall maintain a minimum of two 35mm SLR cameras on site at all times during working hours. The photographic record shall include photographs and transparencies of archaeological features, appropriate groups of features, and structures. Each photograph and transparency shall clearly show details of the above, and may require the use of artificial lighting to achieve suitable definition. Each photograph and transparency shall include an appropriate graduated scale, a north arrow, and a header board detailing (as a minimum) the project event code and context/feature number. In addition, the C257 Archaeology Contractor shall take appropriate record photographs to illustrate work in progress.
- 7.7.57 The transparencies shall be mounted in suitable frames for long-term curation in preparation for deposition with the archive. Digital photography and video recording may be appropriate in some circumstances and the C257 Archaeology Contractor shall set out proposals for such recording in the C257 Archaeology Contractor's Method Statement for approval by the Project Archaeologist.
- 7.7.58 Where appropriate a photogrammetric record or laser scan record shall be made of complex structures, features and horizons, liable to be damaged in the course of the investigation, such as buildings or parts of buildings. Appropriate technical specification and scales shall be specified in the SS-WSI and addressed in the C257 Archaeology Contractor's Method Statement.

7.8 Specific Requirements for the excavation of trial trenches or pits

- 7.8.1 The C257 Archaeology Contractor or Principal Contractor (as required by the Works Information) shall ensure that water is discharged and arisings from archaeological excavations are stored in accordance with the Principal Contractor's environmental protection requirements (as set out in the package Works Information and their Environmental Management Plan) and any relevant consents for the worksite. The Project Manager shall monitor discharge rates and if necessary conductivity of discharge waters to ensure compliance.
- 7.8.2 Should any material be excavated that is deemed to be contaminated or potentially contaminated it shall be investigated, controlled (e.g. placed separately from clean material) and removed from the site in accordance with the Principal Contractor's environmental protection requirements (as set out in their Environmental Management Plan).
- 7.8.3 The C257 Archaeology Contractor shall ensure, in liaison with the Project Archaeologist that adequate protection is provided for any archaeological remains. Any

specific archaeological requirements relating to backfilling shall be included by the C257 Archaeology Contractor in their Method Statement.

- 7.8.4 The trenches shall be pumped dry by the Principal Contractor and any necessary protection measures for archaeological remains (in addition to those for below ground infrastructure, services or utilities) shall be completed prior to backfilling. Backfilling and reinstatement shall be undertaken by the Principal Contractor as specified in the package works information and in accordance with the approved C257 Archaeology Contractor's Method Statement or other instruction from the Project Archaeologist and/or Project Manager. Generally, all backfill material shall consist of non-toxic, uncontaminated, non-putrescible, natural and inert material which shall be compacted and (if necessary) tested (dynamic compaction test or other) in accordance with a specification provided by the Project Manager. Surface conditions shall be reinstated to the required standard.
- 7.8.5 In order to protect any waterlogged remains during the works, the C257 Archaeology Contractor may identify a requirement for trial excavations to be allowed to refill with water overnight. In such cases, the C257 Archaeology Contractor shall request approval from the Project Manager and shall ensure that any hazards to staff or 3rd parties are minimised.

7.9 Archaeological science

- 7.9.1 The strategy for sampling archaeological and palaeo-environmental deposits and structures (which can include soils, timbers, pollen, diatoms, animal bone, human bone etc.) will be developed by the Project Archaeologist in consultation with English Heritage Regional Science Advisor and the Archaeology Consultant. On-site work and off-site analysis of the processed samples and remains will be undertaken by the C257 Archaeology Contractor's environmental archaeologist as specified in the C257 Archaeology Contractor's Method Statement.
- 7.9.2 The finds retrieval policies of the appropriate recipient museum will be adopted. In accordance with the collection and retention strategy set out in SS-WSI, all finds (artefacts and ecofacts) visible during excavation shall be collected and processed by the C257 Archaeology Contractor. In some cases, sampling may be the most appropriate strategy. Finds shall be appropriately packaged and stored under optimum conditions, as detailed in the RESCUE/UKIC publication First Aid for Finds (Watkinson and Neal 1998).
- 7.9.3 Where there is evidence for industrial activity, macroscopic technological residues (or a sample of them) shall be collected by hand. Separate samples (c. 10ml) shall be collected for micro-slugs (hammer-scale and spherical droplets). Reference should be made to the Centre for Archaeology Guideline on Archaeometallurgy (English Heritage 2001). Assessment of any technological residues shall be undertaken.
- 7.9.4 Where appropriate, samples shall be taken for scientific dating (for example radiocarbon dating, OSL, thermoluminescence at the evaluation stage). This may apply where dating by artefacts is insecure or absent, and where dating is necessary for development of the SS-WSI for subsequent mitigation strategies. Procedures and specifications shall follow English Heritage guidance (English Heritage 2008b).
- 7.9.5 Buried soils and sediment sequences shall be inspected and recorded on site by the C257 Archaeology Contractor's geoarchaeologist, since field inspection may provide sufficient data for understanding site formation processes. Procedures and techniques presented in the English Heritage documents Environmental Archaeology (English

Heritage 2002) and Geoarchaeology (English Heritage 2007) shall be followed. Samples for laboratory assessment shall be collected where appropriate, following agreement with the Project Archaeologist.

- 7.9.6 Deposits shall be sampled for retrieval and assessment of the preservation conditions and potential for analysis of biological remains following English Heritage guidance (English Heritage 2002). The sampling strategy shall include a reasoned justification for selection of deposits for sampling, and shall be developed by the C257 Archaeology Contractor's environmental archaeologist or recognised bioarchaeologist in liaison with the Project Archaeologist. Flotation samples and samples taken for coarse-mesh sieving from dry deposits shall be processed at the time of the fieldwork wherever possible, to permit variation of sampling strategies if necessary. Sampling strategies for wooden structures shall follow the methodologies presented in Brunning (1996).
- 7.9.7 Artefacts, biological samples and soils shall be assessed for evidence of site and deposit formation processes and taphonomy and especially for evidence of recent changes that may have been caused by alterations in the site environment.
- 7.9.8 Assessment of finds assemblages shall include x-radiography of all iron objects (after initial screening to exclude obviously recent debris) and, where appropriate, non-ferrous artefacts (including all coins). Where necessary, active stabilisation /consolidation shall be carried out to ensure long-term survival of the material, but with due consideration to possible future investigations.
- 7.9.9 Once assessed, all material shall be packed and stored in optimum conditions, as described in First Aid for Finds (Watkinson and Neal 1998). Waterlogged organic materials shall be processed in accordance with: Guidelines for the care of waterlogged archaeological leather (English Heritage/Archaeology Leather Group 1995) and Waterlogged wood: the recording, sampling, conservation and curation of structural wood (Brunning 1996).
- 7.9.10 Samples for absolute dating shall be submitted promptly to the supply laboratory proposed by the C257 Archaeology Contractor or other supplier as instructed by the Project Archaeologist. Delivery times shall be agreed to ensure that the results are available to aid development of specifications for subsequent mitigation strategies in the SS-WSI. Where it is proposed to date human remains, the time limits for reburial imposed by Schedule 15 of the Crossrail Act (for remains removed from burial grounds) or set out in the relevant burial licence under the Burial Act 1857 (in all other cases) shall be adhered to.
- 7.9.11 Processing of all soil samples collected for biological assessment, or sub-samples of them, shall be completed as soon as reasonably practicable. The preservation state, density and significance of material retrieved shall be assessed by the C257 Archaeology Contractor's recognised specialist. Special consideration shall be given to any evidence for recent changes in preservation conditions that may have been caused by alterations in the site environment. Unprocessed sub-samples shall be stored in appropriate conditions in accordance with the C257 Archaeology Contractor's Method Statement.
- 7.9.12 Samples collected for geo-archaeological assessment shall be processed promptly by the C257 Archaeology Contractor's specialist, particularly where storage of unprocessed samples is thought likely to result in deterioration. Appropriate assessment shall be undertaken as agreed with the Project Archaeologist. Where preservation in situ is a viable option, consideration shall be given to minimising the possible effects of

compression and loading on the physical integrity of the site and any hydrological or chemical impacts of the proposed construction works (English Heritage 2002).

- 7.9.13 Animal bone assemblages, or sub-samples of them, shall be assessed by the C257 Archaeology Contractor's specialist with reference to English Heritage guidance (English Heritage 2002).
- 7.9.14 The results from any specific investigations in Archaeological Science shall be included in the Site Archive and presented in the evaluation report or final fieldwork report. Reports shall include sufficient detail to permit assessment of potential for analysis. They shall include tabulations of data in relation to site phasing and contexts, and include non-technical summaries. The objective presentation of data shall be clearly separated from interpretation i.e. recommendations for further investigations, (both on samples already collected, and at future excavations), shall be clearly separated from the results and interpretation.

7.10 Generic specification for Environmental Sampling

- 7.10.1 Appropriate features and deposits shall be sampled to retrieve palaeo-environmental and economic indicators. The C257 Archaeology Contractor shall make provision for the sampling of a wide range of contexts for potential assessment and analysis for plant and animal micro/macro fossils and soils/sediments in order to fulfil the aims set out in the SS-WSI.
- 7.10.2 The C257 Archaeology Contractor shall use ten litre plastic buckets (with lids and handles), or strong polythene bags (double bagged) secured at the neck, for the recovery of bulk 'disturbed' environmental samples. An adhesive label recording the project event code, context number and sample information shall be securely fixed to a vertical face of the bucket only or attached to the neck of the bag. Labels shall be completed with an indelible ink pen. A duplicate non-adhesive label shall be inserted within the bucket or between the polythene bags.
- 7.10.3 The selection, preparation for and methods of taking samples together with their size, presentation and processing shall be in accordance with current best practice (e.g. IFA Standard and Guidance for Artefact and Environmental Study, Collection, Research and Conservation 2008d; English Heritage –Geoarchaeology, 2007; English Heritage - Archaeological Science at PPG16 interventions: Best Practice Guidance for Curators and Commissioning Archaeologists, 2003).
- 7.10.4 The C257 Archaeology Contractor shall be responsible for the protection of all samples and finds and for their transport (including loading and unloading) to the C257 Archaeology Contractor's facilities or other location as agreed with the Project Archaeologist. Samples shall be protected at all times from temperatures below 5 and above 25 degrees Celsius and from wetting and drying out due to weather exposure.
- 7.10.5 Bulk samples shall normally be in the range of 10-60 litres. The size selected will depend on the likely density of macrofossils in the soil. The lower end of the range (10-20 litres) will be suitable for the recovery of macrofossils from waterlogged deposits. For non-waterlogged deposits the sample volume is likely to be in the middle to higher range (20-40 or 40-60 litres) dependant upon site activity, conditions and preservation. The residue of soil left in the bottom of any inhumations after the removal of human remains shall be retrieved for bulk processing. Vessel or pit fills containing human remains shall be processed as bulk samples to ensure the maximum retrieval of cremated bone.

Cremation vessels and deposits of placed human bone within cut features may require excavation in spits. The fill residues from the excavation of these features shall be bulk sampled to ensure maximum retrieval of cremated bone, associated small finds and floral and faunal remains. All work shall be undertaken in compliance with the generic Crossrail standards for Human Remains (see Section 7A) which may require the reburial of human remains within a specific timeframe.

- 7.10.6 For 'bulk disturbed' samples the limits of the sample zone shall be recorded and identified on plan.
- 7.10.7 The C257 Archaeology Contractor shall use appropriately sized monolith or kubiena boxes for the recovery of 'undisturbed' monolith samples for geo-archaeological study (pollen, other microfossil and micromorphological studies etc). Care shall be taken to ensure that wherever possible only newly exposed sections are sampled to avoid contamination, desiccation and decalcification. This sampling shall be undertaken under supervision of the C257 Archaeology Contractor's environmental specialist. Boxes shall be wrapped neatly and tightly in bin-liners or plastic sacks and secured with rubber bands. A label shall be attached to the outside (in duplicate) with site name and code, feature/context number and depths of sample.
- 7.10.8 The C257 Archaeology Contractor shall record the depth of the 'undisturbed' monolith at the top and the bottom of the sample. There shall be a 50mm overlap between each monolith. This information shall be plotted onto a section drawing at an appropriate scale, with all levels reduced to heights relative to Ordnance Datum. Where the sample crosses archaeological context boundaries these shall be noted on the sample recording proforma.
- 7.10.9 Where it is not possible to insert monolith boxes, the C257 Archaeology Contractor shall take a vertical series of small 'spot' samples. Samples shall be at 20mm vertical intervals with no more than 10mm depth being sampled. In the case of deposits with a low organic content it may be necessary to take as much as 5g or even 20g per sample. If so, sampling shall be extended laterally at a given depth in 10mm deep spits.
- 7.10.10 Where appropriate, the C257 Archaeology Contractor shall take contiguous column samples for the retrieval of macrofossils. The individual sub-samples will be of 1-10kg, depending on the nature of the deposit and the category of material to be retrieved. Where several specialists are involved it may be necessary to take separate sub-samples for a range of palaeo-environmental evidence (for example, insects, molluscs and seeds) to ensure that adequate sub-samples are available for specialist assessment.



8 Deliverables

8.1 Archaeological Contractors Method Statement

8.1.1 The C257 Archaeology Contractor shall provide a detailed Method Statement for the works for the Project Archaeologist's approval. The Method Statement shall be prepared in association with the Principal Contractor, taking account of their Environmental Management Plan and other relevant site information provided by them and requirements for the works set out in the Works Information (e.g. relating to health and safety, security, engineering design requirements and attendances). The Method Statement shall include, as appropriate:

- a) A resource plan and programme and CV's;
- b) The C257 Archaeology Contractor's IT capability and proposed IT plan (including specific survey methods for on-site recording of stratigraphic profiles and sub-surface topographic modelling;
- c) The C257 Archaeology Contractor's approach to Archaeological Science;
- d) The methods for survey and setting out works;
- e) The methods to address the specific event types required (trial trench, area excavation etc);
- f) The safe method of working whilst excavating trenches or pits including any temporary works required;
- g) The method for disposing of water from trenches and test pits in waterlogged ground;
- h) Site management plan to include details of the method for preparing safe access route to the working areas, the proposed site accommodation, services and welfare;
- i) The retention and disposal policies for samples and artefacts recovered during the work;
- j) The method for excavating and recording inhumations and cremations in compliance with the generic Crossrail standards for Human Remains (see Section 7.1);
- k) The method for preparation of the required reports, archive and all associated deliverables;
- l) The procedures for assessment of potential for analysis (post excavation assessment); analysis and publication proposals;
- m) The method for preparation of the digital dataset, digital drawings, and digital report deliverables;
- n) The C257 Archaeology Contractor's methods and approach for undertaking the site based works and off site processes to completion.

- o) The Health and Safety Plan and Site-Specific Risk Assessment (including unexploded ordnance);
- p) The Quality Assurance Plan;
- q) The procedures for on- and off- site security and emergency response plan (including environmental incidents);
- r) The method for complying with project generic and site specific environmental and consent requirements; and
- s) The C257 Archaeology Contractor's requirements and specification for services and facilities and attendances required to be supplied by the Principal Contractor or the Employer.

8.2 Site Archives

- 8.2.1 The site archive shall be organised to be compatible with other archaeological archives in London, or where outside the greater London area, any specific requirements of the receiving museum. This requirement for archival compatibility includes computerised databases.
- 8.2.2 For London archives, individual descriptions of all archaeological strata and features excavated or exposed shall be entered onto prepared pro-forma recording sheets which include the same fields of entry on the recording sheets of Museum of London Archaeology. Sample recording sheets, sample registers, finds recording sheets, registered finds catalogues and photographic record cards shall also follow the Museum of London Archaeology equivalents.
- 8.2.3 Archives shall be prepared to conform with current best practise (e.g. Brown and Duncan 2007; Institute of Field Archaeologists 2008f) The archive shall cover all finds, samples and records (drawn, written, photographic and electronic) collected and produced during the works. The archive shall be indexed and internally consistent. The C257 Archaeology Contractor shall complete the site archive and submit to the Project Archaeologist within 8 weeks of completion of a fieldwork event.
- 8.2.4 The site archive shall be deposited by at a museum to be confirmed by the Project Archaeologist.

8.3 Digital Data

- 8.3.1 The C257 Archaeology Contractor shall produce a digital data archive of all primary field data produced during the works in accordance with ADS guidelines (Richards and Robinson 2001).
- 8.3.2 The C257 Archaeology Contractor shall prepare and provide field and laboratory data, evaluation or excavation trench and phasing plans showing archaeological features recorded, and report text in digital form, as well as in paper form. Consideration should be given to recording electronic plans during fieldwork.
- 8.3.3 The digital archive for each fieldwork event shall be copied to CD-R or DVD (recordable laser disc) and submitted to the Project Archaeologist for archiving in the Employer's document management system.

- 8.3.4 Final reports, site plans and other illustrations shall be prepared in accordance with the Employer's Information Management standards and procedures.
- 8.3.5 All data files submitted shall be scanned by a virus detection programme updated to the most current version. The disk label shall clearly indicate:
- Confirmation that this check has been carried out (including details of the virus checking programme name and version used) and that the submission is virus free.
 - Fieldwork event name and code.
 - Supplier company name, date and QA details (as a minimum, the name, position and signature of the approver).
- 8.3.6 Prior to commencing the works, the C257 Archaeology Contractor shall submit an example hard copy and data output of each of the data formats required (i.e. data, graphic, CAD and text) produced by their current software, for approval by the Project Archaeologist. The C257 Archaeology Contractor shall inform the Project Archaeologist of any changes or upgrades made to approved software prior to processing any works data. The sample disk shall include data from a previous real job or jobs.
- 8.3.7 A sequential numbering of data issues shall be rigorously adhered to so that no data versions are submitted out of sequence. The organisation of the data prior to submission shall be the responsibility of the C257 Archaeology Contractor. The C257 Archaeology Contractor shall ensure that data originating from different sources within the C257 Archaeology Contractor's organisation is compatible with the project requirements. The C257 Archaeology Contractor shall nominate one person to the Project Archaeologist who is the main point of contact for matters relating to the digital data submissions.
- 8.3.8 Where errors or inconsistencies are noted in the data, by either the Project Archaeologist or Archaeological Contractor they shall be corrected by the C257 Archaeology Contractor and a corrected data file issued to the Project Archaeologist. When a change or addition is made to the data within an issue, a complete data group shall be re-issued, not just the changed fields. This may not require complete replacement of the whole data set which includes other previous issues.
- 8.3.9 Where any changes are made to a data record between digital data submissions, the C257 Archaeology Contractor shall record the date of the change and the name of the person carrying out the change. The C257 Archaeology Contractor shall ensure that each data amendment is carried out correctly.
- 8.3.10 The C257 Archaeology Contractor shall make two identical copies of the digital archive. The first copy shall be retained by the C257 Archaeology Contractor until the expiry of the Contract maintenance period. The second copy shall be issued to the Project Archaeologist.
- 8.3.11 A digital archive for each Crossrail site (incorporating individual event archives) shall be submitted to a regional or national data archive as agreed with the service provider by the Employer.

8.4 Interim Statement

- 8.4.1 Refer to section 6.2 in each WSI Addendum for a list of deliverables required at each worksite.
- 8.4.2 Within 7 days of completion of a Critical Phase or Phase 1 fieldwork event, or as otherwise instructed to do so, the C257 Archaeology Contractor shall submit an Interim Statement to the Project Archaeologist.
- 8.4.3 The Interim Statement shall be brief, and the information contained commensurate with the timescale for production. The report shall not duplicate effort to be utilised at a later date and shall draw on the data gathered during the initial assessment undertaken during fieldwork.
- 8.4.4 A site plan indicating all as-dug investigations shall be provided. Key stratigraphic profiles and topographic templates of the major stratigraphic units shall be provided, including the depths of contexts in mOD and mATD.
- 8.4.5 The Interim Statement including illustrations shall be submitted as a single PDF file to the Project Archaeologist. CAD drawing files shall also be submitted.
- 8.4.6 The Interim Statement text shall be submitted in hard copy and as an MS Word *.document in accordance with the Employer's information management standards and procedures.
- 8.4.7 The Interim Statement shall include an approved report title sheet and QA page (to be supplied by the Employer).
- 8.4.8 The following shall appear in the footer or header of each Interim Statement:
© CRL Ltd, 20\$\$
- 8.4.9 Copies of the Interim Statement shall be provided by the Project Archaeologist to Rob Whytehead (English Heritage) and the City of London for comment.

8.5 Survey Report

- 8.5.1 The C257 Archaeology Contractor shall provide a written and graphic survey report for the works upon completion of fieldwork. Evidence shall be provided for check measurements and results of levelling for establishment of TBM's. The survey report shall be submitted by the C257 Archaeology Contractor to the Project Archaeologist within 2 weeks of the completion of fieldwork.
- 8.5.2 The C257 Archaeology Contractor shall prepare and submit 'as excavated' site area outlines and levels in accordance with Crossrail standard CRS-SDT-05. Each drawing shall identify the relevant event code and sub-site division, if applicable.

8.6 Fieldwork Report

- 8.6.1 Refer to section 6.2 in each WSI Addendum (appendices 1-4) for a list of deliverables required at each worksite.

- 8.6.2 The evaluation, excavation and watching brief reports shall be prepared by the C257 Archaeology Contractor within 6 weeks of the completion of the fieldwork (unless this is varied by the Project Archaeologist). The Fieldwork Reports shall follow the standard structure set out in City of London Planning Advice Note 3 and IFA standards i.e.:

Contents list

Non technical summary

1. Introduction
2. Planning background
3. Previous work(s) relevant to archaeology of site (DBA, DDBA, surveys etc)
4. Geology and topography of site
5. Research objectives and aims
6. Methodology of site-based and off-site work
7. Results and observations including quantitative report, stratigraphic report(including any constraints on site).
8. Assessment of results against original expectations (using criteria for assessing national importance i.e. period, relative completeness, condition, rarity, and group value) and review of evaluation strategy
9. Statement of potential of archaeology
10. Conclusions and recommendations for appropriate mitigation strategy
11. Publication and dissemination proposals (in addition to fieldwork report)
12. Archive deposition
13. Bibliography
14. Acknowledgements
15. Sites & Monuments Record form
16. A3 plans

- 8.6.3 The Fieldwork Reports shall provide an illustrated factual statement and statement of importance with associated assessment of potential for further fieldwork and/or analysis of the archive. The Fieldwork Reports shall utilise information collected during archaeological fieldwork and from any other appropriate sources agreed with the Project Archaeologist.

- 8.6.4 The Fieldwork Reports shall include sections detailing the background to the project, any previous relevant research and investigation, location and topography/geology, a description of the methodology employed and the techniques adopted. Where relevant, these sections shall include location plans with scale and grid co-ordinates.

- 8.6.5 Each component of the works (e.g. stratigraphic/structural, artefactual and environmental/economic) shall be supported by a statement setting out:

- A quantification of the resource (tabulated and cross referenced as appropriate);
- Provisional dating and evidence for residuality and intrusiveness;
- The range of material, including sampling and/or taphonomic biases; and

- The condition of the material, including preservation bias.
- 8.6.6 The stratigraphic statement shall include: a description of the geomorphology and sedimentation record of the survey area; a description of the fieldwork results (brief context descriptions supported by plans and sections as necessary, with levels related to Ordnance Datum); a trench summary table indicating depths of all major stratigraphic units, and their boundaries. Photographs shall be included where appropriate.
- 8.6.7 The C257 Archaeology Contractor shall produce a subsurface model(s) and profiles to illustrate the extent, character and depth of the major stratigraphic topology identified. The model shall be correlated with previous works within the survey area in order to inform the mitigation design. The processing software and presentation format of the data shall be included in the C257 Archaeology Contractor's Method Statement for approval by the Project Archaeologist.
- 8.6.8 The assessment of results and statement of potential shall include the C257 Archaeology Contractor's conclusions based on the recorded data, e.g. the monument/site class represented, site/feature function and relevant parallels. The statement shall also comment on the potential of the data to address the projects' research themes. As appropriate, comment shall be made on the site as a whole and the individual components (e.g. artefactual, palaeo-environmental, economic). The statement shall utilise the criteria laid down by the Secretary of State for Culture, Media and Sport Criteria for Scheduling, to establish importance.
- 8.6.9 In reporting the results of the works, the accuracy of the original expectations and the appropriateness of the methods adopted shall be assessed by the C257 Archaeology Contractor in order to illustrate what level of confidence can be placed on the information. The Project Archaeologist will use that information as the basis for developing any further mitigation strategy and/or further analysis and publication.
- 8.6.10 The reports shall be illustrated with a site location plan, survey location plans as appropriate (to include archaeological interpretation of results), and individual trench and area plans identifying archaeological features exposed and investigated.
- 8.6.11 When submitted at evaluation stage, the reports shall set out an outline recommendation for mitigation. This may include preservation in situ and/or further investigation and recording of the remains and/or watching brief. The development of a detailed mitigation strategy shall be progressed by the Project Archaeologist in liaison with the Project Manager's engineering design team, the C257 Archaeology Contractor, and the English Heritage Regional Science Advisor (and other statutory authority), as appropriate.
- 8.6.12 Copies of the Fieldwork Reports shall be provided by the Project Archaeologist to Rob Whytehead (English Heritage) and the City of London for comment.
- 8.6.13 The following shall appear in the footer or header of each Fieldwork Report:

© CRL Ltd, 20\$\$

8.7 SMR/HER Summary Sheet

- 8.7.1 The C257 Archaeology Contractor shall complete a GLSMR Summary Sheet for the works (i.e. one per fieldwork event). The Summary Sheet shall be included in the Fieldwork Reports.

8.8 Summary Report

- 8.8.1 A short summary report of no more than 500 words (the Summary Report) for the works shall be prepared by the C257 Archaeology Contractor for submission to the Project Archaeologist for subsequent publication within London Archaeologist or another local (county) journal or publication outlet specified by the Project Archaeologist.
- 8.8.2 The C257 Archaeology Contractor shall submit the draft Summary Report to the Project Archaeologist for approval within 8 weeks of the completion date of the fieldwork event. The C257 Archaeology Contractor shall allow two weeks in the programme of works for the Project Archaeologist to provide comments. The C257 Archaeology Contractor shall include any amendments required by the Project Archaeologist in the final Summary Report which shall be submitted within one week of receiving the Project Archaeologist's comments on the draft report.
- 8.8.3 The Summary Report shall be submitted as an MS Word *.document in accordance with the Employer's information management standards and procedures.

8.9 Post excavation assessment

- 8.9.1 If instructed by the Project Archaeologist, the C257 Archaeology Contractor shall undertake a post-excavation assessment of the site archive and submit a report of their findings to the Project Archaeologist for approval. Assessment of potential for analysis shall be undertaken in accordance with English Heritage guidelines.
- 8.9.2 The C257 Archaeology Contractor shall provide details of its current post excavation assessment procedures with their Method Statement.



9 Site Monitoring & Progress Reports

- 9.1.1 The C257 Archaeology Contractor shall provide weekly written progress reports and attend weekly progress meetings with the Project Archaeologist and Project Manager and shall be represented at such meetings to the satisfaction of the Project Archaeologist. The C257 Archaeology Contractor shall provide information describing progress on-site to date, the processing of samples and artefacts and feedback from any initial assessment.
- 9.1.2 The City of London archaeologist and, if required the English Heritage Inspector for works affecting a Scheduled Monument (collectively the 'external consultees') shall be informed in writing at least one week in advance of commencement of fieldwork by the Project Archaeologist.
- 9.1.3 Periodic updates on the progress of the Crossrail archaeology programme shall be submitted to the external consultees by the Project Archaeologist. The C257 Archaeology Contractor shall provide information to the Project Archaeologist as requested to inform this reporting.
- 9.1.4 The Project Archaeologist shall arrange and convene monitoring site visits by the external consultees, as appropriate. There shall be no unauthorised access to the works in any other circumstances. Any visits to the works shall be in accordance with the Principal Contractor's health and safety, site access and security requirements.
- 9.1.5 The C257 Archaeology Contractor may propose that archaeological excavation be carried out as an extension to evaluation works, if the scope of such work is readily incorporated into the SS-WSI. The detailed method for this work shall be agreed between the C257 Archaeology Contractor and the Project Archaeologist at a site meeting and subsequently in writing between the Project Archaeologist and the relevant external consultees.



10 Personnel requirements

- 10.1.1 The C257 Archaeology Contractor shall provide project personnel of experience as described below. The personnel shall be approved by the Project Archaeologist. Approval may be withdrawn by the Employer at their discretion and in accordance with the contract conditions.
- 10.1.2 The C257 Archaeology Contractor shall submit CVs of all proposed personnel including any specialists, but excluding site technician grades, to the Project Archaeologist for approval if this has not already been done as part of the pre-qualification process.
- 10.1.3 The works shall be managed, directed and staffed by appropriately qualified and experienced personnel. The C257 Archaeology Contractor's Key Person shall possess at least ten years relevant experience.
- 10.1.4 The excavation, sampling and recording of the works shall be directed in the field by a Fieldwork Director who is a Member of the Institute of Field Archaeologists (MIFA) The Fieldwork Director shall be on site throughout the fieldwork stages.
- 10.1.5 The C257 Archaeology Contractor's project team shall include a Historic Buildings specialist and an environmental archaeologist suitably qualified in archaeological science and geo-archaeological sediment description methods, and on site sample processing and assessment techniques.
- 10.1.6 The C257 Archaeology Contractor's project team shall be staffed by technician grades with minimum six months experience in appropriate aspects of excavation and recording.
- 10.1.7 Specialist staff employed on any aspect of the works, including post-excavation assessment or analysis of any kind including the writing of reports, shall be suitably qualified and shall be supervised by personnel with a minimum of ten years of relevant experience in their field (this may be inclusive of post-graduate studies).
- 10.1.8 Specialist staff shall be available, normally at 24 hours notice, for the duration of the works to provide advice on any specialist tasks to be undertaken.



11 References and glossary of terms

- Brown, Duncan H 2007. Archaeological Archives: A guide to best practice in creation, compilation, transfer and curation, Archaeological Archives Forum, ISBN 0948393912.
- Brunning, R. 1996. Waterlogged wood. Guidelines on the recording, sampling, conservation and curation of waterlogged wood. English Heritage, London.
- Canti, M. 1996. Guidelines for carrying out assessments in Geoarchaeology. Ancient Monuments Laboratory Report 34/96, English Heritage.
- Crossrail 2005. Assessment of Archaeological Impacts, Technical Report, Part 2 of 6, Central Section, Report Number 1E0318-C1E00-00001
- Crossrail 2006. Archaeological Programming Assessment, Report Number 1E0318-G0E00-00006 (Rev B)
- Crossrail 2007. Archaeology Generic Written Scheme of Investigation, Document Number CR-PN-LWS-EN-SY-00001
- Crossrail 2008b. Archaeological Detailed Desk Based Assessment Liverpool Street Station, Report No CR-SD-LIV-EN-SR-00001
- Crossrail 2008c. MDC3 Archaeology Updated Baseline Assessment, Document Number 20032008-87MB-YYK5.
- Crossrail 2008d, Project Control Schedule 05.
- Crossrail 2008f. Procedure for non-listed built heritage recording. Document number CR-PN-PRW-EN-PD-00010
- Crossrail 2009. Archaeological Monitoring of Ground Investigations, Borehole Package 13, September 2009.
- Crossrail 2009. Archaeological Watching Brief and Evaluation, Utilities trial trenches, Liverpool Street and London Wall, Museum of London Archaeology, November 2009.
- Crossrail 2010. Central Section Report, Archaeology Framework C257 – Central Package. Summary of LSS85 Archive – Broadgate Excavations. C257-MLA-T1-XTC-C101_WS102-00001. Museum of London Archaeology.
- Crossrail 2011. C257 Archaeology Central. Interim Statement Archaeological Evaluation (C138 Moorgate Shaft) 91-109 Moorgate – XSP10. Document Number TBC. Museum of London Archaeology
- English Heritage 2000. Metric survey specifications for English Heritage, English Heritage, London.
- English Heritage 2001. Archaeometallurgy. Centre for Archaeology Guidelines 2001/01, English Heritage, London.
- English Heritage 2002. Environmental Archaeology. A guide to the theory and practice of methods, from sampling and recovery to post-excavation, Centre for Archaeology Guidelines 2002/01, English Heritage, London.
- English Heritage 2002a. Human Bones from Archaeological sites. Guidelines for producing assessment documents and analytical reports. Centre for Archaeology Guideline, unnumbered, English Heritage, London.

- English Heritage 2006a. Guidelines on the X-radiography of Archaeological metalwork, English Heritage, London.
- English Heritage 2006b. Our portable past, English Heritage, London.
- English Heritage 2008a. Investigative Conservation Guidelines on how the detailed examination of artefacts from Archaeological sites can shed light on their manufacture and use, English Heritage, London.
- English Heritage 2008b. Luminescence dating. Guidelines, English Heritage, London.
- English Heritage/Archaeological Leather Group 1995. Guidelines for the care of waterlogged Archaeological leather, English Heritage, London.
- Goodburn-Brown D. and UKIC Archaeology Section, revised edition 2001. Excavated Artefacts and Conservation UK Sites.
- Handley M 1999. Microfilming Archaeological archives, IFA Paper 2.
- Hillam, J. 1998. Dendrochronology: Guidelines on producing and interpreting dendrochronological data, English Heritage, London.
- Institute of Field Archaeologists 2001. Standard and guidance for Archaeological excavation, Reading.
- Institute of Field Archaeologists 2008a. Standard and guidance for Archaeological desk-based assessment. Reading.
- Institute of Field Archaeologists 2008b. Standard and guidance for an Archaeological watching brief, Reading.
- Institute of Field Archaeologists 2008c. Standard and guidelines for finds work, Reading.
- Institute of Field Archaeologists 2008d. Standard and guidance for the collection, documentation, conservation and research of Archaeological materials, Reading.
- Institute of Field Archaeologists 2008e. Standards and guidance: field evaluation, Reading.
- Institute of Field Archaeologists 2008f. Draft Standard and guidance for the creation, preparation, transfer and deposition of Archaeological archives, Reading.
- McKinley, J. and Roberts, C. 1993. IFA Technical Paper 13: Excavation and post-excavation treatment of cremated and inhumed human remains. Institute of Field Archaeologists.
- Museum of London, 1987. Finds Procedures Manual.
- Museum of London, 1994. Archaeology Site Manual.
www.museumoflondon.org.uk/laarc/guidelines/ASM_3edn_1994.pdf
- Museum of London, 1998. General Standards for the Preparation of Archaeological Archives deposited with the Museum of London
<http://www.museumoflondonarchaeology.org.uk/English/ArchiveResearch/DeposResource/GuideDep.htm>
- Museum of London, 1999. General Standards for the Preparation of Archaeological Archives deposited with the Museum of London, Supplement.
- Museum of London Archaeology Service, 2007. Broadgate, London EC2, A Summary of Archaeological Survival. Museum of London Archaeology Service.
- Museum of London Archaeology. 2009. XRF09 Progress Reports.
- Nixon, T, McAdam, E, Tomber, R, and Swain, H, 2003, A Research Framework for London Archaeology 2002, Museum of London Archaeology Service.



- Richards JD and Robinson D (eds) 2001. Digital archives from excavation and fieldwork: guide to good practice. 2nd Ed. Archaeology Data Service.
- Society of Museum Archaeologists 1993. Selection, retention and dispersal of Archaeological collections. Guidelines for use in England, Northern Ireland, Scotland and Wales. SMA: London.
- Walker, K. 1990. Guidelines for the preparation of excavation archives for long-term storage, Archaeology Section of the United Kingdom Institute for Conservation.
- Watkinson, D. and Neal, V. 1998. First Aid for Finds (3rd edition), RESCUE and the Archaeology Section of the United Kingdom Institute for Conservation.



Annex 1 Archaeological Research Agenda

Refer to Section 4 of this document and the Generic WSI



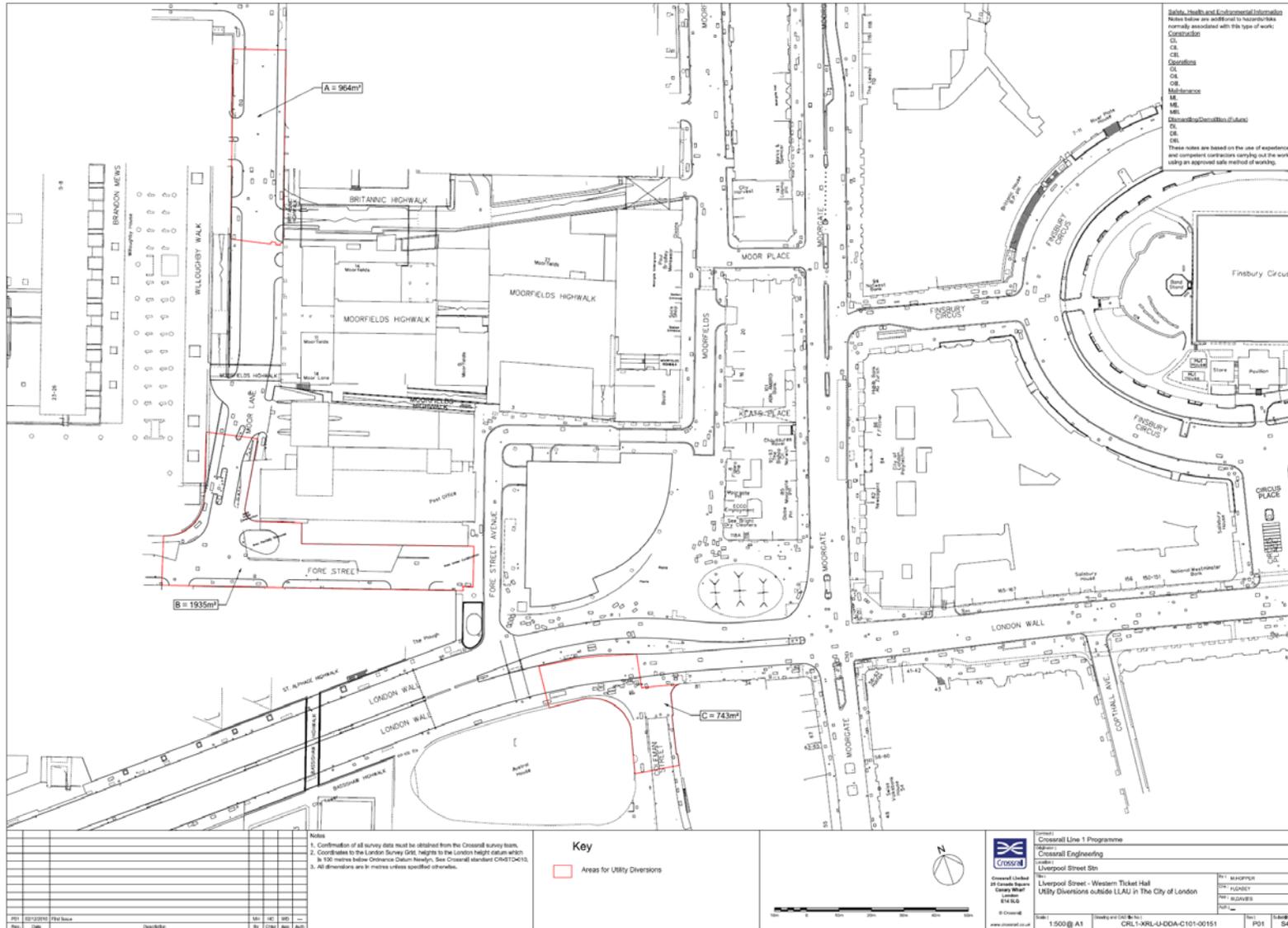
Annex 2 Site Information

Refer to construction information plan

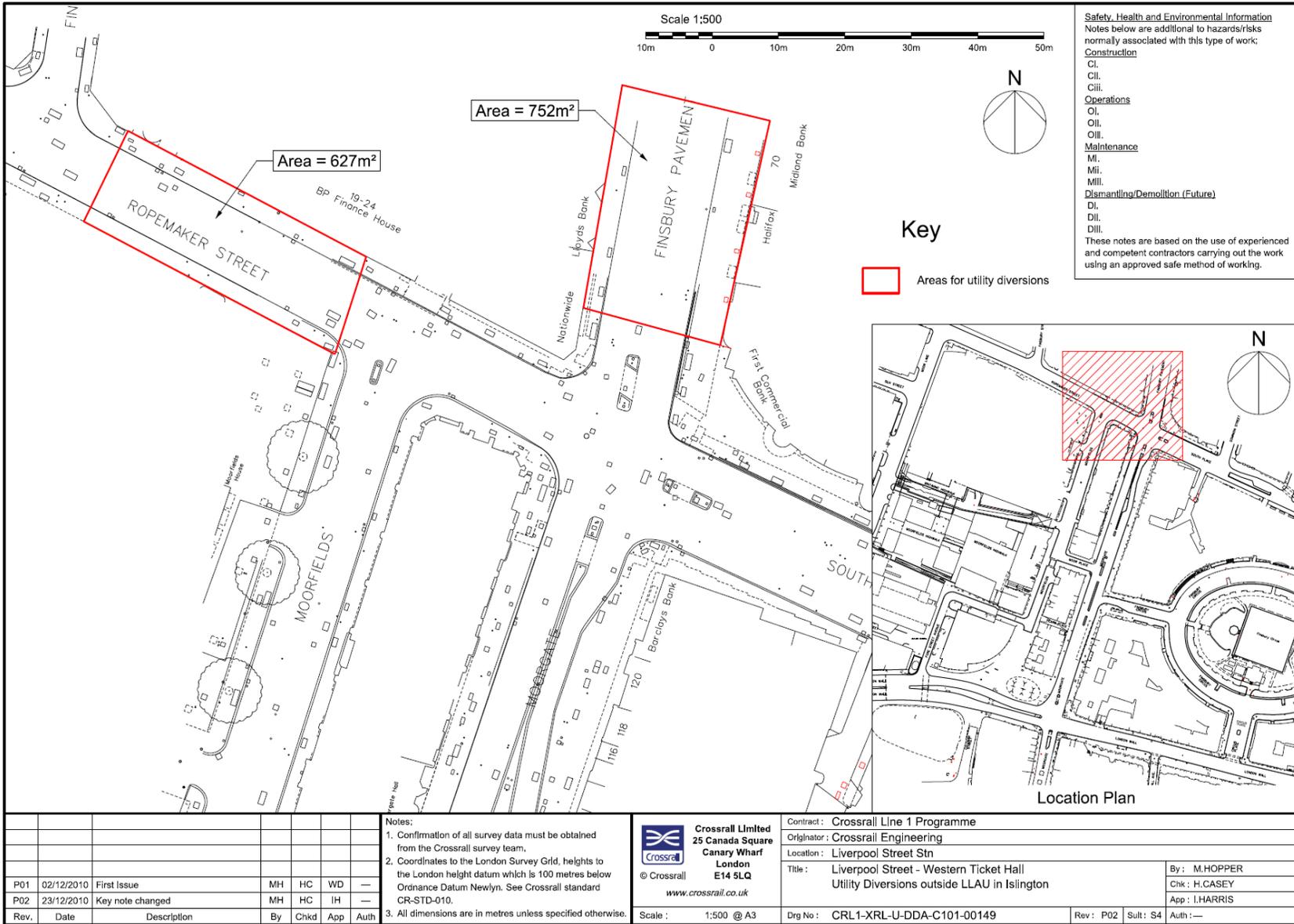


Annex 3 Plans and other illustrations

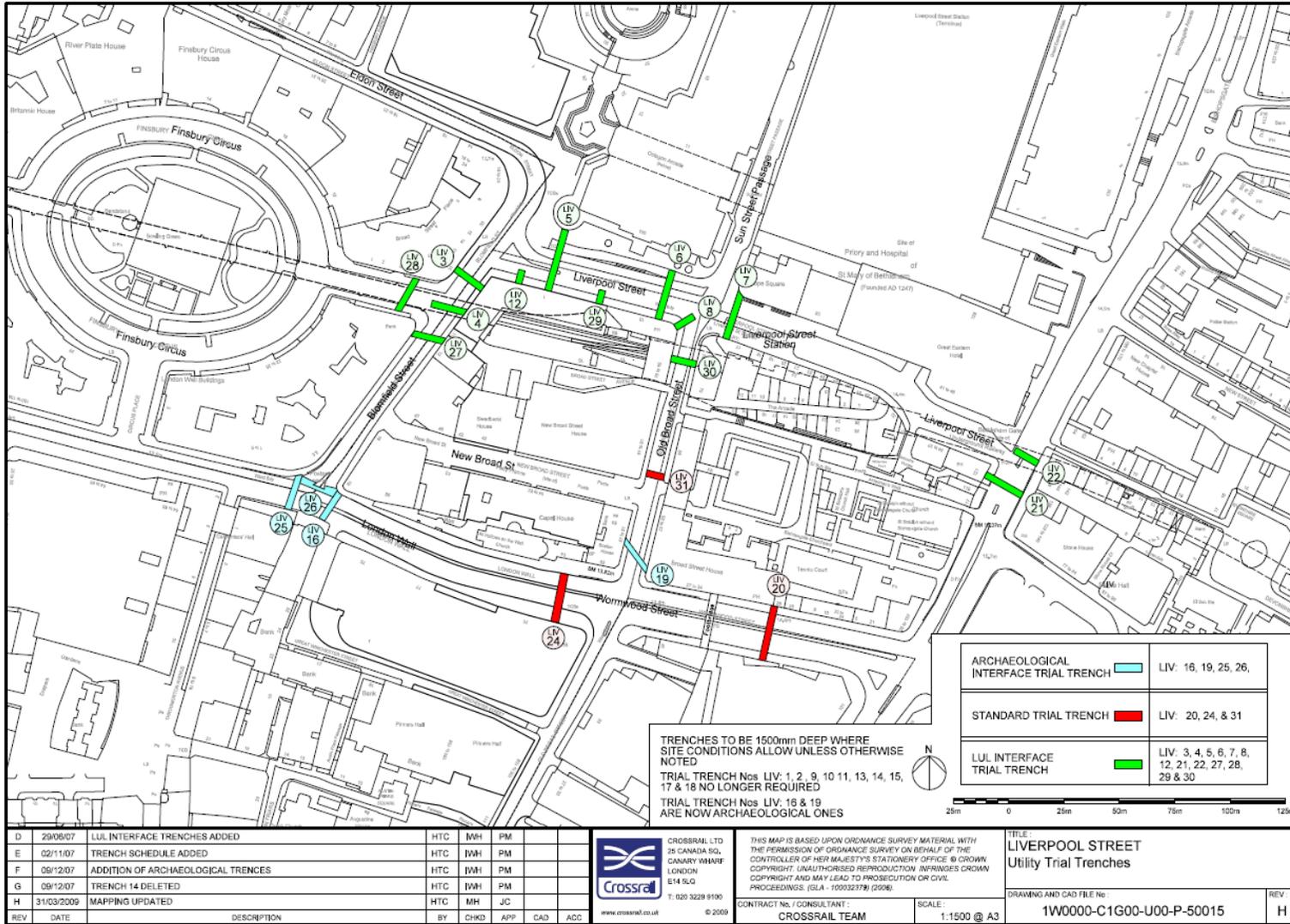
Also refer to plans at the rear of the WSI Addenda (Appendices 1-4).



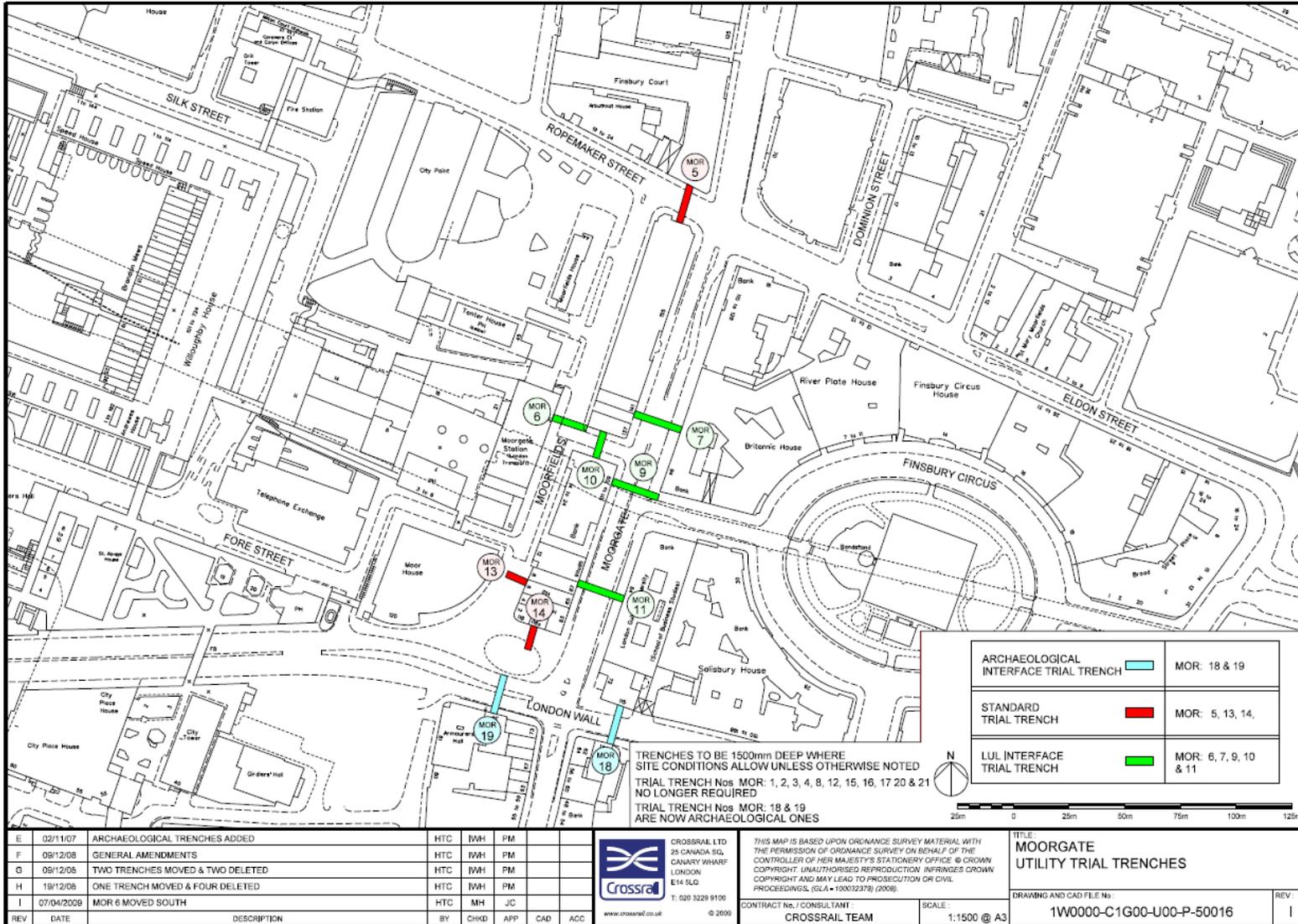
Utility Diversions outside LLAU in the City of London



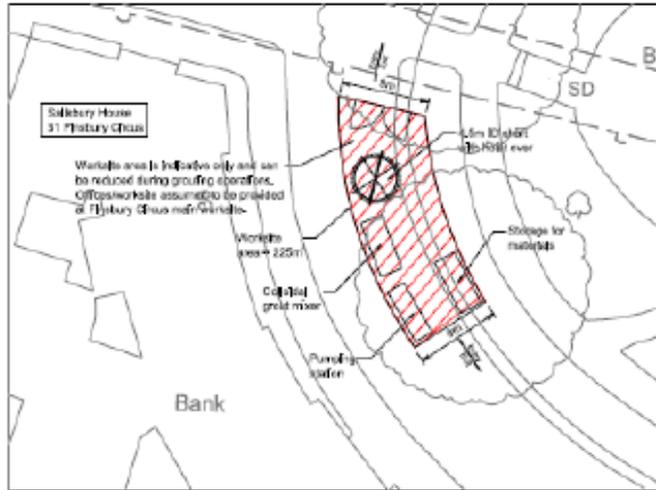
Utility diversions outside LLAU in the London Borough of Islington



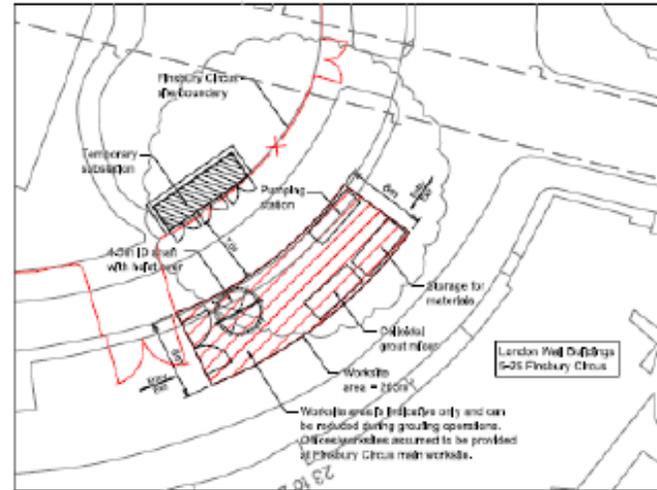
Utilities trial trench location plan



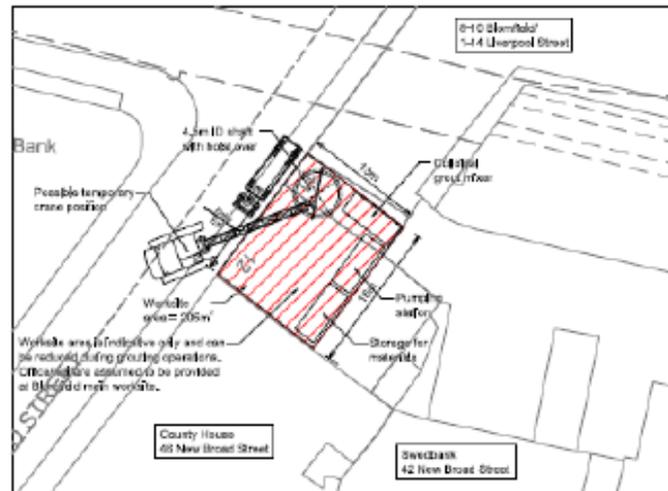
Utilities trial trench location plan



Grout Shaft No. 1 - Finsbury Circus Worksite (West)



Grout Shaft No. 2 - Finsbury Circus Worksite (East)

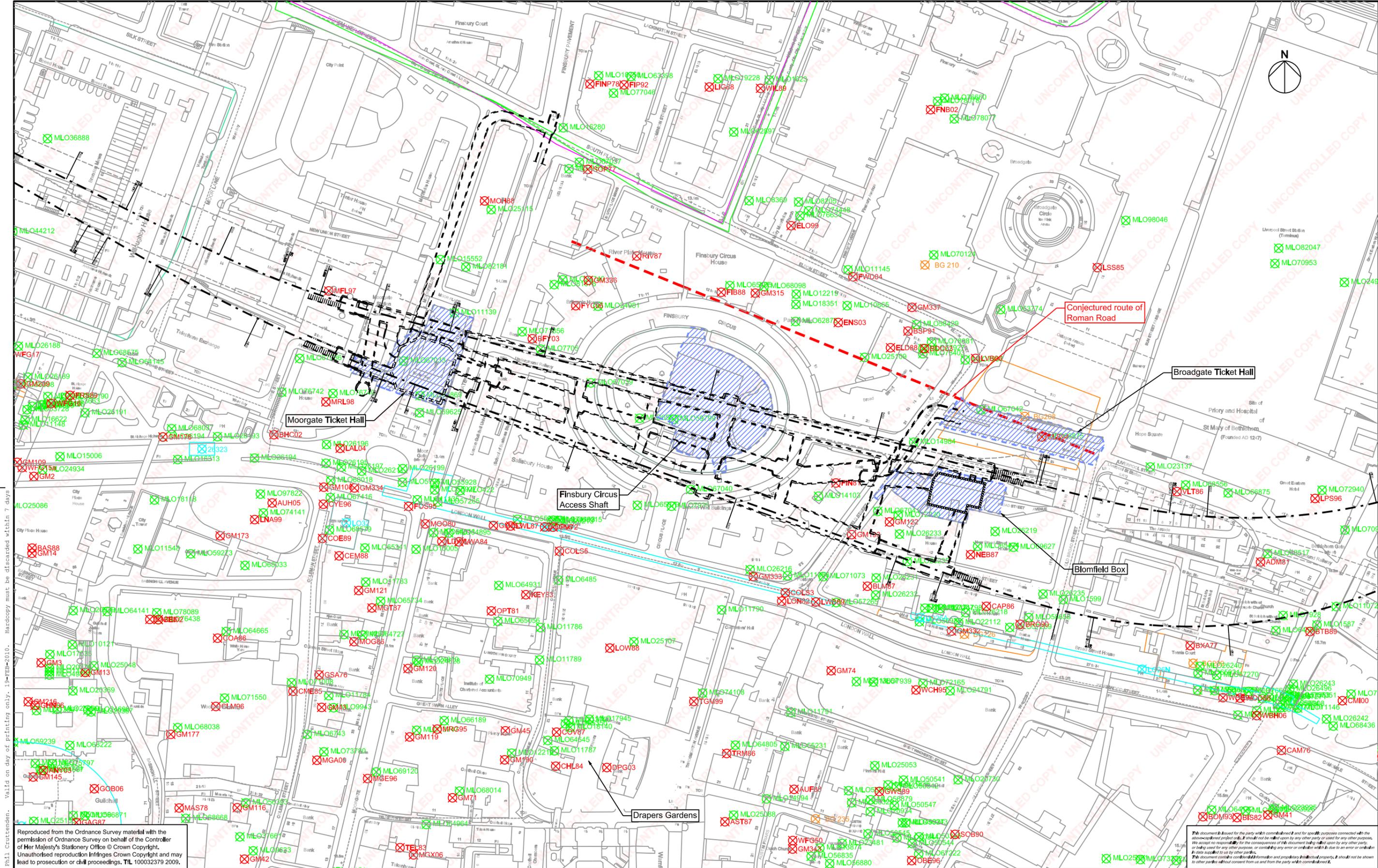


Grout Shaft No. 3 - Blomfield Street Worksite



Grout Location No. 5 - Moorhouse Ground Floor Worksite

Grout Shaft location plan (as at RIBA E)



Reproduced from the Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. TIL 100032379 2009.

| Rev. | Date | First Issue | Description | By | Chk'd | App |
|-------|------|-------------|-------------|----|-------|-----|
| P01.1 | | | | | | |

Notes

| | | | | | | |
|--|--|--|--|--|--|--|
| | | | | | | |
|--|--|--|--|--|--|--|

LEGEND

- MLO21941 Greater London Sites & Monuments Record
- ATL89 Site Codes
- Archaeological Priority Zone
- Registered Parks and Gardens
- BG205 Burial Ground
- L036 Scheduled Ancient Monuments
- Crossrail Worksite

Scale: 1:1000@A1

Drawing and CAD No: C138-MMD-T1-DDA-C101-00001

Crossrail

Contract 1: Liverpool Street Station Design
 Client: Mott MacDonald Limited
 Location: Liverpool Street Stn
 Title: Archaeological Baseline

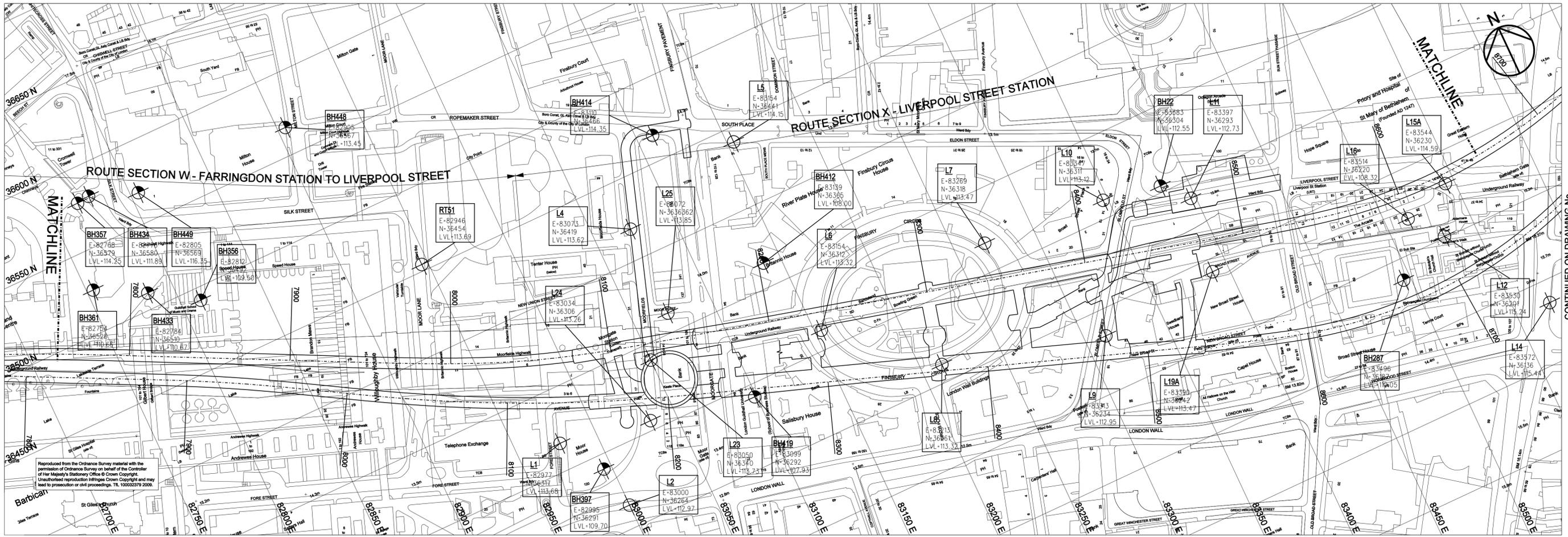
By: P.CRUTENDEN
 Chk: -
 App: -
 Rev: P01.1
 Sub: S0

© Crossrail
 www.crossrail.co.uk

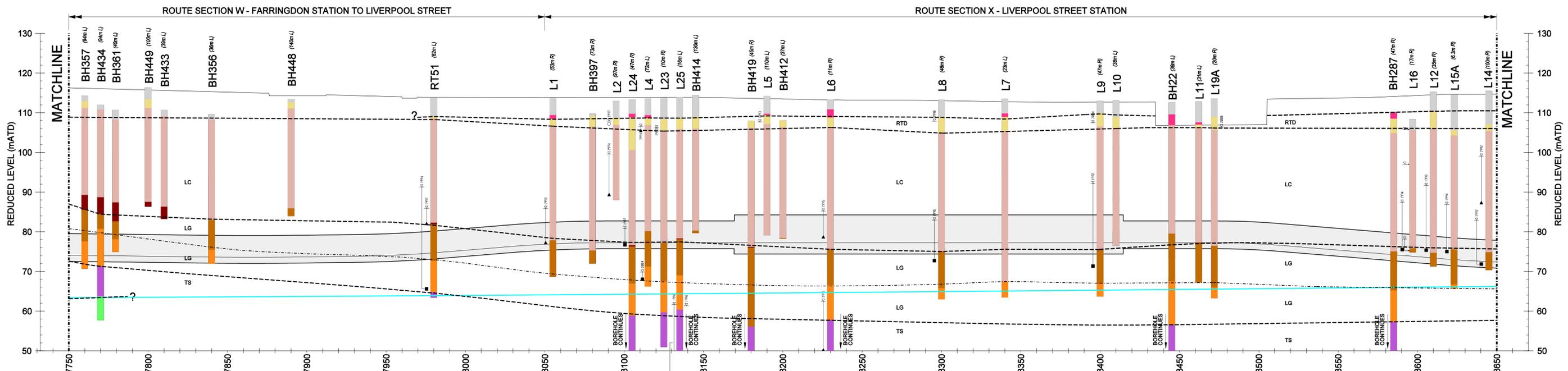
Unapproved Copy - Printed by: Phil Crutenden. Valid on day of printing only. 19-FEB-2010. Hardcopy must be discarded within 7 days.

Work in progress

RESTRICTED



PLAN



NOTES:
 1. Refer to drawings 1D0101-G0G00-P-03000 for Key Plan and General Notes
 2. The piezometric levels shown on the drawings are based on average reliable readings where available. For recent Crossrail boreholes uncertain piezometric levels are indicated with a question mark. For pre-2000 Crossrail boreholes the piezometric levels are based on historical data with the year of the most recent reliable piezometer reading indicated. The deep aquifer piezometric level is based on contoured information obtained from Crossrail and third party monitoring wells in August 2008. The piezometric levels shown on these drawings are indicative only and should not be relied upon. Refer to Crossrail Report 1D0101-C1G00-00506 and 1D0101-G0G00-0569 for complete and current groundwater monitoring data.

| | | | | | | | | | | | | | | | |
|---|--|--|--|---|--|---|--|---|--|--|--|---|--|---|--|
| GEOLGY MADE GROUND ALLUVIUM (INCLUDING LANGLEY SILT) RIVER TERRACE DEPOSITS LONDON CLAY FORMATION HARWICH FORMATION | | LAMBETH GROUP (UPPER/UNCLASSIFIED) LAMBETH GROUP (LOWER) THANET SAND CHALK | | INTERPOLATED GEOLOGICAL BOUNDARY UNCERTAINTY WITH INTERPOLATION MID LAMBETH HIATUS DEEP AQUIFER PIEZOMETRIC LEVEL RISE IN WATER LEVEL LEVEL OF WATER STRIKE | | EXPLORATORY HOLE TYPE AND INSTRUMENT DETAILS ENVIRONMENTAL BOREHOLE PUSHED THIN-WALL SAMPLING SELF-BORING PRESSUREMETER/PERMEAMETER CONE PENETROMETER TEST ROTARY DRILLED MENARD PRESSUREMETER ROTARY OPEN HOLED (DRILLER'S LOG ONLY) | | RECORDED PIEZOMETRIC HEAD INSTRUMENT LOCATION UNCERTAIN PIEZOMETRIC HEAD INSTRUMENT LOCATION STANDPIPE PIEZOMETER STANDPIPE PIEZOPRESS PIEZOMETER VIBRATING WIRE PIEZOMETER PNEUMATIC PIEZOMETER | | RAIL LEVEL (SECTION) TUNNEL ALIGNMENT (SECTION) CURRENT CROSSRAIL BOREHOLES CROSSRAIL PRE-2000 BOREHOLES HISTORIC BOREHOLES (NON-CROSSRAIL) CURRENT CROSSRAIL TRIAL PITS CROSSRAIL PRE-2000 TRIAL PITS | | CROSSRAIL LIMITED 25 CANADA SQUARE CANARY WHARF LONDON E14 5LQ TEL: 020 3229 9100 www.crossrail.co.uk | | CONTRACT No. / CONSULTANT: 1125/GCG TITLE: PLAN AND GEOLOGICAL LONG SECTION ROYAL OAK TO STEPPY GREEN CHAINAGE 7750 TO 8650 (EASTBOUND) SCALE: 1:1250 @ A1 DRAWING AND CAD FILE No.: 1D0101-G0G00-G00-P-03520 REV: C | |
|---|--|--|--|---|--|---|--|---|--|--|--|---|--|---|--|



Annex 4 Health and Safety Requirements

Designers Risk Assessment and CDM requirements

Archaeological Contractor's risk assessments and Health and Safety Plans

Archaeological Contractor's Safety Audits, Safety inspections, Reporting of Accidents

Personal Protective Equipment (PPE)

Labelling of Hazardous Substances, Contaminated Land

Crossrail Health and Safety Management System, Crossrail Drugs and Alcohol Policy

Crossrail Policy for work on Network Rail Land

The Designers Risk Assessment is set out below; for the other above items please refer to the Works Information for the C257 Archaeological Contract.



WORK PACKAGE
C138 Liverpool Street Station
CDM Register for Archaeological Investigations

Document Number: C138-MMD-T1-LRG-C101-50002

Document History:

| Version | Date | Prepared by: | Checked by: | Approved by: | Reason for Revision: |
|---------|----------|--------------|-------------|--------------|----------------------|
| 1.0 | 01.02.11 | M. Court | C. Jones | A. Harper | First issue |

| CROSSRAIL CENTRAL (PDP) REVIEW AND ACCEPTANCE STATUS | |
|---|--|
| This decal is to be used for submitted documents requiring acceptance by Crossrail Central. | |
| <input type="checkbox"/> | Code 1. Accepted. Work May Proceed |
| <input type="checkbox"/> | Code 2. Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated |
| <input type="checkbox"/> | Code 3. Not Accepted. Revise and resubmit. Work may not proceed |
| <input type="checkbox"/> | Code 4. Received for information only. Receipt is confirmed |
| Reviewed/Accepted by (signature) | |
| Print Name: | Date: |
| Acceptance by Crossrail Central does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail Central approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier. | |

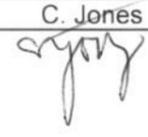
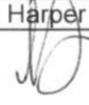
This document contains proprietary information. No part of this document may be reproduced without prior written consent from the chief executive of Crossrail Ltd.

Mott MacDonald Issue and Revision Record

Document Title: C138 Liverpool Street Station - CDM Register for Archaeological Investigations

Document Number: C138-MMD-T1-LRG-C101-50002

Design Team

| Rev | Date: | Originator | Checker | Approver | Description |
|-----|----------|---|---|--|-------------|
| 1.0 | 01.02.11 | M. Court  | C. Jones  | A. Harper  | First issue |

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it

| | |
|--|-------------------------------|
| Risk Register for | Archaeological investigations |
| Design Team | Liverpool Street Station |
| Design Package No. | C138 |
| Design Risk Register developed to RIBA Stage | N/A |
| Design Risk Register Interfaces with | C502. |

| | |
|--------------------------------------|--------------------------|
| Locations | Liverpool Street |
| Lead Design Co-ordinator | Andy Harper |
| Risk Register under review from / to | January - February 2011. |
| Interface Lead Design Coordinator | N/A |

| | |
|---------------------|------------------------|
| Date | 1st February 2011 |
| PDP CDM-C | Bechtel (H. Rizkallah) |
| Design Team Leader | Charles Jones |
| Interface PDP CDM-C | N/A |

Guide to Likelihood Rating (probability or chance that event will occur)

| Descriptor | Description |
|------------|--|
| Very Low | Improbable, highly unlikely to occur |
| Low | Remote, unlikely to happen but could |
| Medium | Occasional, increased chance or probability, event could happen or occur |
| High | Probable, more likely to happen than not |
| Very High | Frequent, highly likely to happen, almost certain. |

Guide to Impact Rating (Severity of impact)

| Descriptor | Description |
|------------|--|
| Very Low | Minor Injuries- may require some minor first aid treatment but not requiring medical attention |
| Low | Minor injuries-requiring first aid and/or medical attention |
| Medium | Injury or illness incurred reportable under RIDDOR and/or lost time from work |
| High | Major injury or illness with long term health effects, long absence from work |
| Very High | Fatality, Fatalities |

| Likelihood Rating | Impact Rating | | | | |
|-------------------|---------------|--------|--------|--------|-----------|
| | Very Low | Low | Medium | High | Very High |
| Very High | 5 | MEDIUM | HIGH | HIGH | HIGH |
| High | 4 | MEDIUM | MEDIUM | HIGH | HIGH |
| Medium | 3 | LOW | MEDIUM | MEDIUM | HIGH |
| Low | 2 | LOW | LOW | MEDIUM | HIGH |
| Very Low | 1 | LOW | LOW | LOW | MEDIUM |

| Ref No. | Location | Operation or activity being considered | Hazard | Risk | Current Risk Exposure | | Design Mitigation Action | Risk Owner | Residual Risk (Risk Matrix) | | Residual Risk Owner | Comments and/or details of further development and/or information required | Interface with and location |
|---------|-----------------|--|--|--|-----------------------|----|---|------------|-----------------------------|----|---------------------|--|-----------------------------|
| | | | | | L | I | | | L | I | | | |
| | All sites | Excavation | Contact with moving site vehicles/plant | Risk of injury to the public due to congestion at street level caused by construction activities at worksites. | M | H | 1) PC to ensure provision of adequate pedestrian and traffic space and access for emergency vehicles 2) CRL to liaise with LU and LFEPA and building owners re deliveries and emergency access 3) Works to be undertaken within hoarded worksite 4) PC to provide safe access/egress routes for site vehicles. 5) Provision of laydown areas for excavated spoil. | PC | VL | L | PC | See Crossrail Guidance booklet - Plan the work. Work the Plan. | |
| | Finsbury Circus | Excavation | London Underground Met & Circle line below Finsbury circus | Damage to tunnel of Met & Circle line causing debris to fall onto operational railway. | M | VH | 1) Archaeology contractor to liaise with CRL Principal Contractor who is currently on site. 2) Comply with PC site induction and site rules for working adjacent to LU asset. | PC | VL | VH | PC | | |
| | All sites | Excavation | Contact with live services and unknown obstructions | Conflict with obstructions (utilities/substructures/etc.) in ground leading to possible injury. | M | VH | 1) See WSI (Written Scheme of Investigation) documents for plans of known services. 2) Interface and approval from service/utility owners to be gained prior to construction of Main Works 3) PC to ensure temporary protection of adjacent services is provided. | PC | L | H | PC | See : Addendum to WSI: Trial Trench Evaluation - Broadgate Ticket Hall - C138-MMD-T1-RST-C101-00004 Addendum to WSI: Trial Trench Evaluation, Watching Brief & Detailed Excavation - Finsbury Circus (XRZ10) C138-MMD-T1-RST-C101-00006. See Crossrail Guidance booklet - Plan the work. Work the plan. | |
| | All sites | Excavation | Inadequate Access | Inadequate access for emergency vehicles to incidents to properties leading to injury/fatality to public during emergency event. | M | VH | 1) Consultation with LFEPA and third party property owners required to agree Assembly Points for buildings. 2) Access arrangement to shown on worksite drawings. 3) PC to ensure the worksite does not impede emergency access requirements. | PC | L | L | PC | | |
| | All sites | Construction - General | Restricted access around the area of the station and worksite during construction - particularly for PRM usage | Injury to public due to restricted access | M | M | Temporary hoarding and site lines to be reviewed to comply with DDA requirements, including provision for tactile pavement, drop kerbs etc. | PC | L | M | PC | | |

| Ref No. | Location | Operation or activity being considered | Hazard | Risk | Current Risk Exposure | | Design Mitigation Action | Risk Owner | Residual Risk (Risk Matrix) | | Residual Risk Owner | Comments and/or details of further development and/or information required | Interface with and location |
|---------|------------------|--|--------------------------------|--|-----------------------|----|---|------------|-----------------------------|----|---------------------|---|-----------------------------|
| | | | | | L | I | | | L | I | | | |
| | Liverpool Street | Excavation | Contaminated ground | Risk to operatives during excavation from former burial ground BG208, - risk to operatives from diseases e.g. smallpox, anthrax etc. | L | H | 1) Archaeological Detailed Desk Based Assessment for Liverpool Street Station (CD-SD-LIV-EN-SR-00001) has been undertaken and has highlighted area/extent of Burial Ground BG208. 2) See also WSI addendum. | PC | VL | L | PC | Addendum to WSI: Trial Trench Evaluation - Broadgate Ticket Hall - C138-MMD-T1-RST-C101-00004 | |
| | Moorfields | Excavation | Contaminated ground. | Occupational ill-health from contact with contaminated ground. TP 52 identifies the presence of heavy metals and Asbestos within made ground. | M | H | Risk cannot be mitigated through design. Information to be given to Contractor through Works Information documents and added to SHE boxes on relevant drawings. | PC | M | H | PC | TP52 relates to an area opposite Moor House. | |
| | All sites | Excavation | Flooding | Flooding of trenches due to extreme weather conditions, existing hydrogeology or burst water main in vicinity. | L | H | 1) Review existing utilities information to determine location of known water mains / sewers. 2) Review existing geotechnical information relating to groundwater. 3) Trenches not being excavated into gravel, thus reducing likelihood of water ingress. 4) Use of trench boxes to be considered to prevent water ingress. 5) PC to produce emergency plan. | PC | L | L | PC | | |
| | All sites | Excavation | Uncovering unexploded ordnance | Injuries/multiple fatalities to operatives and public and extensive damage to surrounding buildings & infrastructure. | H | VH | 1) Initial desk study report on UXO produced during Scheme Design Stage and no specific risk identified for Liverpool Street Station although general risk remains. 2) Specialist sub-contractor appointed by CRL and has reviewed UXO risk and produced recommended mitigation measures. 3) Monitoring Plan to be produced during detailed design and implemented during construction. 4) Information to be included within Pre-Construction information. The Construction Phase Unexploded Ordnance Threat Assessment – Volume 2: Royal Oak Portal to Pudding Mill Lane makes reference to Liverpool Street and states that: "The risk of encountering UXO on this route is considered possible, based on the level of bombing in the region and the items found post-WWII. However, given the active region, the possibility of UXO existing is considered remote". | PC | L | VH | PC | 1) Crossrail explosive Ordnance Threat Assessment for the Crossrail Route Liverpool Street to Pudding Mill Lane 1D0101-G0G00-00037. 2) Construction Phase Explosive Ordnance Threat Assessment for Crossrail Project Volume 2: Royal Oak to Pudding Mill Lane Portal 1D0101-G0G00-00554 May 2009. Report concludes for Liverpool Street Station that for tunnelling and deep excavation required for site personnel and Explosive Ordnance Disposal Engineer should be on call during the works. | |



Annex 5 Environmental Protection Requirements

Refer to the Works Information for the C257 Archaeological Contract.



Annex 6 Programme and Order of Work

Refer to section 6 above and the WSI Addenda in appendices 1-4.



Annex 7 Enabling and Temporary Works Design Requirements

Please refer to the WSI Addenda (appendices 1-4)



Annex 8 Security Requirements

Refer to the C257 Archaeology Contractor (MoLA) Method Statement.



Annex 9 Need for Screening or other protective works

Please refer to the WSI Addenda (appendices 1-4) And the Principal Contractors Method Statement



Annex 10 Procedure for the notification of the Discovery of Human Remains

Refer to the Generic WSI



Annex 11 Procedure for notification of the Discovery of material falling under the Treasure Act 1996

Refer to the Generic WSI



Annex 12 Procedure for notification of major unexpected discoveries

Refer to the Generic WSI



Appendix 1 – ADDENDUM TO WSI: TRIAL TRENCH EVALUATION, WATCHING BRIEF & DETAILED EXCAVATION - MOORGATE (XSJ10)



**DESIGN PACKAGE C138
LIVERPOOL STREET STATION**

**ADDENDUM TO WSI: TRIAL TRENCH
EVALUATION, WATCHING BRIEF & DETAILED
EXCAVATION - MOORGATE WORKSITE (XSJ10)**

Document Number: C138-MMD-T1-TCP-C101-00001

Document History:

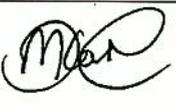
| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|-----------|------------|--------------|---------------|--------------|-------------------------------------|
| 4.0 | 04 03 2010 | Mike Court | Charles Jones | Sandra Allen | Updated for inclusion in the SS-WSI |
| | | | | | |

| CROSSRAIL CENTRAL (PDP) REVIEW AND ACCEPTANCE STATUS | |
|---|--|
| This decal is to be used for submitted documents requiring acceptance by Crossrail Central. | |
| <input type="checkbox"/> | Code 1. Accepted. Work May Proceed |
| <input type="checkbox"/> | Code 2. Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated |
| <input type="checkbox"/> | Code 3. Not Accepted. Revise and resubmit. Work may not proceed |
| <input type="checkbox"/> | Code 4. Received for information only. Receipt is confirmed |
| Reviewed/Accepted by:(signature) | |
| Print Name: | Date: |
| Acceptance by Crossrail Central does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail Central approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier. | |

This document contains proprietary information. No part of this document may be reproduced without prior written consent from the chief executive of Crossrail Ltd.



Document History Continued:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|-----------|------------|---|---|--|---|
| 1.0 | 14 07 2010 | Mike Court | Charles Jones | David Spaughton | For PDP Review |
| 2.0 | 30 07 2010 | Mike Court | Charles Jones | David Spaughton | Incorporating Crossrail Central (JC) comments |
| 3.0 | 09 09 2010 | Mike Court | Charles Jones | Alex Graham | Drawing update |
| 4.0 | 04.03.2011 | Mike Court | Charles Jones | Sandra Allen | Updated for inclusion in the SS-WSI |
| | |  |  |  | |
| | | | | | |

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited:

This document is issued for the party which commissioned it and for specific purposes connected with the Crossrail project only;

It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract, or used for any other purpose;

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose;

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it, Crossrail Limited or Crossrail Central.



Contents

| | |
|---|-----------|
| 1 Introduction | 4 |
| 1 Introduction | 4 |
| 2 Scope of Works | 4 |
| 2.1 Aims of the proposed investigation | 4 |
| 2.2 Site Specific Objectives..... | 5 |
| 3 Requirements for all Principal Contractors | 5 |
| 4 Specific Requirements for C212 Demolition Contractor..... | 6 |
| 4.1 Archaeological Trial Trench Evaluation..... | 6 |
| 5 Specific Requirements for C216 Utilities Contractor | 7 |
| 5.1 Archaeological General Watching Brief & Targeted Watching Brief | 7 |
| 6 Specific Requirements for the 87 Moorgate/8 Moorfields Internal Stability Contractor | 8 |
| 6.1 General Watching Brief | 8 |
| 7 Specific Requirements for C501 Contractor | 8 |
| 7.1 Archaeological Excavation | 8 |
| 8 Specific Requirements for C502 Contractor | 10 |
| 8.1 Targeted Watching Brief..... | 10 |
| 9 Instructions to Archaeological Contractor and Specification | 10 |
| 9.1 Archaeological Evaluation; Watching Brief and Excavation | 10 |
| 9.2 Deliverables | 11 |
| 9.3 Site Archives | 12 |
| 9.4 Post-excavation..... | 12 |
| 10 Provisional Timetable | 12 |
| Appendix A – Archaeological Mapping Information..... | 13 |
| Table 1 Summary of archaeological events at the Moorgate worksite..... | 4 |
| Table 2 Conceptual archaeological model | 5 |
| Table 3 Deliverables for each fieldwork event..... | 11 |
| Table 4 Provisional Timetable | 12 |

1

Introduction

This document provides details of the programme of archaeological investigation required to evaluate and mitigate the impact of construction of Crossrail Works at the Moorgate Worksite, including utility diversions and protective works in nearby streets, on archaeological deposits. It sets out the location and recording activities required at the Moorgate worksite during the demolition and enabling works and provides an indication of archaeological mitigation works that may be required during the main works phases.

This document is an addendum to the Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001) and should be read in conjunction with that document.

This document outlines the requirements of the *Principal Contractors* (C212; C216; C501; and C502) and the requirements of the Archaeological Contractor (C257).

2 Scope of Works

2.1 Aims of the proposed investigation

The overall aim is to identify the extent and survival of archaeological deposits, in particular those relating to the medieval and Roman periods and possibly earlier deposits, all of which would be removed by the Moorgate Shaft construction works. This will be achieved through a programme of archaeological evaluation and mitigation works, a summary of which is set out in Table 1 below.

Table 1 Summary of archaeological events at the Moorgate worksite

| Event Type | Event Code | Principal Contractor | Addendum Specific Requirements Section |
|--|--------------|----------------------|--|
| Trial trench evaluation (6 trenches). Nb. 1 trench in 91-109 Moorgate has already been carried out | XSJ10 | C212 | 4 |
| Targeted watching brief (during excavation of 4 Moorgate Station Sewer diversion manholes). General watching brief during Moorgate sewer diversion | | C501 | 7.1.2 & 7.1.3 |
| General watching brief (Moorgate Combined Utility Diversions and the London Wall Heading) | XSJ10 | C216 | 5.1 |
| Power auger survey with shaft and ground reduction footprint | XSJ10 | C501 | 7.1.4 |
| <i>Archaeological excavation (within Diaphragm Walled Shaft)</i> | <i>XSJ10</i> | <i>C501</i> | <i>7.1</i> |
| General watching brief (Ground reduction to 110m ATD in Moorgate worksite (outside diaphragm walled shaft)) | XSJ10 | C501 | 7.1.3 |
| Targeted watching brief (Ground reduction to 107.5m ATD in Moorgate worksite (outside diaphragm walled shaft)) | | C502 | 8.1 |
| General watching brief on guide trenches for diaphragm wall installation | XSJ10 | C501 | 7.1.3 |
| General watching brief on ground reduction by 0.3m in the basement of 8 Moorfields | XSJ10 | Tbc | 6.1 |

*nb. Items in italics are to be confirmed following the trial trench evaluation

A conceptual archaeological model has been developed as shown in Table 2 below:

Table 2 Conceptual archaeological model

| Layer | Estimated surface elevation (m ATD) | Estimated base elevation (m ATD) | Archaeological potential |
|---|-------------------------------------|----------------------------------|--------------------------|
| Street level | 113.25 | | n/a |
| 91-109 Moorgate basement level | 110.00 | | n/a |
| 87 Moorgate/8 Moorfields basement level | 111.00 | | n/a |
| Made ground (in street) | 113.00 | 109.5 | Yes |
| Moorfield Marsh deposits | 109.50 | 108.50 | Yes |
| Redeposited brickearth (Roman) | 108.50 | 108.00 | Yes |
| Natural brickearth and terrace gravel | 108.00 | 101.00 | Yes (in upper layers) |
| London Clay | 108.00 | 76.00 | None |

*NB. The information provided in the above table is to inform the design in this document, but is not meant to provide an accurate deposit model. Actual deposit depths will be determined by the trial trench evaluation (Section 3.1).

2.2 Site Specific Objectives

The objectives of the archaeological investigation are set out below.

1. Trial Trench Evaluation will refine the extent and significance of the archaeological resource and inform further mitigation measures.
2. Mitigation in the form of archaeological excavation and watching brief to excavate and record archaeological deposits for analysis and dissemination.

3 Requirements for all Principal Contractors

In addition to the Specific Requirements for each Principal Contractor set out in sections 4 to 7, all *Principal Contractors* must provide the following services to facilitate archaeological investigations:

- Ensure no live underground services exist in area of excavation;
- Use of excavators or other plant within the area shall only be undertaken with the agreement and under the observation of C257 Archaeologist;
- Allow safe access for archaeological operatives into the site and provide any required temp works;
- Allow suitable access from ground level to bottom of excavated area for archaeologists to work;
- Provide drainage in excavation where required;
- If *in situ* human remains are encountered, provide covering for the exposed area to prevent public views of the works, these should be:
 - large enough to allow safe working;
 - waterproof;



- translucent (to provide sufficient light); and
- be of a type that can be quickly erected and removed to facilitate machine access when required.
- Prior to backfilling, any *in situ* human remains will be covered with an appropriate Terram geotextile and layer of clean sand (e.g. 0.2m in thickness) as directed by the *C257 Archaeological Contractor*. The materials are to be provided by the *Principal Contractor*;
- Provide appropriate material to compensate for reduction in volume when reinstating;
- Provide the following services and facilities to C257:
 - Power;
 - Lighting;
 - Water (for welfare);
 - Welfare;
 - Small plant and tools.
- Provide all plant and operatives required to complete the works;
- Provide further technical advice to C257 as maybe required to safely complete the works.
- Unless otherwise arranged, the *Principal Contractor* shall provide the following site accommodation facilities for the use of archaeological operatives, inclusive of any hardstanding and services required:
 - Toilets, with drying and washing facilities;
 - First Aid;
 - Temporary office for the use of archaeologists, including 2 desks (NB. desks are not required for General Watching Brief); and,
 - Secure storage.

4 Specific Requirements for C212 Demolition Contractor

4.1 Archaeological Trial Trench Evaluation

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for the definition of trial trench evaluation.

8 trial trenches are required in total, comprising 6 (5 remaining) in the basement of 91-109 Moorgate and 2 in the basement of 17-31 Moorfields (Drawing: C138-MMD-T1-DDA-C101_Z-10065 – Appendix A). These trenches are required to identify the extent and significance of the archaeological resource and inform further mitigation measures. The trial trenches each measure 2m x 4m x 2m deep. A single trench (Trench 6), measuring 2m x 2m x 2m deep has been excavated in advance of the full evaluation.

The *Principal Contractor* (C212) shall break out the areas shown on drawing C138-MMD-T1-DDA-C101_Z-10065 (Appendix A).

Modern overburden (if present) will be removed by the *Principal Contractor* (C212) by machine under archaeological supervision by the *Archaeological Contractor* (C257). The interface between modern overburden and the first archaeological horizon will be cleaned by the *C257 Archaeological Contractor* by hand excavation to expose marsh deposits (anticipated to survive 0.5m beneath the existing basement slab). These will then be removed in spits of 0.2m to 0.5m (or as directed by the *Archaeological Contractor* (C257)) under archaeological supervision to

expose earlier archaeological horizons sealed by the marsh deposits. The sequence of marsh deposits will be recorded by the *Archaeological Contractor (C257)* during the removal process. Following the removal of the overburden and the marsh deposits, the underlying archaeological deposits will be recorded and sampled by the *Archaeological Contractor (C257)* to identify the survival, extent and significance of the deposits. During this stage a smaller area within each trench may be further reduced by the *C257 Archaeological Contractor* to identify the extent and survival of earlier archaeological features. If present these features will be planned and recorded by the *C257 Archaeological Contractor*.

4.1.1 Archaeological Trial Trench Evaluation Procedure

In addition to the requirements set out in section 3, the method of working for the *C212 Contractor* during the works shall allow for:

- Remove, under supervision of C257 Archaeologist the basement floor slab at the trial trench locations and modern overburden, to the predicted level of archaeological deposits, anticipated to be approximately 0.5m below current slab level;
- Provide appropriate plant to remove hand excavated spoil from trial trenches (e.g. a hoist or other appropriate method);
- Place excavated material in spoil heaps at an agreed safe distance from the site of the trenches and backfill on completion;
- Provide temporary works (such as shoring) to support excavations where personnel access for the investigation is required;
- Further to exposing the archaeological horizon sealed by Moorfield Marsh deposits the Contractor should allow for further localised machine/hand dug excavation within each trial trench in spits of 0.2m to 0.5m (or as directed by C257) to remove materials once they have been recorded by C257 until the full sequence of archaeological deposits is identified. Estimated to be up to approximately 107m ATD; and
- Allow for up to 2 archaeologists for 1 week per trial trench to be on site.

5 Specific Requirements for C216 Utilities Contractor

5.1 Archaeological General Watching Brief & Targeted Watching Brief

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for definitions of General and Targeted Watching Briefs.

General Watching Brief is required during Moorgate Combined Utilities Diversions including the London Wall Heading (Drawing CRL1-XRL-U-DDA-C101-00056); For further information regarding utilities diversion works refer to Works Information volumes 2A and 2B (Document Numbers: C216-PDP-W-XWI-CRG03-00001 and 00002).

5.1.1 Archaeological General Watching Brief Procedure

In addition to the requirements set out in section 3, the method of working for the *C216 Contractor* during the works shall allow for:

- The removal of modern material, made ground and topsoil, and 'Moorfield Marsh' deposits will be carried out under archaeological observation, anticipated to be up to between 1.5m and 2m below ground level for utility diversion works.



- Allow suitable access from ground level to bottom of excavated area for archaeologists to rapidly record significant archaeological deposits which may be encountered.
- Allow for up to 2 archaeologists to be on site during groundworks.

6 Specific Requirements for the 87 Moorgate/8 Moorfields Internal Stability Contractor

6.1 General Watching Brief

General watching brief is required during targeted ground reduction by 0.3m in the basement of 8 Moorfields.

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (tbc)* during the works shall allow for:

- The removal of 0.3m of material from the basement of 8 Moorfields will be carried out under archaeological observation;
- Allow suitable access from ground level to bottom of excavated area for archaeologists to rapidly record significant archaeological deposits which may be encountered.
- Allow for 1 archaeologist to be on site during groundworks.

7 Specific Requirements for C501 Contractor

7.1 Archaeological Excavation

***It should be noted that the archaeological trial trench evaluation outlined in section 4 above will inform the scope of archaeological excavation, if required.**

Archaeological excavation, if required, will take place after the installation of diaphragm walling, mini piling and any permeation grouting.

The *Principal Contractor C501* shall undertake to break out the area within the inner face of the diaphragm walls (see C138-MMD-T1-DDA-C101_Z-10066 (Appendix A) for approximate location). This investigation area is required to mitigate the impact of the construction of the Moorgate Shaft. NB. Until the trial trench evaluation is carried out the area considered for archaeological excavation includes the entire area within the inner face of the diaphragm walled shaft area.

Modern overburden (if present) will be removed by the *Principal Contractor (C501)* by machine under archaeological supervision by the *Archaeological Contractor (C257)*. The interface between the modern overburden and the first archaeological horizon will be cleaned by the *C257 Archaeological Contractor* by hand excavation to expose marsh deposits (anticipated to survive approximately 0.5m beneath the existing basement slab). These will then be removed by the *Principal Contractor (C501)* under archaeological supervision to expose earlier archaeological horizons sealed by the marsh deposits. The sequence of marsh deposits will be recorded by the *Archaeological Contractor (C257)* during the removal process. Marsh deposits are estimated to survive to an approximate depth of 108m ATD. Following the removal of the overburden and the marsh deposits, the underlying archaeological deposits will be recorded and sampled by the *Archaeological Contractor (C257)* with provision for more detailed sample investigation and recording of any features of particular interest identified during this stage. After this stage the site level will be further reduced to determine if any earlier archaeological features survive beneath them. If present these features will be again planned, recorded and sample



investigated in order to establish character, function and date. Archaeological deposits are estimate to survive up to approximately 106m ATD.

7.1.1 Archaeological Excavation Procedure

In addition to the requirements set out in section 3, the method of working for *the C501 Contractor* during the works shall allow for:

- Remove, under supervision of C257 Archaeologist the basement floor slab and modern overburden, to the predicted level of archaeological deposits, anticipated to be approximately 0.5m below current slab level;
- Prepare and undertake breakout, removal and storage of 19th and 20th Century, or other, structures and soils agreed in liaison with the C257 Archaeologist;
- Provide appropriate plant to remove hand excavated spoil from trial trenches (e.g. a hoist or other appropriate method);
- Provide temporary works to support excavations where personnel access for the investigation is required;
- Machine/hand excavate in stages, as directed by the *Archaeological Contractor (C257)* to remove materials once they have been recorded by the *Archaeological Contractor (C257)* until the full sequence of archaeological deposits is identified. Estimated to be down to approximately 106m ATD; and
- Allow for up to 10 archaeologists to be on site.

7.1.2 Archaeological Targeted Watching Brief Procedure

A targeted watching brief is required during the excavation of manholes relating to the Moorgate Station Sewer Diversion (Drawing C138-MMD-T1-DDA-C101_Z-10065 – Appendix A).

During the excavation of the manholes (MH S1; S2; S3 and S4) relating to the Moorgate Station Sewer Diversion the following procedure is to be incorporated into the *Principal Contractors* method of work in addition to the requirements set out in section 3:

- Remove, under supervision of C257 Archaeologist the basement floor slab/modern material at the manhole locations, modern overburden, and 'Moorfield Marsh' deposits until the deposits sealed by the marsh are exposed, estimated to be at approximately 108m ATD;
- The *Principal Contractor (C501)* will allow for archaeological deposits to be excavated in stages within each Manhole to remove materials once they have been recorded by C257 until the full sequence of archaeological deposits is recorded. Archaeological deposits are estimated to be present between 108m ATD and 106m ATD;
- Allow for up to 2 archaeologists to be on site per manhole.

7.1.3 General Watching Brief

General Watching Brief is required during the excavation of guide trenches for diaphragm walling and in ground reduction within the wider Moorgate worksite to 110m ATD) and the Moorgate sewer diversion.

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (C501)* shall allow for:

- The removal of all material to 110m ATD will be carried out under archaeological observation.



- Provide suitable access from ground level to bottom of excavated area for archaeologists to rapidly record significant archaeological deposits which may be encountered.
- Allow for up to 2 archaeologists to be on site.

7.1.4 Power Auger Survey

In the Moorgate worksite provision shall be made by the *C501 Contractor* for the *C257 Archaeological Contractor* to carry out a power auger survey comprising up to 15 locations, the locations of which are to be determined by *C257* in liaison with the *C501 Contractor* with regard to on-site programming. The aim of this survey is to provide deposit depth and survival information to inform mitigation measures at the Moorgate worksite and to provide enough material for micro-ecofact sampling (pollen, diatoms etc).

The survey will be carried out alongside archaeological mitigation works.

In addition to the requirements set out in section 3, the method of working for *the C501 Contractor* during the works shall allow for:

- Power Augering should be carried out by the *Archaeological Contractor (C257)* during Moorgate Combined Utility Diversions within Moorfields and Fore Street Avenue after the existing utilities have been disconnected/removed; and
- Allow for up to 2 archaeologists to be on site.

8 Specific Requirements for C502 Contractor

8.1 Targeted Watching Brief

Targeted Watching Brief is required during Main Works ground reduction in the wider Moorgate Shaft worksite (Moorfields, Fore Street Avenue and the basement of 17-31 Moorfields)

8.1.1 Archaeological Targeted Watching Brief Procedure

In addition to the requirements set out in section 3, the method of working for *the C502 Contractor* during the works shall allow for:

- The *Principal Contractor* will allow for archaeological deposits to be excavated in stages during Main Works ground reduction to approximately 107.5m ATD to remove materials once they have been recorded by *C257* until the full sequence of archaeological deposits is recorded to the maximum depth of ground reduction.
- Targeted Watching Brief may be downgraded to General Watching Brief should Main Works ground reduction not extend below 'Moorfield Marsh' deposits. See section 4.1 for description of General Watching Brief methodology.
- Allow for up to 4 archaeologists to be on site during the ground reduction works.

9 Instructions to Archaeological Contractor and Specification

9.1 Archaeological Evaluation; Watching Brief and Excavation

It is proposed that a programme of archaeological investigation comprising trial trench evaluation; general and targeted watching brief, a power auger survey and potentially archaeological excavation be carried out at the Moorgate worksite. Further details on the

requirements of the Archaeological contractor are to be found in the Site Specific Written Scheme of Investigation, document reference number: C138-MMD-T1-RST-C101-00001.

The Archaeological Contractor shall:

- Provide a team of suitably qualified archaeologists, experienced in archaeological site evaluation and the nature of archaeological deposits which are expected on this site;
- Provide a method statement for carrying out the works;
- Provide a risk assessment and health and safety plan;
- During Trial Trench Evaluation, Excavation and Targeted Watching Brief, following the initial overall strip and clean, individual features are to be hand cleaned and defined: sufficient to determine type, plan form and relationships (e.g. for structures and rebuilds); and recorded. Sufficient archaeological features/structures are to be sample excavated either using a smaller machine with graded digging bucket (by the *Principal Contractor* under archaeological supervision) or hand cleaned if appropriate;
- When this initial investigation is completed it will be followed by a second strip, removing 'Moorfields Marsh' deposits to the level of earlier features (medieval and Roman) and then sampling and recording process described above will be repeated at this level.
- The exact methodology of the Power Auger Survey will be set out in the Archaeological Contractors (C257) Method Statement. It is envisaged that dependent on on-site conditions that C257 will use a hand held power auger, with a core width of 50mm, 75mm or 100mm.

9.2 Deliverables

Table 3 summarises the Deliverables required per fieldwork event:

Table 3 Deliverables for each fieldwork event

| Fieldwork Event | Deliverables | | | |
|--|------------------------|----------------|---------------|------------------|
| | Weekly Progress Report | Interim Report | Deposit Model | Fieldwork Report |
| XSJ10 (Trial Trench Evaluation; TWB at sewer manhole excavation) | ✓ | ✓ | | ✓ |
| XSJ10 (GWB on utilities & ground reduction to 110m ATD; TWB on ground reduction to 107.5m ATD) | ✓ | ✓ | | ✓ |
| XSJ10 (Power Auger Survey) | ✓ | | ✓ | ✓ |
| <i>XSJ10 Archaeological Excavation</i> | <i>tbc</i> | <i>tbc</i> | <i>tbc</i> | <i>tbc</i> |

*nb. Items in italics are to be confirmed following the trial trench evaluation

Refer to the following sections of the Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001) for further information regarding the following report types:

- Weekly progress reports – WSI section 10;
- Interim report – 7 days after completion of fieldwork – WSI section 9.4; and

- Trial Trench Evaluation; Watching Brief and Excavation reports – WSI section 9.6.

9.3 Site Archives

Refer to section 8.2 in the Site Specific Written Scheme of Investigation, document reference number: C138-MMD-T1-RST-C101-00001.

9.4 Post-excavation

Refer to the detail set out within the CRL/Crossrail Central Archaeological Contract and the Written Scheme of Investigation for Liverpool Street Station (C138-MMD-T1-RST-C101-00001).

10 Provisional Timetable

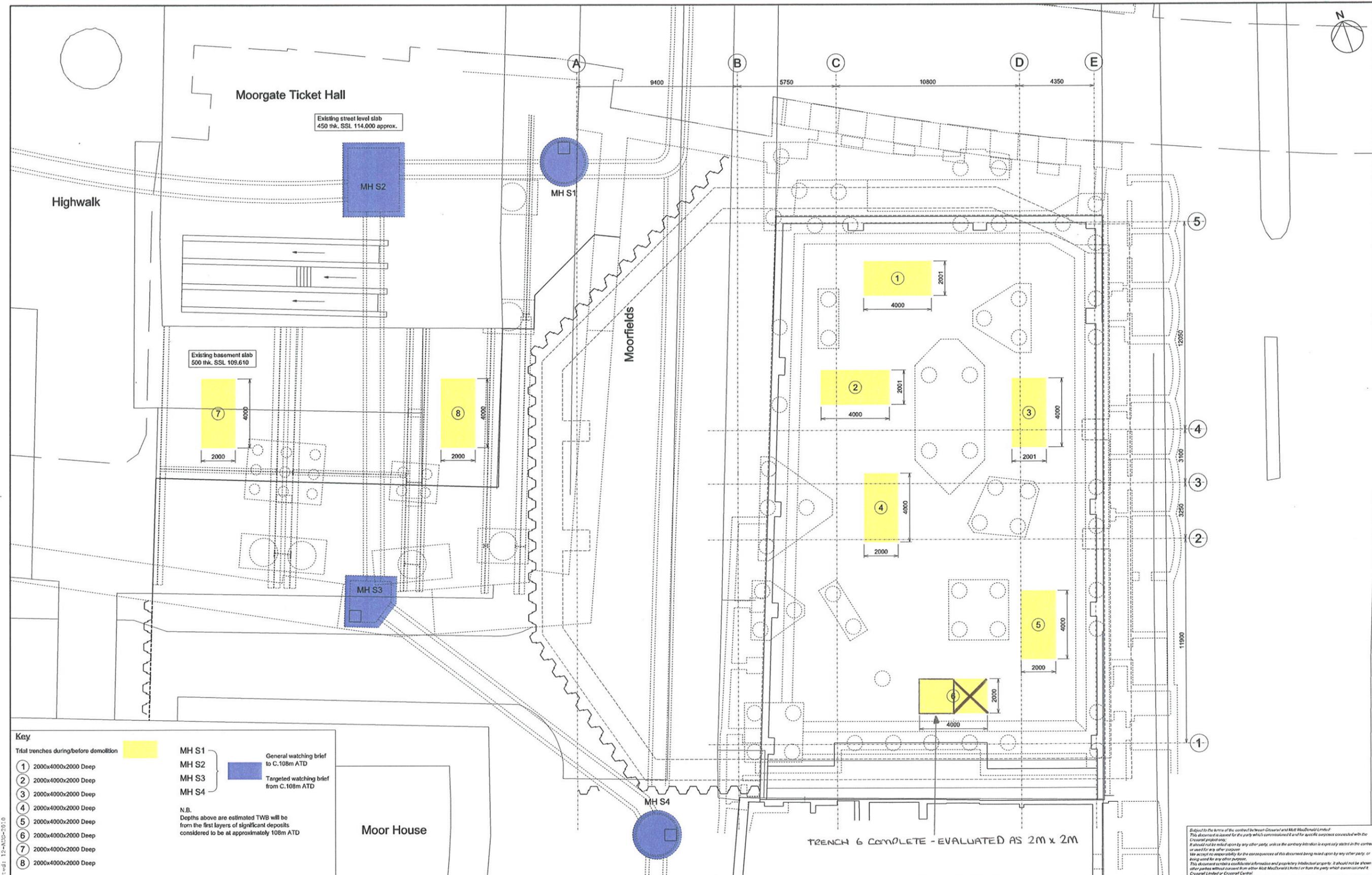
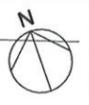
Table 4 Provisional Timetable

| Activity | Principal Contractor | Construction Phase |
|--|----------------------|---|
| Excavation of 6 trial trenches in basement of 91-109 Moorgate (5 trenches remaining, estimate 1 week per trench, can be concurrent – maximum 5 weeks) | C212 | Demolition (10 May 2011 to 14 June 2011) |
| Excavation of 2 trial trenches in basement of 17-31 Moorfields (estimate 1 week per trench, can be concurrent –maximum 2 weeks) | C212 | Demolition (tbc) |
| General watching brief during combined utilities diversions and the London Wall Heading | C216 | Utilities diversions (21 March 2010 to 27 Jan 2012) |
| General and targeted watching brief during 4 manhole excavations and Moorgate sewer diversion | C501 | Sewer diversion (02 Sept 2011 to Aug 2012) |
| Power auger survey (estimate 0.5 days per auger location) | C501 | Main Works (25 Nov 2011 to 12 Mar 2012) |
| General and targeted watching brief during ground lowering of Moorfields, Fore Street Avenue, and the basement of 17-31 Moorfields, to the south of the High Walk (estimate 1 month) | C501 & C502 | GWB – Enabling Works for Shaft Construction (13 Jan 2012 to 17 April 2012) TWB – tbc |
| <i>Archaeological excavation within diaphragm walls of Moorgate Shaft (estimate 2 months)</i> | <i>C501</i> | <i>Main Works (25 Nov 2011 to 14 Mar 2012)</i> |
| General watching brief on guide trenches for diaphragm walling | C501 | Main Works (Nov 2011 to Mar 2012) |
| General watching brief on ground reduction by 0.3m in basement of 8 Moorfields | Tbc | Enabling Works (May to June 2011) |

*nb. Items in italics are to be confirmed following the trial trench evaluation



Appendix A – Archaeological Mapping Information



Key

Trial trenches during/before demolition

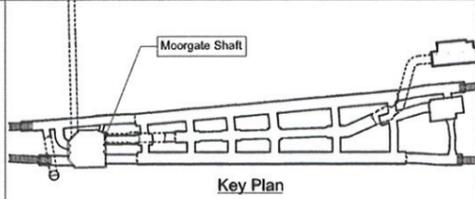
① 2000x4000x2000 Deep
 ② 2000x4000x2000 Deep
 ③ 2000x4000x2000 Deep
 ④ 2000x4000x2000 Deep
 ⑤ 2000x4000x2000 Deep
 ⑥ 2000x4000x2000 Deep
 ⑦ 2000x4000x2000 Deep
 ⑧ 2000x4000x2000 Deep

MH S1
 MH S2
 MH S3
 MH S4

General watching brief to C.108m ATD
 Targeted watching brief from C.108m ATD

N.B.
 Depths above are estimated TWB will be from the first layers of significant deposits considered to be at approximately 108m ATD

Key
 TRENCHES IN 91-109 MOORGATE TO BE CARRIED OUT AFTER DEMOLITION.



Subject to the terms of the contract between Crossrail and Mott MacDonald Limited. This document is issued for the party which commissioned it and for specific purposes connected with the Crossrail project only. It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract or used for any other purpose. We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose. This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it. Crossrail Limited or Crossrail Central.

Copy Approved for Design - Created: 12-NOV-2010

| Rev. | Date | Description | DP By | MD Ctd | SA App | Auth |
|------|------------|-------------|-------|--------|--------|------|
| P01 | 30/07/2010 | First Issue | | | | |

Contract: Liverpool Street Station Design
 Designer: Mott MacDonald Limited
 Location: Liverpool Street Stn

Crossrail Limited
 25 Canada Square
 Canary Wharf
 London
 E14 5LQ

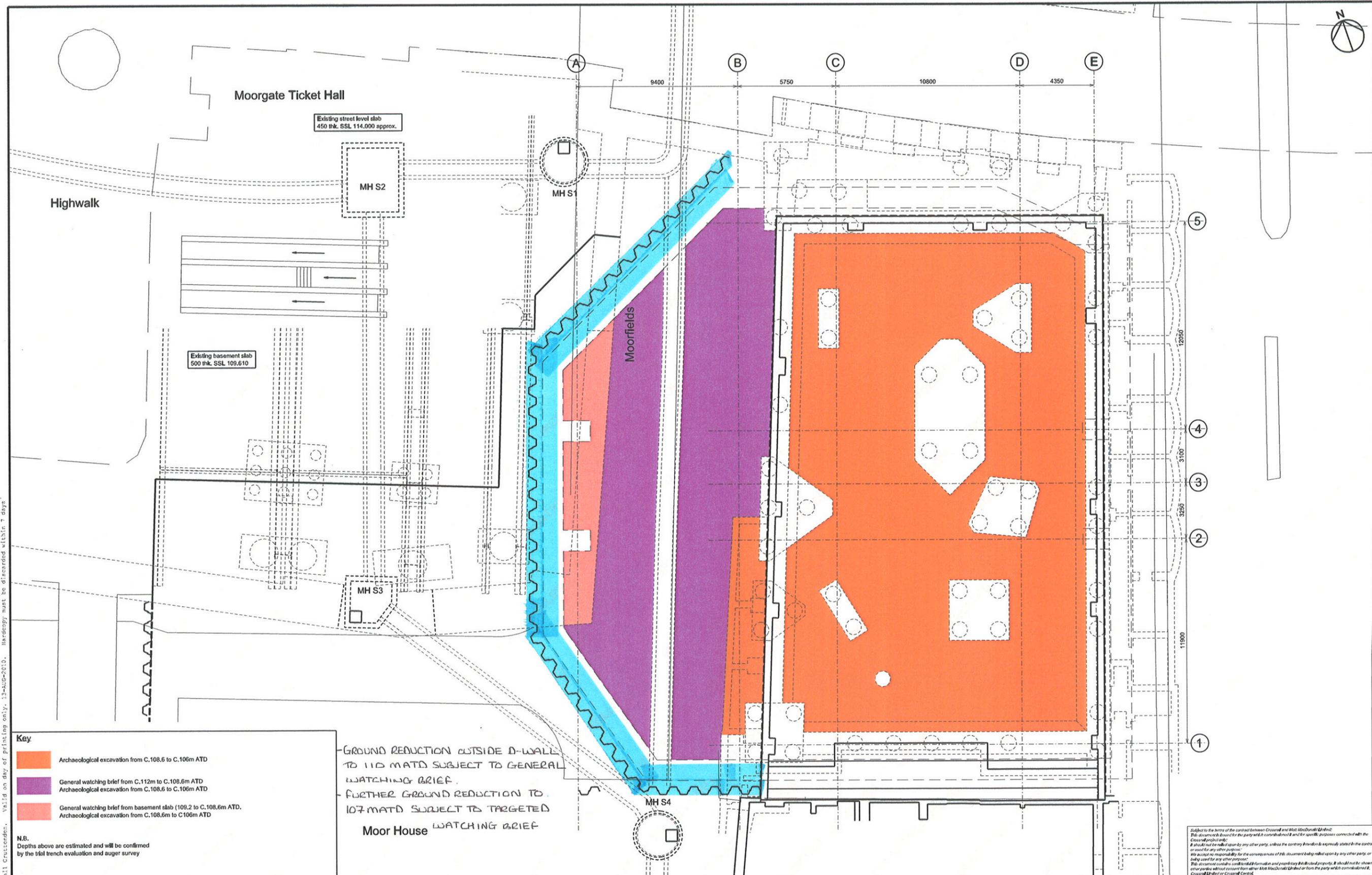
© Crossrail
 www.crossrail.co.uk

Title: Moorgate Shaft
 Archaeological Evaluation Drawings

By: D. PLATT
 Ck: M. COLLING
 App: S. ALLEN
 Auth: ...

Scale: 1:100@A1
 Drawing and CAD file No: C138-MMD-T1-DDA-C101_Z-10065
 Rev: P01
 Subability: S4

RESTRICTED
 Fit for authorisation



Key

- Archaeological excavation from C.108.6 to C.106m ATD
- General watching brief from C.112m to C.108.6m ATD
Archaeological excavation from C.108.6 to C.106m ATD
- General watching brief from basement slab (108.2 to C.108.6m ATD).
Archaeological excavation from C.108.6m to C106m ATD

N.B.
Depths above are estimated and will be confirmed by the trial trench evaluation and auger survey

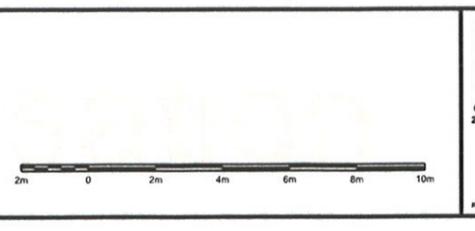
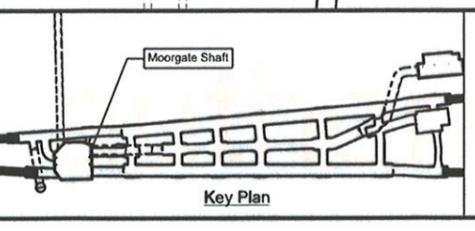
GROUND REDUCTION OUTSIDE D-WALL TO 110 MATD SUBJECT TO GENERAL WATCHING BRIEF.

FURTHER GROUND REDUCTION TO 107 MATD SUBJECT TO TARGETED WATCHING BRIEF

| Rev. | Date | Description | By | Chkd | App | Auth |
|------|------------|-------------|----|------|-----|------|
| P01 | 30/07/2010 | First Issue | DP | MD | SA | |

Key

- GENERAL WATCHING BRIEF ON GUIDE TRENCHES FOR D-WALLING (APPROXIMATE AREA)



Crossrail

Contract: Liverpool Street Station Design
Originator: Mott MacDonald Limited
Location: Liverpool Street Stn
Title: Moorgate Shaft Archaeological Evaluation Drawings

By: D. PLATT
CHK: M. DILLING
App: S. ALLEN
Auth: _____

Scale: 1:100 @ A1
Drawing and CAD File No: C138-MMD-T1-DDA-C101_Z-10066
Rev: P01
Subsidiary: S4

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited. This document is issued for the party with control and for specific purposes connected with the contract and should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract or used for any other purpose. We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose. This document contains confidential information and proprietary information, it should not be shown to other parties without consent from either Mott MacDonald Limited or from the party with control and Crossrail Limited or Crossrail Central.

Unapproved Copy - Printed by: PH11 Crossrail. Valid on day of printing only. 13-AUG-2010. Hardcopy must be discarded within 7 days

RESTRICTED
Fit for authorisation



**Appendix 2 – ADDENDUM TO WSI: TRIAL TRENCH EVALUATION,
WATCHING BRIEF & DETAILED EXCAVATION – FINSBURY CIRCUS
(XRZ10)**



**DESIGN PACKAGE C138
LIVERPOOL STREET STATION**

**ADDENDUM TO WSI: TRIAL TRENCH
EVALUATION, WATCHING BRIEF & DETAILED
EXCAVATION – FINSBURY CIRCUS (XRZ10)**

Document Number: C138-MMD-T1-RST-C101-00006

Document History:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|-----------|------------|--------------|-----------------|--------------|---|
| 1.0 | 28 07 2010 | Mike Court | Charles Jones | Sandra Allen | For PDP Acceptance |
| 2.0 | 20 08 2010 | Mike Court | Matthew Dilling | Sandra Allen | Incorporating Crossrail Central (JC) comments |
| 3.0 | 04 03 2011 | Mike Court | Charles Jones | Sandra Allen | Updated for inclusion in the SS-WSI |
| | | | | | |

| CROSSRAIL CENTRAL (PDP) REVIEW AND ACCEPTANCE STATUS | |
|---|--|
| This decal is to be used for submitted documents requiring acceptance by Crossrail Central. | |
| <input type="checkbox"/> | Code 1. Accepted. Work May Proceed |
| <input type="checkbox"/> | Code 2. Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated |
| <input type="checkbox"/> | Code 3. Not Accepted. Revise and resubmit. Work may not proceed |
| <input type="checkbox"/> | Code 4. Received for information only. Receipt is confirmed |
| Reviewed/Accepted by:(signature) | |
| Print Name: | Date: |
| Acceptance by Crossrail Central does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail Central approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier. | |

This document contains proprietary information. No part of this document may be reproduced without prior written consent from the chief executive of Crossrail Ltd.

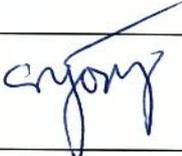


Mott MacDonald Issue and Revision Record

Document Title: C138 – Liverpool Street Station Addendum to WSI: Trial Trench Evaluation Watching Brief & Detailed Excavation Finsbury Circus

Document number: C138-MMD-T1-RST-C101-00006

Document History Continued:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|-----------|------------|---|--|--|---|
| 1.0 | 28 07 2010 | Mike Court | Charles Jones | Sandra Allen | For PDP Review |
| 2.0 | 20 08 2010 | Mike Court | Matthew Dilling | Sandra Allen | Incorporating Crossrail Central (JC) comments |
| 3.0 | 04 03 2011 | Mike Court | Charles Jones | Sandra Allen | Updated for inclusion in the SS-WSI |
| | |  |  |  | |

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited:

This document is issued for the party which commissioned it and for specific purposes connected with the Crossrail project only;

It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract, or used for any other purpose;

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose;

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it, Crossrail Limited or Crossrail Central.



Contents

| | |
|--|-----------|
| 1 Introduction | 4 |
| 2 Scope of Works | 4 |
| 2.1 Aims of the proposed investigation | 4 |
| 2.2 Site Specific Aims and Objectives | 5 |
| 3 Requirements for all Principal Contractors | 5 |
| 4 Specific Requirements for JB Riney..... | 6 |
| 4.1 Archaeological Auger Survey | 6 |
| 4.2 Archaeological Trial Trench Evaluation – Temporary Access Shaft | 6 |
| 5 Specific Requirements for C216 Utilities Contractor | 7 |
| 5.1 Archaeological General Watching Brief..... | 7 |
| 6 Specific Requirements for C510 Contractor | 8 |
| 6.1 Archaeological Excavation – Finsbury Circus Gardens | 8 |
| 6.2 Archaeological Targeted Watching Brief – Finsbury Circus Grout Shafts..... | 9 |
| 7 Instructions to Archaeological Contractor and Specification | 9 |
| 7.1 Archaeological Evaluation; Watching Brief and Excavation | 9 |
| 7.2 Deliverables | 10 |
| 7.3 Site Archives | 11 |
| 7.4 Post-excavation..... | 11 |
| 8 Provisional Timetable | 11 |
| Appendix A – Archaeological Mapping Information..... | 12 |
| Table 1 Summary of archaeological events at the Finsbury Circus worksite | 4 |
| Table 2 Conceptual archaeological model | 4 |
| Table 3 Deliverables for each fieldwork event..... | 10 |
| Table 4 Provisional Timetable | 11 |

1 Introduction

This document provides details of the programme of archaeological investigation required to evaluate and mitigate the impact of construction works on archaeological deposits at Finsbury Circus. It sets out the location and recording activities required during the enabling works phase and provides an indication of archaeological mitigation works that may be required during the main works phases.

This document is an addendum to the Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001) and should be read in conjunction with that document.

This document outlines the requirements of the *Principal Contractors* (JB Riney; C216; and C510) and the requirements of the Archaeological Contractor (C257).

2 Scope of Works

2.1 Aims of the proposed investigation

The overall aim is to identify the extent and survival of archaeological deposits, in particular those relating to the medieval and Roman periods and possibly earlier deposits, all of which would be removed by construction of the Temporary Access Shaft and the two compensation grout shafts at Finsbury Circus. This will be achieved through a programme of archaeological evaluation and mitigation works, a summary of which is set out in Table 1 below.

Table 1 Summary of archaeological events at the Finsbury Circus worksite

| Event Type | Event Code | <i>Principal Contractor</i> | Addendum Specific Requirements Section |
|--|------------|-----------------------------|--|
| Power auger survey (2 locations) | XRZ10 | JB Riney | 4.1 |
| Trial trench evaluation (1 trench) | | JB Riney | 4.2 |
| General watching brief (utilities diversions in Finsbury Circus) | | C243 | 5.1 |
| General watching brief (during grout shaft exploration investigations) | | JB Riney | Works complete |
| <i>Archaeological excavation (within Temporary Access Shaft footprint)</i> | | <i>C510</i> | 6.1 |
| Targeted watching brief (Finsbury Circus Grout Shafts) | | C510 | 6.2 |

*nb. Items in italics are to be confirmed following the trial trench evaluation

A conceptual archaeological model has been developed as shown in Table 2 below:

Table 2 Conceptual archaeological model

| Layer | Estimated surface elevation (m ATD) | Estimated base elevation (m ATD) | Archaeological potential |
|---|-------------------------------------|----------------------------------|--------------------------|
| Street level | 113.5 | | n/a |
| Basement level (partially within former wine bar) | 109.5 | | n/a |

| Layer | Estimated surface elevation (m ATD) | Estimated base elevation (m ATD) | Archaeological potential |
|-----------------------------------|-------------------------------------|----------------------------------|--------------------------|
| Made ground | 112.50 | 110.50 | Yes |
| Moorfield Marsh deposits | 110.50 | 108.50 | Yes |
| Redeposited brickearth (Roman) | 108.50 | 108.00 | Yes |
| Natural brickearth/terrace gravel | 108.00 | 105.00 | Yes |
| London clay | 105.50 | 75.00 | None |

*NB. The information provided in the above table is to inform the design in this document, but is not meant to provide an accurate deposit model. Actual deposit depths will be determined by the trial trench evaluation (Section 3.1).

2.2 Site Specific Aims and Objectives

The objectives of the archaeological investigation are set out below.

1. Trial Trench Evaluation will refine the extent and significance of the archaeological resource and inform further mitigation measures.
2. Mitigation in the form of archaeological excavation and watching brief to excavate and record archaeological deposits for analysis and dissemination.

3 Requirements for all Principal Contractors

In addition to the Specific Requirements for each Principal Contractor set out in sections 4 to 7, all *Principal Contractors* must provide the following services to facilitate archaeological investigations:

- Ensure no live underground services exist in area of excavation;
- Use of excavators or other plant within the area shall only be undertaken with the agreement and under the observation of C257 Archaeologist;
- Allow safe access for archaeological operatives into the site and provide any required temp works;
- Allow suitable access from ground level to bottom of excavated area for archaeologists to work;
- Provide drainage in excavation where required;
- If *in situ* human remains are encountered, provide covering for the exposed area to prevent public views of the works, these should be:
 - large enough to allow safe working;
 - waterproof;
 - translucent (to provide sufficient light); and
 - be of a type that can be quickly erected and removed to facilitate machine access when required.
- Prior to backfilling, any *in situ* human remains will be covered with an appropriate Terram geotextile and layer of clean sand (e.g. 0.2m in thickness) as directed by the *C257 Archaeological Contractor*. The materials are to be provided by the *Principal Contractor*;



- Provide appropriate material to compensate for reduction in volume when reinstating;
- Provide the following services and facilities to C257:
 - Power;
 - Lighting;
 - Water (for welfare);
 - Welfare;
 - Small plant and tools.
- Provide all plant and operatives required to complete the works;
- Provide further technical advice to C257 as maybe required to safely complete the works.
- Unless otherwise arranged, the *Principal Contractor* shall provide the following site accommodation facilities for the use of archaeological operatives, inclusive of any hardstanding and services required:
 - Toilets, with drying and washing facilities;
 - First Aid;
 - Temporary office for the use of archaeologists, including 2 desks (NB. desks are not required for General Watching Brief); and,
 - Secure storage.

4 Specific Requirements for JB Riney

4.1 Archaeological Auger Survey

Provision shall be made by the *Principal Contractor (JB Riney)* for the *Archaeological Contractor (C257)* to carry out a power auger survey comprising 2 locations (Drawing C138-MMD-T1-DDA-C101_Z-10070 – Appendix A) within the footprint of the Temporary Access Shaft. The aim of this survey is to provide a sample of the Moorfield Marsh deposits, to determine the truncation to archaeological deposits and to inform the trial trench evaluation.

The Power Auger Survey will be carried out by the *Archaeological Contractor (C257)*.

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (JB Riney)* during the works shall allow for:

- Remove, under supervision of C257 Archaeologist any surface and/or underlying modern obstructions at the auger locations; and
- Allow for up to 2 archaeologists to be on site.

4.2 Archaeological Trial Trench Evaluation – Temporary Access Shaft

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for the definition of Trial Trench Evaluation.

1 trial trench is required in the footprint of the Temporary Access Shaft (Drawing C138-MMD-T1-DDA-C101_Z-10070 – Appendix A). This trench is required to identify the extent and significance of the archaeological resource and inform further mitigation measures. The trench is 8m x 2m x 6m deep (T1).



The *Principal Contractor (JB Riney)* shall break out the areas shown on drawing C138-MMD-T1-DDA-C101_Z-10070 (Appendix A).

Modern overburden, if present, will be removed by the *Principal Contractor (JB Riney)* under archaeological supervision by the *Archaeological Contractor (C257)*. The interface between modern overburden and the first archaeological horizon will be cleaned by the *C257 Archaeological Contractor* by hand excavation to expose marsh deposits (anticipated to survive beneath the existing basement slab in trench T2; and approximately 1.2m below ground level in trenches T1). These will then be removed by the *Principal Contractor (CJB Riney)* by machine under archaeological supervision to expose earlier archaeological horizons sealed by the marsh deposits. The sequence of marsh deposits will be recorded by the *Archaeological Contractor (C257)* during the removal process. Following the removal of the overburden and the marsh deposits, the underlying archaeological deposits, cut into and immediately overlying the terrace gravels, will be recorded and sampled by the *Archaeological Contractor (C257)* to identify the survival, extent and significance of the deposits. During this stage a smaller area within each trench may be further reduced by machine/hand digging in spits of 0.2m to 0.5m (or as directed by the *Archaeological Contractor (C257)*) by the *Principal Contractor (JB Riney)* under archaeological supervision to identify the extent and survival of earlier archaeological features. If present these features will be planned and recorded by the *Archaeological Contractor (C257)*.

4.2.1 Archaeological Trial Trench Evaluation Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (JB Riney)* during the works shall be before or during the excavation phase:

- Remove, under observation of C257 Archaeologist the modern overburden, to the predicted level of archaeological deposits;
- Provide appropriate plant to remove hand excavated spoil from trial trenches (e.g. a hoist or other appropriate method);
- Provide temporary works to support excavations where personnel access for the investigation is required, such as shoring;
- Further to exposing the archaeological horizon sealed by Moorfield Marsh deposits the Contractor should allow for further localised machine/hand dug excavation within each trial trench in spits of 0.2m to 0.5m (or as directed by C257) to remove materials once they have been recorded by C257 until the full sequence of archaeological deposits is identified;
- Allow for up to 4 archaeologists for 1 week per trial trench to be on site; and

5 Specific Requirements for C216 Utilities Contractor

5.1 Archaeological General Watching Brief

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for the definition of General Watching Brief.

General Watching Brief is required during utilities diversion works in Finsbury Circus. For further information regarding utilities diversion works refer to Works Information volumes 2A and 2B (Document Numbers: C216-PDP-W-XWI-CRG03-00001 and 00002).



5.1.1 Archaeological General Watching Brief Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (C216)* during utility diversion works shall allow for:

- The removal of modern material, made ground and topsoil, and 'Moorfield Marsh' deposits will be carried out under archaeological observation, anticipated to be up to between 1.5m below ground level for utility diversion works.
- Allow suitable access from ground level to bottom of excavated area for archaeologists to rapidly record significant archaeological deposits which may be encountered.
- Allow for up to 2 archaeologists to be on site during groundworks.

6 Specific Requirements for C510 Contractor

6.1 Archaeological Excavation – Finsbury Circus Gardens

*** It should be noted that the archaeological trial trench evaluation outlined in section 4 will inform the scope of archaeological excavation, if required. The works outlined in this section are included to provide an idea to the relevant contractors of the possible archaeological works that they may need to facilitate. The following works may be subject to a change in scope.**

Archaeological excavation, if required, will take place prior to or during the excavation of the Temporary Access Shaft in Finsbury Circus. However, until the trial trench evaluation is carried out the area considered for archaeological excavation is uncertain.

This investigation area is required to mitigate the impact of the construction of the Temporary Access Shaft on archaeological resources.

Existing base slabs and modern overburden (if present) will be removed by the *Principal Contractor (C510)* by machine under archaeological supervision by the *Archaeological Contractor (C257)* to expose marsh deposits (anticipated to survive at approximately 1.2m below ground level and immediately beneath the basement slab of the former wine bar). These will then be removed by the *Principal Contractor (C510)* in spits of 200mm to 500mm (or as directed by the *Archaeological Contractor (C257)*). The interface between modern overburden and the first archaeological horizon will be cleaned by the *C257 Archaeological Contractor* by hand excavation to expose earlier archaeological horizons sealed by the marsh deposits. The sequence of marsh deposits will be recorded by the *Archaeological Contractor (C257)* during the removal process. Following the removal of the overburden and the marsh deposits, the underlying archaeological deposits will be recorded and sampled by the *Archaeological Contractor (C257)* with provision for more detailed sample investigation and recording of any features of particular interest identified during this stage. After this stage the site level will be further reduced to determine if any earlier archaeological features survive beneath them. If present these features will be again planned, recorded and sample investigated in order to establish character, function and date. Archaeological deposits are estimated to survive up to approximately 6m below ground level.

6.1.1 Archaeological Excavation Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (C510)* shall before or during the construction of the Temporary Access shaft and two grout shafts in Finsbury Circus:



- Remove, under supervision of C257 Archaeologist the basement floor slab of the former wine bar and modern overburden and obstructions, to the predicted level of archaeological deposits, anticipated to be approximately 1.2m below current ground level;
- Provide appropriate plant to remove hand excavated spoil (e.g. a hoist or other appropriate method);
- Provide temporary works to support excavations where personnel access for the investigation is required, such as shoring;
- Machine excavate in stages, as directed by the *Archaeological Contractor (C257)* to remove materials once they have been recorded by the *Archaeological Contractor (C257)* until the full sequence of archaeological deposits is identified. Estimated to be down to approximately 6m below ground level.
- Allow for up to 8 archaeologists to be on site; and

6.2 Archaeological Targeted Watching Brief – Finsbury Circus Grout Shafts

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for the definition of Targeted Watching Briefs.

Targeted Watching Brief is required during the construction of the two grout shafts in Finsbury Circus.

6.2.1 Archaeological Targeted Watching Brief Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (C510)* during the excavation of the two grout shafts shall allow for:

- Remove, under observation of C257 Archaeologist the modern road surface, and any modern overburden to expose 'Moorfield Marsh' deposits (the surface of which are estimated to be at approximately 2-3m below ground level).
- Remove 'Moorfield Marsh' deposits by machine in spits of 200mm to 500mm (or as directed by the *Archaeological Contractor (C257)*) under supervision by the C257 Archaeologist until the deposits sealed by the marsh are exposed, estimated to be approximately 4.5 to 6m below ground level;
- The *Principal Contractor (C510)* will allow for archaeological deposits to be excavated in stages, as directed by the *Archaeological Contractor (C257)* until the full sequence of archaeological deposits is recorded. Archaeological deposits are estimated to be present up to approximately 6m below ground level;
- Allow for up to 2 archaeologists to be on site per grout shaft;

7 Instructions to Archaeological Contractor and Specification

7.1 Archaeological Evaluation; Watching Brief and Excavation

It is proposed that a programme of archaeological investigation comprising trial trench evaluation; general and targeted watching brief, a power auger survey and potentially archaeological excavation be carried out at Finsbury Circus worksite and at the site of the two compensation grout shafts in Finsbury Circus. Further details on the requirements of the *Archaeological contractor* are to be found in the Site Specific Written Scheme of Investigation, document reference number: C138-MMD-T1-RST-C101-00001.

The Archaeological Contractor shall:

- Provide a team of suitably qualified archaeologists, experienced in archaeological site evaluation and the nature of archaeological deposits which are expected on this site;
- Provide a Method Statement inclusive of risk assessment and safe method of working;
- During Trial Trench Evaluation, Targeted Watching Brief and Excavation, following the initial overall strip and clean, individual features are to be hand cleaned and defined: sufficient to determine type, plan form and relationships (e.g. for structures and rebuilds); and recorded. Sufficient archaeological features/structures are to be sample excavated either using a smaller machine with graded digging bucket (by the *Principal Contractor* under archaeological supervision) or hand cleaned if appropriate;
- When this initial investigation is completed it will be followed by a second strip, removing 'Moorfields Marsh' deposits to the level of earlier features (medieval and Roman) and then sampling and recording process described above will be repeated at this level.
- The exact methodology of the Power Auger Survey will be set out in the Archaeological Contractors (C257) Method Statement. It is envisaged that dependent on on-site conditions that C257 will use a hand held power auger, with a core width of 50mm, 75mm or 100mm. Auger depths will be to surface of terrace gravels (estimated to be at approximately 109.00m ATD).

7.2 Deliverables

Table 3 summarises the Deliverables required per fieldwork event:

Table 3 Deliverables for each fieldwork event

| Fieldwork Event | Weekly Progress Report | Interim Report | Deposit Model | Fieldwork Report |
|--|------------------------|----------------|---------------|------------------|
| XRZ10 (Trial Trench Evaluation & Power Auger Survey) | ✓ | ✓ | ✓ | ✓ |
| XRZ10 (GWB on utilities) | ✓ | ✓ | | ✓ |
| XRZ10 (GWB and Power Auger Survey on grout shaft exploratory trenches) | ✓ | ✓ | ✓ | ✓ |
| XRZ10 (TWB at grout shaft excavations) | ✓ | ✓ | | |
| <i>XRZ10 Archaeological Excavation</i> | <i>tbc</i> | <i>tbc</i> | <i>tbc</i> | <i>Tbc</i> |

*nb. Items in italics are to be confirmed following the trial trench evaluation

Refer to the following sections of the Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001) for further information regarding the following report types:

- Weekly progress reports – WSI section 10;
- Interim report – 7 days after completion of fieldwork – WSI section 9.4; and
- Trial Trench Evaluation; Watching Brief and Excavation reports – WSI section 9.6.



7.3 Site Archives

The site archive shall be organised to be compatible with other archaeological archives in London. Refer to section 8.2 in the Site Specific Written Scheme of Investigation, document reference number: C138-MMD-T1-RST-C101-00001.

7.4 Post-excavation

Refer to the detail set out within the CRL/Crossrail Central Archaeological Contract and the Written Scheme of Investigation for Liverpool Street Station (C138-MMD-T1-RST-C101-00001).

8 Provisional Timetable

Table 4 Provisional Timetable

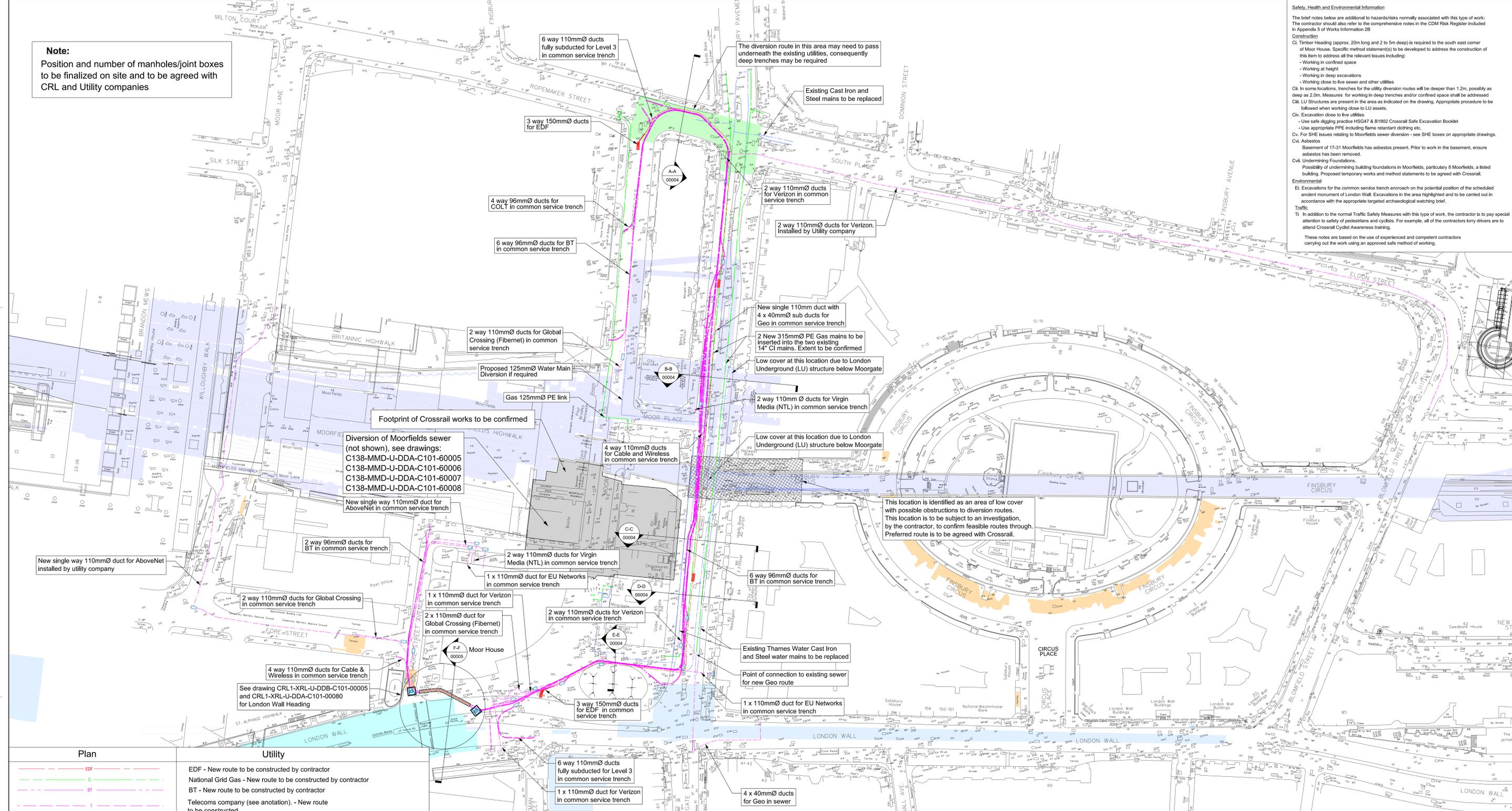
| Activity | Principal Contractor | Construction Phase |
|---|----------------------|---|
| Power auger survey in the footprint of the Temporary Access Shaft (estimate 2 days) | JB Riney | Enabling works (March 2011) |
| Excavation of 1 trial trench in the footprint of the Temporary Access Shaft (estimate 1 week for archaeology only) | JB Riney | Enabling Works (March 2011) |
| General watching brief during utility diversion works in Finsbury Circus | C216 | Enabling Works (March 2011 to August 2011) |
| General watching brief on exploratory investigation trenches at grout shaft locations | JB Riney | Works complete. |
| Targeted watching brief during the excavation of the two Grout Shafts | C510 | Main Works (March to May 2011) |
| <i>Archaeological excavation in the footprint of the Temporary Access Shaft and the grout shafts (estimate 4 weeks Temporary Access Shaft; and 2 weeks per grout shaft)</i> | <i>C510</i> | <i>Excavations, if required, can follow on immediately from evaluation trenches; or during Main Works (March 2011 April 2011)</i> |

*nb. Items in italics are to be confirmed following the trial trench evaluation



Appendix A – Archaeological Mapping Information

Note:
Position and number of manholes/joint boxes to be finalized on site and to be agreed with CRL and Utility companies



Safety, Health and Environmental Information

The brief notes below are additional to hazards/risks normally associated with this type of work. The contractor should also refer to the comprehensive notes in the CDM Risk Register included in Appendix 5 of Works Information 2B

Construction

Ci. Timber Heading (approx. 20m long and 2 to 5m deep) is required to the south east corner of Moor House. Specific method statement(s) to be developed to address the construction of this item to address all the relevant issues including:

- Working in confined space
- Working at height
- Working in deep excavations
- Working close to live sewer and other utilities

Cii. In some locations, trenches for the utility diversion routes will be deeper than 1.2m, possibly as deep as 2.0m. Measures for working in deep trenches and/or confined space shall be addressed

Ciii. LU Structures are present in the area as indicated on the drawing. Appropriate procedure to be followed when working close to LU assets.

Civ. Excavation close to live utilities

- Use safe digging practice HSG47 & B1902 Crossrail Safe Excavation Booklet
- Use appropriate PPE including flame retardant clothing etc.

Cv. For SHE issues relating to Moorfields sewer diversion - see SHE Boxes on appropriate drawings.

Cvi. Asbestos

Basement of 17-31 Moorfields has asbestos present. Prior to work in the basement, ensure asbestos has been removed.

Cvii. Undermining Foundations

- Possibility of undermining building foundations in Moorfields, particularly 8 Moorfields, a listed building. Proposed temporary works and method statements to be agreed with Crossrail.

Environmental

Ei. Excavations for the common service trench encroach on the potential position of the scheduled ancient monument of London Wall. Excavations in the area highlighted and to be carried out in accordance with the appropriate targeted archaeological watching brief.

Traffic

Ti. In addition to the normal Traffic Safety Measures with this type of work, the contractor is to pay special attention to safety of pedestrians and cyclists. For example, all of the contractors lorry drivers are to attend Crossrail Cyclist Awareness training.

These notes are based on the use of experienced and competent contractors carrying out the work using an approved safe method of working.

| Plan | Utility |
|------|---|
| | EDF - New route to be constructed by contractor |
| | National Grid Gas - New route to be constructed by contractor |
| | BT - New route to be constructed by contractor |
| | Telecoms company (see annotation) - New route to be constructed |
| | Cable & Wireless - New route to be constructed by contractor |
| | Colt - New route to be constructed by contractor |
| | Verizon (Worldcom) - New route to be constructed |
| | Thames Water - New route to be constructed by contractor |
| | Combined Water drainage - New route to be constructed by contractor |
| | Foul Water drainage - New route to be constructed by contractor |
| | Surface Water drainage - New route to be constructed by contractor |
| | Proposed Ticket Hall footprint (i.e. Exclusion Zone) |
| | Unknown underground structure (various heights) |
| | Approximate location - remains of London Wall |
| | Underground car park (minimal road cover) |
| | London Underground Structure |

Notes

- This drawing summarizes all of the diversion works at Liverpool Street for the western ticket hall. It has limited information for each diversion and does not show the existing utilities/telecoms. Individual diversion routes with more detail are shown on the following drawings:
 Gas: CRL1-XRL-U-DDA-C101-00058
 Water: CRL1-XRL-U-DDA-C101-00068
 Moorfields Sewer: C138-MMD-U-DDA-C101-60005, C138-MMD-U-DDA-C101-60006, C138-MMD-U-DDA-C101-60007, C138-MMD-U-DDA-C101-60008
 EDF: CRL1-XRL-U-DDA-C101-00057
 BT: CRL1-XRL-U-DDA-C101-00061
 COLT: CRL1-XRL-U-DDA-C101-00065
 Cable and Wireless: CRL1-XRL-U-DDA-C101-00076
 Verizon: CRL1-XRL-U-DDA-C101-00062
 Global Crossing: CRL1-XRL-U-DDA-C101-00063
 Geo: CRL1-XRL-U-DDA-C101-00055

AboveNet: CRL-XRL-U-DDA-C101-00066
 Level 3: CRL1-XRL-U-DDA-C101-00064
 Virgin Media: CRL1-XRL-U-DDA-C101-00054
 EU Networks: CRL1-XRL-U-DDA-C101-00078
 For all sections see drawings: CRL1-XRL-U-DDB-C101-00004
 For existing public utilities see drawing: CRL1-XRL-U-DDA-C101-00069
 London Wall Heading: CRL1-XRL-U-DDB-C101-00005 and CRL1-XRL-U-DDA-C101-00080
 Topographical Survey: CRL1-XRL-U-DDA-C101-00070

**THIS DRAWING IS PRELIMINARY AND FOR TENDER PURPOSES ONLY
IT IS NOT TO BE USED FOR CONSTRUCTION**

Location of proposed works is indicative only and are to be confirmed by contractors design

| Rev. | Date | Description | By | Chkd | App | Auth |
|------|------------|--------------------|----|------|-----|------|
| P01 | 11/09/2010 | First Issue | MH | WD | WD | |
| P02 | 15/09/2010 | Revised for tender | MH | HC | WD | |

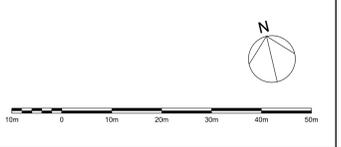
Notes

- Confirmation of all survey data must be obtained from the Crossrail survey team.
- Coordinates to the London Survey Grid, heights to the London height datum which is 100 metres below Ordnance Datum Newlyn. See Crossrail standard CR-STD-010.
- All dimensions are in metres unless specified otherwise.

Whilst every care has been taken in the preparation of this drawing, the original land marks / apparatus configuration may have been altered since the survey / drawing was produced. The users shall make further enquiries and investigations to satisfy themselves as to the adequacy of this drawing and position of the apparatus. The exact positions of the apparatus should be verified by the use of suitable detecting devices and safe digging practices in accordance with HSG47. Further advice on the location of the apparatus should be requested from the owner. No representation is made by Crossrail Limited, its agents or servants as to the accuracy, completeness, sufficiency or otherwise of this drawing and the position of the apparatus.

All apparatus shall be treated as live unless proved otherwise by the owner. It is the user's responsibility to ensure that information on the location of the apparatus is provided to all persons (either direct labour or contractors) working in proximity to the apparatus.

Coordinates to London Survey Grid, heights to London Height Datum. London Height Datum is 100 metres below Ordnance Datum Newlyn. See Crossrail Standard CR-STD-010. Only colour reproductions to be used.



Crossrail

Crossrail Limited
25 Canada Square
London
E14 5LQ

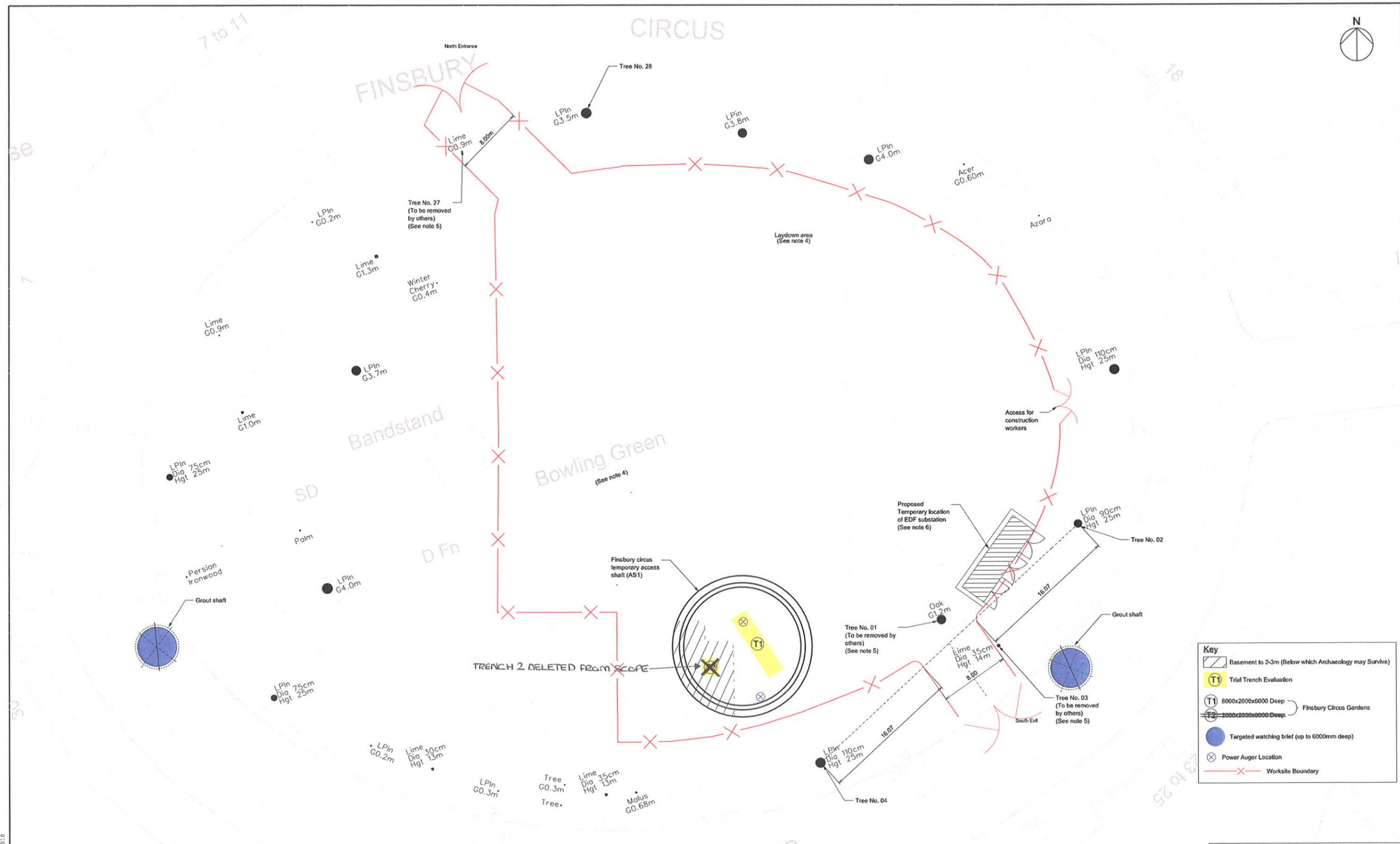
Contract: Crossrail Line 1 Programme
 Project: Crossrail Engineering
 Location: Liverpool Street Stn
 Title: Contract C216
 Liverpool Street - Western Ticket Hall
 Public Utilities - Settlement Mitigation measures and
 New routes for Combined Diversions

Scale: 1:500 @ A0
 Drawing and CAD file No: CRL1-XRL-U-DDA-C101-00056
 Rev: P02
 Sub: S4

Author: M. HOPPER
 Designer: M. HOPPER
 Checker: M. HOPPER
 Approver: M. HOPPER

Copyright Reserved for Design - Crossrail - 15-09-2010

File for authorisation



Key

- Basement to 2-3m (Below which Archaeology may Survive)
- Trial Trench Evaluation
- 8000x2000x6000 Deep
- 2000x2000x8000 Deep
- Targeted watching brief (up to 6000mm deep)
- Power Auger Location
- Worksite Boundary

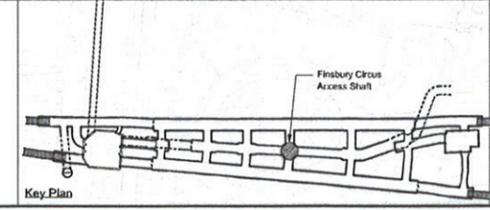
Finsbury Circus Gardens

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited. This document is issued for the party who's contracted it and for specific purposes connected with the Crossrail project only. It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract or used for any other purpose. We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose. This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it. Crossrail Limited or Crossrail Central.

Reproduced from the Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. TIL 100032379 2009.

| Rev. | Date | Description | By | Chkd | App | Auth |
|------|------------|--|----|------|-----|------|
| P01 | 27/07/2010 | First Issue | DP | MD | SA | |
| P02 | 28/07/2010 | | DP | MD | SA | |
| P03 | 20/08/2010 | Incorporating Crossrail Central Comments | PC | MD | SA | |

Notes
TRENCH 2 DELETED FROM SCOPE



Crossrail
Contract: Liverpool Street Station Design
Client: Mott MacDonald Limited
Location: Liverpool Street Stn
Title: Finsbury Circus Archaeological Evaluation Drawing

By: P. CRUTTENDEN
Chk: M. DILLING
App: S. ALLEN
Auth: ...

Scale: 1:200 @ A1
Drawing and CAD file No: C138-MMD-T1-DDA-C101_Z-10070
Rev: P03
Subsidiary: S4

Copy Approved for Design - Created: 20-NOV-2010

Fit for authorisation
RESTRICTED



**Appendix 3 – ADDENDUM TO WSI: TRIAL TRENCH EVALUATION,
WATCHING BRIEF & DETAILED EXCAVATION – BLOMFIELD BOX
(XSL10)**

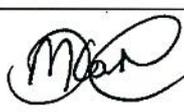
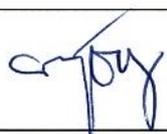


**DESIGN PACKAGE C138
LIVERPOOL STREET STATION**

**ADDENDUM TO WSI: TRIAL TRENCH
EVALUATION, WATCHING BRIEF & DETAILED
EXCAVATION – BLOMFIELD BOX (XSL10)**

Document Number: C138-MMD-T1-RST-C101-00005

Document History:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|-----------|------------|---|---|--|-------------------------------------|
| 1.0 | 21 07 2010 | Mike Court | Charles Jones | Sandra Allen | For PDP Acceptance |
| 2.0 | 20 08 2010 | Mike Court | Charles Jones | Sandra Allen | Incorporating PDP comments |
| 3.0 | 01 03 2011 | Mike Court | Charles Jones | Sandra Allen | Updated for inclusion in the SS-WSI |
| | |  |  |  | |

| CROSSRAIL CENTRAL (PDP) REVIEW AND ACCEPTANCE STATUS | |
|---|--|
| This decal is to be used for submitted documents requiring acceptance by Crossrail Central. | |
| <input type="checkbox"/> | Code 1. Accepted. Work May Proceed |
| <input type="checkbox"/> | Code 2. Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated |
| <input type="checkbox"/> | Code 3. Not Accepted. Revise and resubmit. Work may not proceed |
| <input type="checkbox"/> | Code 4. Received for information only. Receipt is confirmed |
| Reviewed/Accepted by:(signature) | |
| Print Name: | Date: |
| Acceptance by Crossrail Central does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail Central approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier. | |

This document contains proprietary information. No part of this document may be reproduced without prior written consent from the chief executive of Crossrail Ltd.



Document History Continued:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|-----------|------------|---|---|--|-------------------------------------|
| 1.0 | 21 07 2010 | Mike Court | Charles Jones | Sandra Allen | For PDP Review |
| 2.0 | 10 08 2010 | Mike Court | Charles Jones | Sandra Allen | Incorporating PDP comments |
| 3.0 | 01.03.2011 | Mike Court | Charles Jones | Sandra Allen | Updated for inclusion in the SS-WSI |
| | |  |  |  | |
| | | | | | |
| | | | | | |

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited:

This document is issued for the party which commissioned it and for specific purposes connected with the Crossrail project only;

It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract, or used for any other purpose;

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose;

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it, Crossrail Limited or Crossrail Central.



Contents

| | |
|--|-----------|
| 1 Introduction | 4 |
| 2 Scope of Works | 4 |
| 2.1 Aims of the proposed investigation | 4 |
| 2.2 Site Specific Objectives..... | 5 |
| 3 Requirements for all Principal Contractors | 5 |
| 4 Specific Requirements for C212 Demolition Contractor..... | 6 |
| 4.1 Archaeological Auger Survey | 6 |
| 4.2 Archaeological Trial Trench Evaluation..... | 6 |
| 5 Specific Requirements for C216 Utilities Contractor | 7 |
| 5.1 Archaeological General Watching Brief..... | 7 |
| 6 Specific Requirements for C502 Contractor | 8 |
| 6.1 Archaeological Excavation | 8 |
| 7 Specific Requirements for C503 Contractor | 9 |
| 7.1 General Watching Brief | 9 |
| 8 Instructions to Archaeological Contractor and Specification | 9 |
| 8.1 Archaeological Evaluation; Watching Brief and Excavation | 9 |
| 8.2 Deliverables | 10 |
| 8.3 Site Archives | 11 |
| 8.4 Post-excavation..... | 11 |
| 9 Provisional Timetable | 11 |
| Appendix A – Archaeological Mapping Information..... | 12 |
| Table 1 Summary of archaeological events at the Blomfield worksite | 4 |
| Table 2 Conceptual archaeological model | 4 |
| Table 3 Deliverables for each fieldwork event..... | 10 |
| Table 4 Provisional Timetable | 11 |

1 Introduction

This document provides details of the programme of archaeological investigation required to evaluate and mitigate the impact of construction of the Blomfield Box, piling and ground lowering on archaeological deposits. It sets out the location and recording activities required at the Blomfield Street worksite during the demolition and enabling works phases and an indication of works that may be required during the main works phase.

This document is an addendum to the Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001) and should be read in conjunction with that document.

This document outlines the requirements of the *Principal Contractors* (C212; C216; C502; and C503) and the requirements of the Archaeological Contractor (C257).

2 Scope of Works

2.1 Aims of the proposed investigation

The overall aim is to identify the extent and survival of archaeological deposits, in particular those relating to the medieval and Roman periods and possibly earlier deposits, all of which would be removed by the Blomfield Box construction works. This will be achieved through a programme of archaeological evaluation and mitigation works, a summary of which is set out in Table 1 below.

Table 1 Summary of archaeological events at the Blomfield worksite

| Event Type | Event Code | Principal Contractor | Addendum Specific Requirements Section |
|--|------------|----------------------|--|
| Trial Trench Evaluation (6 trenches) | XSL10 | C212 | 4.2 |
| Power Auger Survey (8 locations) | | C212 | 4.1 |
| General Watching Brief (utilities diversions on Blomfield Street, New Broad Street, Old Broad Street, Broad Street Avenue) | | C216 | 5.1 |
| <i>Archaeological Excavation (within Diaphragm Walled Shaft)</i> | | C502 | 6.1 |
| General Watching Brief (excavation of the Powerlink cable shaft) | | C503 | 7.1 |

**nb. Items in italics are to be confirmed following the trial trench evaluation*

A conceptual archaeological model has been developed as shown in Table 1 below:

Table 2 Conceptual archaeological model

| Layer | Estimated surface elevation (m ATD) | Estimated base elevation (m ATD) | Archaeological potential |
|--|--|----------------------------------|--------------------------|
| Street level | 113.50 | | n/a |
| Basement level (at 11-12 Blomfield Street) | 109.50 (107.00 in deep basement to rear) | | n/a |
| Made ground | 113.00 | 111.50 | Yes |



| Layer | Estimated surface elevation (m ATD) | Estimated base elevation (m ATD) | Archaeological potential |
|--|-------------------------------------|----------------------------------|--------------------------|
| Moorfied Marsh deposits | 111.50 | 109.00 | Yes |
| Walbrook deposits (in western section of site) | 110.00 | 107.05 | Yes |
| Terrace gravel | 109.00 | 105.50 | Yes |
| London clay | 105.50 | 76.50 | None |

*nb. The information provided in the above table is to inform the design in this document, but is not meant to provide an accurate deposit model. Actual deposit depths will be determined by the trial trench evaluation (Section 3.1).

2.2 Site Specific Objectives

The objectives of the archaeological investigation are set out below.

1. Trial Trench Evaluation will refine the extent and significance of the archaeological resource and inform further mitigation measures.
2. Mitigation in the form of archaeological excavation and watching brief to excavate and record archaeological deposits for analysis and dissemination.

3 Requirements for all Principal Contractors

In addition to the Specific Requirements for each Principal Contractor set out in sections 4 to 7, all *Principal Contractors* must provide the following services to facilitate archaeological investigations:

- Ensure no live underground services exist in area of excavation;
- Use of excavators or other plant within the area shall only be undertaken with the agreement and under the observation of C257 Archaeologist;
- Allow safe access for archaeological operatives into the site and provide any required temp works;
- Allow suitable access from ground level to bottom of excavated area for archaeologists to work;
- Provide drainage in excavation where required;
- If *in situ* human remains are encountered, provide covering for the exposed area to prevent public views of the works, these should be:
 - large enough to allow safe working;
 - waterproof;
 - translucent (to provide sufficient light); and
 - be of a type that can be quickly erected and removed to facilitate machine access when required.
- Prior to backfilling, any *in situ* human remains will be covered with an appropriate Terram geotextile and layer of clean sand (e.g. 0.2m in thickness) as directed by the *C257 Archaeological Contractor*. The materials are to be provided by the *Principal Contractor*;
- Provide appropriate material to compensate for reduction in volume when reinstating;



- Provide the following services and facilities to C257:
 - Power;
 - Lighting;
 - Water (for welfare);
 - Welfare;
 - Small plant and tools.
- Provide all plant and operatives required to complete the works;
- Provide further technical advice to C257 as maybe required to safely complete the works.
- Unless otherwise arranged, the *Principal Contractor* shall provide the following site accommodation facilities for the use of archaeological operatives, inclusive of any hardstanding and services required:
 - Toilets, with drying and washing facilities;
 - First Aid;
 - Temporary office for the use of archaeologists, including 2 desks (NB. desks are not required for General Watching Brief); and,
 - Secure storage.

4 Specific Requirements for C212 Demolition Contractor

4.1 Archaeological Auger Survey

During the demolition phase within the basement of 11-12 Blomfield Street provision shall be made by the *Principal Contractor (C212)* for the *Archaeological Contractor (C257)* to carry out a power auger survey comprising 8 locations (Drawing C138-MMD-T1-DDA-C101_Z-10061 and 10062 – Appendix A). The aim of this survey is to provide deposit depth and survival information to inform mitigation measures in the basement and lower ground floor at the Blomfield Street worksite.

The Power Auger Survey will be carried out by the *Archaeological Contractor (C257)*.

In addition to the requirements set out in section 3, the *Principal Contractor (C212)* shall during or immediately after the demolition phase:

- Remove, under supervision of C257 Archaeologist the basement floor slab and any underlying modern obstructions at the auger locations;
- Allow for up to 2 archaeologists to be on site; and

4.2 Archaeological Trial Trench Evaluation

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for the definition of trial trench evaluation.

6 trial trenches are required in total, comprising 6 trenches in the lower ground floor (Drawing C138-MMD-T1-DDA-C101_Z-10062 – Appendix A) of 11-12 Blomfield Street. The trenches are 4m x 2m x 3m deep (T1; T3; T4; T5; T6) and 2m x 2m x 2m deep (T2).

The *Principal Contractor (C212)* shall undertake to break out the areas shown on C138-MMD-T1-DDA-C101_Z-10062 and C138-MMD-T1-DDA-C101_Z-10061 (Appendix A). These trenches



are required to identify the extent and significance of the archaeological resource and inform further mitigation measures.

The basement slab and modern overburden (if present) will be removed by the *Principal Contractor (C212)* by machine under archaeological supervision by the *Archaeological Contractor (C257)*. The interface between modern overburden and the first archaeological horizon will be cleaned by the *C257 Archaeological Contractor* by hand excavation to expose marsh deposits (anticipated to survive beneath the existing basement slab). These will then be removed by the *Principal Contractor (C212)* by machine/hand digging in spits of 0.2m to 0.5m (or as directed by the *Archaeological Contractor (C257)*) under archaeological supervision to expose earlier archaeological horizons sealed by the marsh deposits. The sequence of marsh deposits will be recorded by the *Archaeological Contractor (C257)* during the removal process. Following the removal of the overburden and the marsh deposits, the underlying archaeological deposits will be recorded and sampled by the *Archaeological Contractor (C257)* to identify the survival, extent and significance of the deposits. During this stage a smaller area within each trench may be further reduced under archaeological supervision to identify the extent and survival of earlier archaeological features. If present these features will be planned and recorded by the *Archaeological Contractor (C257)*.

4.2.1 Archaeological Trial Trench Evaluation Procedure

In addition to the requirements set out in section 3, the *Principal Contractor (C212)* shall during or after the demolition phase:

- Remove features (e.g. relating to the former Balls Brothers Bar) and non-structural elements (e.g. partition walls) to facilitate the trial trench evaluation.
- Remove, under supervision of C257 Archaeologist the basement floor slab at the trial trench locations and modern overburden and obstructions, to the predicted level of archaeological deposits, anticipated to be approximately 0.5m below current slab level;
- Provide appropriate plant to remove hand excavated spoil from trial trenches (e.g. a hoist or other appropriate method);
- Provide temporary works to support excavations where personnel access for the investigation is required, such as shoring;
- Further to exposing the archaeological horizon sealed by Moorfield Marsh deposits the Contractor should allow for further localised machine/hand dug excavation within each trial trench in spits of 0.2m to 0.5m (or as directed by C257) to remove materials once they have been recorded by C257 until the full sequence of archaeological deposits is identified. Estimated to be up to approximately 105.5m ATD; and
- Allow for up to 2 archaeologists for 1 week per trial trench to be on site.

5 Specific Requirements for C216 Utilities Contractor

5.1 Archaeological General Watching Brief

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for a definition of general watching brief.

General Watching Brief is required during utilities diversion works on Blomfield Street, New Broad Street, Old Broad Street, and Broad Street Avenue.. For further information regarding utilities diversion works refer to Works Information volumes 2A and 2B (Document Numbers: C216-PDP-W-XWI-CRG03-00001 and 00002).



5.1.1 Archaeological General Watching Brief Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (C216)* during utility diversion works shall allow for:

- The removal of modern material, made ground and topsoil, and 'Moorfield Marsh' deposits will be carried out under archaeological observation, anticipated to be up to between 1 and 1.5m below ground level for utility diversion works.
- Allow for up to 2 archaeologists to be on site during groundworks.

6 Specific Requirements for C502 Contractor

6.1 Archaeological Excavation

*** It should be noted that the archaeological trial trench evaluation outlined in section 4 will inform the scope of archaeological excavation, if required. The works outlined in this section are included to provide an idea to the relevant contractors of the possible archaeological works that they may need to facilitate. The following works may be subject to a change in scope.**

Archaeological excavation, if required, will take place after the demolition of 11-12 Blomfield Street. The archaeological work is required to mitigate the impact of the construction of the Blomfield Box and associated piling and ground lowering. It is likely that archaeological excavation, if required, will be within the footprint of the lower ground floor and in the southern extent of the piled box, rather than the deeper basement at the rear of the building. However, until the trial trench evaluation is carried out the area considered for archaeological excavation includes the entire area of the shaft inside the piles forming the Blomfield shaft. The archaeological investigation shall therefore be undertaken in two phases. Phase 1 will cover the area of the lower ground floor within the structure used to support the sides of the excavation and the vertical interval down to the level of the basement. Phase 2, if required, will cover the area of within the main piles forming the Blomfield shaft and the vertical interval from the deep basement down to the level at which it is considered there is no further archaeological potential.

The *Principal Contractor C502* shall be responsible for breaking out existing floors over the areas of excavation.

Modern overburden (if present) will be removed by the *Principal Contractor (C502)* by machine under archaeological supervision by the *Archaeological Contractor (C257)*. The interface between modern overburden and the first archaeological horizon will be cleaned by the *C257 Archaeological Contractor* by hand excavation to expose marsh deposits (anticipated to survive approximately 0.5m beneath the existing basement slab). These will then be removed by the *Principal Contractor (C502)* by machine/hand digging in spits of 0.2m to 0.5m (or as directed by the *Archaeological Contractor (C257)*) under archaeological supervision to expose earlier archaeological horizons sealed by the marsh deposits. The sequence of marsh deposits will be recorded by the *Archaeological Contractor (C257)* during the removal process. Marsh deposits are estimated to survive to an approximate depth of 109m ATD. Following the removal of the overburden and the marsh deposits, the underlying archaeological deposits will be recorded and sampled by the *Archaeological Contractor (C257)* with provision for more detailed sample investigation and recording of any features of particular interest identified during this stage. After this stage the site level will be further reduced to determine if any earlier archaeological features survive beneath them. If present these features will be again planned, recorded and sample investigated in order to establish character, function and date. Archaeological deposits are estimated to survive up to approximately 105m ATD.



6.1.1 Archaeological Excavation Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (C502)* shall prior to the installation of piling:

- Remove, under supervision of C257 Archaeologist the basement floor slab and modern overburden and obstructions, to the predicted level of archaeological deposits, anticipated to be approximately 0.5m below current slab level;
- Provide appropriate plant to remove hand excavated spoil (e.g. a hoist or other appropriate method);
- Provide temporary works to support excavations where personnel access for the investigation is required, such as shoring;
- Machine excavate in stages, as directed by the *Archaeological Contractor (C257)* to remove materials once they have been recorded by the *Archaeological Contractor (C257)* until the full sequence of archaeological deposits is identified. Estimated to be down to approximately 105m ATD.
- Allow for up to 10 archaeologists to be on site; and

7 Specific Requirements for C503 Contractor

7.1 General Watching Brief

General watching brief is required during excavation of the shaft for the Powerlink Cable Tunnel (part of the Enabling Works) down to the top surface of the London Clay or base of deposits found to have archaeological potential.

7.1.1 Archaeological General Watching Brief Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (C503)* during excavation of the Powerlink Cable Shaft shall allow for:

- The removal of modern material, made ground and gravel deposits will be carried out under archaeological observation, anticipated to be up to between 1.5m and 2m below track level.
- Allow suitable access from ground level to bottom of excavated area for archaeologists to rapidly record significant archaeological deposits which may be encountered.
- Allow for up to 2 archaeologists to be on site.

8 Instructions to Archaeological Contractor and Specification

8.1 Archaeological Evaluation; Watching Brief and Excavation

It is proposed that a programme of archaeological investigation comprising trial trench evaluation; and general watching brief, a power auger survey and potentially archaeological excavation be carried out at the Blomfield Street worksite. Further details on the requirements of the Archaeological contractor are to be found in the Site Specific Written Scheme of Investigation, document reference number: C138-MMD-T1-RST-C101-00001.

The Archaeological Contractor shall:

- Provide a team of suitably qualified archaeologists, experienced in archaeological site evaluation and the nature of archaeological deposits which are expected on this site;
- Provide a Method Statement inclusive of risk assessment and safe method of working;
- Provide a risk assessment and health and safety plan;
- During Trial Trench Evaluation and Excavation, following the initial overall strip and clean, individual features are to be hand cleaned and defined: sufficient to determine type, plan form and relationships (e.g. for structures and rebuilds); and recorded. Sufficient archaeological features/structures are to be sample excavated either using a smaller machine with graded digging bucket (by the *Principal Contractor* under archaeological supervision) or hand cleaned if appropriate;
- When this initial investigation is completed it will be followed by a second strip, removing 'Moorfields Marsh' deposits to the level of earlier features (medieval and Roman) and then sampling and recording process described above will be repeated at this level.
- The exact methodology of the Power Auger Survey will be set out in the Archaeological Contractors (C257) Method Statement. It is envisaged that dependent on on-site conditions that C257 will use a hand held power auger, with a core width of 50mm, 75mm or 100mm. Auger depths will be to surface of terrace gravels (estimated to be at approximately 109.00m ATD).

8.2 Deliverables

Table 3 summarises the Deliverables required per fieldwork event:

Table 3 Deliverables for each fieldwork event

| Fieldwork Event | Deliverables | | | |
|---|------------------------|----------------|---------------|------------------|
| | Weekly Progress Report | Interim Report | Deposit Model | Fieldwork Report |
| XSL10 (Trial Trench Evaluation;) | ✓ | ✓ | ✓ | ✓ |
| XSL10 (Power Auger Survey) | | | | |
| XSL10 (GWB on utilities diversions and Powerlink shaft) | ✓ | ✓ | | ✓ |
| <i>XSL10 Archaeological Excavation</i> | <i>tbc</i> | <i>tbc</i> | <i>tbc</i> | <i>tbc</i> |

*nb. Items in italics are to be confirmed following the trial trench evaluation

Refer to the following sections of the Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001) for further information regarding the following report types:

- Weekly progress reports – WSI section 10;
- Interim report – 7 days after completion of fieldwork – WSI section 9.4; and
- Trial Trench Evaluation; Watching Brief and Excavation reports – WSI section 9.6.



8.3 Site Archives

Refer to section 8.2 in the Site Specific Written Scheme of Investigation, document reference number: C138-MMD-T1-RST-C101-00001.

8.4 Post-excavation

Refer to the detail set out within the CRL/Crossrail Central Archaeological Contract and the Written Scheme of Investigation for Liverpool Street Station (C138-MMD-T1-RST-C101-00001).

9 Provisional Timetable

Table 4 Provisional Timetable

| Activity | Principal Contractor | Construction Phase |
|--|----------------------|---|
| Power Auger Survey in basement of 11-12 Blomfield Street (estimate 1 week) | C212 | Enabling works (06 Jun 2011 to 04 Jul 2011) |
| Excavation of 6 trial trenches in lower ground floor of 11-12 Blomfield Street (estimate 1 week per trench, can be concurrent) | C212 | Enabling works (06 Jun 2011 to 04 Jul 2011) |
| General Watching Brief during utility diversion works on Blomfield Street, New Broad Street, Old Broad Street, and Broad Street Avenue | C216 | Enabling Works (March 2011 to Jan 2012) |
| <i>Archaeological excavation in the footprint of 11-12 Blomfield Street (estimate 2 months)</i> | <i>C502</i> | <i>Main Works (Aug 2011 to Sept 2012)</i> |
| General Watching Brief during excavation of the Powerlink Cable Shaft | C503 | Enabling Works (Dec 2011 to May 2012) |

*nb. Items in italics are to be confirmed following the trial trench evaluation



Appendix A – Archaeological Mapping Information

Safety, Health and Environmental Information
 Notes below are additional to hazards/risks normally associated with this type of work:

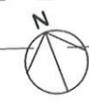
Construction
 Ci. LSUC-003 to 001 - Undermining of existing structures or foundations during excavation/ construction, injury to public
 Cii. LSUC-006 to 004 - Injuries to operatives and delays during excavation

Operations
 Ol. LSUC-008 to 007 - Injuries to unauthorised persons entering the utilities corridor, flooding

Maintenance
 Mi. LSUC-008 to 007 - Injuries to unauthorised persons entering the utilities corridor, flooding

Dismantling/Demolition (Future)
 Di.
 Dii.
 Diii.

These notes are based on the use of experienced and competent contractors carrying out the work using an approved safe method of working.



SL

BROAD

BLOMFIELD STREET

• TRIAL TRENCHES TO OCCUR AFTER DEMOLITION
 • FINAL LOCATIONS MAY CHANGE.

Swedbank

New Broad Street

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited.
 This document is issued for the party which commissioned it and for specific purposes connected with the Crossrail project only.
 It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract or used for any other purpose.
 We accept no responsibility for the consequences of this document being read upon by any other party, or being used for any other purpose.
 This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it.
 Crossrail Limited or Crossrail Central

Copy Approved For Design - Crossrail - 20-N30-2010

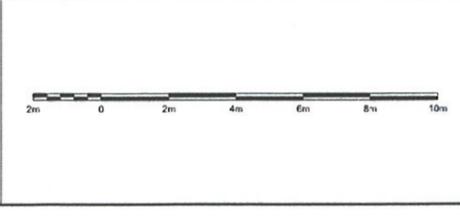
| Rev. | Date | Description | By | Chkd | App | Auth |
|------|------------|------------------------|----|------|-----|------|
| P01 | 21/07/2010 | First Issue | PC | MD | | |
| P02 | 21/07/2010 | Amended after checking | PC | MD | SA | |
| P03 | 13/08/2010 | | DP | MD | SA | |

Notes

| | | | | | | |
|--|--|--|--|--|--|--|
| | | | | | | |
|--|--|--|--|--|--|--|

Key

| | | | |
|------|--------------------------------|------|--------------------|
| (T1) | 2m x 2m x 2m deep Trial Trench | (A2) | Power Auger Survey |
| (T2) | 2m x 2m x 2m deep Trial Trench | (A4) | Power Auger Survey |
| (T3) | 4m x 2m x 2m deep Trial Trench | (A8) | Power Auger Survey |
| (T4) | 4m x 2m x 2m deep Trial Trench | | |
| (T5) | 4m x 2m x 2m deep Trial Trench | | |
| (T6) | 4m x 2m x 2m deep Trial Trench | | |



Crossrail
 Crossrail Limited
 25 Canada Square
 Canary Wharf
 London
 E14 5LQ
 © Crossrail
 www.crossrail.co.uk

Contract: Liverpool Street Station Design
 Originator: Mott MacDonald Limited
 Location: Liverpool Street Stn
 Title: Archaeological Evaluation in Lower Ground Floor
 11-12 Blomfield Street

By: D. PLATT
 Chk: M. MORLING
 App: S. ALLEN
 Auth: ...

Scale: 1:100 @ A1
 Drawing and CAD file No: C138-MMD-T1-DDA-C101_Z-10062
 Rev: P03
 Subability: S4

Fit for authorisation
 RESTRICTED



Appendix 4 – ADDENDUM TO WSI: TRIAL TRENCH EVALUATION – BROADGATE TICKET HALL (XSM10)



C138 - LIVERPOOL STREET STATION

ADDENDUM TO WSI: TRIAL TRENCH EVALUATION – BROADGATE TICKET HALL (XSM10)

Document Number : C138-MMD-T1-RST-C101-00004

Document History:

| Version: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|----------|------------|--------------|-----------------|--------------|-------------------------|
| 1.0 | 19 08 2010 | Mike Court | Matthew Dilling | Sandra Allen | For PDP Approval |
| 2.0 | 04 03 2011 | Mike Court | Charles Jones | Sandra Allen | For inclusion in SS-WSI |
| | | | | | |

| CROSSRAIL CENTRAL (PDP) REVIEW AND ACCEPTANCE STATUS | |
|---|--|
| This decal is to be used for submitted documents requiring acceptance by Crossrail Central. | |
| <input type="checkbox"/> | Code 1. Accepted. Work May Proceed |
| <input type="checkbox"/> | Code 2. Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated |
| <input type="checkbox"/> | Code 3. Not Accepted. Revise and resubmit. Work may not proceed |
| <input type="checkbox"/> | Code 4. Received for information only. Receipt is confirmed |
| Reviewed/Accepted by@signature) | |
| Print Name: | Date: |
| Acceptance by Crossrail Central does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail Central approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier. | |

This document contains proprietary information. No part of this document may be reproduced without prior written consent from the chief executive of Crossrail Ltd.

Mott MacDonald Issue and Revision Record

Document Title: C138 – Liverpool Street Station Addendum to WSI: Trial Trench Evaluation – Broadgate Ticket Hall

Document number: C138-MMD-T1-RST-C101-00004

Document History Continued:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|------------------|--------------|---|---|--|--------------------------|
| 1.0 | 19 08 2010 | Mike Court | Matthew Dilling | Sandra Allen | For PDP Approval |
| 2.0 | 04 03 2011 | Mike Court | Charles Jones | Sandra Allen | For inclusion in SS-WSI |
| | |  |  |  | |
| | | | | | |

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited:

This document is issued for the party which commissioned it and for specific purposes connected with the Crossrail project only;

It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract, or used for any other purpose;

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose;

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it, Crossrail Limited or Crossrail Central.



Contents

| | |
|--|-----------|
| 1 Introduction | 4 |
| 2 Scope of Works | 4 |
| 2.1 Aims of the proposed investigation | 4 |
| 2.2 Site Specific Aims and Objectives | 5 |
| 3 Requirements for all Principal Contractors | 5 |
| 4 Specific Requirements for Excavating Contractor (JB Riney) | 6 |
| 4.1 Archaeological Trial Trench Evaluation..... | 6 |
| 4.2 Archaeological General Watching Brief..... | 8 |
| 5 Specific Requirements for C503 Contractor – Utilities Corridor | 8 |
| 5.1 Archaeological General Watching Brief and Targeted Watching Brief..... | 8 |
| 5.2 Archaeological Excavation | 9 |
| 6 Specific Requirements for C502 Contractor | 11 |
| 6.1 Archaeological Excavation | 11 |
| 7 Instructions to Archaeological Contractor and Specification | 12 |
| 7.1 Archaeological Evaluation; Watching Brief and Excavation | 12 |
| 7.2 Deliverables | 13 |
| 7.3 Site Archives | 14 |
| 7.4 Post-excavation..... | 14 |
| 8 Provisional Timetable | 14 |
| Appendix A – Archaeological Mapping Information..... | 15 |
| Table 1 Summary of archaeological events at the Liverpool Street worksite..... | 4 |
| Table 2 Conceptual archaeological model | 5 |
| Table 3 Deliverables for each fieldwork event..... | 13 |

1 Introduction

This document provides details of the scope and programme of archaeological investigation required to evaluate and mitigate the impact of construction of the Broadgate Ticket Hall and Utilities Corridor on archaeological deposits. It sets out the location and recording activities required at the Liverpool Street worksite during the demolition, enabling works and provides an indication of the archaeological mitigation works that may be required during the main works phases.

This document is an addendum to the Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001) and should be read in conjunction with that document.

This document outlines the requirements of the *Principal Contractors* (JB Riney; C503; C502) and the requirements of the Archaeological Contractor (C257).

2 Scope of Works

2.1 Aims of the proposed investigation

The overall aim is to identify the extent and survival of archaeological deposits, in particular those relating to the known burial ground (BG208), which survives within the worksite footprint, and also deposits relating to the medieval and Roman periods and possibly earlier deposits, all of which would be removed by the utilities corridor and Broadgate Ticket Hall construction works. This will be achieved through a programme of archaeological evaluation and mitigation works, a summary of which is set out in Table 1 below

Table 1 Summary of archaeological events at the Liverpool Street worksite

| Event Type | Event Code | Principal Contractor | Addendum Specific Requirements Section |
|---|------------|----------------------|--|
| Trial Trench Evaluation (12 trenches) in footprint of ticket hall and utilities corridor | XSM10 | JB Riney | 4.1 |
| General watching brief (Exploratory trenches on British Land to front of 100 Liverpool Street) | | JB Riney | 4.2 |
| General watching brief (Test pit and core in basement of Railway Tavern) | | JB Riney | 4.2 |
| General & Targeted Watching Brief (secondary utilities diversions) | | C503 | 5.1 |
| Sample excavation by the C257 Archaeological Contractor and rapid removal by a licensed burial contractor (1.25m piles and guide wall for utilities corridor) | | C503 | 5.2 |
| Sample excavation by the C257 Archaeological Contractor and rapid removal by a licensed burial contractor (utilities corridor) | | C503 | 6.1 |
| Archaeological Excavation, including sample excavation by the C257 Archaeological Contractor and rapid removal by a licensed burial contractor (1.25m piles and guide wall for station box) | | C502 | 6.1 |

| | | | |
|---|-------|---------------|-----|
| <i>Archaeological Excavation, including Sample excavation by the C257 Archaeological Contractor and rapid removal by a licensed burial contractor (Station box)</i> | | C502 | 6.1 |
| General watching brief on 1.25m piling arisings | | C502 and C503 | 5.1 |
| English Heritage Level 2 survey of the Broad Street Station Ticket Hall and the Queen Victoria Tunnel | XSB10 | C502 | n/a |

*nb. Items in italics are to be confirmed following the trial trench evaluation

A conceptual archaeological model has been developed as shown in Table 1 below:

Table 2 Conceptual archaeological model

| Layer | Estimated surface elevation (m ATD) | Estimated base elevation (m ATD) | Archaeological potential |
|--|-------------------------------------|----------------------------------|--------------------------|
| Street level | 113.00 | | n/a |
| Basement level (partially within utilities corridor) | 111.5 | 109.5 | n/a |
| Made ground | 113.00 | 111.00 | Yes |
| Burial ground (estimated depths) | 111.00 | 109.00 | Yes |
| Moorfield Marsh deposits | 110.50 | 108.5 | Yes |
| Alluvium (relating to the Walbrook) | 108.5 | 106.00 | Yes |
| Terrace gravel | 107.00 | 106.00 | Yes |
| London clay | 106.00 | 77.50 | None |

*NB. The information provided in the above table is to inform the design in this document, but is not meant to provide an accurate deposit model. Actual deposit depths will be determined by the trial trench evaluation (Section 4).

2.2 Site Specific Aims and Objectives

The objectives of the archaeological investigation are set out below.

1. Trial Trench Evaluation will refine the extent and significance of the archaeological resource and inform further mitigation measures.
2. Mitigation in the form of archaeological excavation and/or watching brief to excavate and record archaeological deposits for analysis and dissemination.

3 Requirements for all Principal Contractors

In addition to the Specific Requirements for each Principal Contractor set out in sections 4 to 7, all *Principal Contractors* must provide the following services to facilitate archaeological investigations:

- Ensure no live underground services exist in area of excavation;
- Use of excavators or other plant within the area shall only be undertaken with the agreement and under the observation of C257 Archaeologist;
- Allow safe access for archaeological operatives into the site and provide any required temp works;



- Allow suitable access from ground level to bottom of excavated area for archaeologists to work;
- Provide drainage in excavation where required;
- If *in situ* human remains are encountered, provide covering for the exposed area to prevent public views of the works, these should be:
 - large enough to allow safe working;
 - waterproof;
 - translucent (to provide sufficient light); and
 - be of a type that can be quickly erected and removed to facilitate machine access when required.
- Prior to backfilling, any *in situ* human remains will be covered with an appropriate Terram geotextile and layer of clean sand (e.g. 0.2m in thickness) as directed by the *C257 Archaeological Contractor*. The materials are to be provided by the *Principal Contractor*;
- Provide appropriate material to compensate for reduction in volume when reinstating;
- Provide the following services and facilities to C257:
 - Power;
 - Lighting;
 - Water (for welfare);
 - Welfare;
 - Small plant and tools.
- Provide all plant and operatives required to complete the works;
- Provide further technical advice to C257 as maybe required to safely complete the works.
- Unless otherwise arranged, the *Principal Contractor* shall provide the following site accommodation facilities for the use of archaeological operatives, inclusive of any hardstanding and services required:
 - Toilets, with drying and washing facilities;
 - First Aid;
 - Temporary office for the use of archaeologists, including 2 desks (NB. desks are not required for General Watching Brief); and,
 - Secure storage.

4 Specific Requirements for Excavating Contractor (JB Riney)

4.1 Archaeological Trial Trench Evaluation

12 trial trenches are required in total, comprising 3 in the footprint of the utilities corridor and a further 9 in the road and northern pavement of Liverpool Street (Drawing C138-MMD-T1-DDA-C101_Z-10052 – Appendix A).

In order to inform a mitigation strategy at this site, early evaluation is required, therefore, trial trenches are located between existing known utilities. Dimensions for these trenches are provided (Drawing C138-MMD-T1-DDA-C101_Z-10052 – Appendix A), however, when the trench areas are initially opened the actual size of trenches may vary in order to safely accommodate excavation around utilities.



The dimensions of the trenches are 2m x 2m x 2m deep; 2m x 4m x 2m deep; and 1.5m x 4m x 2m deep. Within selected trenches further excavation is required to identify: a) the base level of any burials present (estimated to be between 3m to 4m below ground level); and b) the full sequence of archaeological deposits (estimated to be up to 5m to 6m below ground level). Therefore the final depth of selected trenches (probably up to 3 trenches in total – to be informed during the evaluation) will be up to 6m.

The *Principal Contractor (JB Riney)* shall undertake to break out the areas shown on Drawing C138-MMD-T1-DDA-C101_Z-10052 (Appendix A). These trenches are required to identify the extent and significance of the archaeological resource and inform further mitigation measures.

Modern overburden (if present) will be removed by the *Principal Contractor (JB Riney)* by machine/hand digging under archaeological supervision by the *Archaeological Contractor (C257)* to a depth of approximately 1.3m to 1.5m below ground level or to the surface of the first archaeological horizon (whichever comes first) to ensure that each trench location avoids existing utilities. It is expected that human remains will be encountered at this stage. Following the removal of the overburden, the underlying archaeological deposits (e.g. human remains) will be recorded and sampled by the *Archaeological Contractor (C257)* to identify the survival, extent and significance of the deposits. During this stage selected trenches will be further reduced by hand digging by the *Archaeological Contractor (C257)* to identify the depth of burials and the extent and survival of earlier archaeological features. If present these features will be planned and recorded by the *Archaeological Contractor (C257)*.

4.1.1 Archaeological Trial Trench Evaluation Procedure

In addition to the requirements set out in section 3, the *Principal Contractor (JB Riney)* shall:

- Ensure that exposed services are adequately protected during the works;
- Remove, under supervision of C257 Archaeologist the surface and modern overburden at the trial trench locations, to the predicted level of archaeological deposits, anticipated to be approximately 1.3m to 1.5m below current ground level;
- Provide appropriate plant and operatives to remove hand excavated spoil from trial trenches (e.g. a hoist or other appropriate method);
- Provide temporary works to support excavations where personnel access for the investigation is required, such as shoring;
- Contractor should allow for selected trenches to be further reduced by C257 until the full sequence of archaeological deposits is identified. Estimated to be up to approximately 106m ATD;
- Provide covering for the trial trenches to prevent public views of the works due to the potential for human remains, these should be:
 - large enough to allow safe working;
 - waterproof;
 - translucent (to provide sufficient light); and
 - be of a type that can be quickly erected and removed to facilitate machine access when required.
- Prior to backfilling, any in situ human remains will be covered with an appropriate Terram geotextile and layer of clean sand (e.g. 0.2m in thickness) as directed by the *C257 Archaeological Contractor*;
- Provide appropriate material to compensate for reduction in volume when reinstating;
- Provide any traffic management measures that may be required for the works; and



- Allow for up to 3 archaeologists per trial trench to be on site.

4.2 Archaeological General Watching Brief

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for the definition of General Watching Brief.

General Watching Brief is required during the excavation of exploratory trenches on British Land to the front of 100 Liverpool Street and on a single test pit being excavated in the basement of the Railway Tavern public house.

General Watching Brief is required for the removal of modern material and made ground, anticipated to be between approximately 1.0 to 1.5m below ground level for these works. C257 will record archaeological deposits to the maximum depth of impact caused by the utilities works. NB. This could include human remains.

4.2.1 Archaeological General Watching Brief Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (JB Riney)* shall allow for:

- The removal of modern material, made ground and topsoil will be carried out under archaeological observation, anticipated to be up approximately 1.5m below ground level for utility diversion works.
- If safe to do so allow access from ground level to bottom of excavated area for archaeologists to rapidly record significant archaeological deposits which may be encountered.
- Allow for 1 archaeologist to be on site.

5 Specific Requirements for C503 Contractor – Utilities Corridor

5.1 Archaeological General Watching Brief and Targeted Watching Brief

Refer to the Generic WSI (CR-PN-LWS-EN-SY-00001) for the definition of General Watching Brief.

General Watching Brief and Targeted Watching Brief are required during secondary utilities diversion works at the Liverpool Street worksite. It is currently anticipated that targeted watching brief will predominantly be required during sewer diversion works to the east and west of the utilities corridor.

General Watching Brief is required for the removal of modern material and made ground, anticipated to be up approximately 1.5m below ground level for secondary utility diversion works. For excavations deeper than 1.5m the *Principal Contractor (C503)* will allow for archaeological deposits to be excavated in stages (Targeted Watching Brief). The *C257 Archaeological Contractor* will advise if and when archaeological deposits are encountered, triggering the Targeted Watching Brief (It is estimated that the trigger point will be at approximately 1.5-1.7m). C257 will record archaeological deposits to the maximum depth of impact caused by the utilities works until the full sequence of archaeological deposits is recorded. NB. This could include human remains.

For further information regarding utilities diversion works refer to C503 Works Information volumes 2A and 2B (forthcoming).



General Watching Brief is also required to observe piling arisings.

5.1.1 Archaeological General Watching Brief Procedure

In addition to the requirements set out in section 3, the method of working for the *Principal Contractor (C503)* during utility diversion and piling works shall allow for:

- The removal of modern material, made ground and topsoil will be carried out under archaeological observation, anticipated to be up approximately 1.5m below ground level for utility diversion works. For excavations deeper than 1.5m see section 5.1.2.
- If safe to do so allow access from ground level to bottom of excavated area for archaeologists to rapidly record significant archaeological deposits which may be encountered.
- During piling works the *Principal Contractor (C503)* shall enable access to piling arisings for one C257 Archaeologist to observe and recover archaeological remains that may be present.
- Allow for up to 2 archaeologists to be on site.

5.1.2 Archaeological Targeted Watching Brief Procedure

During the secondary utilities diversions the following procedure is to be incorporated into the *Principal Contractors* method of work in addition to the requirements set out in section 3, and is linked to the General Watching Brief outlined above in section 5.1.1:

- The *Principal Contractor (C503)* will allow for archaeological deposits to be excavated in stages (Targeted Watching Brief) during secondary utilities diversions when excavations are greater than 1.5m below ground level or when the first archaeological horizon is reached. The *C257 Archaeological Contractor* will advise if and when archaeological deposits are encountered, triggering the Targeted Watching Brief. C257 will record archaeological deposits to the maximum depth of impact caused by the utilities works;
- Prior to backfilling, any in situ human remains which have been uncovered but which have been left in situ (as directed by the *C257 Archaeological Contractor*) will be covered with an appropriate Terram geotextile and layer of clean sand (e.g. 0.2m in thickness) as directed by the *C257 Archaeological Contractor*; and
- Provide covering for the works to prevent public views of the works due to the potential for human remains (if encountered), these should be:
 - large enough to allow safe working;
 - waterproof;
 - translucent (to provide sufficient light); and
 - be of a type that can be quickly erected and removed to facilitate machine access when required.

5.2 Archaeological Excavation

***It should be noted that the archaeological trial trench evaluation outlined in section 4 will inform the scope of archaeological mitigation required. The works outlined in this section are included to provide an idea to the relevant contractors of the possible archaeological works that they may need to facilitate. The following works may be subject to a change in scope.**

Archaeological excavation, if required, will take place in two phases in relation to the construction of the utilities corridor. It is envisaged that human remains relating to the known



burial ground will be removed using a combination of a specialist burials contractor and through archaeological excavation by *C257 Archaeological Contractor*.

NB. The *Principal Contractor (C503)* will be required to subcontract a specialist exhumation contractor to assist with the works. This will be instructed by the Project Manager.

Phase I

After secondary utilities diversions and prior to the installation of 1.250m piles and guide walls the *Principal Contractor C503* shall undertake to excavate a trench on the line of the 1.250m piles and guide walls, of a width suitable to allow the *C257 Archaeological Contractor* safe access to work (e.g. 2m). This investigation area is required to mitigate the impact of the 1.250m piles on buried human remains.

Modern overburden (if present) will be removed by the *Principal Contractor (C503)* by machine under archaeological supervision by *C257 Archaeological Contractor* to approximately 1.5m below ground level or to the first archaeological horizon. At this depth human remains are expected. The human remains will be removed using a combination of archaeological excavation by the *C257 Archaeology Contractor* and a specialist burials contractor. Human remains are expected to a depth of approximately 4m below ground level.

Phase II

After installation of the mini piles and 1.250m piles the *Principal Contractor (C503)* is required to integrate advanced archaeological excavation into the *C503* excavation of the utilities corridor.

Modern overburden (if present) will be removed by the *Principal Contractor (C503)* by machine under archaeological supervision by *C257 Archaeological Contractor* to approximately 1.5m below ground level or to the first archaeological horizon. At this depth human remains are expected. The human remains will be removed using a combination of archaeological excavation by the *C257 Archaeology Contractor* and a specialist burials contractor. Human remains are expected to a depth of approximately 4m below ground level.

Following the removal of human remains, the underlying archaeological deposits will be recorded and sampled by the *Archaeological Contractor (C257)* with provision for more detailed sample investigation and recording of any features of particular interest identified during this stage. After this stage the site level will be further reduced by the *Principal Contractor (C503)* (under archaeological supervision by the *C257 Archaeological Contractor*) to determine if any earlier archaeological features survive beneath them. If present these features will be again planned, recorded and sample investigated in order to establish character, function and date.

5.2.1 Archaeological Excavation Procedure

In addition to the requirements set out in section 3, the *Principal Contractor (C503)* shall:

- Ensure no live underground services exist in area;
- Remove, under supervision of *C257 Archaeologist* modern layers, to the predicted level of archaeological deposits, anticipated to be approximately 1.5m below ground level;
- Provide appropriate plant to remove hand excavated spoil (e.g. a hoist or other appropriate method);
- Provide temporary works to support excavations where personnel access for the investigation is required, such as shoring;
- Machine excavate in stages, as directed by the *Archaeological Contractor (C257)* or *specialist burials contractor* to remove materials once they have been recorded by the *Archaeological Contractor (C257)* until the full sequence of archaeological deposits is identified. Estimated to be down to approximately 106m ATD.



- Provide covering for the trial trenches to prevent public views of the works due to the potential for human remains, these should be:
 - large enough to allow safe working;
 - waterproof;
 - translucent (to provide sufficient light); and
 - be of a type that can be quickly erected and removed to facilitate machine access when required.
- Provide all plant and operatives required to complete the works;
- Allow for up to 10 archaeologists to be on site; and

6 Specific Requirements for C502 Contractor

6.1 Archaeological Excavation

***As mentioned in section 5.1.3 it should be noted that the archaeological trial trench evaluation outlined in section 4 will inform the scope of archaeological excavation, if required. The works outlined in this section are included to provide an idea to the relevant contractors of the possible archaeological works that they may need to facilitate. The following works may be subject to a change in scope.**

Archaeological excavation, if required, will probably be in two main phases:

Phase III - In advance of 1.25m piling of the main box

Prior to the installation of the northern and eastern 1.25m piles and guide walls the *Principal Contractor C502* shall undertake to excavate a trench on the line of the northern and eastern lines of 1.25m piles and guide walls, of a width suitable to allow the *C257 Archaeological Contractor* safe access to work (e.g. 2m). This investigation area is required to mitigate the impact of the 1.25m piles on buried human remains.

Modern overburden (if present) will be removed by the *Principal Contractor (C502)* by machine under archaeological supervision by *C257 Archaeological Contractor* to approximately 1.5m below ground level or to the first archaeological horizon. At this depth human remains are expected. The human remains will be removed using a combination of archaeological excavation by the *C257 Archaeology Contractor* and a specialist burials contractor. Human remains are expected to a depth of approximately 4m below ground level.

Phase IV - Within the piled walls of the main box

The *Principal Contractor C502* shall break out the area within the inner face of the 1.25m piled walls. This investigation area is required to mitigate the impact of the construction of the Broadgate box. NB. Until the trial trench evaluation is carried out (see section 4) the area considered for archaeological excavation includes the entire area within the inner face of the 1.25m piled box area, excluding the footprint of the Queen Victoria Tunnel and the existing Sub-Station (former Broad Street Station Ticket Hall).

Modern overburden will be removed by the *Principal Contractor (C502)* by machine under archaeological supervision by the *C257 Archaeological Contractor* to approximately 1.5m below ground level or to the first archaeological horizon (whichever comes first). At this depth human remains are expected. The human remains will be removed using a combination of archaeological excavation by the *C257 Archaeology Contractor* and a specialist burials contractor. Human remains are expected to a depth of approximately 4m below ground level.



Following the removal of human remains, the underlying archaeological deposits will be recorded and sampled by the *Archaeological Contractor (C257)* with provision for more detailed sample investigation and recording of any features of particular interest identified during this stage. After this stage the site level will be further reduced by the *Principal Contractor (C502)* (under archaeological supervision by *C257 Archaeological Contractor*) to determine if any earlier archaeological features survive beneath them. If present these features will be again planned, recorded and sample investigated in order to establish character, function and date. NB. The *Principal Contractor (C503)* will be required to subcontract a specialist exhumation contractor to assist with the works. This will be instructed by the Project Manager.

6.1.1 Archaeological Excavation Procedure

It is highly likely that archaeological excavation will be required within the piled box (to be determined after archaeological trial trench evaluation (see section 4)). The mitigation strategy will be determined after the evaluation is complete.

In addition to the requirements set out in section 3, the *Principal Contractor* shall:

- During piling works the *Principal Contractor (C502)* shall enable access to piling arisings for one *C257 Archaeologist* to observe and recover archaeological remains that may be present.
- Remove, under supervision of *C257 Archaeologist* modern layers, to the predicted level of archaeological deposits, anticipated to be approximately 1.5m below ground level;
- Provide appropriate plant to remove hand excavated spoil (e.g. a hoist or other appropriate method);
- Provide temporary works to support excavations where personnel access for the investigation is required, such as shoring;
- Machine excavate in stages, as directed by the *Archaeological Contractor (C257)* to remove materials once they have been recorded by the *Archaeological Contractor (C257)* until the full sequence of archaeological deposits is identified. Estimated to be down to approximately 106m ATD.
- Provide covering for the trial trenches to prevent public views of the works due to the potential for human remains, these should be:
 - large enough to allow safe working;
 - waterproof;
 - translucent (to provide sufficient light); and
 - be of a type that can be quickly erected and removed to facilitate machine access when required.
- Provide all plant and operatives required to complete the works;
- Allow for up to 20 archaeologists to be on site; and

7 Instructions to Archaeological Contractor and Specification

7.1 Archaeological Evaluation; Watching Brief and Excavation

It is proposed that a programme of archaeological investigation comprising trial trench evaluation; general and targeted watching brief and potentially archaeological excavation be carried out at the Liverpool Street worksite. Further details on the requirements of the



Archaeological contractor are to be found in the Site Specific Written Scheme of Investigation, document reference number: C138-MMD-T1-RST-C101-00001.

The Archaeological Contractor shall:

- Obtain a burial license a suitable time prior to the works.
- Provide a team of suitably qualified archaeologists, experienced in archaeological site evaluation and the nature of archaeological deposits which are expected on this site. A geo-archaeologist and osteologist will also be required;
- Provide a suitably qualified buildings archaeologist;
- Provide a Method Statement inclusive of risk assessment and safe method of working;
- During Trial Trench Evaluation, Excavation and targeted Watching Brief, following the initial overall strip and clean, individual features are to be hand cleaned and defined: sufficient to determine type, plan form and relationships (e.g. for structures and rebuilds); and recorded. Sufficient archaeological features/structures are to be sample excavated either using a smaller machine with graded digging bucket (by the *Principal Contractor* under archaeological supervision) or hand cleaned if appropriate;
- During the evaluation phase, where articulated human remains are encountered in situ, the lifting of human skeletal remains shall be kept to the minimum which is compatible with an adequate evaluation (refer to section 7.3 of the WSI). Notwithstanding this, the Archaeological Contractor shall ensure that all burials are planned/photographed in-situ and that appropriate samples have been recovered prior to any lifting.
- A sampling strategy for human remains during the mitigation phase will be developed by C138 and C257 in discussion with the City of London and Ministry of Justice.

7.2 Deliverables

Table 3 summarises the Deliverables required per fieldwork event:

Table 3 Deliverables for each fieldwork event

| Fieldwork Event | Weekly Progress Report | Interim Report | Deposit Model | Fieldwork Report |
|--|------------------------|----------------|---------------|------------------|
| XSM10 (Trial Trench Evaluation) | ✓ | ✓ | ✓ | ✓ |
| XSM10 (GWB/TWB on utilities) | ✓ | ✓ | | ✓ |
| XSM10 Archaeological Excavation (utilities corridor) | ✓ | ✓ | ✓ | ✓ |
| XSM10 Archaeological Excavation (station box) | ✓ | ✓ | | |

*nb. Items in italics are to be confirmed following the trial trench evaluation

Refer to the following sections of the Written Scheme of Investigation (C138-MMD-T1-RST-C101-00001) for further information regarding the following report types:

- Weekly progress reports – WSI section 10;
- Interim report – 7 days after completion of fieldwork – WSI section 9.4; and
- Trial Trench Evaluation; Watching Brief and Excavation reports – WSI section 9.6.



7.3 Site Archives

The site archive shall be organised to be compatible with other archaeological archives in London. Refer to section 8.2 in the Site Specific Written Scheme of Investigation, document reference number: C138-MMD-T1-RST-C101-00001.

7.4 Post-excavation

Refer to the detail set out within the CRL/Crossrail Central Archaeological Contract and the Written Scheme of Investigation for Liverpool Street Station (C138-MMD-T1-RST-C101-00001).

8 Provisional Timetable

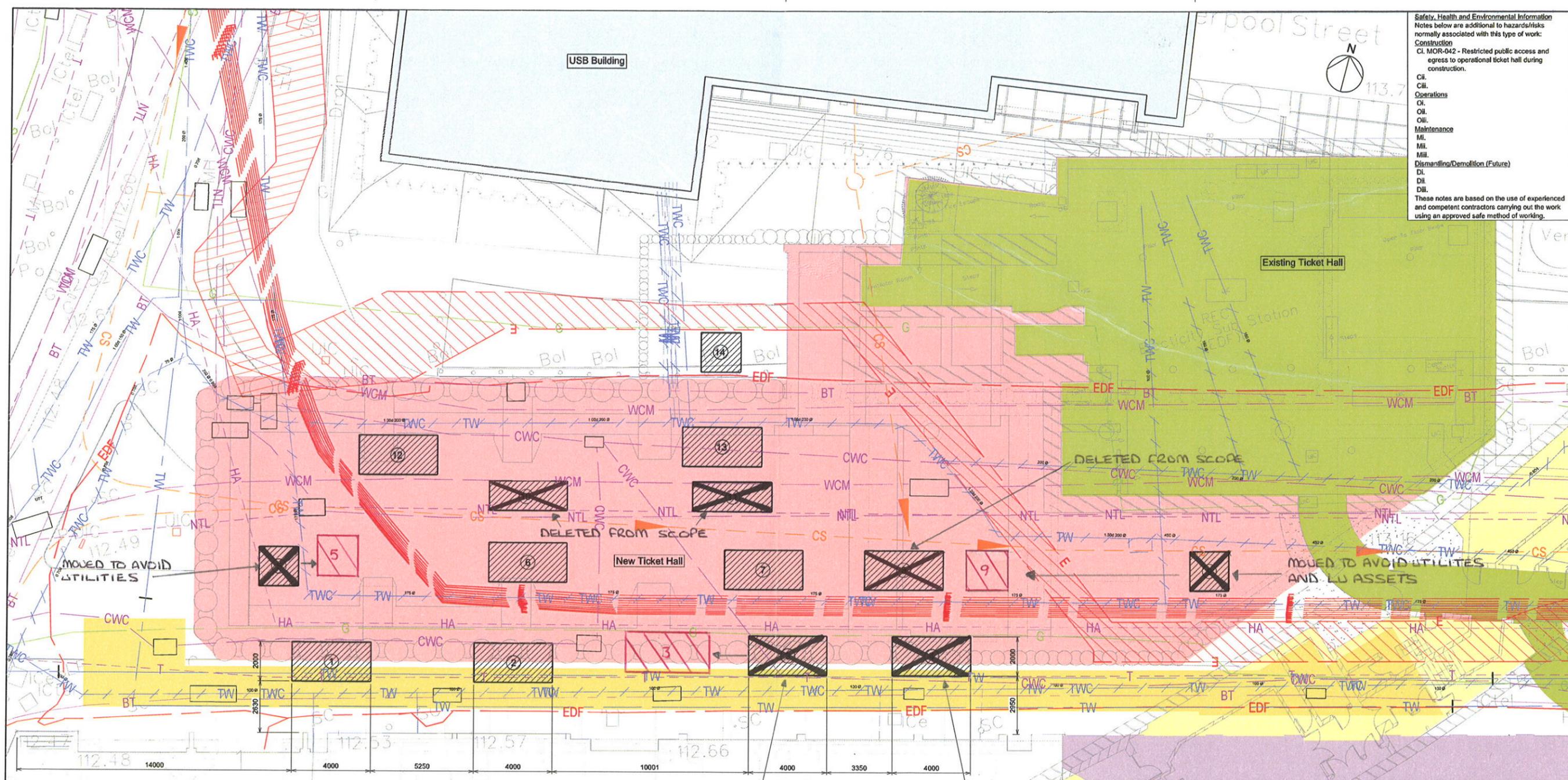
| Activity | Principal Contractor | Construction Phase |
|---|----------------------|---|
| C257 to obtain Burial License | C257 | License obtained for evaluation phase, a second license is required for mitigation works. |
| Trial trench evaluation JB Riney Phase 2 (4 trenches in Broadgate Box footprint) | JB Riney | Feb to March 2011 |
| Trial trench evaluation JB Riney Phase 3 (4 trenches in Broadgate Box footprint) | JB Riney | March 2011. |
| Trial trench evaluation JB Riney Phase 4: (4 trenches in utilities corridor footprint) | JB Riney | March to April 2011 |
| General watching brief on shallow exploratory trenches to front of 100 Liverpool Street on British Land | JB Riney | April April 2011 |
| General watching brief on test pipt in basement of Railway Tavern | JB Riney | March 2011 |
| General and Targeted Watching Briefs on secondary utilities diversions | C503 | Enabling Works (Aug 2011 to Mar 2012) |
| General Watching Brief on piling arisings | C503 & C502 | Enabling Works (Oct 2011 to Sept 2013) |
| <i>Archaeological excavation in the path of 1.25m piles for utilities corridor (estimate 6 weeks)</i> | C503 | <i>Enabling Works (Oct 2011 to Nov 2011)</i> |
| <i>Archaeological excavation in the footprint of the utilities corridor (estimate 3 months)</i> | C503 | <i>Enabling Works (tbc)</i> |
| <i>Archaeological excavation in the footprint of 1.25m piles for station box (estimate 4 weeks)</i> | C502 | <i>Main Works (Aug 2013 to Sept 2013)</i> |
| <i>Archaeological excavation in the footprint of the piled box (estimate 5 months)</i> | C502 | <i>Main Works (2013)</i> |

*nb. Items in italics are to be confirmed following the trial trench evaluation



Appendix A – Archaeological Mapping Information

Safety, Health and Environmental Information
 Notes below are additional to hazards/risks normally associated with this type of work:
Construction
 Cl. MOR-042 - Restricted public access and egress to operational ticket hall during construction.
 Cl.
 Cl.
Operations
 Cl.
 Cl.
Maintenance
 Cl.
 Cl.
Dismantling/Demolition (Future)
 Cl.
 Cl.
 Cl.
 These notes are based on the use of experienced and competent contractors carrying out the work using an approved safe method of working.



- KEY**
- Critical - Phase 1**
- ① 2m x 4m x 2m deep
 - ② 2m x 4m x 2m deep
 - ③ 2m x 4m x 2m deep
 - ④ 2m x 4m x 2m deep
- Within each trench further small areas of excavation required to determine depth of burlins and earlier deposits (up to 4 - 6m deep)
- Phase 2**
- ⑤ 2m x 2m x 2m deep
 - ⑥ 2m x 4m x 2m deep
 - ⑦ 2m x 4m x 2m deep
 - ⑧ 2m x 4m x 2m deep
 - ⑨ 2m x 2m x 2m deep
 - ⑩ 1.5m x 4m x 2m deep
 - ⑪ 1.5m x 4m x 2m deep
 - ⑫ 2m x 4m x 2m deep
 - ⑬ 2m x 4m x 2m deep
 - ⑭ 2m x 2m x 2m deep
- Within each trench further small areas of excavation required to determine depth of burlins and earlier deposits (up to 4 - 6m deep)

| Plan | Utility |
|------|--|
| EDF | EDF - Existing Route survey |
| G | National Grid gas - Existing Route from survey |
| BT | BT - Existing Route from survey |
| NTL | Telecoms company (not specified) See relevant individual Diversion drawing for owner |
| NTL | Virgin Media 9 (NTL) - Existing Route from survey |
| CWC | Virgin Media (Vitel) Teletest - Existing Route from survey |
| WCM | Verizon (Workicom) - Existing Route from survey |
| TW | Thames Water - Existing Route from survey |

| Plan | Utility |
|------|---|
| FW | Combined Water drainage - Existing Route from records (example) (Utility annotated on line as above with dotted line style & colour to show taken from records) |

| | |
|---------------------------|------------------------------------|
| USB Building | New ticket hall |
| Queen Victoria Tunnel | Existing Ticket Hall / Sub-station |
| Underground LU structure | Railway Tavern Public House |
| Proposed Utility Corridor | |

| Rev. | Date | Description | By | Chkd | App | Auth |
|------|------------|-------------|----|------|-----|------|
| P01 | 22/07/2010 | First Issue | PC | MD | SA | |
| P02 | 20/08/2010 | | PC | MD | SA | |

Notes

- Confirmation of all survey data must be obtained from the crossrail survey team.
- Coordinates to the London Survey Grid, heights to the London height Datum which is 100 metres below Ordnance Datum Newlyn. See Crossrail Standard CR-STD-010.
- All dimensions are in metres unless specified otherwise.

NOTE: Trenches are located between known Utilities, size and position may be altered as required when excavations are underway

4 TRENCHES DELETED FROM SCOPE (T4, T8, T10, T11)
3 TRENCHES MOVED LOCATION (T5, T3, T9)

Scale: 1:100 @ A1

Crossrail

Crossrail Limited
 25 Canada Square
 Canary Wharf
 London
 E14 5LQ

Contract:
Liverpool Street Station Design

Originator:
Mott MacDonald Limited

Location:
Liverpool Street Stn

Title:
**Liverpool Street - Broadgate Ticket Hall
 Trial Trench Evaluation**

By: P. CRUTTENDEN
 Chk: MDILLING
 App: SALLLEN
 Auth: ...

Scale: 1:100 @ A1
 Drawing and CAD file No: C138-MMD-T1-DDA-C101_Z-10052
 Rev: P02
 Submittal: S4

© Crossrail
 www.crossrail.co.uk

Copy Approved for Design - Created: 20-AUG-2010

Fit for authorisation

RESTRICTED



Safety, Health and Environmental Information
 Notes below are additional to hazards/risks normally associated with this type of work:

Construction
 Cl.
 CII.
 CIII.
Operations
 OL.
 OII.
 OIII.
Maintenance
 MI.
 MII.
 MIII.
Dismantling/Demolition (Future)
 DI.
 DII.
 DIII.

These notes are based on the use of experienced and competent contractors carrying out the work using an approved safe method of working.

Unapproved Copy - Printed by: David Kaminski. Valid on day of printing only. 22-JUL-2010. Hardcopy must be discarded within 7 days

| Rev. | Date | Description | By | Chkd | App | Auth |
|-------|------|-------------|----|------|-----|------|
| P01.1 | | First Issue | | | | |

Notes

| | |
|-----------------------------|-----------------------------------|
| LSS85 | Burial Ground BG208 (approximate) |
| LSS85 (watching brief area) | |
| FWD04 | |
| LVB06 | |

Scale: 1:200 @ A1

Crossrail
 25 Canada Square
 Canary Wharf
 London
 E14 5LQ

Contract: Liverpool Street Station Design
 Originator: Mott MacDonald Limited
 Location: Liverpool Street Stn

Title: Liverpool Street
 Previous Archaeological Investigations
 In The Broadgate Area

By: D.KAMINSKI
 Chk: _____
 App: _____
 Auth: _____

Rev: P01.1 Sub: S0

Drawing and CAD file No: C138-MMD-T1-DDA-C101_1-10070

Work in progress
 RESTRICTED



Appendix 5 – Addendum to WSI: Factual Reports - Archaeology



C138 – Liverpool Street Station
Archaeology- Addendum to WSI: Factual Reports
Document Number: C138-MMD-T1-RST-C101-500001

Document History:

| Revision: | Date: | Prepared by: | Checked by: | Approved by: | Reason for Issue: |
|-----------|----------|--------------|-------------|--------------|---|
| 1 | 08-03-11 | M Court | C Jones | Sandra Allen | Design deliverables issued to C501 at award |
| | | | | | |

| CROSSRAIL CENTRAL (PDP) REVIEW AND ACCEPTANCE STATUS | |
|---|--|
| This decal is to be used for submitted documents requiring acceptance by Crossrail Central. | |
| <input type="checkbox"/> | Code 1. Accepted. Work May Proceed |
| <input type="checkbox"/> | Code 2. Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated |
| <input type="checkbox"/> | Code 3. Not Accepted. Revise and resubmit. Work may not proceed |
| <input type="checkbox"/> | Code 4. Received for information only. Receipt is confirmed |
| Reviewed/Accepted by:(signature) | |
| Print Name: | Date: |
| Acceptance by Crossrail Central does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail Central approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier. | |

This document contains proprietary information. No part of this document may be reproduced without prior written consent from the chief executive of Crossrail Ltd.



Document Title: Archaeology - Addendum to WSI: Factual Reports

Document number: C138-MMD-T1-RST-C101-500001

Mott MacDonald Issue and Revision Record

Design Team

| Rev | Date | Originator | Checker | Approver | Description |
|-----|----------|------------|---------|--------------|-------------------------|
| 1 | 08-03-11 | M Court | C Jones | Sandra Allen | For Inclusion in SS-WSI |

Subject to the terms of the contract between Crossrail and Mott MacDonald Limited:

This document is issued for the party which commissioned it and for specific purposes connected with the Crossrail project only;

It should not be relied upon by any other party, unless the contrary intention is expressly stated in the contract, or used for any other purpose;

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose;

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from either Mott MacDonald Limited or from the party which commissioned it, Crossrail Limited or Crossrail Central

Introduction

This addendum is a supplementary report to the SS-WSI (C138-MMD-T1-RST-C101-00001) and associated addenda. It is a live document comprising a list of the archaeological documentation available at any given date, including the field and desk study data used to prepare and periodically update the archaeological SS-WSI and deliverables produced by the design team and the C257 Archaeology Framework Contractor (Museum of London Archaeology) in relation to the archaeological ground investigations at the Liverpool Street worksites.

This addendum is intended to allow tracking of archaeological documentation in between full updates of the SS-WSI.

Background studies and specifications

MDC3 Mott MacDonald/Scott Wilson, 2008. *Archaeological Detailed Desk Based Assessment Liverpool Street Station*. Document number CR-SD-LIV-EN-SR-00001

Museum of London Archaeology (MoLA) reports (pre-C257)

Museum of London Archaeology Service, 2005. *Crossrail Environmental Statement: Assessment of Archaeological Impacts, Technical Report, Part 2 of 6, Central Section*, Document number 1E0318-C1E00-00001

Museum of London Archaeology Service, 2006. *Archaeological Programming Assessment*, Document number 1E0318-G0E00-00006 (Rev B) **Superseded by the Site-Specific WSI and WSI Addenda**

Museum of London Archaeology Service, 2007. *Broadgate, London EC2, A Summary of Archaeological Survival*. Document number tbc.

Museum of London Archaeology Service, 2008. *MDC3 Archaeology Updated Baseline Assessment*, Document number 20032008-87MB-YYK5.

Museum of London Archaeology, 2009. *Archaeological Watching Brief and Evaluation, Utilities trial trenches, Liverpool Street and London Wall*, November 2009. Document number tbc

Museum of London Archaeology 2009. *Progress Reports: Archaeological Monitoring of Ground Investigations, Borehole Package 13 and 29*, September 2009. Document number tbc.

Archaeology Contractor C257 (MoLA) deliverables

Museum of London Archaeology, 2010. *Central Section Report, Archaeology Framework C257 – Central Package. Summary of LSS85 Archive – Broadgate Excavations*. Document number C257-MLA-T1-XTC-C101_WS102-00001.

Museum of London Archaeology 2010. *C257 Archaeology Central. Interim Statement Archaeological Evaluation (C138 Moorgate Shaft) 91-109 Moorgate – XSP10*. Document number tbc.