






C257 ARCHAEOLOGY CENTRAL
Method Statement
Archaeological Excavation and General
Watching Brief
Broadgate Areas 1 to 6 (XSM10)

Document Number: C257-MLA-T1-GMS-C101-50002

Document History:

Revision:	Date:	Prepared by:	Checked by:	Approved by:	Reason for Issue:
1.0	09.01.15	Various	Simon Davis	Nicholas Elsdon	'Technical' sections only (no H&S MS, or RAs); for PC Review
1.1	19.01.14	Simon Davis	Ian Grainger	Nicholas Elsdon	With H&S MS and RAs added, For PC Review
2.0	27.01.15	Simon Davis	Ian Grainger	Nicholas Elsdon	Revised from PC comments, for CRL Review
3.0	25.02.15	Simon Davis	Ian Grainger	Nicholas Elsdon	Revised from CRL comments and later information
3.1	29.06.15	Alison Telfer	Ian Grainger	Nicholas Elsdon	Revised for Area 1 from results of Area 2/3 – DRAFT for PC Review
3.2	06.07.15	Alison Telfer	Ian Grainger	Nicholas Elsdon	Revised from PC Review for sign off
4.0	06.07.15	Alison Telfer	Ian Grainger	Nicholas Elsdon	For CRL Review
					

Document uncontrolled once printed. All controlled documents are saved on the CRL Document System

2a. Stakeholder (Principal Contractor: C502 LOR) review required? YES NO

(If NO, strike out sections 2a & 2b and go to section 3)

This document has been reviewed by R. GRESHAM in the capacity of P. LEADER^{LOR} for coordination, compliance, integration, and acceptance as a safe system of work, output, control, sequence. This document is acceptable for transmittal to CROSSRAIL for no objection to the works being executed as described.

Sign: [Signature]

Name: R. GRESHAM

Date: 6/7/15

2b. Review by Stakeholder (if required):

Stakeholder Organisation	Job Title	Name	Signature	Date	Acceptance
					<input type="checkbox"/>
					<input type="checkbox"/>
					<input type="checkbox"/>

3. Acceptance by Crossrail

Crossrail Review and Acceptance Decal			
This decal is to be used for submitted documents requiring acceptance by Crossrail.			
<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) <u>[Signature]</u>	Print Name: <u>N WIKER</u>	Position: <u>PM</u>	Date: <u>09/07/15</u>
<small>Acceptance by Crossrail does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier.</small>			

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

Notes for Readers

This version of the method statement has been revised for Area 1, using lessons learned, and additional data, from Areas 5 and 2/3.

Various readers of this method statement and risk assessment are likely to be directly interested in different parts of the document. The following table is intended to help readers identify which sections cover their main interests.

Reader's main interest	Most relevant sections
Principal Contractor	2, 2.3 3.1 4 5 6 13 14 15 20 21
Health, Safety, & Environment	13 14 15 20 21
Contractual	0 1 4 9 10 12 16
Archaeological methodology	1 3 5 6 7 8 12

Contents

1	Introduction	8
1.1	Site Description.....	8
1.2	Scope of archaeological fieldwork.....	8
1.3	Previous work on the site.....	10
1.4	Geological and Topographical setting	11
1.5	Archaeological and Historic Background	12
1.6	Deposit survival	13
1.7	Area 4.....	15
2	Interfaces and Communication Plan	16
2.1	Interface with Project Archaeologist	16
2.2	Interface with C257 Contract Administrator.....	16
2.3	Interface with Principal Contractor.....	16
2.4	Interface with Crossrail Project Archaeologist.....	17
2.5	Interface with External Consultees.....	17
3	Scope of Works	18
3.1	Planned Fieldwork Events.....	18
3.2	Confirmation of Methods and Standards	18
3.3	Aims and Objectives.....	19
3.4	Event Codes	22
4	Site Management Plan	23
4.1	Tools and Equipment.....	23
4.2	Training and Certification.....	23
4.3	Site Monitoring.....	23
4.4	Progress Reporting.....	23
4.5	Resource Plan	24
4.6	Provisional Programme	27
4.7	Working Hours	27
4.8	Shift handover	28
5	Fieldwork Methodology	29
5.1	Overall Work Phases	29
5.2	General Watching Brief Methodology (incl. Phase 1 tasks).....	30
5.3	Phases 2 to 4: Archaeological Excavation Methodology	32
5.4	Specific methodologies for Area 1.....	33
5.5	Recording Methods.....	33
5.6	Metal Detecting	34

5.7	Survey and Setting Out Method and IT Capability	36
6	Burial deposits and human remains	37
6.1	Site-specific Strategy for human remains	37
6.2	General considerations	38
6.3	Site-Specific Post-medieval Human Remains Strategy: Phase 1 and General Watching Briefs	39
6.4	Site-Specific Post-medieval Human Remains Strategy: Phase 2	39
6.5	Site-Specific Human Remains Strategy: Phases 3 and 4	43
6.6	Disarticulated human bone	44
6.7	Photography of in-situ burial deposits	44
6.8	Labelling and bagging burial deposits	45
6.9	Cremation burials (Phase 4)	46
6.10	Sampling from Inhumations	46
6.11	Lead coffins	46
6.12	Processing of Human Remains	49
6.13	Off-site assessment Scanning of Human remains (Categories A and B)	49
7	Archaeological Science Strategy	50
7.1	Introduction	50
7.2	Geoarchaeological sampling	50
7.3	Environmental sampling	52
7.4	Radiocarbon Dating	54
7.5	Animal Bone	54
8	Artefact Recovery and Conservation	55
8.1	General	55
8.2	Site-specific strategy for building materials	55
8.3	Site-specific strategy for coffin furniture	58
8.4	Treasure	59
9	Deliverables and Submission Programme	60
10	Document Control and Record Keeping	61
11	Archiving and Dissemination Method	61
12	Additional Details	62
12.1	Unexpected and Nationally-important remains	62
12.2	Progress Photographs	62
12.3	Management of Consents	62
12.4	CDM Responsibilities and Reporting	63
12.5	Rail Sites	64
12.6	Highway Sites	64

12.7	Health and Safety Reporting	64
12.8	Liaison with Principal Contractor	65
12.9	Behavioural Safety BMOS	65
13	Emergency Response.....	66
13.1	Emergency Preparedness & Response Plan	66
13.2	Training.....	67
13.3	Emergency & Accident Equipment.....	67
13.4	Monitoring & Testing	67
13.5	Emergency & Accident Incident Reporting.....	67
14	Environmental Management	69
14.1	Contamination.....	69
14.2	Water Disposal	69
14.3	Site Waste Management Plan.....	69
14.4	Vehicles/Motorised Equipment	69
14.5	Other Requirements.....	70
15	Quality Assurance Plan	70
16	Community Relations	70
16.1	General	70
16.2	Confidentiality	70
17	Responsible Procurement.....	71
18	Bibliography	72
19	Health and Safety Method Statement.....	73
19.1	Introduction and Purpose.....	73
19.2	Scope of Document	73
19.3	Responsible Persons and Site Management	74
19.4	Scope of Works.....	74
19.5	Methodology, Programme and Sequence	74
19.6	Health and Safety Control Measures	74
19.7	Safety of Excavations, trench or work areas, shoring and barriers	75
19.8	Planning and Attendance Resourcing.....	79
19.9	Briefing Arrangements	83
19.10	First Aid	84
19.11	Accident, Incident, Near Miss and Environmental Incident Reporting.....	85
19.12	Fatigue during shift-working.....	86
19.13	Emergency Procedures – Site General.....	86
19.14	Emergency Services Contact Details	87
19.15	Route to Hospital	87

20 Risk Assessments	88
21 Annex: C502 Site Requirements	113
22 Registers	120
23 MOLA Health Surveillance	125
23.1 Fitness to Work Declaration	125
24 Programme	128
25 Figures	129

Figures

(forming section 26)

Fig 1 Site location

Fig 2 Plan showing archaeological survival (RL1-XRL-U-DDA-C101-00181 from WSI Addendum, Crossrail 2014b)

Fig 3 Plan showing location of excavation Areas 1 to 3 and 5, and watching brief Areas 4 and 6 (BTH-SKE-004 Exhumation and archaeological excavation sequence of works Rev02, 12.02.14)

Fig 4 Schematic typical section, showing archaeological sequence (WSI Addendum, Crossrail 2014b, 11)

Fig 5 Summary of Phases of work in Areas 1, 2/3, and 5, with approximate excavation depths and contractor responsibilities (WSI Addendum, Crossrail 2014b, 17)

1 Introduction

Area 5 and Area 2/3 were completed between February and May 2015. This version (v4) of the method statement has been revised for the excavation of Area 1, using the results and lessons learned from the earlier areas, in particular, Area 2/3. The main revisions have been to the deposit survival table (section 1.6), the shift work pattern and programme (sections 20.12, and 21 RA63, and programme in section 25). For information relating to Areas 2/3 and 5, see v3 of this method statement.

1.1 Site Description

This method statement covers works on the site of the future Crossrail Broadgate Ticket Hall, Liverpool Street, London EC2M, within the City of London. The site forms an area in the road and pavement of Liverpool Street, to the east of Blomfield Street, and to the south and west of the disused former Broad Street ticket hall/sub-station (see Fig 1). The approximate site centre lies at Ordnance Survey NGR 533050 181610.

1.2 Scope of archaeological fieldwork

Archaeological investigations are to be carried out on this site by Museum of London Archaeology (MOLA). The requirements are set out in:

- A Crossrail **Site-specific Written Scheme of Investigation (SS-WSI): Liverpool Street Station, Site-specific Written Scheme of Investigation, Doc. No. C138-MMD-T1-RST-C101-00001** Version 3.1, 08.03.2011.
- A Crossrail **WSI Addendum: C502 Liverpool Street Station SS-WSI Addendum for Archaeological Excavation and Watching Brief at Broadgate Ticket Hall (XSM10), Doc. No. C502-XRL-T1-RST-CR101-50002, Version 2, 01.07.14**

For those unfamiliar with the site and construction works, this method statement should be read in conjunction with the above Addendum.

For this work, the site has been broken down into Areas 1 to 6 (of which 2 and 3 effectively form a single work area: Area 2/3), see Fig 3.

Within Areas 1, 2/3, and 5, the programme of archaeological excavation (and preliminary work by the Principal Contractor and exhumation contractor) has been divided into 4 phases, as defined in the WSI Addendum (3.1.6), see section 5 and Fig 4 and Fig 5 for details. Please note that the levels and thicknesses quoted are averages, and will vary across the areas:

- Phase 1:** **General Watching Brief** by MOLA on: removal of 1–1.5m of **modern made ground** by the C502 Principal Contractor and Exhumation Contractor, followed by removal of c 0.2m of **post-cemetery deposits** containing **disarticulated human remains** by the C502 Principal Contractor and Exhumation Contractor, to the surface of *in situ* burials.
- Phase 2:** **Archaeological excavation of *in situ* 16th- to 18th-century burial ground** by MOLA, c 1.3m thick, plus burials cut into underlying horizons.
- Phase 3:** **Archaeological excavation** by MOLA of post-Roman deposits (**horticultural features, Moorfields Marsh and subsequent consolidation**), c 1.4m thick.

Phase 4: Archaeological excavation by MOLA of c 1.5m of **Roman** and 0.7m of pre-Roman (Walbrook/alluvial) deposits.

Within Area 4, located at the western end of the site (west of Areas 2 and 5) a General Watching Brief (GWB) will be undertaken by MOLA. This work will be carried out during excavations of modern overburden and made-ground by C502 to monitor spoil that potentially may contain deposits of disarticulated human bone (refer also to the following table).

The remaining tasks from the WSI Addenda (all under Principal Contractor C502 Laing O'Rourke) which are covered this method statement are:

Area	Phase	Task	Provisional Programme
			Note: dates depend on progress by both C502 and MOLA, and use or not of contingency
Area 1	Phase 1	<ul style="list-style-type: none"> General Watching Brief on removal of modern overburden and disarticulated human remains by C502 Principal Contractor and exhumation contractor 	Start: 8th or 9th July 2015 Duration: up to 6 days (1 week) (including erection of screening/roof) (single shifts, weekend working; although double shifts may be required)
Area 1	Phase 2	<ul style="list-style-type: none"> Archaeological Excavation of Bedlam burial ground 	Start: 13th July 2015 Duration: 18 days (3 weeks) (contingency 6 days (double shifts))
Area 1	Phase 3a	<ul style="list-style-type: none"> Pre-propping: Archaeological Excavation of post-Roman marsh and reclamation deposits 	Start: 10th August 2015 Duration: 2 days (double shifts)
Area 1	Phase 3b	<ul style="list-style-type: none"> (Possible GWB on any groundworks for propping, if required) 	Start: 12th August 2015 Duration: 22 days (3.7weeks) (assume single shifts)
Area 1	Phase 3c	<ul style="list-style-type: none"> Post-propping: as Phase 3 	Start: 9th September 2015 Duration: 7 days (double shifts)
Area 1	Phase 3ac	<ul style="list-style-type: none"> Contingency Phases 3a & 3c 	Start: 17th September 2015 Duration: 2 days (double shifts)
Area 1	Phase 4	<ul style="list-style-type: none"> Archaeological Excavation of Roman deposits 	Start: 21st September 2015 Duration: 25 days (4.5 weeks) (contingency 6 days (double shifts))

Area 4	–	<p>General Watching Brief on removal of modern overburden and any human remains (expected to be disarticulated) by C502 Principal Contractor and exhumation contractor, to a depth of 1.5m below existing ground level.</p> <p>The current understanding is that only localised groundworks are required for drainage/utility works and landscaping for public realm works.</p>	<p>Start: 2016</p> <p>Duration: TBD</p>
---------------	---	--	---

Note: the remaining task from the WSI Addendum, general watching brief on excavation and exhumation along the pile lines, was covered by a separate method statement: C257 Archaeology Central, Method Statement, Archaeological Watching Briefs, Broadgate Ticket Hall Pile Line (XSM10), C257-MLA-T1-GMS-C101-50001, v1 16.06.14 (MOLA 2014b). This work has been completed.

The overall purpose of these tasks is to mitigate the impact of the works upon archaeological remains, by making an adequate record of them during the construction ground works (a mitigation strategy of *preservation by record* in line with Crossrail requirements).

These archaeological investigations form part of the mitigation for the Broadgate Ticket Hall site, as detailed in the WSI Addendum (section 3).

This Method Statement has been developed in conjunction with the Principal Contractor, C502 (Laing O'Rourke) who will be responsible for ensuring that attendances and enabling works for the archaeological scheme are carried out as specified.

If the project design or scope/method of working are subject to changes during the works, the method statement will be updated and re-issued to the Crossrail Project Archaeologist for approval, in accordance with the specified document control procedures (see section 9 of this document).

1.3 Previous work on the site

The Broadgate Ticket Hall site has been the subject of a series of archaeological evaluation trenches/pits, and various watching briefs on utilities and other works (works to 2013 shown on Fig 2). The results are included in the following sections, and are reported on in:

- MOLA for Crossrail, 2012a *Central Section Project, Fieldwork Report, Archaeological Evaluation and Watching Brief Broadgate Ticket Hall (XSM10)*, Doc. No. C257-MLA-X-RGN-CRG02-50064, v2, 07.03.12.
- MOLA for Crossrail, 2012b *C257 Archaeology Central, Fieldwork Report, Archaeological Excavated Evaluations and Watching Briefs, Pit 4, Pit 11, Trench 14 and 15, Pile Line Pits and SSET/UKPN Utility Diversions, Broadgate Ticket Hall (XSM10)*, Doc. No. C257-MLA-X-XCS-CRG02-50015, v2, 20.06.12.
- MOLA for Crossrail, 2014a *Fieldwork Report, Archaeological Excavation and Watching Briefs, Broadgate Ticket Hall Utilities Combined Report 2013 (XSM10)*, Doc. No.: C257-MLA-T1-RGN-CRG03-50014, v1 15.04.14

In addition, work undertaken in 2014 included partial excavation of the western end of Area 5 (Area 5 West) and a general watching brief on excavation and exhumation of the pile lines by the C502 Principal Contractor and their exhumation contractor. The results of this work

will be integrated into the subsequent post-excavation assessment report (see section 9, along with the remaining work in Area 5, and that in Area 2/3, which was completed between February and May 2015.

1.4 Geological and Topographical setting

The site lies on the sands and gravels of the Third (Taplow) Thames Terrace. The river terrace deposits are overlaid by a layer of alluvium, probably associated with the River Walbrook and its tributaries. Sporadic deposits of brickearth have been recorded in areas of the site, overlying the terrace gravels.

Previous Crossrail archaeological fieldwork on the Broadgate Ticket Hall site suggests that within the Broadgate Ticket Hall 'box' forming Areas 1–3 and 5–6, the overall the surface of the terrace gravels slopes down from east–west, towards the former Walbrook stream. The terrace gravels lie at an average of c 106.9m ATD, varying between c 106.4 at the western end of the site, and c 107.9m ATD towards the east. See 1.6 for predicted levels in Area 1.

West of the Ticket Hall box, beneath the western tip of Area 4, this level may fall to approximately 106.2m ATD, in the former Walbrook stream channel. However, the planned Crossrail groundworks in this area are not deep enough (up to 1.5m below original ground level [bGL]) to reach natural geology.

1.5 Archaeological and Historic Background

The archaeological and historic background was covered in the Detailed Desk Based Assessment (DDBA) (Crossrail 2008) and the SS-WSI (see section 1 above) and the reports listed in section 1.3. Only the archaeological potential of the site is summarised below. The presence of many of the predicted deposits has been demonstrated by previous work on the site, and is described below as '**demonstrated potential**'.

Overall, the Broadgate Ticket Hall site has:

- **Demonstrated potential for Roman remains** such as Walbrook deposits (potentially channels, alluvium with palaeoenvironmental evidence, revetments, overbank flooding), reclamation of the Walbrook valley, land drainage ditches, burial activity (inhumation and cremation), as well as re-deposited human remains and grave goods, as-yet undefined extra-mural and roadside activity, and possibly stabling or other occupation.
- There is also **demonstrated potential** for a local **Roman road** (with *in situ* wheel ruts, hipposandals and roadside ditches), predicted to be present in Area 1. The road has now been recorded in the north-eastern corner of Area 2, continuing to the south-east to Area 1.
- Current information suggests that the main Roman channel of the Walbrook lay west of the Ticket hall box (MOLA 2014a, Figs 3 & 4). Works in the western tip of Area 4 will be too shallow to reach these remains.
- **Demonstrated potential** for the fringes of the Saxon (or earlier) to medieval **Moorfields Marsh**, including artefacts such as the bone skates and leather working remains recovered in evaluation.
- *Low potential* for Saxon activity, owing to the presence of the Moorgate Marsh. *Low potential* for prehistoric activity, which is likely to be limited to stray finds and sporadic truncated features.
- **Demonstrated potential for medieval industry**, undertaken during the initial formation stages of the marsh itself. A series of pits were recorded at the eastern end of Area 3, apparently using water from the Walbrook as part of an industrial process. These are expected to continue into Area 1.
- **Demonstrated potential for horticultural trenches** and plant-related features dating to the 16th-century St Mary Bethlehem Hospital..
- **Demonstrated potential for reclamation/consolidation dumps**, preparing the area for the cemetery in the 16th century.
- **Demonstrated potential** for post-medieval remains in the form of both **disarticulated human remains and *in situ* burials** from the late 16th to early 18th-century Bethlehem hospital burial ground (BG208: Crossrail 2005b), and the dumping of waste artefacts from craft industries such as bone and glass working. Also buildings and other structures from **18th-century or later buildings** encroaching on the burial ground, which may contain re-used grave slabs in the foundations.
- *Moderate potential* for a historically-attested pulpit, and other structures similar to those seen on 17th-century maps, which could be present within the current excavation area.

1.6 Deposit survival

Localised parts of the site have already been excavated in earlier trial pits, trenches, watching briefs, and localised excavation (1.3). The surviving areas of archaeology at the end of 2013 are shown on Fig 2.

1.6.1 Areas 2/3, 5 and 6

All archaeological remains have been removed within Areas 2/3, 5 and 6.

Predicted Schematic typical sections

1.6.2 Area 1

The deposits predicted in the table below for Area 1 have been updated following excavation of Area 2/3.

[table on next page to avoid break in table]

Area 1

Deposit	Thickness <i>Approximate</i>	Level of Surface <i>Approximate</i>	Level of base <i>Approximate</i>
MODERN (overburden/truncation)	1–1.5m	(Ground level - original road surface = 112.9–113.0m ATD (113.0m ATD (Area 1), 112.9m ATD (Area 4))	Extremely varied but generally at 111.5m ATD
TOP OF BURIAL GROUND (Comprising <i>in situ</i> grave fills truncated by later post-medieval activity. Contains disarticulated human remains)	0.2m	111.5m ATD	111.3m ATD
POST-MEDIEVAL WALLS/BUILDINGS (Potentially cemetery and post-cemetery buildings)	0.2–0.5m	111.5m ATD (111.2–111.5m ATD)	111.0m ATD
BURIAL GROUND (c 3 to 6 burials per m ³ in previous fieldwork – c 5.5 burials per m ³ in Area 2/3)	1.3m (1.3–1.85m)	111.3m ATD (110.5–111.5m ATD)	110.0m ATD (lowest burials generally at between 110.0m and 110.3m ATD, with a small number of burials lower than this, to a maximum depth of 109.45m ATD)
BURIAL GROUND CONSOLIDATION	0.6–0.8m	110.7m ATD (110.6–110.8m ATD)	110.0m ATD
GARDEN CUT FEATURES (Dated approximately medieval to 1550s. Including ditches, pits, tree bowls and bedding trenches)	0.4–1.5m deep (localised features cut into marsh)	110.0m ATD	109.4m ATD (108.9–109.6m ATD)
MOORFIELDS MARSH (Dated post-Roman to approximately medieval. Cut by large linear pits)	1.1–1.4m	110.0m ATD (Top of pits at 109.4m ATD)	108.9m ATD (Base of pits at 108.3m–108.5m ATD)
ROMAN DEPOSITS (Includes south edge of Roman road with road side ditches, dumps, drainage, pits and burials)	1.0–1.4m	108.9m ATD (108.6–108.9m ATD) (Surface of the last/highest Roman road surface previously found at 108.8–108.9m ATD Surface of the first Roman road surface previously found at 108.3–108.4m ATD)	107.8m ATD (Individual burials cut down to c 107.5m–107.7m ATD)
BRICKEARTH (Pre-Roman/geoarchaeology)	0.2–0.5m	107.8m ATD (107.8–107.9m ATD)	107.6m ATD (107.4–107.7m ATD)
TERRACE GRAVELS (archaeologically sterile)	0.4–1.5m	107.6m (107.4–107.9m ATD)	106.2–106.5m ATD
London Clay	n/a	106.2–106.5m ATD	n/a

1.7 Area 4

A generic site-wide deposit model is presented here, covering Area 4, derived from that in the WSI Addendum (Crossrail 2014b). It should be noted that this represents average figures for what is likely to be highly variable, both overall and locally.

Deposit	Thickness – Approximate	Depth of Surface below ground level – Approximate	Depth of base below ground level – Approximate
MODERN (overburden/truncation)	1–1.5m	0m (Ground level - original road surface = 112.3–113.3m ATD (112.3-112.6m ATD (west), 113.3m ATD (north), 112.3m ATD (south), 112.65m ATD (centre), 112.9m ATD (east))	111.5m ATD (111.1–111.6m ATD)
POST-MEDIEVAL CEMETERY CLEARANCE/LEVELLING (w disarticulated human remains)	0.1–0.5m	111.5m ATD (111.1–111.9m ATD)	111.2m ATD (110.9–111.6m ATD)
POST-MEDIEVAL WALLS/BUILDINGS (Cemetery and post-cemetery buildings, cemetery boundary wall)	0.3–1.3m	111.5m ATD (110.8–111.35m ATD)	111.1m ATD (110.45–111.0m ATD)
BURIAL GROUND (c 3 to 6 burials per m ³ in previous fieldwork)	1.3m (0.95–1.4m)	111.1m ATD (110.5–111.5m ATD)	109.75m ATD (109.45–110.2m ATD)
BURIAL GROUND CONSOLIDATION	0.3–0.5m	110.4m ATD (109.4–110.7m ATD)	110.2m ATD (109.0–110.3m ATD)
MOORFIELDS MARSH (Post-Roman to c 1550s, in west cut by medieval NNE-SSW drainage ditch historically known as the 'Deep Ditch')	1.1–1.5m	110.2m ATD (109.0–110.3m ATD) (‘Deep Ditch’ found at 109.3m ATD (south) and 109.6m ATD (north))	109.0m ATD (108.3–109.25m ATD)
ROMAN DEPOSITS (South edge of Roman road with road side ditches. Dumps, occupation, drainage, potentially cut by Roman burials)	1–1.5m	109.1m ATD (108.1–109.25m ATD) (Surface of the last/highest Roman road surface previously found at 108.8-108.9m ATD Surface of the first Roman road surface previously found at 108.3–108.4m ATD)	107.6m ATD (107.2–108.2m ATD)
ALLUVIUM (Pre-Roman/geoarchaeology)	0.5–1m	107.6m ATD (107.2–108.2m ATD)	106.9m ATD (106.4–107.9m ATD)
TERRACE GRAVELS (archaeologically sterile)	0.4–1.5m	106.9m (106.4–107.9m ATD)	106.2–106.5m ATD
London Clay	Unknown	106.2–106.5m ATD	

2 Interfaces and Communication Plan

2.1 Interface with Project Archaeologist

The Method Statement has been developed jointly with the Principal Contractor, C502 Laing O'Rourke and then submitted to the Project Archaeologist for approval. Any comments have been incorporated. Regular daily and weekly progress reports will be submitted to the Project Archaeologist (see 4.4), and will be augmented by progress meetings and site visits when required, in order to optimise communications and feedback.

2.2 Interface with C257 Contract Administrator

MOLA and Crossrail shall submit costings and timesheet reports in accordance with the C257 contract to the Contract Administrator.

2.3 Interface with Principal Contractor

2.3.1 General

MOLA has liaised with the Principal Contractor, Laing O'Rourke to prepare the Method Statement. The archaeological investigations will be undertaken under the auspices and supervision of the Principal Contractor. This interface extends to joint Health and Safety planning under CDM requirements. MOLA will provide the Principal Contractor with all necessary information to support site start-up (eg names of staff for inductions), health and safety planning; and (if required) to support the Principal Contractors' Permits to Dig/Penetrate. The majority of this information will be contained in this Method Statement. MOLA will liaise with the Principal Contractor regarding access, order of works, programme and commencement date.

The Principal Contractor shall give MOLA 3 months' notice of the start of work in Area 1 (as large numbers of new staff will need to be recruited for the shift work) and 4 weeks' notice of start date(s) for each other work area or task. If a start date is delayed and staff cannot be redeployed to funded work, MOLA will require payment for the time stood down.

2.3.2 Handover and Completion forms

Areas of excavation will be handed over from MOLA to the C502 Laing O'Rourke Principal Contractor either:

- temporarily at the end of a Phase or sub-phase (eg end of Phase 3a in Area 1), or
- permanently at the end of the Phase 4 works for an area

Similarly, C502 Laing O'Rourke will hand areas of excavation over to MOLA at the end of propping works in Area 1 .

Where an area of excavation is handed over from MOLA to C502 Laing O'Rourke, a completion form for that area will be produced, to a format produced by the Crossrail Project Archaeologist, and distributed via the Crossrail eB document system (see 10).

C502 handover sheets. When C502 hand over an area to MOLA for archaeological works, MOLA will sign a handover sheets to accept it; on completion of archaeological work, MOLA will sign and hand the area back, and C502 will sign off acceptance of the completed area.

2.4 Interface with Crossrail Project Archaeologist

MOLA shall liaise with Crossrail Project Archaeologist to implement the correct archaeological design specification, described in the SS-WSI and Addendum (Section 1 above).

2.5 Interface with External Consultees

The Project Archaeologist shall liaise with the City of London and English Heritage to inform them of the archaeological works.

3 Scope of Works

3.1 Planned Fieldwork Events

This Method Statement sets out the methodology and health and safety requirements for the tasks described in section 1.2 for the future Crossrail Broadgate Ticket Hall in Liverpool Street.

The mitigation strategy for the site is *preservation by record*.

There is currently no provision for *preservation in situ* within this project; however, very significant deposits (such as well-preserved wooden artefacts) may be block-lifted and/or assessed for conservation as part of the excavation process.

3.2 Confirmation of Methods and Standards

The archaeological fieldwork and reporting will be conducted in accordance with the following guidance and standards:

- Brickley M and McKinley JI 2004. (eds.) Guidelines to the Standards for Recording Human Remains, BBAO/IFA paper no. 7
- Campbell, G, Moffett, L and Straker, V 2011 'Environmental Archaeology. A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition)'. Portsmouth: English Heritage
- Corporation of London Department of Planning and Transportation, 2004 Planning Advice Note 3: Archaeology in the City of London, Archaeology Guidance
- Crossrail Environmental Minimum Requirements (Crossrail 2008)
- Crossrail Archaeology Generic Written Scheme of Investigation (draft July 2009)
- Crossrail Archaeology Specification for Evaluation & Mitigation (including Watching Brief) (CR-PN-LWS-EN-SP-00001)
- Crossrail Code of Construction Practice
- Crossrail SS-WSI – Liverpool Street Station, Site-specific Written Scheme of Investigation, Crossrail April 2010, Doc. No. C138-MMD-T1-RST-C101-00001 Version 2
- Addendum to the SS-WSI: C502 Liverpool Street Station SS-WSI Addendum for Archaeological Excavation and Watching Brief at Broadgate Ticket Hall (XSM10), Doc. No. C502-XRL-T1-RST-CR101-50002, Version 2
- English Heritage, 2004, Geoarchaeology: using earth sciences to understand the archaeological record
- English Heritage/Church of England, 2005, Guidance for best practice for treatment of human remains excavated from Christian burial grounds in England
- English Heritage, Greater London Archaeology Advisory Service [GLAAS], February 2014, Standards for Archaeological Work, London Region
- Institute for Archaeologists (IFA) Standards and guidance for watching briefs and excavation (IFA 2001 and 2008)
- Mays S, Brickley M, and Dodwell N, 2004, Centre for Archaeology Guidelines. Human Bones from Archaeological Sites: guidelines for producing assessment documents and analytical reports. English Heritage

- McKinley, J and Roberts, C, 1993, Excavation and Post-Excavation treatment of cremated and inhumed human remains. IFA technical paper 13
- MOLA (Powers N), 2014d Guidance on the sampling of inhumation graves and grave fills
- Museum of London Archaeological Site Manual (1994)
- Museum of London General Standards for the preparation of archaeological archives deposited with the Museum of London (1998)
- Museum of London (Powers N (ed.)), 2008, Human osteology method statement, <http://www.museumoflondon.org.uk/NR/rdonlyres/2D513AFA-EB45-43C2-AEAC-30B256245FD6/0/MicrosoftWordOsteologyMethodStatementMarch2008.pdf>
- Museum of London Archaeology Service (Powers N), undated, Guidelines for the assessment of inhumations and disarticulated bone, unpublished
- United Kingdom Institute for Conservation's Conservation Guidelines No. 2

3.3 Aims and Objectives

3.3.1 Overall Research Aims

The original overarching research aims were listed in the WSI (Crossrail 2010) and stated that 'Archaeological investigation and mitigation within the Crossrail worksites for Liverpool Street Station have the potential to contribute to the research themes (from *A Research Framework for London Archaeology 2002*, MoL 2002) set out below:

Evidence relating to the Walbrook, its tributaries and Moorgate 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 (eg Saxon use of surviving Roman fabric) and the influence on craftsmanship, manufacture and building techniques.

Evidence relating to the Medieval Bethlehem Hospital precinct and cemetery (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 [Municipal] 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.

3.3.2 Fieldwork Objectives

The overall objective of the excavation and watching briefs, as stated in the WSI Addendum (2.1.1) is:

- to mitigate the impact of constructing the new Crossrail Broadgate Ticket hall on the archaeological resource through a programme of archaeological investigation, recording, analysis and dissemination in accordance with the Crossrail Generic WSI (document number CRPN-LWS-EN-SY-00001) and the standards listed therein.

And that:

- The programme of archaeological work aims to achieve a detailed recording and sampling of all phases of natural and manmade activity sufficient to understand the extent, form, date, character, historical significance and regional and international context of the remains.

The site-specific objectives are set out below. These are derived from the WSI Addendum (section 2.3), with additional aims devised by MOLA (RM9, BB12, PM5). Further aims have been devised by MOLA from the results of Areas 5 and 2/3 (RM10 to RM13).

3.3.2.1 Roman and medieval

- RM 1 Investigate the natural topography and geomorphic development of the site prior to human intervention
- RM2 Investigate the form of the River Walbrook in its various phases, any crossing points, including any waterlaid deposits with potential for organic preservation and palaeo-environmental remains.
- RM3 Determine if the ditch found in Pit 11/Trench 1 [and Area 2] is the canalised eastern edge of the Blomfield Street Walbrook channel, and whether this feature was open into the post-Roman period.
- RM4 Characterise and understand the nature, form, and dating of the different phases of Roman extra-mural activity and land use, including potential settlement occupation and date of any building remains and the function and date of drainage features and how they relate to the Walbrook and Moorfields Marsh.
- RM5 Determine the structure, form, phasing and dates of use of the probable Roman road alignment [which] continues across the site and, if so, how it relates to other Roman activity within the area.
- RM6 Are there any further primary Roman burials within the site area? How do apparently primary context deposits of human skulls and cremation deposits recovered from the west of the site relate to re-deposited human remains recovered from parts of the

site? What can the human remains tell us of the lives of individual Londoners in the Roman period?

- RM7 Investigate the character, extent and date of the Moorfields Marsh deposits in this area. Do the marsh deposits represent a continual process of flood inundation from the post Roman period through the medieval period? Can this process be accurately dated? What evidence is there for land stabilisation and agricultural use/refuse disposal in the medieval period?
- RM8 What evidence is there for reclamation of the area of the area in the medieval or post-medieval period?
- RM9 What is the distribution of disarticulated Roman, or pre-Roman, human remains, and what can be inferred from it, eg from where may it have originated, and under what conditions? What does it suggest about nearby Roman cemeteries west and east of the Walbrook?
- RM10 What is the significance of the Roman shackles?
- RM11 What can be understood of the relationship between this known floodplain and evidence for burial practices in the Roman period?
- RM12 What is the significance of the decapitation burials? How do these relate to the cremation urn found only few metres away to the west?
- RM13 What evidence is there for further medieval industry in the area of the site? What part did the clay-lined pits play in the process of manufacture?

3.3.2.2 New Churchyard/Bedlam burial ground:

- BB1 Characterise and date the sequence of late medieval dumping and reclamation associated with the establishment of the cemetery. What evidence is there for the original boundary of the burial ground, its subsequent rebuilding and any intra site spatial organisation?
- BB2 Characterise and refine the sequence and dating of burials. How was the cemetery filled up? Is there evidence for intermittent import of other soils and hiatus referred to in historic documents? Does structural evidence for the alleged pulpit survive?
- BB3 Can different burial practices be defined? Use of shrouds, coffins, mass burial pits? How does it change spatially and chronologically? What indication is there for formal organisation/management and zoning? Can burial episodes be related to historic events such as documented plagues?
- BB4 Is there a zone of multiple or pit burials in the northern part of the site around Trenches 13 and 14, and the 1985 excavations?
- BB5 What date did the cemetery go out of use and how was the site prepared for subsequent re-use as gardens and then development? Can the gradual encroachment of Georgian buildings and plots in the 18th century be phased and dated?
- BB6 Can gravestones, marker/ledger slabs [or coffin plates] provide evidence which will identify individuals, and can these be correlated with documentary sources?
- BB7 What evidence is there for coffin use, construction type, furniture and coffin plates? Although preservation of these has been shown to be poor, what use of specialist recovery methods and scientific testing could be applied [to enhance the data recovered]?

- BB8 How can osteology studies be used to describe the population of the burial ground and what scientific samples should be taken to determine the role of various pathogens particularly in relation to potential plague victims?
- BB11 Can scientific sampling of soil samples be used to illuminate any of the other research objectives? [not numbered in WSI Addendum].
- BB9 Can skeletal evidence, injury, or other indicators be correlated with biographic details derived from burial records?
- BB10 Can the skeletal evidence be correlated with burial records to build a picture of the population of the cemetery as a whole and establish chronological trends during the use of the cemetery relating to parish origin, age and cause of death, gender, social, occupation, and religious belief profiles etc?
- BB12 What structures were constructed within the burial ground whilst it was in use, eg a historically-attested pulpit, or structures similar to those seen on maps of 1658 and 1676?

3.3.2.3 Other post-medieval:

- PM1 What is the date and taphonomy of deposition of the important worked bone assemblage? For example, do these dumped deposits post-date the cemetery deposits, or do they represent intermittent deposition during and after the use of the cemetery?
- PM2 Can any spatial and chronological patterns of the different types of bone artefact be identified in different parts of the site? How do these relate to any zonal patterning in the cemetery?
- PM3 Can documentary research identify evidence for the activities and industries in the surrounding area that are likely represented by waste materials dumped in the cemetery?
- PM4 How was the burial ground location treated in the Georgian and Victorian eras with reference to the character and date of the structural remains relating to 18th and 19th-century urbanisation and development?
- PM5 How did Liverpool Street develop in the 19th century, notably with the construction the former Broad Street ticket hall and associated structures, and sewerage beneath the roadway?

3.4 **Event Codes**

The sitecode is **XSM10**.

4 Site Management Plan

4.1 Tools and Equipment

Tools and equipment appropriate for the archaeological works will be ordered by the MOLA Project Officer(s) and delivered to site by the MOLA Equipment Officer from the MOLA central store. See 20.8.2 for details.

4.2 Training and Certification

MOLA provides Safety Training for its staff as follows:

- Induction Training for all staff (undertaken on joining MOLA, and as appropriate on individual projects).
- General H&S Training for supervisory staff (an H&S awareness course targeted at Field and Support Staff).
- Specialist H&S Training (designed to cover specialist areas and to update professional knowledge; as appropriate to deployment)

All MOLA staff on site will be competent to carry out their archaeological work. On site, all staff will be supervised by a competent person from MOLA, usually a member of the site supervisory team (Project Officer, Senior Archaeologist or Assistant Senior Archaeologist).

For certain specific aspects of MOLA work only those members of staff with the relevant training and certification will be allowed to undertake them. These include Cable and Pipe/Underground Service Location, Chainsaws, Confined Spaces (see 20.7.4). However, only the confined spaces training is likely to be required on this site.

All MOLA staff have passed a CITB Health and Safety Test to operative level and will carry their CSCS card on site at all times (CSCS, Construction Related Organisation CRO White Card for Archaeological Technician, Code 5363; other cards are available for site visitors etc).

In some cases, MOLA staff who have recently passed a CSCS test and are awaiting their card will have only the CITB pass letter confirming their result. C502 have confirmed that this will be acceptable until their card is received.

All staff will have their MOLA ID cards with them (see 20.6.1).

4.3 Site Monitoring

The site will be monitored by the MOLA Project Managers (Nicholas Elsdon, BSc, and Simon Davis, BA) via site visits, as and when required, in order to provide advice and support to the MOLA Supervisors. The MOLA H&S Compliance Manager, Ian Grainger, will also regularly monitor and make visits to the site, see 13.4.

4.4 Progress Reporting

MOLA has agreed a programme of weekly written contract C257 progress reports and progress meetings with the Project Archaeologist. MOLA shall provide information describing

progress on-site to date, the processing of samples and artefacts and feedback from initial assessment, and a BMOS report (see 13.6).

In addition to the contract C257 weekly progress reports, C257_PMI_0059 instructs a series of project-specific reporting for this site (details TBC):

- Daily Report with quantification of staff numbers and burials or volume excavated, delays etc
- Weekly Broadgate Quantification Report with more detailed quantification for the week, including off-site processing and osteological assessment etc

See C257_PMI_0059 for full detail.

4.5 Resource Plan

4.5.1 Excavation:

- The excavation (Phases 2 to 4) in Area 1 will be conducted in two shifts, see 4.7. See the programme (section 25) for detail.
- See 4.5.2 for a diagram of the staffing organisation described below.
- Overall on-site direction and coordination of the excavation fieldwork (Phases 2 to 4), day-to-day liaison with the Principal Contractor and Crossrail, and contributions to weekly and timesheet reporting, will be conducted by MOLA Project Officers (Crossrail Grade 3).

There will be one Project Officer on each shift for Area 1.

Where required, the Project Officer for the early shift (Project Officer 1) will take precedence over the Project Officer for the late shift (Project Officer 2), eg if there is disagreement over an issue which cannot be otherwise resolved.

However, the **first point of contact** at any time is the Project Officer who is **on-shift at that point**. *No-one will contact a Project Officer (or any other member of MOLA shift-working staff) about work issues out of their working hours without permission from MOLA management.* This is only likely to be given in exceptional cases.

- Project Officer 1 (PO1) will therefore work throughout the fieldwork, and the subsequent reporting, post-excavation assessment, and publication stages of the project. Similarly, one Senior Archaeologist (SA1) will provide continuity throughout all stages of the project.
- The excavation within each area will be supervised by one Senior Archaeologist (Grade 4 or 5) per shift in Area 1.
- Each Senior Archaeologist will be assisted by an Assistant Senior Archaeologist (one on each shift).
- The sites will also be staffed by 10 Archaeologists (Grade 6 or 7) per shift in Area 1.
- Osteologists will be on-site during the Phase 2 excavations of the burial ground with one per shift, plus a third covering part of each shift, in Area 1.

- Geoarchaeologists will be on site continuously for limited periods during Phase 3 in Area 1, with the addition of one Geoarchaeologist for one late shift in Area 1.
- There will also be support from MOLA Geomatics, Geoarchaeology, and Photographic team members when required. Other archaeological specialists (Grade 8) may be called in if necessary.

Supervisory team for Area 1

- **Project Officer, early shift (PO1)** – for the duration of the project fieldwork and post-excavation): Alison Telfer
- **Senior Archaeologist, early shift (SA1)** – for the duration of the project fieldwork and post-excavation): Robert Hartle
- **Project Officer, late shift (PO2):** Andy Daykin

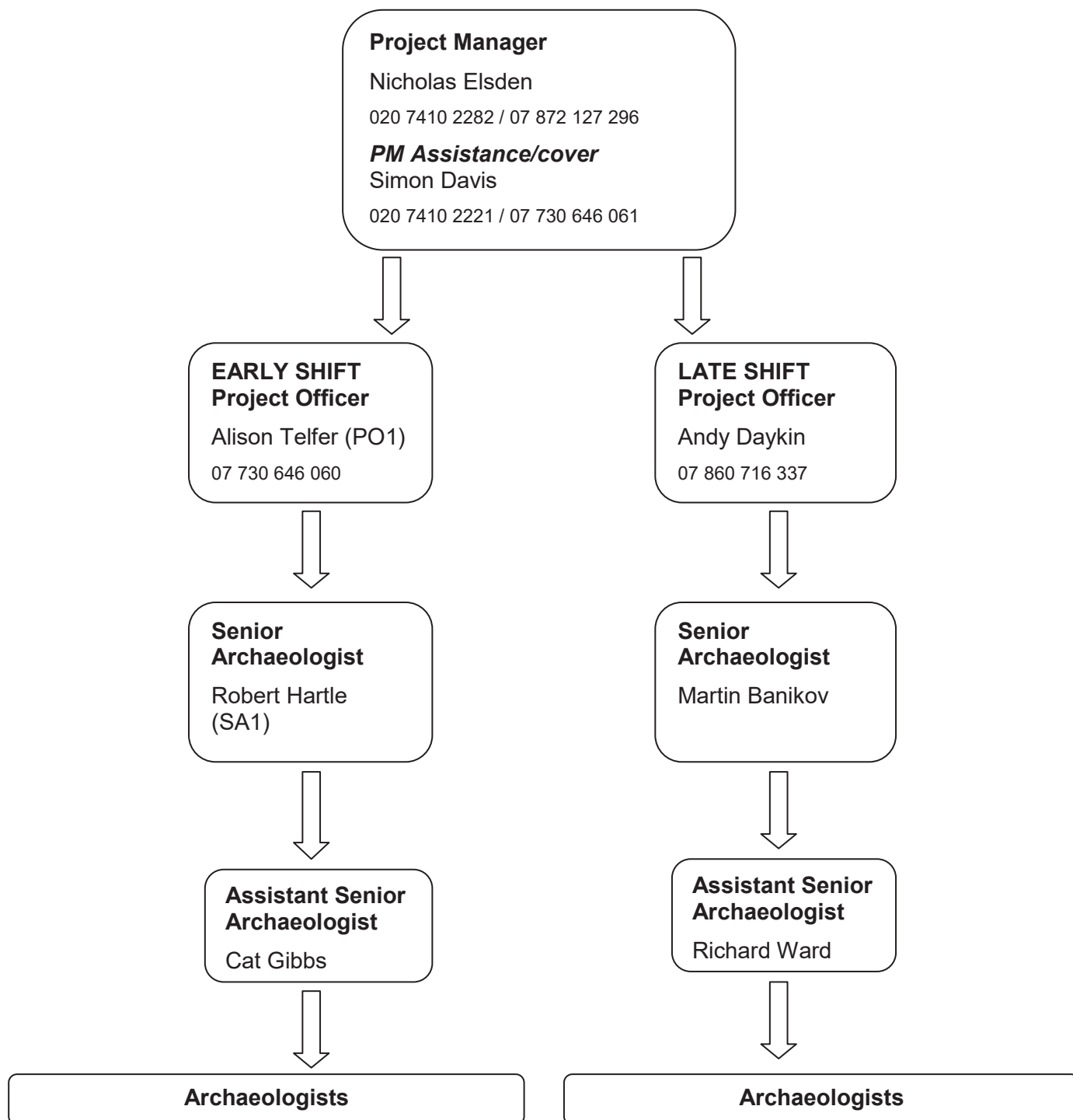
Senior Archaeologist, late shift (SA2): Martin Banikov

[table on next page to avoid break in table]

4.5.2 Organigramme

The team structure (for the larger Area 2/3) described in 4.5.1 is shown below:

For Area 1, there will be now be two Project Officers, one Senior Archaeologist and one Assistant Senior Archaeologist per shift (see 4.5.1 for detail).



4.5.3 General Watching Brief:

- The watching briefs will be supervised by one or two MOLA Senior Archaeologists (Grade 4 or 5) with support from MOLA Geomatics, Geoarchaeology, and Photographic team members, and other specialists (Grade 8), as necessary.
- It is predicted that the general watching brief in Areas 1 and 4 will require one Senior Archaeologist.
- If additional staff are necessary this will be arranged with the Project Archaeologist, in liaison with the C502 Principal Contractor.

Staff of Grade 5 and above will have their CVs submitted to Crossrail for approval. All staff will be registered with Crossrail.

The Project Officers and Senior Archaeologists will be confirmed to Crossrail and the Principal Contractor in advance of fieldwork.

All archaeological staff are normally direct MOLA employees, ordinarily full time. For this project, staff may be seconded from other archaeological organisations (to be arranged as required).

The working hours are set out in 4.7 below.

4.6 Provisional Programme

The predicted overall start dates and durations for the work are included in section 1.2.

See section 25 for the full programme.

4.7 Working Hours

4.7.1 Excavation (shift work programming)

In the excavation of Area 1 MOLA will work two shifts, Monday to Saturday, from 7:00 to 15:30, and 15:00 to 23:00 (14:30 for PO2 and SA). This allows for a half-hour handover period between the two teams, with a one hour handover for Project Officers and Senior Archaeologists from 14:30 to 15:30, the additional half hour now occurring before the full team handover (see 4.8 for shift briefings).

MOLA staff will take a 30 minute break in the morning and a 30 minute break for lunch. Breaks will be staggered to adequately accommodate other contractor activities within the welfare areas.

The expected schedule for morning and lunch/dinner breaks are summarised below.

Where MOLA staffing is less than approximately 20 people per shift (as in Area 1):

- (1st shift) break 9.30am–10.00am
- (1st shift) lunch break 12.30pm–1.00pm
- (2nd shift) dinner break 5.30pm--6.00pm
- (2nd shift) break 8.30pm–9.00pm

The planned break schedule will result in an 8 hour early shift followed by a 7.5 hour late shift (excepting late shift Project Officers and Senior Archaeologists for site handover, as above).

The Principal Contractor will obtain Section 61 consent for the extended hours.

4.7.2 Watching Brief

The watching briefs on the exhumation contractor (Phase 1 in each area) are currently predicted to take place within the core Crossrail working hours, which are between 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays as specified in the Environment Requirements (Section 4 of Works Information Vol 2). Where works that require monitoring take place between 07:00 and 08:00, and/or Saturdays between 13:00 and 18:00, they will also be monitored by MOLA.

4.8 Shift handover

In the shift handover period (see 4.7 for times) the early shift Project Officers and Senior Archaeologists will brief their late shift counterparts on the preceding shift's work, work predicted for the next shift, any health and safety issues identified, and all other relevant information to allow continuity of work.

Similarly, the early shift Assistant Senior Archaeologists and Archaeologists will brief their late shift counterparts in the details of these issues for the individual features and deposits currently being worked. This will include current understanding of the archaeological sequence (matrix diagram) and the point to which individual features and contexts have been recorded, excavated, and sampled, and their interpretation.

As this will not be possible for the end of the day, the late shift Project Officers and Senior Archaeologists will leave full written notes for the early shift supervisor to cover the next day. The later shift Assistant Senior Archaeologists and Archaeologists will contribute to these notes, and where required label deposits with practical information (eg 'next to come out', 'sampled <00>') as well as context etc numbers.

The entire relevant shift team will attend a daily briefing prior to starting work in active archaeology areas (see 20.9.3).

5 Fieldwork Methodology

*It should be emphasised that the levels and thicknesses quoted for archaeological deposits are **general predictions** based on the earlier fieldwork on the site. They are **average** values **likely to vary considerably** across the site, and within areas, with both depths of later disturbance or horizons, and the thickness of archaeological features. Therefore, it is **not possible to give precise levels** for the surfaces or bases of archaeological deposits. Approximate levels are given here, to the nearest 0.1m, but in practice the levels at which archaeological deposits are present will need to be **determined by MOLA** during the course of the work.*

5.1 Overall Work Phases

These works take place after the installation of the secant piled walls of the station box, which form the shoring of the edges of the areas of excavation.

5.1.1 Area 1

As mentioned in section 1.2, the preliminary ground reduction phase of works by the Principal Contractor and exhumation contractor, and subsequent phases of archaeological excavation by MOLA are set out in the preceding WSI Addendum (Crossrail 2014, 3.1.6). These phases are listed below and tabulated in Fig 5. They are also shown on a schematic cross section of the site, in Fig 4 of the Addendum).

<p>Phase 1: GWB by MOLA on the excavation of upper 1–1.5m of modern made ground by the C502 Principal Contractor and Exhumation Contractor, followed by excavation of c 0.2m of post-cemetery deposits containing disarticulated human remains by the C502 Principal Contractor and Exhumation Contractor, to the surface of in situ burials.</p> <p>Phase 2: Archaeological hand excavation by MOLA of cemetery deposits between c 111.5 and 109.45m ATD (see section 6).</p> <p>Phase 3: Archaeological excavation by MOLA (machine aided using plant provided by the C502 Principal Contractor) of post-Roman deposits [Moorfields Marsh, medieval industry, early post-medieval horticultural features and subsequent consolidation] between an average depth of c 110.7 and 108.3m ATD.</p> <p>Phase 4: Archaeological excavation by MOLA of Roman and pre-Roman Walbrook/alluvium deposits between an average depth of c 108.9m ATD and the surface of underlying terrace gravels at c 107.6m ATD.</p>
--

Phases 1 to 4 will take place at different times in the different areas, as shown in section 1.2, and the programme in section 25.

Within these phases, the work will be carried out to the following methodologies below, but the detailed sequence and programme of works in each area differs, see 5.4.

5.1.2 Area 4

The works in Area 4 consists of a single phase of general watching brief (GWB).

5.2 General Watching Brief Methodology (incl. Phase 1 tasks)

General watching briefs (GWB) are required in Area 4 during the Phase 1 work in Area 1 (Fig 3) and during the limited stages of the installation of propping in Area 1.

Where requested by Crossrail, monitoring will also include any further relevant works undertaken by the contractors that risk disturbing archaeological deposits.

5.2.1 Site-specific General Watching Brief methodology

MOLA will monitor the Phase 1 work undertaken by C502 Principal Contractor Laing O'Rourke, and the C502 exhumation contractor TCS, as a general watching brief, to identify and record any surviving archaeological remains exposed by those works (this excludes recording the disarticulated human remains being removed by the exhumation contractor. The exhumation contractor will provide quantification of the human remains removed to MOLA, for provision to Crossrail). Possible remains include 18th- and 19th-century buildings, including buildings encroaching on the burial ground after its closure, remains of the former Broad Street station, and waste from craft industries.

For Phase 1 tasks:

- The C502 Principal Contractor will remove **modern overburden** using a mechanical excavator with a flat-bladed ditching bucket (unless agreed otherwise) [approx. 1.1m deep].
- The C502 exhumation contractor will remove deposits containing **disarticulated human bone** down to the surface of the *in situ* burial ground, or other archaeological remains [average approx. 0.3m deep].
- The MOLA Senior Archaeologist/Project Officer conducting the watching brief will determine when *in situ* remains have been reached [expected at average of approx. 111.5m ATD, 1.4m below ground level].
- The C502 Principal Contractor or exhumation contractor will remove by hand the remaining disarticulated human remains and modern overburden, under close MOLA supervision, in order to minimise the time required at the start of Phase 2, and allowing the Project Archaeologist to refine the allocation of Method 1 and Method 2 areas for Phase 2 (see 1.2).
- In Phase 1 works, extensive *in situ* archaeological remains will normally be defined, exposed and left for full archaeological excavation in Phase 2. However if discrete features (for example walls) can be recorded (and where practicable, excavated/removed) during Phase 1 this will be undertaken with the agreement of the Project Archaeologist and Principal Contractor. Similarly, if the Principal Contractor requires any post-medieval archaeological features or structures to be partially or completely removed (for safety reasons for example) these will be exposed, cleaned and recorded before their removal.

For Propping/Phase 3 tasks:

In the GWBs during propping and temporary works in Area 1, it is assumed that any significant archaeological deposits would need to be locally excavated and recorded (unless they can be left *in situ*). This would be arranged following discussions with the Project Archaeologist and the Principal Contractor.

For less significant remains (such as the predicted consolidation), the methodology will be as per section 5.2.2.

For Area 4:

It is currently understood that there will be no bulk ground excavation across Area 4, but localised excavation for drainage, utilities and landscaping for public realm, will take place.

MOLA will monitor the groundworks undertaken by C502, and (if present) the removal for reburial of both disarticulated human remains and any *in situ* burials by the C502 Exhumation Contractor (WSI Addendum – Crossrail 2014, 6.3.1).

The MOLA Senior Archaeologist/Project Officer will expose and record any archaeological remains (apart from *in situ* burials, which are being removed by the exhumation contractor) which survive within the area (eg structure or features associated with the burial ground or post-cemetery development, and craft industry waste).

Following recording, the MOLA Senior Archaeologist/Project Officer will supervise the removal of any walls by C502, to ensure that any re-used headstones or burial monuments are recorded and where appropriate retained. If earlier archaeological remains are identified beneath these structures, they will be hand cleaned and recorded.

5.2.2 Generic General Watching Brief methodology

A General Watching Brief consists of a basic monitoring presence to observe the works carried out either by the Principal Contractor or their sub-contractor, without constraint on their working methods (Crossrail 2009 Archaeology Specification for Evaluation & Mitigation (including Watching Brief) CR-PN-LWS-EN-SP-0001, version 3). This includes making a basic record of notes, measurements, drawings and photographs consistent with an observation role: eg character, depth, date and survival/truncation of deposit sequence, and the height of the natural geology. Monitoring and recording during a general watching brief will generally be made by observation from ground level. During a general watching brief, MOLA staff will only enter the trench or area of excavation by agreement with the Principal Contractor or their sub-contractor (providing that there is proper access and that it is safe to do).

[table on next page to avoid break in table]

5.3 Phases 2 to 4: Archaeological Excavation Methodology

Summary of methodology for Archaeological Excavation (Fig 3)

Phase 2: 16th to 18th-century Burial Ground

- Fieldwork Objectives: BB1 to BB12, PM1 to PM5
- MOLA will archaeologically excavate the burial ground, and associated or later structures and deposits to its base at an estimated average c 110.4m ATD, c 2.8–3.0m BGL (down to 109.45–110.4m ATD locally in individual graves/burial pits, possibly deeper isolated locations). This will include burials cut into the underlying Phase 3 deposits. For the archaeological excavation methodology for human remains (including the two different excavation methodologies) see section 6.

Phase 3: Post-Roman Moorfields Marsh and consolidation (see also 5.4)

- Fieldwork Objectives: RM3, RM4, RM7, RM8, RM13, BB1
- MOLA will archaeologically excavate any further features associated with early post-medieval horticulture (c 16th-century), the consolidation of the Moorfields Marsh (c 16th-century) and the underlying Moorfields Marsh, any further features associated with medieval industry, along with any other associated remains.
- **3.1** – Firstly, where possible, areas of extensive homogenous deposits will be excavated using a mechanical excavator provided by the C502 Principal Contractor (along with a banksman, operator, etc) using a flat bladed bucket, under close archaeological direction and control. This is expected to be (depend on safety considerations and modern intrusions) the removal of one half of the deposits in Area 1 (provisionally the southern 'half', not necessarily 50%).
- *If any features or other significant deposits are present within/cut through the marsh or consolidation: machining will temporarily cease at that location (moving to another part of the area), and MOLA will rapidly record and excavate the features/deposits, before machine excavation recommences.*
- **3.2** – This will produce an east–west section (or composite section, as necessary) across the site, showing the profile of the marsh and Walbrook Valley. After cleaning, this will be recorded and sampled by a MOLA Geoarchaeologist (supported by the site team as appropriate).
- **3.3** – Following recording and sampling, the remainder of the marsh and consolidation deposits will be mechanically excavated using the same methodology as Phase 3.1 above.

Phase 4: Roman activity, and earlier alluvium

- Fieldwork Objectives: RM1 to RM6, RM9 to RM12
- MOLA will archaeologically excavate the remains of Roman activity. These will normally be hand excavated, but extensive homogenous deposits, such as reclamation dumps, may make use of localised machine excavation, by the C502 Principal Contractor (along with a banksman, etc), under close archaeological direction and control.
- Where extensive alluvial deposits are present (expected across most of the site, underlying Roman activity), these will be recorded and excavated using the same methodology as Phase 3 (machine excavation under close archaeological direction and control to produce an east–west sections, geoarchaeological recording and sampling, machine excavation of the remainder).

5.3.1 Generic methods

A brief outline of MOLA's working methods are highlighted in section 20.7.3.

5.4 Specific methodologies for Area 1

The detailed sequence and programme of works in each area differs, to allow for varying engineering works to prop the secant piled walls in Area 1. (For completion forms, see 2.3.2).

5.4.1 Area 1

- **Phase 1 and Phase 2:** will be conducted as per the standard methodology (see 5.2 and 5.3).
- **If burials extend below 110.3m ATD, as is likely, MOLA will consult with C502 and the Project Archaeologist as to whether their extent and local density allows or prevents their excavation during Phase 2. If it is considered that excavation would reduce stability before propping, then protective materials will need to be installed by C502 before commencing Phase 3b propping.** Historic England's Regional Science Advisor has been consulted about the depth and specification for such temporary protection (semi-permeable material, sand, and boards (see 20.8.1.1).
- **Phase 3:** it is predicted that the upper c 0.4m of the 'post-Roman' deposits (16th-century consolidation of the Moorfields Marsh) will need to be removed to form the construction level for the propping in Area 1. Therefore Phase 3 in Area 1 will be conducted in three sub-phases:
 - Phase 3a:** MOLA excavate the upper c 0.1m of the 'post-Roman' deposits (predicted to be 16th-century consolidation of the Moorfields Marsh, (as well as possible horticultural features in the top of the marsh), down to the construction level for the props of 110.3m ATD. This will use the standard Phase 3 methodology (see 5.3).
 - Phase 3b:** C502 install protective materials (eg tarpaulins and boards, for dumped deposits not predicted to be sensitive) under General Watching Brief from MOLA. C502 then install the props, and subsequently remove the protective materials. If any excavations are required to install the props, MOLA will monitor this and record the deposits exposed and removed under a General Watching Brief.
 - Phase 3c:** MOLA excavate the remaining 'post-Roman' deposits (further 16th-century consolidation, horticultural features overlying Moorfields Marsh deposits and medieval industrial features). This will also use the standard Phase 3 methodology (see 5.3).
- **Phase 4:** will be conducted as per the standard methodology (see 5.3), but working beneath the props.

5.5 Recording Methods

The archaeological remains will be recorded to best practice standards, in order to achieve archaeological objectives. On-site recording will include as a minimum:

- The written record of individual context descriptions on appropriate pro-forma sheets. For additional recording required for the burial methodology, see 6.4.

- The drawn record: including plans of individual contexts, supplemented by multi-context plans of features or structures if these are required to provide additional information (or if appropriate for multiple features with simple relationships in watching brief conditions), and section drawings (1:10, 1:20, or 1:50). Isolated archaeological remains (artefacts) may be spot-located in plan and a height provided where possible. Deposits which are regular in plan (cut features such as pits and ditches for example) may be located though co-ordinates, annotated with dimensions, and recorded digitally.
- A stratigraphic matrix of the sequence of deposits and structures encountered in each trench will be produced.
- The photographic record: photographs will be taken with a digital camera of resolution of 12 megapixel or greater, providing similar resolution to a conventional 35mm SLR. The photographic record will include photographs of archaeological deposits, appropriate groups of features, structures, and topographic deposits. Each photograph will be recorded on site using a proforma photographic record sheet, showing image number, area/test pit, context number(s), subject/description, direction of view, and date. In addition, appropriate record photographs will be undertaken to illustrate work in progress.
- Levels on plans, sections and other fieldwork records shall be related to Ordnance datum.
- Other appropriate drawn and written records will be produced (for environmental sampling etc) as is necessary.

5.6 Metal Detecting

5.6.1 General principles

Metal detecting will not be undertaken during the Phase 1 and 2 elements of work at the site. Metal detecting within post-medieval burial sites, particularly those dating to the 18th and 19th centuries, can potentially produce a great deal of metalwork often from poorly sealed contexts and often low-grade in terms of archaeological value or significance. Given that all or most discrete burial deposits will be investigated using hand excavation procedures, it is likely that most metal small-finds will be identified and either collected, retained or discarded by the archaeologists at the time of excavation (see 8.3), negating the need for metal detecting during this phase of work.

Metal detecting is proposed during the Phase 3 and 4 elements of the archaeological work (post-Roman and Roman/pre-Roman deposits respectively). During Phase 3, exposed surfaces (and spoil if safe and practicable) created during the mechanical excavation of any post-Roman material (Moorfields Marsh for example) will be scanned by a metal detector, as will excavated areas (and spoil) created by localised hand excavation. During Phase 4, deposits identified as of Roman or Late Prehistoric date will be metal detected prior to and during archaeological excavation. The site-specific methodologies for these phases are detailed below.

5.6.2 Staffing and equipment

The proposed methodology requires up to two trained operatives on site, during only the first shift, whose prime responsibility will be metal detecting. These personnel will be highly experienced volunteers, who regularly contribute to large and complex archaeological sites with MOLA. All volunteer MOLA staff will be full CSCS card holders and will work within the same parameters as conventional MOLA employees. The metal detectorists, with the MOLA

site supervisors, will be responsible for ensuring that the scanning strategy is followed and is consistent. The appointed personnel will also be responsible for ensuring that the equipment is maintained and stowed correctly, and for undertaking the actual detecting work. Metal detectors and any associated equipment will be stored either within the strongboxes within the trenches, or within the steel tool-storage container provided for MOLA.

In the case that metal detecting is required during the second (later) shift during the Phase 3 and 4 excavations (for example in the case that a feature producing metal-work has been partially excavated during the previous shift) MOLA will retain up to two metal detectors on-site, such that appropriately trained MOLA excavation staff are able to scan relevant deposits as they are completed or excavated.

5.6.3 Method and Recording

The strategy can be broken down into four basic components:

1. **During machine excavation within Phase 3 and (if used) 4:** regular scans over exposed areas or spits. These will be supplemented if necessary by more focused scans if deposits of higher potential for metalwork are identified, or an excavated feature producing a lot of metalwork is encountered. Regular scanning will enable the ongoing assessment of immediate potential for metal finds and will ensure adequate opportunity for metal finds to be located and recovered.
2. **Archaeological hand excavation in Phase 4 (and any discrete features present in Phase 3):** regular scans will be made of features/contexts before and during excavation, to identify potential finds spots. Spoil from contexts forming such potential finds spots will be regularly scanned as hand excavation progresses. Scanning should take place while the archaeologists excavating the contexts are present, where possible, to keep them informed of results, ensure context numbers are properly assigned and records are consistent.
3. Spoil from these areas is likely to be placed on boards and scanned by the metal detectorist. Once scanned the checked spoil can then be removed to the spoil storage areas.
4. A systematic record of recovered metal finds will be made during the scanning process: the context number from the relevant deposit (and for machine excavation of large deposits the basic location of each find and its OD height of the spit or context from which it was recovered will also be recorded). This data will then be cross-referred with the relevant context sheets for that deposit. In some cases (pit groups producing significant metalwork assemblages for example) additional context numbers will be allocated as required. Finds labels will be marked with **MD** in permanent marker to clarify what proportion of finds was found through detection and what proportion by hand collection. Context sheets also have boxes to note whether metal detecting has taken place, these should also be filled in as a matter of course. Communication between the detectorists, site supervisors and the excavators will be key to a well-documented record.
5. After consultation on site between the Project Archaeologist and MOLA a decision will be taken on the retention strategy for the metal finds recovered. In this way common or low-grade finds that may have limited value for retention, conservation or further study, can be reviewed for significance and may be retained for other stakeholders involved in Crossrail activities (for example items may be retained for local interest groups, public displays or events).

5.7 Survey and Setting Out Method and IT Capability

The required methodology for IT (including site survey) will be carried out in accordance with the C257 Contract and project standard survey requirements.

- In the **excavation** (Phases 2 to 4 in Area 1), MOLA Geomatics staff will survey and maintain MOLA's local baselines to Crossrail London Survey Grid co-ordinates, using Crossrail survey control. The MOLA Geomatics team will collect locational data using tripod mounted, Leica reflectorless EDMs (total stations). It is not anticipated that Roving GPS units will be used at the site due to the constraints of deep excavations within a built up area, but MOLA are able to deploy this equipment should it be required.
- MOLA will obtain from either the Principal Contractor C502 Laing O'Rourke or Crossrail's survey department the locations and values of the project datums in the area of the site.
- For some forms of features (eg burial vaults or extensive building remains) laser scanning may be an appropriate method to supplement (not replace) standard methods of survey. If such cases arise, a process will be agreed between MOLA, the Project Archaeologist, and Crossrail's specialists who have this equipment.
- In situations where the Principal Contractor has surveyed 'as-dug' locations of the **general watching brief** areas (Area 4), then this digital data will be passed to MOLA to reduce the extent of MOLA surveying.
- In some circumstances during these **general watching briefs**, it may be appropriate and more efficient for the Principal Contractor's surveyors (if they are available) to survey any MOLA temporary baselines/reference points, or individual features, as required. This will be determined by liaison between MOLA and the Principal Contractor. MOLA will also obtain from the Principal Contractor or Project Archaeologist CAD plans to London Survey Grid of the area as-dug.
- Otherwise, for the **general watching briefs** (eg the Phase 1 task in Area 1), MOLA Geomatics staff will survey MOLA's baselines/reference points, or individual features, as required. If the Principal Contractor has not surveyed an as-dug location (see above), MOLA will also survey the limits of excavation.
- Upon completion of the fieldwork, a Site Survey Report will be compiled for any surveying conducted by MOLA.

6 Burial deposits and human remains

6.1 Site-specific Strategy for human remains

Six Roman burials were found during excavations in Area 2/3. Works in Area 4 are too shallow to reach Roman deposits. A number of redeposited human bones were also found in Roman features. Further *in situ* burials and redeposited bone may be present during Phases 3 and 4) in Area 1; these will be dealt with according to MOLA's normal methodology, with all burials being fully recorded, excavated, and recovered for further investigation off-site. See 6.5 and 6.9. No medieval human remains have been found during earlier fieldwork.

All Roman and medieval inhumations will be dealt with using the same method as for the Category A post-medieval burials.

The strategy for post-medieval human remains, however, differs:

It is predicted from previous fieldwork on the site that approximately 750 burials from the 16th to 18th-century Bedlam Burial Ground will be present in Area 1 (based on the average density in Area 2/3).

Exhumation for the post-medieval burials at the Broadgate Ticket Hall site was originally proposed to be a sample of 40% of the area to be excavated archaeologically by MOLA and recovered for further investigation, whilst the remaining 60% of the area was to be exhumed by an exhumation contractor and go straight to reburial.

Further consideration by Crossrail suggested that it would be difficult in the circumstances of an archaeological watching brief on removal by an exhumation contractor to obtain archaeological information. In particular, this was unlikely to be able to identify multiple or mass burial pits or other significant features (suggested by earlier fieldwork).

Therefore, the following strategy has been devised by Crossrail with MOLA for dealing with this very large quantity of human remains, in order to address the specific circumstances of this site. The overall strategy is set out in the WSI Addendum (Crossrail 2014, 6.2.1 to 6.2.15):

During the Phase 2 excavation, two different excavation methodologies will be used side by side, to provide a statistically/archaeologically valid sample and ensure prompt reburial of majority of the human remains: Method 1 (40% of available site area) and Method 2 (60% of the available site area); see sections 6.1 to 6.4 for full explanation of the methodology.

- In **Phase 1**, the C502 exhumation contractor will remove the layer of disturbed burials (redeposited, disarticulated, human bone) which has been demonstrated to overlie the *in situ* burials.
- In **Phase 2**, the *in situ* burials will be excavated as follows:
 - **Method 1:** 40% of the area to be excavated archaeologically by MOLA and the skeletons recovered for further investigation. These form **Category A** burials.
 - **Method 2:** 60% of the area to be excavated archaeologically by MOLA, but after assessment by an Osteologist, recording, and lifting, the majority of the skeletons (forming **Category C**) would be passed to the C502 exhumation contractor for reburial in the near future, with no further archaeological investigation.

Any burials determined by a MOLA osteologist to be 'special cases' (forming **Category B**) would be treated the same as the Category A burials, and recovered for further investigation.

6.2 General considerations

The overall methodology for human remains is set out in detail in the SS-WSI and Addendum, and the MOLA Framework Method Statement (Technical Submission 2.4, section 4.6) and is not repeated here. It is known that human remains will be present on this site, and therefore an exhumation licence from the Ministry of Justice has been obtained, see 12.3 for details.

Cemetery soils and *in situ* burials are predicted for Area 1, between c 111.3m and a maximum depth of 109.45m ATD, with the surface of the upper level of surviving *in situ* burials varying across the site between 110.0 and 111.3m ATD.

When human remains are present (excavation Phases 1 and 2 (and possibly Phases 3 or 4) in Area 1, also [if present] during the watching briefs in Area 4), *in accordance with the legal requirements of the burial licence* (12.3), the **Principal Contractor, C502 Laing O'Rourke will be required to screen the burials from any public view, including views from above** – eg windows of buildings overlooking the site on Liverpool Street, Blomfield Street and Old Broad Street (see 20.8.1, also WSI Addendum 4.5.3 & 4.6.1).

Archaeological investigation of human remains will be carried out in accordance with the relevant documents in section 3.2, in particular:

- Centre for Archaeology Guidelines. Human Bones from Archaeological Sites: guidelines for producing assessment documents and analytical reports [English Heritage (Mays S, Brickley M, and Dodwell N) 2004]
- Human osteology method statement [Museum of London (ed. Powers N) 2008]

Infant and neonatal burials will be block-lifted to ensure full recovery. Where foetal remains are found in utero, they will be given a unique context number but will be retained with the remains of the mother throughout the post-excavation process.

The archaeologists will avoid leaving remains exposed overnight wherever possible.

Any fragile or unusual remains (for example those with pathological lesions) will be carefully packaged and stored on site, and will be given priority for transportation to the MOLA offices at Mortimer Wheeler House, to avoid damage. Similarly neonatal remains will be carefully packaged and stored/stacked within stackable plastic trays (bread crates or similar are the most suitable and will be supplied by MOLA) so that fragile human bone is not damaged during storage and onward transport.

In the case that sealed lead coffins and/or soft tissue deposits are encountered, these will not be further investigated until a task-specific Risk Assessment of the deposit has been undertaken by MOLA. This is further detailed within section 6.11.

Excavated remains to be recovered will be held temporarily in secure storage at the Liverpool Street worksite, prior to transfer to the MOLA processing facilities.

The soil from grave fills and cemetery deposits, even where hand excavated, has potential to contain human remains. Such soils will be visually inspected by MOLA staff, and will be stored separately by the Principal Contractor from other spoil. If deemed necessary by the Crossrail Project Archaeologist, they will be subsequently taken by an exhumation contractor to be screened for human remains. Where identified the exhumation contractor will recover and rebury them in accordance with the burial licence.

It currently appears unlikely that soft tissue, sealed or unsealed lead coffins, sealed crypts, (or animal hair with potential for Anthrax spores), might be present. If they are encountered, the procedure for lead coffins is defined in section 6.11, for other hazards work will stop immediately, the localised excavation area will be vacated, and specific individual

circumstances will be assessed. Work will not recommence until a new task specific risk assessment has been produced, and its requirements enacted (eg provision of task-specific PPE (see Risk Assessment 34), and method of safe removal and storage of remains).

To reduce delays, preliminary risk assessments are included in section 21 (RAs 35b, 35c, and 35d, at end of the risk assessments). These are NOT to be used as they stand, but the individual circumstances must be assessed in conjunction with the C502 Principal Contractor and appropriate specialists (including the C502 exhumation contractor), and the appropriate risk assessment(s) modified and signed off by the MOLA Project Officer or Senior Archaeologist, and by the MOLA H&S Compliance Manager, before work may recommence.

For coffin fittings and metalwork see 8.3.

6.3 Site-Specific Post-medieval Human Remains Strategy: Phase 1 and General Watching Briefs

During Phase 1 within Area 1 and the General Watching Brief in Area 4, MOLA will only be monitoring the collection and removal for reburial of disarticulated human remains by the C502 exhumation contractor, as per the WSI Addendum (Crossrail 2014). The exhumation contractor will quantify the collected remains, and pass this to MOLA, who will pass it to Crossrail. MOLA will not, therefore, be recording or retrieving human remains, unless specifically instructed by the Project Archaeologist for eg any significant *in situ* burials.

At the end of the Phase 1 work, the C502 exhumation contractor will ensure that the disarticulated and disturbed horizon is completely removed, by hand cleaning with eg spades or hoes (under supervision and direction of MOLA) following the expected highly localised minor changes in level of the surface of the undisturbed *in situ* burials.

6.4 Site-Specific Post-medieval Human Remains Strategy: Phase 2

6.4.1 Allocation of Method 1 and Method 2 areas

The area allocation for Methods 1 (40%) and 2 (60%) (see 6.1,) will be agreed between MOLA and Crossrail, and defined in advance of the relevant fieldwork by the Project Archaeologist.

At the start of the Phase 2 excavation, MOLA will clean the surface of the cemetery deposit so that (where possible) the layout and distribution of the upper layer of burials is visible. This will enable the provisional layout of the areas of Method 1 and Method 2 methodologies to be refined by the Project Archaeologist and MOLA (see flow diagram 6.4.2).

The areas will be allocated to produce an even coverage of Area 1, intended to address any variations between east and west, and north and south parts of the excavation areas. This distribution will take into account areas of burials that have been previously removed by previous fieldwork and modern truncation, and for convenience may be aligned with any boundaries between rows of burials visible on the surface after cleaning. Whilst not strictly a pure mathematically random sample, this is not a selective sampling process (eg we are not allocating the Method 1 (40%) areas based on the features of burials seen at the surface). Thus the Category A burials probably form as reasonable a random sample as can be obtained in a cemetery, especially if the variations through its depth, not visible at the surface of these deeply stratified intercutting deposits, are considered. The same cannot be said of the Category B burials, which have been chosen for unusual characteristics, and therefore their statistics will be kept separate from Category A in assessment and analysis (as will Category C data, which has been biased by removal of the Category B).

For these burial deposits, the method deployed (Method 1/Category A: 40% or Method 2/Categories B and C: 60%) will be clearly marked on the relevant context sheet and/or context register, allowing for checks to be made during the post-excavation assessment and analyses of the recovered and retained human bone assemblages.

6.4.2 Methodology summary (see flow diagram 6.4.3)

As described in 6.1, burials in the **40% of the area** of the site assigned to **Method 1** will be excavated to the **normal MOLA methodology** for efficient excavation and recording of large numbers of standardised post-medieval burials. They are lifted and bagged using up to five separate bags (refer to 6.8.1), stored temporarily on site in secure storage, and transferred to MOLA facilities for processing and further investigation (initially, recording for post-excavation assessment, and potentially analysis for publication). These are designated **Category A** burials.

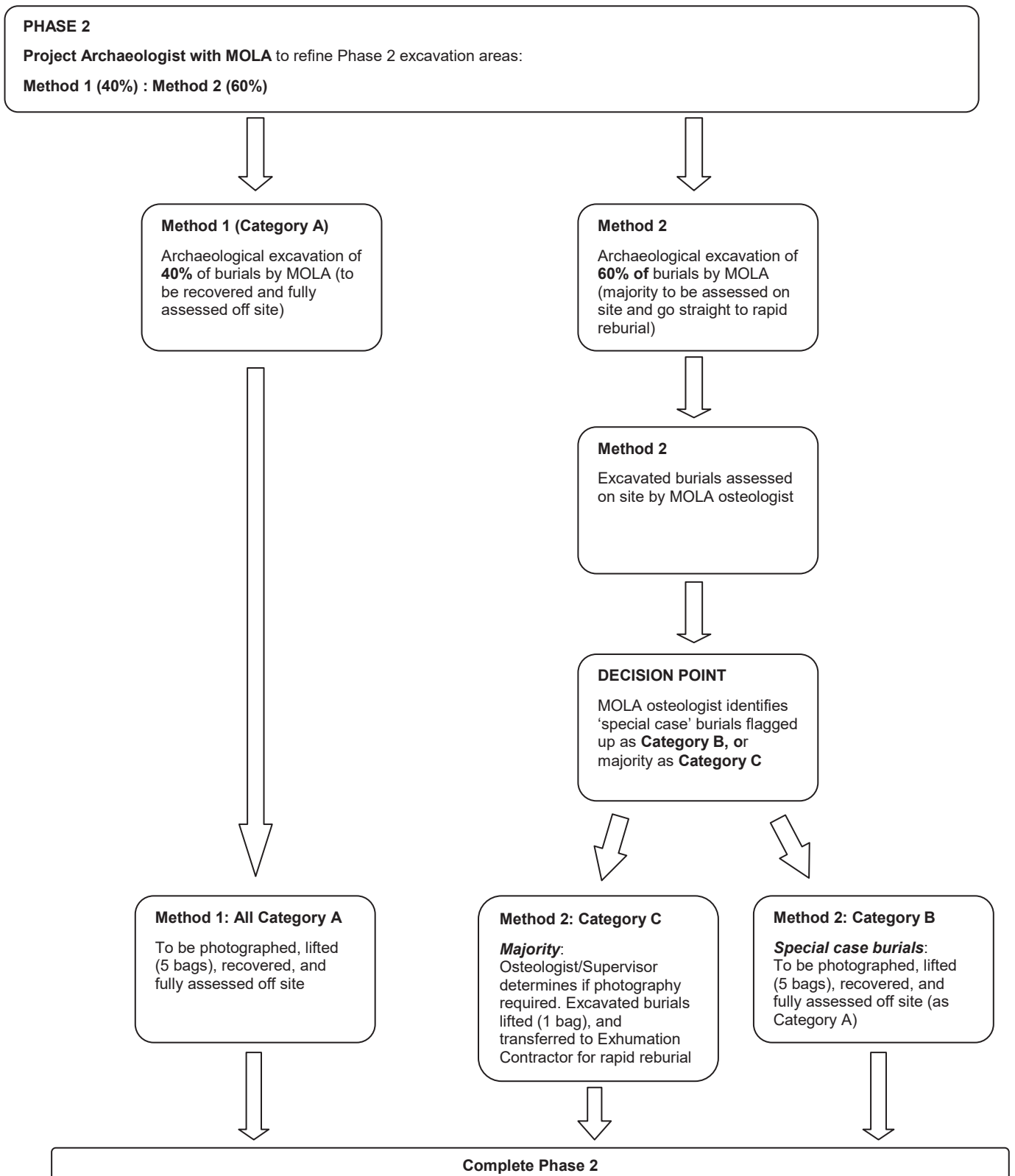
*Where a burial lies **across the boundaries** of the Method 1 and Method 2 areas, it will be treated as belonging to the area in which its **head** lies, **unless** determined otherwise by a MOLA supervisor or Osteologist.*

In the **60% of the area** of the site assigned to **Method 2**, the process differs.

- Once identified, the skeletons are exposed and cleaned sufficiently for an Osteologist to assess them.
- An Osteologist assesses whether the burial is a 'special case' (see 6.4.5). If so, it is assigned to **Category B**, and is treated the same as Category A.
- If the burial is one of the majority which do **not** merit 'special case' Category B methods, they are assessed on site by the Osteologist, who will record (where possible) age, biological sex, and any obvious pathologies and/or injuries. These are designated **Category C** burials.
- At the same time, the excavator will record the burial using the standard MOLA methods, with the exception that photography is not required for the majority of Category C burials (as they will not be assessed or analysed further before reburial, a record photograph, and the associated time-consuming cleaning, is not necessary unless the burial shows unusual characteristics, yet does not merit Category B status. A mechanism to allow for unusual Category C deposits to be photographed has however been devised, and is explained below. [note: some excavators suggest that photography is unnecessary for ANY standardised post-medieval burial that has no significant features]. However, the general site photography will include wider views of burials in all three categories.
- In occasional circumstances, the Osteologist and/or a supervisor may assess that a Category C burial merits a photograph, but not Category B (special case) status (for example particularly good preservation, but no interesting pathologies). This deposit will then be cleaned photographed and recorded (as for a Category A burials). Following assessment, recording and any photography, Category C burials will be lifted, bagged in a single bag (6.8.2), and stored securely prior to being collected by the exhumation contractor for reburial.

The processual details of excavation Phase 2 are further described in the following, and illustrated in the flow diagram 6.4.3.

6.4.3 Flow diagram summarising Methodology for Phase 2 burials



6.4.4 Method 1: Category A burials (40%): General considerations

Method 1: (excavation of Category A burial deposits)

- Archaeological excavation of 40% cemetery deposit from each area.
- MOLA to excavate, record, photograph and remove burial deposits.
- Human skeletons bagged as **Category A**
- Collected by MOLA, stored, and investigated further off-site by the MOLA osteology team.

Category A burial deposits will be excavated in accordance with the standards and guidance set out within sections 3.2 and 6.1 of this document. Once exposed and trowel cleaned, record photographs will be taken. Generally single detail photographs showing the full extent of the burial will be taken, and retained for the field archive record (6.7). The purpose of these images will be to capture detail of the burial itself, details of grave goods (if any), and truncation from other burial deposits or later disturbance.

Because of the standardised position of post-medieval burials, in most cases, where skeleton and coffin are preserved, both will not be planned. Coffins will be planned to scale; skeletons will only be planned to scale if there is no coffin, and will comprise c 6–8 points at eg the skull and major joints, to indicate its position and location. In addition a measured sketch of the *in situ* burial deposit will be undertaken on the reverse of the MOLA skeleton recording sheet.

When all recording, photography, and any sampling (6.10) have been completed, the Category A skeletal remains will be recovered and bagged (6.8) for assessment (off-site).

6.4.5 Method 2: Category B and C burials (60%): General considerations

Method 2: (excavation of Category B and C burial deposits)

- Archaeological excavation of 60% of the cemetery deposit (defined by areas).
- MOLA to expose and record burials
- MOLA osteologist to determine if a burial is **Category B ‘special case’** or **Category C** (majority).
- **Category B:**
 - MOLA to excavate, record, photograph, lift and bag/label (5 bags) burial deposit (as for Category A).
 - Collected by MOLA, stored and assessed off-site by the MOLA osteology team.
- **Category C:**
 - MOLA osteologist to undertake **in-situ** basic assessment recording prior to lifting.
 - MOLA osteologist/supervisor to determine if photograph is required
 - bagged/labelled (single bag)
 - transferred to Exhumation Contractor for storage and reburial

As detailed in section 6.4 site specific recording methodologies have been developed for the Category B and C excavations. Method 2 (60% sample) is intended to record standardised

information from burials (which would otherwise have been lost if exhumed by an exhumation contractor), to form part of the overarching analysis of the site burial sample across the site. It also allows burials of particular archaeological or osteological interest (Category B) to be identified, and fully assessed off-site after cleaning/processing.

Category B burial deposits ('special cases') may be selected out of the 60% sample by the MOLA osteology team. This additional selection process (or decision point, in the flow chart) is intended to allow an opportunity for burials of particular archaeological or osteological interest to be identified and retained for further analysis by MOLA. Category B selections might include: those in multiple burial pits, well-preserved coffins, tombs, named individuals, and those with grave goods. Individuals or groups with unusual pathologies or other non-standard, interesting, characteristics may also be retained. These decisions will be informed by the research aims for the excavation.

For **Category C** burials (the majority of the 60% sample) articulated skeletal remains will be sufficiently trowel-cleaned to allow for an on-site MOLA osteologist to make a rapid assessment and record the age and sex of the individual and any visible pathology. The MOLA osteologist and/or supervisor will assess the need for a photograph of the in-situ skeleton.

Following on from the rapid recording and assessment process, **Category C** burials will be lifted, bagged and labelled by MOLA. The bagged Category C deposit will then be transferred to the C502 exhumation contractor (TCS) for storage and reburial.

6.5 Site-Specific Human Remains Strategy: Phases 3 and 4

In general, medieval and Roman inhumations will be dealt with using the same method as the Category A post-medieval burials (6.4.4). In some cases, burials of medieval and Roman date may require more detailed excavation and recording because the burial type (or group) is distinctive in some way. For example burials from these dates can be interred prone, or not aligned east–west, as is the convention for Christian burials. Similarly, graves may contain assemblages of grave goods, or be associated with deposits, such as crushed chalk or charcoal. The key differences in excavation and recording technique may be applicable to one or all of the following:

- Additional cleaning and definition of skeletal remains and associated deposits to allow detailed assessment
- Additional cleaning, definition and detail recording of burial structures (for example stone-lined cists or individual tombs)
- Detail photography of select parts of the burial deposit (For example coins placed on the eyes of an individual or grave goods)
- Scaled drawn plans of *in situ* skeletal remains, particularly if prone, crouched, with unusual alignments, or with the skull placed elsewhere in the grave (other than in the correct anatomical position) (drawn at 1:20)
- Scaled drawn plan of interred associated grave goods (or added to above when planned)
- Additional levelling if burials are found not interred within conventional graves (for example buried within pits or wells)
- Bulk sampling of imported deposits, such as crushed chalk or charcoal

See 6.9 for cremations.

6.6 Disarticulated human bone

6.6.1 Disarticulated human bone from Phase 2

A large assemblage of disarticulated human bone is expected during the Phase 2 excavations, and therefore a simple and specific methodological approach is required to efficiently manage the amount of material being collected. Generally, it will not be appropriate to record an estimate for a minimum number of individuals (MNI) for disarticulated human bone, although the exhumation contractor will quantify the remains collected.

In cases where disarticulated human bone is encountered as a discrete assemblage (re-buried within a pit or structure for example) or where visible pathology is evident, this material will be scanned by the on-site MOLA osteologists so that a decision can be made about its potential for retention for further investigation.

During Phase 2 in all but specific cases (see above) post-medieval re-deposited disarticulated human bone will not be retained for further examination (assessment). Disarticulated bone will be collected and the assemblages placed into large perforated archive quality polythene finds bags. Each bag of disarticulated bone will be double labelled (6.8) and each bag counted (or catalogued) by MOLA, prior to being transferred to the exhumation contractor for rapid reburial.

6.6.2 Disarticulated human bone from Phases 3 and 4

In cases where small quantities of disarticulated material are recovered during the Phase 3 (post-Roman) and Phase 4 (Roman) excavations, this material will be recovered for off-site assessment.

6.7 Photography of in-situ burial deposits

6.7.1 General

Standard record photographs of burials (and significant deposits of disarticulated bone, and other features) will be undertaken by selected members of the site team who will have been trained by the MOLA photographic department and site supervisors regarding the levels and standards of photography required. Where practicable an image from the foot end of the skeleton, using a tripod with sufficient elevation to produce a near-vertical shot, will be captured for each Category A and B deposit.

This will be supplemented by photography from a MOLA professional photographer, who will visit the site twice a week (throughout Phase 2, as well as Phases 3 and 4), and photograph burials or groups of particular interest, as part of the normal scope of their photography.

6.7.2 Category A and B burials

Digital record photographs will be taken of Category A and B burials, and also coffin plates and coffin furniture and decorative coffin studs.

6.7.3 Category C burials

Category C burials will **not** normally be photographed (6.4.1). A supervisor or osteologist will decide whether a Category C burial requires photography (and the additional cleaning

needed for this). This is expected to affect only a small proportion of burials in the Method 2 areas, as significant characteristics would normally merit Category B status.

6.8 Labelling and bagging burial deposits

A site-specific methodology for the bagging and labelling of human remains from this archaeological fieldwork (Phase 2, and if required Phases 3 and 4) has been devised.

6.8.1 Category A and B burials:

Following excavation and recording the skeletal remains will be carefully lifted for placement in **up to 5** archive quality perforated plastic finds bags.

Each bag will require 2 x Tyvek labels (non-biodegradable) with site code, context number, category and description (eg 'left limbs') of the skeleton **clearly** marked. One label should be contained within the bag, the other stapled to the inside of the bag (note that labels should not be attached to the outside of the bags as these may become dislodged during transferral and storage).

For each **Category A** burial:

- 1 x clear perforated bag for skull (eg 90cm by 60cm), with 2 labels
- 1 x clear perforated bag for torso (eg 90cm by 60cm), with 2 labels
- 1 x clear perforated bag for left limbs (eg 60cm by 45cm), with 2 labels
- 1 x clear perforated bag for right limbs (eg 60cm by 45cm), with 2 labels
- 1 x clear perforated outer bag to contain the above bags (eg 90cm by 60cm), with 2 labels

Category B burials as above, but with a **Yellow outer bag** to prevent confusion with other categories.

6.8.2 Category C burials:

Following excavation/recording and on-site assessment, skeletal remains will be lifted and placed within a **single** large distinctively-coloured (**Red**) archive quality perforated polythene finds bag and labelled individually. The bags will be of a different distinctive colour to those for Category B, to prevent confusion with the other categories.

The rationale for individual bagging and labelling is to retain (a far as practicable) a unique identifier (context number) for each burial should exhumation be required at a later stage, eg after reburial.

For each **Category C** burial:

- 1 x **Red** perforated bag for each individual (eg 90cm by 60cm), with 2 labels

6.8.3 General

More than sufficient yellow and red bags have been purchased by MOLA to cover the predicted number of burials in Categories B and C, respectively. It is therefore unlikely that these will run out. The Project Officer will liaise with the Senior Osteological Processer, and note if, during Area 1 Phase 2, there have been significantly more burials than predicted, and whether the number of bags appears likely to be insufficient. If so, used yellow bags recovered by the MOLA processing department will be re-used to cover the additional Category B burials. For additional Category C burials, either more red bags will be purchased, or if the likely excess is too small to make this viable, other coloured bags in stock will be used to differentiate the Category C burials from Categories A and B, eg black.

6.9 Cremation burials (Phase 4)

It is not anticipated that cremations will be found within the Broadgate Ticket Hall excavation areas, however if present, they will be subject to 100% bulk sampling. If found within urns or in association with other ceramic vessels, these will be recovered where possible as intact burial deposits, and removed off-site for further assessment. Where vessels or urns and their contents are fractured or damaged, these may be excavated and lifted as block deposits.

In cases where cremation deposits are revealed, external specialists including MOLA conservators may be consulted or deployed to site, to stabilise and help lift items. Assessment and suitability for laboratory based excavation by a specialist (off-site) will be aided by X-Ray or CAT scanning.

6.10 Sampling from Inhumations

Samples will be taken for analysis of the abdominal area *only* if discrete individuals can be securely identified, uncontaminated by deposits from other burials, *and* if the soil conditions are wet or moist. Such conditions are unlikely for the dense, intercutting, post-medieval burials at Broadgate Ticket Hall. Control samples may also be taken, in consultation with the appropriate Specialist. [fieldwork objective BB11, 3.3.2]

In the unlikely event that suitable burials are present for the investigation of parasites and other gut contents, soil samples would be taken, in consultation with the appropriate specialists, from immediately over the sacrum, together with two control samples, one from within the grave and one from outside it (MOLA 2014d).

6.11 Lead coffins

Lead coffin burials are not generally expected within the Broadgate Ticket Hall excavation area, although previous archaeological excavations by the Department of Urban Archaeology in the 1980s suggest that there is some potential for them (Dyson et al, 1987, LSS85). These excavations were undertaken immediately to the north of Area 5. Six lead coffins were present within a brick vault. None of the lead coffins were found to be sealed, and no soft human tissue was present, only skeletal remains.

If lead coffins are encountered (in Phase 2 or just possibly in Phase 4) these will not be opened or investigated further until task-specific risk assessments for lead and the integrity of the burial deposit itself has been carried out by the MOLA site supervisory team.

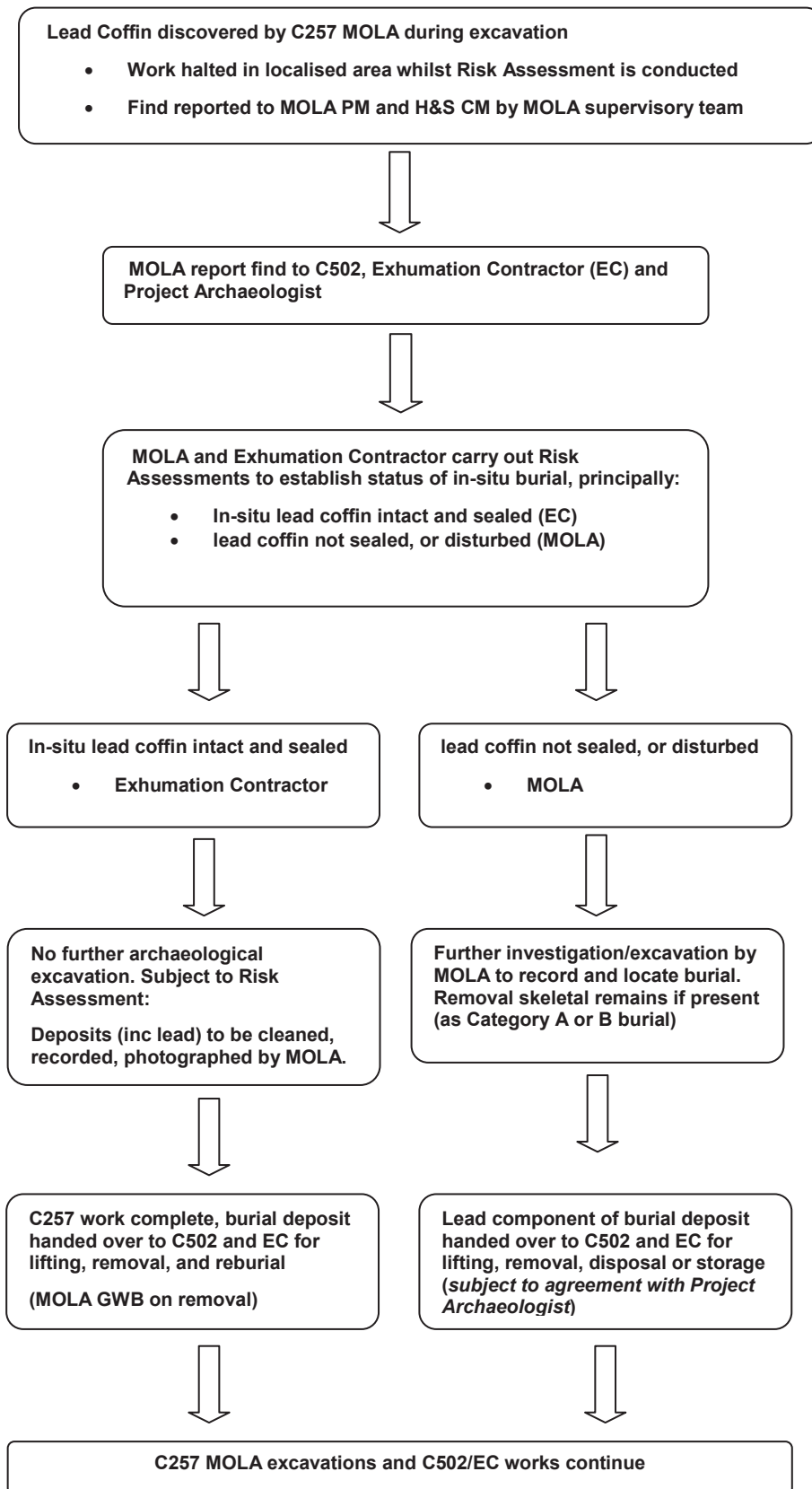
Preliminary risk assessments for this are included in section 21, however, it should be stressed that **the individual situation must be assessed and the preliminary risk assessment(s) must be revised on site**, with the input of the exhumation contractor,

MOLA H&S Compliance Manager, Principal Contractor, and any other relevant parties, eg specialists.

If necessary an addendum to the method statement will be produced in conjunction with the Project Archaeologist, C502 Principal Contractor and the MOLA Health and Safety Compliance Manager to ensure that each deposit is dealt with appropriately.

The following diagram sets out the principles that will be applied when dealing with only lead coffins and in-situ burial deposits they contain.

[table on next page to avoid break in table]



6.12 Processing of Human Remains

Where archaeological excavation of *in situ* burials has been required (post-medieval Category A and B burials, and all medieval or Roman ones), the following processing methodology will be employed at MOLA's off-site facility:

- Treatment of all remains and samples will be to professional standards and in accordance with United Kingdom Institute for Conservation guidelines.
- Inhumations will be washed over a 1mm mesh using a spray hose. Any block lifted remains such as those of neonates, will be processed using a flotation tank with a 1 mm mesh to ensure complete recovery.
- The remains will be washed and laid out for drying on plastic trays. All remains will be kept on their own trays, clearly labelled to avoid comingling.
- The remains will be transferred to a purpose-built drying room where they will be slowly air dried.
- Once fully dry, the remains will then be packaged and boxed to archive standard [LAARC (London Archaeological Archive and Resource Centre) Standards] under the direction of the MOLA Project Officer: Processing and Logistics, and stored until assessment and analysis. Human bone will not be marked.
- Human remains will be stored securely at the MOLA Office until reburial.
- Separate processing methods exist for cremated remains, if any are encountered during the excavation.

6.13 Off-site assessment Scanning of Human remains (Categories A and B)

Following processing as described in 6.12 above, the following assessment scanning methodology will be employed:

- *It is important to keep the statistics from the Category A and Category B burials separate in assessment and analysis. This is because Category A forms a random sample, but Category B burials will be selected for special characteristics, and therefore form a deliberately biased selection, not a random sample.*
- Inhumations will be assessed by a MOLA Human Osteologist. Assessment of all stratified deposits of human remains will be carried out according to English Heritage Centre for Archaeology Guidelines 2004 and MOLA standards (Powers, 2008).
- Assessment data will be recorded in an Excel worksheet. For each context, the level of preservation and completeness will be estimated and a basic catalogue (by body area, not bone, ie skull, dentition, arms, legs etc) will be compiled.
- The remains will be rapidly scanned to provide basic demographic data. Remains will be classified as adult or subadult. Subadults will be subdivided into age groups based on the timings of the eruption of the molar teeth. Basic observation on adult sex will be made.
- Gross pathological changes will be noted using a coding system compatible with that used at analysis.
- The minimum number of individuals within each context will be noted.
- A summary catalogue of disarticulated bone will be produced if appropriate, to aid in establishing the number of individuals within each area.

7 Archaeological Science Strategy

This section covers archaeological science methods, except for those associated with the excavation of human remains which are dealt with in section 6.

7.1 Introduction

The strategy for sampling archaeological structures and deposits and sediments with environmental potential (which can include soils, timbers, animal bone and human burials) has been developed by MOLA in accordance with English Heritage and IFA guidelines. Further advice will be sought from appropriate MOLA specialists, and additionally from the English Heritage Regional Science Advisor, who will review this document. Subsequent on-site work and assessment of the processed samples and remains will be undertaken by MOLA Specialists.

If necessary, samples for absolute dating such as radiocarbon (^{14}C) or timber samples for dendrochronology will be submitted to nominated MOLA external laboratories. This will only be done with the prior approval of the Project Archaeologist where there are particular research objectives to be addressed by such dating.

7.2 Geoarchaeological sampling

This sampling strategy addresses the approach to geoarchaeological sampling for the main archaeological excavation at the Broadgate Ticket Hall, Liverpool Street. Sampling will be conducted taking into account the samples already taken (and those assessed) (MOLA 2014a), with the aim of obtaining coverage of the remaining area of the site and of different types and periods of features.

Given that the earlier phases of work have assessed samples from the MHS1 trench and retains samples from Walbrook/canal deposits at the western end of the Utilities Corridor (MOLA 2014a), the main areas of geoarchaeological focus for this phase of excavation will be on the wider, largely undisturbed, floodplain deposits stretching eastward (see MOLA 2014a, Fig 10). In particular, naturally occurring prehistoric and historic alluvial sediments overlying the river terrace should be sampled taking in the peaty deposit equating with [1032] and upward through the marsh deposits culminating in that similar to [1081]. The sampling of these contexts is intended to further elucidate the relationship between the natural and cultural deposits across the site and to correlate with the facies sequence described in the previous report (MOLA 2014a). This work particularly aims to address Fieldwork Objectives RM1 to 3 and RM7 (3.3.2).

The sections below describe the methodology for undertaking geoarchaeological monolith tin sampling and off-site work (assessment) and reporting. This methodology is in accordance with the advice set out in the English Heritage (GLAAS) *Standards for Archaeological Work, London Region* (English Heritage 2014). It is also guided by the advice set out in the English heritage guidelines for Environmental Archaeology and Geoarchaeology (EH 2002, 2004 respectively).

7.2.1 Geoarchaeological monolith tin, magnetic susceptibility and phosphate sampling (on-site)

- Sections will be maintained through the deposits of geoarchaeological interest during ground reduction and excavation particularly during the Phase 3 (Moorfields Marsh deposits) and the earlier/lower parts of Phase 4 (Roman and earlier alluvial deposits). These will include any deposits that may represent post-Roman through to post-medieval channels/canals possibly associated with the Walbrook and/or drainage ditches and other similar water management features. These sections will be examined, recorded and sampled by a MOLA Geoarchaeologist with the advice of appropriate external specialists if required. Detailed on-site description, and interpretation of the accumulated deposits exposed in section will be undertaken by the geoarchaeologist and selected profiles will be sampled by overlapping monolith tins for off-site sediment and microfossil examination, along with contemporaneous bulk samples for microfossil assessment (insects, plant remains and snails).
- Bulk samples will be taken alongside monolith tins for microfossils (insects, plant remains and snails).
- Further to the monolith tin sampling, Kubiena tin samples at the interface between the Roman and Moorfields Marsh deposits should also be taken for Soil Micromorphology assessment to help clarify the nature of this critical archaeological boundary.
- The description and recording of all soils and sediments will follow standard geoarchaeological terminology and will aim to characterise the visible properties of each deposit, in particular relating to its texture, colour, structure, inclusions and evidence for depositional and post-depositional processes.
- The monolith tin and / or Kubiena tin samples will be recorded on the trench sections.
- If suitable, selected section profiles (eg those sampled by monolith) will be the subject of an assessment of magnetic susceptibility using the Bartington field probe (MS2K in combination with the battery-powered MS2). The aim is to obtain rapid readings of relative changes in magnetic susceptibility down the sediment profile that may relate to surfaces, floors, burnt layers or soils imperceptible by eye.
- If considered appropriate, a field phosphate test (eg blue spot test) will be undertaken to achieve a spatial distribution of enriched phosphate readings within specific Roman horizons with particular reference to the potential presence of horse byre or stable deposits.

7.2.2 Geoarchaeological off-site methodology

The monolith and Kubiena samples and bulk sediment samples will be retained and taken to the MOLA geoarchaeological laboratory.

The following will be completed for the Fieldwork Report:

- The monoliths will be opened and recorded, the results of which will be included in the fieldwork report.
- Bulk sediment samples associated with the monoliths will be processed and assessed for microfossil potential
- An overview of the alluvial stratigraphy of the site will identify the most appropriate

monolith sequences to be sampled for palaeo-environmental assessment and dating.

The monolith tins and bulk sediment samples will then be targeted for environmental assessment at the post excavation stage as follows:

- The selected monolith sequences will be sub-sampled for microfossils (for example, pollen, diatoms, ostracods and foraminifera) and selected bulk sediment samples will be wet sieved through a 1mm mesh, for the recovery of seeds, snails and insects.
- The sub-samples will be submitted to external microfossil specialists for assessment. The residues from the wet sieved bulk sediment samples will be assessed by MOLA environmental specialists.
- Loss on Ignition testing on sedimentary sequences through the marsh sediments and underlying alluvial sediments to provide a rapid assessment of levels of organic (ie marsh material) present in the profile and how this changes through time (and complement the field Magnetic Susceptibility and soil micromorphological results).
- Kubiena tin samples will be sent for Soil Micromorphology assessment by external specialists.
- If present, either identifiable plant remains (twigs, seeds, leaves, which have absorbed atmospheric carbon and not old carbon from groundwater) or bulk organic sediment from key horizons will be submitted to an external lab for radiocarbon (^{14}C) dating in order to provide a chronological framework for the stratigraphic sequence and to enable correlation with the previous work carried out in the area.
- A report will be prepared, that will form a part of the site post-excavation assessment and updated project design. It will combine the results of the geoarchaeological investigation, integrate the data from the specialist reports and radiocarbon dating to contribute to our understanding of the past ecology, evolving landscape and human activity in the local area. Suggestions on the potential of the site at an analysis stage will also be made.

7.3 Environmental sampling

For sampling from burials see 6.10.

The approach to the environmental sampling strategy for the main archaeological excavation at the Broadgate Ticket Hall, Liverpool Street is addressed here. Sampling will be conducted taking into account the samples already taken (MOLA 2014a), with the aim of obtaining coverage of the remaining area of the site and of different types and periods of features.

The majority of the environmental samples will be taken in Phases 3 and 4 (Moorfields Marsh, Roman and alluvial deposits respectively). Sampling intends to address the overall research aims (3.3) and to understand the date, extent, form, character and significance of these deposits across site and through time. For example, to investigate the timing and source of alluvial deposition, the characteristics of the Roman sediments, the boundary between Phase 3 and 4 (why the marsh developed), the nature of marsh conditions through time, and whether its formation was diachronous across site (see 3.3.2). Archaeological deposits that were collected from Area 2/3 show exceptional preservation of environmental material. It is unlikely that smaller samples of material would reduce the potential of the information from the sampled deposits, and therefore **30 L** rather than standard MOLA 40 L samples be employed where **waterlogged preservation** is likely in Area 1.

The sampling of **marsh deposits** during the next phase of excavation in Area 1 is thought to be **unnecessary**, as from recording in Area 2/3, it is clear that these are largely

homogenous deposits and duplicate sampling would add little to the environmental record of the area.

The sampling of **cut features** (such as ditches), however, in particular those obviously continuing east from Area 2/3, would allow any spatial variations across the site to be investigated, adding significantly to the samples already being processed and representing the wider landscape of the Walbrook valley.

Assessing the samples will enable evaluation of the degree of preservation and range of environmental remains preserved within the archaeological deposits, appraise their ability to address the overall site objectives and identify any additional research aims that might also be addressed by the archaeological deposits surviving on the site.

In general, sampling will be undertaken by the archaeologists excavating each trench. However, regular communication with, and site visits by, MOLA environmental archaeologists is recommended, to advise the archaeologists on-site and, where necessary, record and take samples.

Selected negative features or burials will be targeted for environmental sampling, where suitable. Specifically, the work may potentially include the following types of deposit, if present and suitable:

- Pit and ditch fills
- Roadside ditches
- Drainage feature fills
- Organic-rich layers (possible stabling deposits)
- Palaeochannels (or canal) fills

7.3.1 Environmental Methodology

The Project Manager(s) and Site Supervisors (Project Officers and Senior Archaeologists) will ensure the following with the support of a MOLA Environmental Archaeologist:

- That a range of suitable samples are collected from the site for the recovery of an appropriate range of environmental evidence that will contribute to the research strategy that underpins the requirement for excavation and recording.
- That the sampling strategy can be revised on site depending on the deposit types (ie can accommodate work or advice from specialists and be tailored to the particular site conditions).
- That the environmental procedures outlined in section 3.2, and in particular the following documents are followed if required and requested by the Project Archaeologist:
 - Archaeological Site Manual (MoL 1994)
 - Environmental archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation (English Heritage 2011)
- In general and particularly if associated with geoarchaeologically sampled sequences (see section 6.2), bulk samples, 30 litres in size will be the standard samples taken and that the processing methods are designed to recover a wide a range of materials from the same deposit in a single sample.

Sample	Sampled by	Material	Processing
Hand	Archaeologist	Human Bone	Hand washing
Collected	Archaeologist	Large/small mammal, bird, fish	Power-hosed
Bulk (general 40 litre sample)	Archaeologist / environmental specialist	Large/small mammal, bird, fish, reptile, amphibian, marine molluscs, eggshell, plant macrofossils	Flotation or wet sieving
		Insects	Paraffin flotation
		Artefacts	Hand Washed

- The sampling strategy will be monitored throughout the excavation and adapted in light of the preservation and the type of features encountered. A MOLA Environmental Archaeologist will undertake site visits to provide advice and additional advice will be sought from the EH Regional Archaeological Science Advisor when necessary. A MOLA Environmental Archaeologist will be present to discuss the sampling and results of any processing undertaken during any site visit made by the EH Regional Science Advisor and, if requested, by Kathryn Stubbs (Assistant Director Historic Environment, Corporation of London, Planning Department).
- As a general policy, uncontaminated negative features will be bulk sampled and bone collected by hand. Horizontal stratigraphy, if it survives, will be sampled on a spatial basis where appropriate. Unstratified contexts, make-up layers and contexts thought to have a high degree of residual or intrusive material will not be sampled. Bulk samples may also be taken to recover artefacts such as evidence for metalworking and/or other industrial activity.

7.4 Radiocarbon Dating

Particular research objectives may necessitate a programme of radiocarbon (^{14}C) dating, for example to establish timing of Roman feature formation (RM4), or the evolution of Moorfields Marsh (RM7). As stated (section 7.1), this will only take place with the prior approval of the Project Archaeologist, and if necessary with guidance from the EH scientific dating advisor (Dr Peter Marshall). Radiocarbon dates can be simulated before sending samples to the laboratory to verify their potential to provide useful (accurate and sufficiently precise) data.

Geoarchaeological and environmental sequences may provide biostratigraphic age information that can assist in dating sediments, such as that provided by pollen spectra. Any scientific dating undertaken would be modelled (using online software OxCal v4.2) incorporating stratigraphic and relative dating information (ie finds, pottery, dendrochronology and biostratigraphy) in order to build a robust chronostratigraphic system for the site.

7.5 Animal Bone

It is *not* currently expected that such large quantities of animal bone would be present in any one phase as to require a selection or sampling policy (previous fieldwork does not indicate this).

However, if very large quantities of animal bone were to be present, all stratified animal bone would be collected, and a site-specific retention/discard strategy would be devised by the processing and animal bone specialists (probably to be enacted as part of off-site processing).

8 Artefact Recovery and Conservation

8.1 General

The finds retrieval policies of the Museum of London will be adopted. An adequate and representative sample of finds and deposits as advised by appropriate MOLA specialists who will be available to attend site as required. Sampling strategies are developed on a site specific basis to meet the evaluation objectives stated in the Crossrail Site-specific WSI; and the following professional standards, in consultation with appropriate specialists;

- Museum of London (MoL) Archaeological Finds Procedure Manual (2006)
- Relevant English Heritage Centre for Archaeology Guidelines eg on Environmental Archaeology (English Heritage 2011)
- Guidelines of the Society of Museum Archaeologists for the Selection, Retention and Dispersal of Archaeological Collections (SMA 1993).
- IFA Guidelines to the standards for recording human remains (2004)
- Minimum Standards for the Processing, Recording, Analysis and Publication of Post-Roman Ceramics produced by the Medieval Pottery Research Group Occasional Paper 2, (Slowikowski, A, Nenck, B. and Pearce, J 2001)

In general all material from stratified archaeological deposits is retained, unless it is clearly residual or part of a large, but routine, assemblage, in which case samples of both typical and diagnostic items are retained. Exceptions to this form the site-specific strategies for collection and disposal of building material and coffin furniture, which form sections 8.2 and 8.3 below.

Due allowance will be made for occasional specialist attendances which may be needed on and off-site to complete the investigation to the appropriate specified standard. These would only be called upon on a case-by-case basis, if significant structures or strata are revealed. Such attendances may include artefact conservation, photography, surveying, environmental sampling, finds assessment, geoarchaeology and scientific dating. MOLA has a full range of in-house specialists and can therefore deploy such resources at short notice, if needed, eg to advise on sampling strategies.

All finds and samples will be treated in a proper manner and to Museum of London standards (2006). They will be exposed, lifted, cleaned, conserved, marked, bagged and boxed in accordance with the guidelines set out in the United Kingdom Institute for Conservation's Conservation Guidelines No. 2 and the Museum of London's Standards for the Preparation of Finds to be permanently retained by the Museum of London. Metal objects will be x-rayed and appropriate objects then selected for conservation.

8.2 Site-specific strategy for building materials

A site-specific strategy for the collection and sampling of stratified ceramic building material has been devised with the MOLA building materials specialist. Where required, this strategy will be reviewed and adapted during the fieldwork in close consultation with the building materials specialist, and the Project Archaeologist.

Where there is uncertainty about collection or sampling, material will be collected and stored, and the building materials specialist consulted.

In addition, the Project Archaeologist may instruct that additional material is to be collected, eg for exhibition, educational, or artistic use.

The strategy differs for two sets of stratified building material: Roman and medieval/post-medieval.

8.2.1 Roman building material

Note: this includes Roman building material that is residual in later contexts.

8.2.1.1 All of the following materials will be collected:

- painted plaster (both plain and decorated)
- stone veneers (wall and floor)
- voussoir/box flue tiles
- items keyed (scored, combed, roller-stamped)
- tiles and bricks of unusual shape – eg Roman quadrant bricks, roof decoration
- items with markings – ie stamps, signatures, animal prints, shoe/boot marks, graffiti, textile impressions
- unusual and rare fabric types if these can be identified
- tesserae
- daub or clay walling with keyed patterns (eg roller-stamped) or wattle or lath impressions
- any material from brick/tile manufacture or kilns
- worked or dressed stone (*not* un-dressed, roughly-hewn, blocks)
- uncertain stone types – retained for identification by stone specialist (whether dressed or un-dressed)
- stone roofing

8.2.1.2 Structures

Where a structure contains multiple examples of similar *in situ* Roman building material, then it will be sampled as below:

- All of the material in the list in 8.2.1.1 above.
- Other material: a sample of **2 or 3 of each item**, of **each type** of material, as **complete** as possible, will be collected from **each context**.
- Examples of any other variations within the structure will also be collected.

8.2.1.3 Extensive deposits

Where a deposit (eg extensive dump layer) contains a **very large quantity** of Roman building material, then it will be sampled as below. A 'very large quantity' is defined as more than one bread crate, or as advised by the building materials specialist.

- All of the items in the list in 8.2.1.1 above will be collected.
- A random sample will be taken: one 45cm x 31cm bag (18" x 12"), plus:
- A selected sample will be taken of any other items of apparent interest.

8.2.1.4 Other deposits

All other Roman building material will normally be collected. This will probably form the majority of the Roman building material.

8.2.2 Medieval and post-medieval building material

8.2.2.1 All of the following materials will be collected:

- any material relating to tile/brick manufacture – eg biscuit-fired tile, kiln structure, kiln furniture etc
- hearth bricks
- tiles and bricks of unusual shape
- all plain or decorated wall or floor tile
- all glazed tile
- stove tiles
- items with markings – ie stamps, signatures, animal prints, shoe/boot marks, graffiti, textile impressions, lettered frogs etc
- unusual and rare fabric types if these can be identified
- finials / louvers
- terracotta (Tudor and Victorian) and faience mouldings
- daub with wattle or lath impressions
- unusual and rare fabric types, if these can be identified
- worked stone
- all stone items cut from marble and other imported stone types
- uncertain stone types – retained for identification by stone specialist
- Stone wall and floor veneers

8.2.2.2 Post-medieval bricks

- All **moulded, shaped, or decorated bricks** will be collected.
- Bricks with **markers marks** in the base of the frog will be kept (if large numbers of bricks with same mark – keep **2 bricks** with **each clearest mark**)
- Other material: a sample of **2 to 4 bricks**, of **each type** of material, as **complete** as possible, will be collected from **each context**.
- Examples of any other variations within the context will also be collected.

8.2.2.3 Medieval and post-medieval tile and un-worked stone

Where a deposit (eg extensive dump layer) contains a **very large quantity** of medieval or post-medieval tile, or of unworked stone, then it will be sampled as below. A 'very large quantity' is defined as in 8.2.1.3.

- All of the items in the list in 8.2.1.1 above will be collected.
- A random sample will be taken: one 45cm x 31cm bag (18" x 12"), plus:
- A selected sample will be taken of any other items of apparent interest.

8.3 **Site-specific strategy for coffin furniture**

A total of c 750 burials are expected in Area 1, of which less than half are expected to have any form of coffin furniture, mostly heavily corroded coffin nails. Those seen during phases of earlier fieldwork at the site have usually been heavily corroded, almost identical (at least within an individual burial), and therefore provide only limited information.

Coffin furniture from inhumations that are going straight to reburial (Category C; see 6.4) will be treated the same as those which are to be retained for assessment (Categories A and B).

Therefore, collection of stratified coffin furniture will be selective, as listed below:

- **Wood** (from coffin): to be collected if in lift-able condition *and* areas of coffin decoration are present (eg studs, fabric), or other significant features (eg evidence of method of manufacture or carpentry, etc).

*All: a **timber sample** for species identification (or worked wood) to be collected *where condition allows*.*

If extensive remains of a wooden coffin in good condition were to be recovered, they should be retained until they can be assessed by the historic woodwork specialist, who will decide on recording and collection or disposal.

Otherwise to be discarded.

- **Fabric** (from coffin covering, lining, or clothes): to be **collected** (bagged separately from other items).

For the following items, when assessing whether to retain or discard, take into account that

X-Rays and other off-site processes may be able to obtain more information from metal objects than is visible to the naked eye:

- **Coffin handles:** where in good enough condition to identify the form/type, two coffin handles per context will be retained (unless there is variation in the handles, when two per type will be retained). Others will be discarded.
- **Coffin Plates:** to be **photographed** when cleaned and recorded, before attempting to lift them. To be **collected** where they can be lifted, even in fragments. If they disintegrate into very small fragments (as seen in Area 5 West) these will *not* be collected.
- **Decorative coffin studs:** to be **photographed** when cleaned and recorded, before removal. To be **collected** where they can be lifted *in situ* attached to coffin fragments. Where this cannot be done, they will be discarded – unless decorated or otherwise of particular interest.
- **Coffin nails** (not part of coffin material being retained as above): to be discarded after recording, unless of particular interest.
- **Post-medieval lead coffins:** these will *not* be collected by MOLA, but dealt with as described in section 6.6.

8.4 Treasure

All finds falling within the definitions of treasure (Treasure Act 1996) shall be reported immediately to the Project Archaeologist.

The MOLA Field Services Operations Manager (Jamie Andrews) will inform the Department of Treasure and Portable Antiquities at the British Museum. 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.

To protect the finds from theft, MOLA 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, MOLA shall ensure, on liaison with the Project Archaeologist that adequate site security is provided by the Principal Contractor.

9 Deliverables and Submission Programme

MOLA shall provide the following reports in accordance with the C257 Contract and the Site Specific Written Scheme of Investigation (WSI; Crossrail 2010), and Addendum (Crossrail 2014), to the Project Archaeologist, or as otherwise instructed by the Crossrail Project Archaeologist:

- Organisation of site monitoring visits, as and when requested by the Project Archaeologist.
- A weekly illustrated progress report to the Project Archaeologist containing the information required at part 5.10 of the C257 Contract.
- Additional Reporting will be determined by the Project Archaeologist based on results, but may include:
 - A short illustrated interim statement.
 - A survey report.
 - A fieldwork report (including an SMR (OASIS) Summary Sheet)
 - A Summary Report of no more than 500 words for the works shall be prepared by MOLA for submission to the Project Archaeologist for subsequent publication within the London Archaeologist Annual Fieldwork Round-up.
- All levels cited in these reports should be Above Tunnel Datum (TD = OD +100m). All co-ordinates cited in these reports should be based on the Crossrail survey grid, apart from archive copies which will use OS National Grid.
- MOLA will produce monthly progress photographs of archaeological work on the sites in this method statement to contribute to the 30 per month required across the whole of the C257 contract (see 12.2).
- Post-excavation assessment recording and entry onto a database of burials and finds, and other preliminary phases of work towards the Post Excavation Assessment and Update Project Design, will be conducted concurrent with the fieldwork, in order to reduce the time required to complete the Post Excavation Assessment and Update Project Design, which will be issued by December 23rd 2015.

10 Document Control and Record Keeping

MOLA will access the Crossrail eB control system for transmitting reports and other deliverables. The primary report deliverables (as per 9) will be submitted to the Project Archaeologist in draft form (Version 1.0). Any tracked changes or comments added by the Project Archaeologist will then be incorporated and future dated versions (2.0 etc) will be returned via eB accompanied with the appropriate Checklist with Contractor's responses.

11 Archiving and Dissemination Method

The required methodology for off-site work including specialist method statements, assessment, analysis, publication and archive is set out in the SS-WSI and is not repeated here.

Depending on results, it is provisionally expected that the results of this, and previous, fieldwork at Broadgate Ticket Hall, along with the adjacent Crossrail Blomfield Street site, will form publications under product CRL11 of the Crossrail post-excavation and publication strategy (Crossrail 2013).

The site-specific publication and archive requirements will be agreed in conjunction with the Project Archaeologist in the light of the overall approach being developed for the Crossrail project (eg publication format and the extent to which individual sites may be grouped spatially or thematically; and degree to which the archive will be systematised and deposited as a single whole).

12 Additional Details

12.1 Unexpected and Nationally-important remains

The following might be required only in the general watching brief in Area 4. In Area 1, MOLA will fully excavate and record all archaeological features remaining within the footprint of the station box, in advance of ground reduction for the station.

In cases where unexpected discoveries cannot be preserved *in situ*, the response plan would revert to the normal Crossrail mitigation strategy of further archaeological investigation (preservation by record). The aim would be a rapid and commensurate response, targeted to just those remains unavoidably affected by the works. Recording and sampling methods would also be proportionate to the significance of the remains. Additional archaeological resources would be deployed to achieve this, in order to minimise any delay to the Principal Contractor's works. With flexibility and good communication, it is often possible for the development works to continue in other areas while localised discoveries are recorded.

12.2 Progress Photographs

In addition to the archaeological photography specified in the SS-WSI and this Method Statement MOLA will submit a monthly professional photographic record of the progress of the archaeological scope of works. The photographs from the sites in this method statement will form part of the 30 required each month across the whole of the C257 contract.

12.3 Management of Consents

MOLA will liaise with the Employer and Principal Contractor regarding supply of any necessary information in support of required consents, eg road closures, Permit to Dig.

In general separate consents for archaeological works are unlikely to be required, the exception being human remains.

MOLA has obtained from the Ministry of Justice a replacement of the previous **Burial licence** to exhume human remains for archaeological purposes: Licence Number 15-00005, received 13th January 2015. This expires on 31 May 2017.

This covers work by both TCS as the C502 exhumation contractor (if monitored by MOLA) and MOLA on the whole Crossrail Broadgate Ticket Hall site. It has been forwarded to the Project Archaeologist for distribution to the Principal Contractor and any others who require it. A copy will be kept on site with the MOLA site supervisory team (Senior Archaeologist(s) and/or Project Officer(s), depending on Phase and Area).

Two requirements should be noted:

- Clause 2(c) explicitly required screening from public view (see 20.8.1).
- Clause 2(a) requires the work to be done with *due decency*; this is interpreted to mean that members of staff (Crossrail, C502, or MOLA) **may NOT take photographs except for work purposes**, and may **not share photographs or information about the work with the public, media, or other parties via social media, email, or the internet without the approval of the Crossrail Press Office** (see 17.2). Health and Safety

12.4 CDM Responsibilities and Reporting

- MOLA will be supporting and reporting to the Principal Contractor and to the Crossrail Project Archaeologist and CDM Co-ordinator:
- MOLA will be implementing archaeological designs identified in the SS-WSI prepared by the appropriate FDC consultant or the Project Archaeologist. MOLA are therefore not acting as CDM Designer under the Construction (Design and Management) Regulations 2007.

MOLA will provide:

- A current health and safety policy (MOLA 2014c) which includes defined operational procedures and managerial responsibilities, risk assessment/control, and measures to ensure that a safe method of working is implemented by the archaeological team on site. These procedures will be led by and include appropriate advice and support from office-based managers at MOLA.
- Adequate safety information will be displayed within the dedicated MOLA site welfare facility. This information will include; the site specific WSI, current Health and Safety Policy (MOLA 2014c) Health and Safety Law Poster, Data Protection Compliant Accident Book, and copies of Public and Employers Liability Insurance. The MOLA Supervisory Archaeologist is responsible for ensuring that this information is made available.
- Compliance with current legislation and HSE guidance; including the Construction Design and Management Regulations (CDM) 2007 and the Principal Contractor's Health and Safety Policy, safety inductions and fire and emergency procedures.
- Competent and trained field staff qualified to operative level (or higher) of the CITB Health and Safety test and therefore eligible to carry a Construction Related Organisation (CRO) White Card for Archaeological Technician (Code 5363).
- Services of a Project Manager and Supervisory Archaeologist to manage site investigations, including liaison with the Principal Contractor's Health and Safety Co-ordinator and Principal Contractor, attendance at site meetings etc. The Supervisory Archaeologist will act as the key site-based liaison with the Principal Contractor.
- Services of the MOLA H&S Compliance Manager, and a professional health and safety consultant to attend site when required. The MOLA H&S Compliance Manager will report to the Supervisory Archaeologist (on-site) and the MOLA Project Manager, with any concerns or recommendations. A report will be issued after each H&S compliance visit and copies will be issued both to the Principal Contractor's site manager, Project Archaeologist, and the MOLA Project Manager.
- A safety monitoring/reporting procedure. This will include written accident, near miss or dangerous occurrence reporting by the Supervisory Archaeologist to non RIDDOR and RIDDOR standard and any necessary liaison and follow-up of agreed safety actions with the Principal Contractor's site manager and the MOLA H&S Compliance Manager.
- All necessary staff supervision, training and personal protective equipment (PPE) including tool box talks and safety inductions for new staff.
- Review and compliance with the Principal Contractor's Construction Phase Plan under the CDM Regulations 2007.

Trained First Aiders, also a 'Where to get First Aid' poster and a First Aid kit will be located in the dedicated MOLA site welfare facility. The Principal Contractor will also provide first aid facilities on site and inform all site operatives of their whereabouts through site Health and Safety inductions.

The Principal Contractor will provide:

- Overall control and supervision of the site and a safe working environment for all site-based operatives. MOLA will be unable to complete the specified works in any areas where provision for this is not provided.
- Technical services and attendances to the archaeologists as required. These services may include providing, site accommodation, plant for the excavation of trenches and temporary works such as scaffold handrails, shoring and ladders. These requirements are listed in detail in the health and safety section, which forms the second part of this document.
- Construction Phase Plan (CPP).

The CDM Co-ordinator will provide:

- Overall co-ordination of health and safety planning and management.
- A communications structure; including contact details for key personnel, meetings, reporting, etc.
- Supply of material information: eg services and contamination reports; any relevant requirements regarding rights of way, noise, hours of operation, etc.

12.5 Rail Sites

This is not a designated rail site.

12.6 Highway Sites

The majority of the works in Liverpool Street are on a highway, but in a closed-off worksite – MOLA will comply with the Principal Contractors regulations.

12.7 Health and Safety Reporting

Adherence to health and safety procedures will be monitored by the MOLA Health and Safety Compliance Manager, Project Managers, and Site Supervisors (Project Officers and Senior Archaeologists). The H&S Compliance Manager will attend site for regular monitoring visits and, on each occasion, will supply a report on the archaeological work, containing any necessary health and safety recommendations. This will be forwarded to the Principal Contractor's site manager and Project Archaeologist. Where appropriate to the scale of work, regular on-site progress meetings will be held between MOLA, the Project Archaeologist and the Principal Contractor at which any safety issues may be discussed, agreed and actioned.

12.8 Liaison with Principal Contractor

The MOLA Project Officers will act as the principal point of contact with the Principal Contractor's site manager throughout the periods of site investigation. Contact details will be exchanged. The Project Officers will be supported and advised by the MOLA project management team as needed.

The Senior Archaeologists who directly supervise the site team will support the Project Officers in this, in particular in liaison with the Principal Contractor's site team over day to day issues.

12.9 Behavioural Safety BMOS

Mobile phones, personal CD players, i-pods and similar will not be used by MOLA staff in archaeological trenches or areas of work. Smoking and naked flames are not permitted in the trenches or areas of work. Alcohol is not permitted on site. This aspect will be monitored by the MOLA Supervisor and Health and Safety Compliance Manager and reported in the progress report (see 9).

13 Emergency Response

13.1 Emergency Preparedness & Response Plan

MOLA staff will comply with the Principal Contractor's Emergency Plan.

An Emergency Preparedness/Continuity Plan is has been prepared by MOLA and submitted to Crossrail for approval.

A General Emergency Preparedness Plan (EPP) was prepared within the MOLA Health and Safety Plan for C257 – Document Number: C257-MLA-X-XWI-CRG02-50003 v2. This should be referred to for generic emergency and accident issues.

Site-specific issues are as follows:

Employers Incident Response Contact	Crossrail Incident Response Desk - 0208 197 5000
Principal Contractor Incident Response Contact	<ul style="list-style-type: none"> • Stuart Green, LOR Health and Safety Manager (day) • Mobile: 07469 038711 • Chen Mahenthiranathan (night) • Mobile: 07920 205291 • 24 hour duty phone: 07584 468284
MOLA Incident Response Contact	<ul style="list-style-type: none"> • Ian Grainger, MOLA H&S Compliance Manager • igrainger@mola.org.uk • Direct Line: 020 7410 2255 • Mobile: 07730646054 • Nicholas Elsdon, Project Manager • nelsden@mola.org.uk • Direct Line: 020 7410 2282 • Mobile: 07 872 127 296 <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • Simon Davis, Project Manager • sdavis@mola.org.uk • Direct Line: 020 7410 2221 • Mobile: 07 730 646 061
Local A&E location	<p><i>Full A & E at:</i></p> <p>The Royal London Hospital Whitechapel Road London E1 1BB Telephone 0207 377 7781 or 0207 377 7000</p>

	<p>Tube: Whitechapel (Hammersmith and City and District Lines)</p> <p><i>Minor A& E at:</i></p> <p>St Bartholomew's West Smithfield Street, EC1 Telephone 020 7377 7000 Tube: St Paul's (Central Line)</p>
--	--

13.2 Training

MOLA provides Safety Training for its staff as in Section 4.2.

The MOLA Project Officer(s) will attend all emergency training/inductions on Preparedness/Response Plan provided by the Principal Contractor.

13.3 Emergency & Accident Equipment

- MOLA Archaeologists when working singly on the watching brief tasks will carry a single person First Aid Kit and mobile phone.
- During larger tasks a first aid box will be located in the archaeological office on site.
- It expected that the Principal Contractor will also provide basic first aid facilities on site.

13.4 Monitoring & Testing

MOLA staff will comply with Crossrail requirements.

13.5 Emergency & Accident Incident Reporting

All accidents and emergencies must be reported by MOLA staff to the MOLA PO or SA; they will immediately inform the Principal Contractor (see 14.1), who will call the emergency services, if required. All near misses will also be reported. All incidents will be logged in both the Principal Contractor's and MOLA's accident, near miss or witness statement books.

Principal Contractor (C502 LOR) Incident Response Contacts:		
Contact	Name (if applicable)	Telephone Number
LOR Health and Safety Manager	Stuart Green	07 469 038 711
LOR Construction Manager	Kevin Laney	07771 843614
LOR Duty Phone		07584 468284

They will also be reported to the Incident Report Desk, call: 020 8197 5000. In critical situations, MOLA staff will call for an ambulance immediately, and then inform the site manager.

All accidents and emergencies must be reported to the following personnel at Crossrail and MOLA:

- Jay Carver, Project Archaeologist, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ
DD 0203 229 9258, Int 2258
Mobile 07870 191 705

And in his absence Iain Williamson (mobile: 0770 825 565)
- Projectwide CDM Co-ordinator, Crossrail Central, Crossrail Ltd, 25 Canada Square, London E14 5LQ
Mobile 07718 861941
- Nicholas Bateman, Director of Development Services, Museum of London Archaeology, Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
DD 0207 410 2248
- Ian Grainger, H&S Compliance Manager, Museum of London Archaeology, Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
DD 0207 410 2255

14 Environmental Management

The archaeological works will be carried out whilst the Principal Contractor is in possession of the site. MOLA will therefore request a copy of the Principal Contractor's Environmental Management Plan prior to commencement and will supply any necessary inputs with regard to MOLA works. MOLA will comply with the Principal Contractor's Environmental Management System as documented in their Environmental Management Plan, and contribute to their EMS reporting if required.

If any remedial action is needed, eg controls for dust, water, noise or controlled waste, this will be agreed with and undertaken by the Principal Contractor as part of the required attendances (see 13 and Appendix: 20.8.1). In addition an updated MOLA corporate Environmental Management Plan is currently being prepared for submission to Crossrail.

The nominated environmental person is: Alison Telfer, atelfer@mola.org.uk, 020 7410 2276.

14.1 Contamination

MOLA will comply with the Principal Contractor's requirements in relation to any contamination issues. MOLA staff will not disturb or damage asbestos, or undertake asbestos removal from a building, structure, or buried material. If asbestos is found the Principal Contractor will be responsible for having it dealt with by a licenced contractor.

14.2 Water Disposal

The Principal Contractor is responsible for disposal of any ground water pumped from the trenches or other excavations, in accordance with their environmental management plan, with which MOLA will comply.

14.3 Site Waste Management Plan

MOLA staff will adhere to the Principal Contractor's site waste management plan.

It is anticipated that very little waste will be removed from the site from the archaeological works, but any produced will be disposed of by the Principal Contractor in accordance with their Waste Management Plan.

14.4 Vehicles/Motorised Equipment

MOLA staff will liaise with the Principal Contractor to provide safe access and parking for MOLA vehicles if required to attend site. The vehicles are compliant with Crossrail requirements.

All deliveries must be booked in advance using the C502 Laing O'Rourke **Vehicle Movement Booking form**, and the vehicle will be Crossrail-compliant. The form is stored on the MOLA network at: <\\mola-data-2k8\projects\MULTI\1051\XSM10\Field\Broadgate C502 Van Booking Requirements>

Forms must be emailed to Dean Bonvini at Laing O'Rourke: (07 771 941 002)

NAME	VEHICLE REG NO
M Cox	KC54 XTZ & DY59 YWB
A Chopping	KC54 XTZ & DY59 YWB
G Spurr	KC54 XTZ & DY59 YWB
J Medway	EA55 NBJ
S Jones	KC54 XTZ & DY59 YWB
C Drew	KC54 XTZ & DY59 YWB
M Burch	KC54 XTZ & DY59 YWB
V Yendell	KC54 XTZ & DY59 YWB
M Cordero Hernandez	KC54 XTZ & DY59 YWB
CONTACT (All)	020 7410 2200

14.5 Other Requirements

MOLA staff will always be courteous with any members of the public they have dealings with.

15 Quality Assurance Plan

An updated Quality Assurance Plan has been prepared for submission to Crossrail in accordance with the format specified at part 5.4 of the C257 contract. Records will be kept and supplied to Crossrail in accordance with procedures set out in Crossrail Specification CR-PN-LWS-EN-SP-00001, as amplified by the SS-WSI. The MOLA responsible procurement representative is Dawn Jackson, who is a member of the Senior Management Group.

16 Community Relations

16.1 General

MOLA will co-operate with the Project Archaeologist and Principal Contractor regarding any notified community relations issues in relation to the Construction Community Relations Strategy Framework as defined in the Works Information.

16.2 Confidentiality

MOLA will in the first instance refer any media enquires or community relation issues to the Crossrail Helpdesk and the Project Archaeologist.

All MOLA staff working on Crossrail projects will be instructed before commencement to adhere to the confidentiality clause (Conditions of Contract 19.2, and Works Information vol. 2 – 9.7) that they **must not disclose information about any Crossrail project to the public, media or other parties (including social networking sites); either before, during or after working on a Crossrail project, without the approval of the Crossrail Press Office**. This instruction will be repeated at toolbox talks on a regular basis on site.

This is **particularly important where burials** are concerned (see 12.3).

17 Responsible Procurement

An updated Responsible Procurement document was submitted to Alison Jackson, Crossrail on 15th January 2013.

18 Bibliography

Corporation of London Department of Planning and Transportation, 2004 *Planning Advice Note 3: Archaeology in the City of London, Archaeology Guidance*

Crossrail, February 2005a *Environmental Statement*.

Crossrail, February 2005b *Assessment of Archaeology Impacts, Technical Report. Part 2 of 6, Central Route Section*, 1E0318-C1E00-00001, [Specialist Technical Report (STR)].

Crossrail, 2008 *Archaeology Detailed Desk Based Assessment Liverpool Street Station*, Doc. No. CR-SD-LIV-EN-SR-00001.

Crossrail, 2009 *Archaeology Generic Written Scheme of Investigation*, Doc No. CR-PN-LWS-EN-SY-00009.

Crossrail, 2009 *Liverpool Street & Moorgate Utilities Trial Trenches Archaeological Watching Brief & Evaluation*. Doc No. CR-PN-LIV-EN-MS-00003.

Crossrail, 2010 *Liverpool Street Station, Site-specific Written Scheme of Investigation*, Doc. No. C138-MMD-T1-RST-C101-00001, v2, 29.04.10 [SS-WSI]

Crossrail, 2013 *Crossrail Central Archaeology Updated Project Design for Post-Excavation Works*, Document Number: CR-XRL-T1-STP-CR001-50001, v.3, 20.05.13 [Post-excavation strategy]

Crossrail, 2014 *C502 Liverpool Street Station SS-WSI Addendum for Archaeological Excavation and Watching Brief at Broadgate Ticket Hall (XSM10)*, Doc. No. C502-XRL-T1-RST-CR101-50002, v2, 01.07.14

Department of Communities and Local Government, 2010 *Planning Policy Statement 5, Planning for the Historic Environment* [PPS5].

Department of Communities and Local Government, 2012 *National Policy Planning Framework* [NPPF].

Department for Culture, Media, and Sport [DCMS], 2010, *Scheduled Monuments, Identifying, protecting, conserving and investigating nationally important archaeological sites under the Ancient Monuments and Archaeological Areas Act 1979*, March 2010 (<http://www.culture.gov.uk/images/publications/ScheduledMonuments.pdf>)

Department of the Environment, 1990 *Planning Policy Guidance 16, Archaeology and Planning* [PPG16].

Dyson, L, Malt, R, and Wellman, T, 1987 'Excavations at Broad Street Station (LSS85), Parts 1 and 2: the Walbrook and associated features', MoL DUA Archive Report.

English Heritage, 2002, *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation*

English Heritage, Centre for Archaeology (Mays S, Brickley M, and Dodwell N) 2004 *Human Bones from Archaeological Sites: guidelines for producing assessment documents and analytical reports*

English Heritage/Church of England, 2005, *Guidance for best practice for treatment of human remains excavated from Christian burial grounds in England*

English Heritage, Greater London Archaeology Advisory Service [GLAAS], February 2014 *Standards for Archaeological Work, London Region*

Institute for Archaeologists (IFA), 2001 *By-Laws, Standards and Policy Statements of the Institute for Archaeologists: Standards and guidance – Watching Brief*.

Institute for Archaeologists (IFA), 2008 *By-Laws, Standards and Policy Statements of the Institute for Archaeologists, Standard and guidance: Excavation*

Malt, R, and White, W, 1987 *Excavations at Broad Street Station (LSS85), Part 3: the cemetery*. MoL DUA Archive Report.

MOLA for Crossrail, 2012a *Central Section Project, Fieldwork Report, Archaeological Evaluation and Watching Brief Broadgate Ticket Hall (XSM10)*, Doc. No. C257-MLA-X-RGN-CRG02-50064, v2, 07.03.12.

MOLA for Crossrail, 2012b *C257 Archaeology Central Fieldwork Report, Archaeological Excavated Evaluations and Watching Briefs, Pit 4, Pit 11, Trench 14 and 15, Pile Line Pits and SSET/UKPN Utility Diversions, Broadgate Ticket hall (XSM10)*, Doc No: C257-MLA-X-XCS-CRG02-50015, v2, 20.06.12.

MOLA for Crossrail, 2014a *C257 Archaeology Central, Fieldwork Report, Archaeological Excavation and Watching Briefs, Broadgate Ticket Hall Utilities Combined Report 2013 (XSM10)*, Doc No: C257-MLA-T1-RGN-CRG03-50014, v1 15.04.14

MOLA for Crossrail, 2014b *C257 Archaeology Central, Method Statement, Archaeological Watching Briefs, Broadgate Ticket Hall Pile Line (XSM10)*, C257-MLA-T1-GMS-C101-50001, v1 16.06.14

MOLA, 2014c *Health and Safety Policy and Operational Procedures*

MOLA (Powers N), 2014d *Guidance on the sampling of inhumation graves and grave fills*

Museum of London (MoL), 1994 *Archaeological Site Manual*, 3rd edition.

Museum of London, 2002 *A research framework for London archaeology 2002*

Museum of London (ed. Powers N), 2008 *Human osteology method statement*

Museum of London, 2009 *General Standards for the preparation of archaeological archives deposited with the Museum of London*.

19 Health and Safety Method Statement

19.1 Introduction and Purpose

19.1.1 Project Background

Archaeological investigations are to be carried out on this site by Museum of London Archaeology (MOLA). The requirements are set out in the WSI and WSI Addendum (see section 1.2).

19.2 Scope of Document

This Method Statement sets out the specific MOLA safe methods of working to be applied to the tasks listed in the table included within section 1.2 of this document.

This method statement has been developed in conjunction with the C502 Principal Contractor, who will be responsible for ensuring that the archaeological works may be carried out as specified.

19.3 Responsible Persons and Site Management

19.3.1 Site Management

The MOLA Project Officers will ensure that a copy of the MOLA Welfare, Health & Safety Method Statement (RAMS) is made available to the Principal Contractor. Where further changes or additions to the document are required and agreed these should be appended to the site master copy by one of the MOLA Project Officers.

All changes to the WH&S Method Statement will be signed off by the Project Archaeologist, Crossrail H&S Advisor, MOLA Project Manager and MOLA H&S Compliance Manager.

19.4 Scope of Works

19.4.1 Proposed archaeological works

The scope of archaeological works is set out in section 1.2 of this document.

19.5 Methodology, Programme and Sequence

The overall programme is set out in section 25 of this document, predicted overall start dates and durations for the work are summarised in section 1.2 of this method statement.

19.6 Health and Safety Control Measures

19.6.1 Site Access and general considerations

On initial arrival to the site, all MOLA staff will sign in and establish contact with the MOLA Project Officer (site manager) or Senior Archaeologists (site supervisor). All MOLA staff will be taken to the nominated areas of the site to attend Crossrail Health and Safety inductions, MOLA Health and Safety inductions, briefings and toolbox talks. All MOLA staff will follow the C502 access procedure for the site (to be notified to MOLA in advance by the C502 Principal Contractor, Laing O'Rourke). All MOLA staff working at the site will carry identification and CSCS cards with them (staff who have only recently passed the CSCS test will carry their pass letter with them, until the card is received).

The MOLA Project Officers and supervisory team are responsible for ensuring that all MOLA staff study and familiarise themselves with the Method Statement including the Welfare, Health & Safety sections of the document (Sections 20–23); and that they sign the registers at the back of this Method Statement to indicate that they have understood and will comply with it and any included Risk Assessments and Control Measures.

Prior to attendance on site all MOLA staff will have signed the MOLA Health surveillance declaration provided at the rear of this document (section 24).

Any changes or revisions to the WH&S Method Statement (for example updated Risk Assessments) will be signed off by the Project Manager, Project Officer and/or Health and Safety Compliance Manager.

Safe access routes from the site gate to work Areas will be directed through the Aurora biometric turnstyle. Any offices and/or facilities will be erected and maintained at all times throughout the course of the archaeological phases of work by the C502 Principal Contractor.

All visitors to site for archaeological purposes will be accompanied by a member of MOLA staff for the duration of their visit. The MOLA Project Officer will be responsible for informing the Principal Contractor prior to any such site visits, such that the necessary site inductions/briefings can be arranged prior to the visit.

19.6.2 Vehicle movements

See 15.4.

19.6.3 Services and utilities (Gas, Electricity, Water, Drainage, Telecomms)

MOLA staff will comply with any **permit to work/penetrate** systems that are in operation or required by the C502 Principal Contractor, Laing O'Rourke prior to commencing work.

The location and making safe of live services before or during archaeological works is the responsibility of the Principal Contractor, Laing O'Rourke in control of the site. MOLA staff will exercise care and due diligence during the archaeological work.

In so far as is reasonably possible the location of all live underground and overground services has been ascertained by the client and/or his agents and notified to MOLA before the commencing work on site. All known utilities will have been either disconnected, diverted or made safe as appropriate.

No member of MOLA staff will touch or otherwise interfere with a live service even if declared 'safe'. In the event of the accidental disruption of a live service by archaeologists or sub-contractors under archaeological supervision, the MOLA Supervisory team will inform the MOLA Project Manager and the Principal Contractor and the Project Archaeologist, when appropriate MOLA supervisors will call the relevant emergency number.

19.7 Safety of Excavations, trench or work areas, shoring and barriers

19.7.1 Access to trenches and excavation areas

- C502 Laing O'Rourke **Permits to dig** will be issued to MOLA every two weeks throughout the archaeological works. MOLA staff will comply with the requirements of the permit to dig system, prior to entering the excavation areas and starting work.
- The Principal contractor will establish and maintain designated safe routes to and from MOLA areas of work, and demarcate them with suitable barriers/protection as required and necessary. Generally two main systems for access and egress within the site will be used as follows:
 - HAKI or Combisafe steps will be erected for main access/egress
 - Pedestrian routes will be established using Youngman staging and/or GRP walkways

Safe access into deep trench/excavation areas will be provided and maintained by the Principal Contractor.

The MOLA Project Officers and Supervisors will monitor the access routes and excavation areas used by MOLA and liaise with the Principal Contractor on a regular basis to ensure that all working areas are adequately reviewed, maintained and risk assessed as the excavations progress.

No MOLA staff will enter a trench or excavation area if it is declared unsafe by any competent person or by the MOLA Project Officers.

19.7.2 Shoring / Propping

The remaining area of excavation will be shored by the secant piled walls of the station box, constructed in advance of the fieldwork. In Area 1, this will require props to be installed during temporary halts to the archaeological programme (see 25).

The requirement for any additional shoring of trenches or localised areas of deeper excavation will be determined by a competent person taking into account ground and groundwater conditions, weather conditions, nature of work to be undertaken, how long the work will take, adjacent structures. Such shoring will be installed and maintained in accordance with CDM 2007 and HSG 150 throughout the occupancy of the site by a competent contractor appointed by the Principal Contractor. Shoring will be inspected by a 'competent person' before each shift or any event which may have affected the strength of the shoring, or any un-intentional falls of material or equipment.

Where shoring is not possible/practicable, the upper edges of an excavation area may be battered or stepped to allow for a localised working area within the excavation that is safe to work in and access or egress. In all cases the specific area to be shored will be risk-assessed by the MOLA site supervisory team, prior to any temporary works being installed.

19.7.3 Generic methods

In addition to a daily assessment of the fitness of the team, undertaken at the beginning of each shift, the MOLA PO and SA will carry out a visual inspection of the archaeological trench in terms of safe access and a safe working environment within it (eg if affected by an overnight change in weather conditions), The following working methods will also be employed by the MOLA team:

- Working with hand tools

Hand tools in daily use are trowels, draw hoes, mattocks, shovels and hand shovels. Also used, but with less frequency, are spades, garden forks, lump hammers, pick axes, brushes and sledge hammers. All tools are checked at the beginning of each shift to make sure that they comply with the industry safety standard and are discarded if not. Task briefings are carried out where applicable.

- Extra safety measures

On-site manual handling training is given to inexperienced staff.

Staff often work in pairs (ie one mattocking, one shovelling) in order to provide measured rest periods.

Manual work is also alternated with paperwork (although this forms the natural pattern of the job in any case).

- Spoil removal

The method of spoil removal is agreed with the Principal Contractor before work begins, whether involving bucket hoists, conveyor belt or extraction by machine from a single point.

MOLA also use barrow runs, usually comprised of Youngman boards; these are regularly cleaned to minimise slips.

Shovelling boards are also used in order to enable ease of moving spoil across the trench.

- Edges and steps

If archaeological features (eg pits, ditches) are sufficiently deep that unexcavated edges become a hazard, the risk will be assessed as per RAs 06 and 07 in section 21. Likely safety measures are:

To temporarily cease excavation at a safe depth (resuming after adjacent deposits have been taken down)

For the Principal Contractor to provide temporary barriers as edge protection, where practicable

- Working adjacent to other contractors

MOLA frequently works adjacent to other works and in these cases the following are observed:

- Where adjacent works involve a risk of flying debris, the Principal Contractor will provide terram and/or boards to protect the archaeology and the MOLA team will either stand down temporarily or attempt to continue working elsewhere.
- Where adjacent works involve contractors working overhead, the MOLA team will stand down temporarily.
- Where visitors gain access to the trench, they will be accompanied at all times by the MOLA PO or SA and briefed beforehand, especially if they are carrying equipment, such as cameras and tripods.
- Where adjacent works involve a loss of working time, this will be logged in the MOLA Daily Report.

19.7.4 Spoil management

Initially, the use of mechanical hoists or lifting of spoil skips is not anticipated within the excavation areas, as it is intended that spoil will be removed by wheelbarrow to a zone where stockpiled spoil can be taken away by a tracked excavator (at ground level) for removal from site (see section 20.8.1.1 for further detail regarding spoil management).

After propping in area 1 (Phases 3c and 4), spoil skips are likely to be used, lifted by machine – to be confirmed as the design for the roof and working those phases is developed.

In terms of Health and Safety management, spoil, bulk removal and associated muckaway operations will be supervised and managed by C502.

19.7.5 Confined Spaces

- At the time of writing no areas have been defined by MOLA or the Principal Contractor as Confined Spaces. This will be kept under constant review by MOLA, the Principal Contractor and the Project Archaeologist. Where so designated, MOLA staff will work in accordance with a safe system of work specified by C502 Laing O'Rourke and the MOLA risk assessment (21, RA 13).
- MOLA will accept any area as a Confined Space where so designated by the client or Principal Contractor and may independently designate such spaces where the MOLA Project Manager, in consultation with the MOLA H&S Compliance Manager, considers that conditions in the working area are consistent with the need to adopt Confined Spaces working practices.
- Gas monitors will be supplied by C502 when excavation depths exceed 1.5m below the surrounding ground levels.

19.7.6 Machine Excavation

- Machine excavation by C502 during the general watching briefs will be monitored by MOLA, but otherwise completely under the control of C502.
- Machine excavation during Phase 3, and where required Phase 4 (eg Roman alluvium) will be under close MOLA archaeological direction and control, but will at all times be under the overall control and responsibility of the Principal Contractor.
- All machine excavation will be supervised by a competent C502 Banksperson.
- The nominated Banksperson (and MOLA supervisor where required) will work within safe-working exclusion zones set up by C502, around the operational plant.

19.7.7 Hand Excavation during watching briefs

- Any hand excavation by MOLA required during watching briefs will be limited to selected times/areas defined by the MOLA Senior Archaeologist/ Site Supervisor, with the agreement of the Principal Contractor, and will be properly fenced, demarcated and signed.

19.7.8 Lone Working during watching briefs

- The monitoring MOLA Supervisor will complete the necessary signing in procedures for each site visit and will also notify the Principal Contractor's Site Manager of their presence and which works are to be monitored. The MOLA Supervisor will only be providing an attendance to observe, monitor and record the defined Principal Contractor works and therefore will not be working alone. In particular the MOLA Supervisor will not attend works or enter excavations when the Principal Contractor is not present.

19.7.9 COSHH Contaminated Land – General

- The C502 Principal Contractor has stated that the only current COSHH issues identified comprise low-grade risks from human remains and Leptospirosis. Both of these areas have been adequately risk assessed within section 21. Regular risk assessment will be an integral part of the ongoing contamination/COSHH status of the excavation areas.
- Currently there is no known risk from asbestos at the site.
- With the exception of any issue surrounding deposits of human remains, if ground contamination is present or suspected, the Principal Contractor will implement the measures required to protect those affected by the works, including provision of suitable additional PPE and adequate welfare facilities for the changed situation (PPE in addition to that included in section 20.8.3 will be provided by the Principal Contractor rather than MOLA)
- MOLA staff will at all times wear the required and appropriate PPE as instructed by the Principal Contractor and MOLA Project Officers; in addition they will:
 - Report signs of any contaminants on site (for example buried residual asbestos) to the MOLA Project Officers who will inform the MOLA Project Manager, Principal Contractor and Project Archaeologist as appropriate.

- Be given inductions and regular tool box talks by the MOLA Project Officers, specific to the contaminants on site indicating nature, appearance, smell, method and required preventative procedures.
- Keep exposure levels to the minimum necessary to complete their work.
- PPE where required as standard will comprise Orange Hi-Visibility safety trousers and vests/jackets, steel toe-capped boots, safety glasses, and gloves. Additional PPE for contaminated deposits, if required, will be specified and supplied by C502.

19.7.10 Buried Unexploded Ordnance (UXO)

- Information previously provided by the C502 Principal Contractor (and provided to them in their contract) states that:

The potential for unexploded ordnance to be present within the Superficial Deposits is discussed in detail in the Construction Phase Explosive Ordnance Threat Assessment volumes 1 and 2 provided for information in the Site Information. Volume 2 of this document: '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.

[...] for the Works at Liverpool Street Station, the Baseline Statement relating to unexploded ordnance is:

- Unexploded ordnance will not be encountered during the construction of the Works.
- MOLA staff shall comply with the Principal Contractors procedures. If ordnance is found unexpectedly, the MOLA Project Officers shall inform the Principal Contractor immediately and withdraw to a safe place outside the area designated by the Principal Contractor.

19.7.11 Site Rules

- All MOLA Staff will comply with the Principal Contractor's site rules (appended in section 22) and with the MOLA obligations set out in the MOLA Health and Safety Policy (MOLA 2014c) (when applicable).

19.8 Planning and Attendance Resourcing

19.8.1 Principal Contractor's Supply of Attendances

The site specific requirements for services, facilities and attendances to be provided by the Principal Contractor, to enable MOLA to undertake the defined archaeological works are set out below. Those items in **bold (20.8.1.1) are likely to be required** for the Broadgate Ticket Hall works; these will be continuously reviewed by the MOLA Project Officers in conjunction with the Principal Contractor's Site Manager and will be communicated to the MOLA Project Manager, Principal Contractor and Project Archaeologist in the event that such are needed.

As follows:

19.8.1.1 Likely to be required

- **general site security** including hoardings, gateway, warning notices, etc; to create a secure site perimeter, sufficient to prevent unauthorised access.
- **specific site security:** Although the excavation areas are located within the main site hoarding, it may be necessary to separately secure individual excavation areas via a physical barrier (such as Heras fencing) where required. In areas of trench access/egress for example, it may be necessary to install self-closing scaffold gates such that adequate secure edge protection can be maintained around the trench perimeters where required.

Similarly, it may be necessary to place temporary, flexible, free-standing, edge protection (such as plastic barriers) around the edges of any locally excavated features which need to be excavated to a depth where they form a hazard. The requirement for edge protection in these circumstances will be established by task specific risk assessment by the MOLA site supervisory team during the excavations, and not by other parties.

- **secure storage** (eg lockable tool store/cabin and strongboxes) is required for finds, human remains, bulk soil samples, tools and equipment . Storage requirements are summarised below:
 - 3m (10') lockable container with internal shelving/racking, and power/lighting (for storage of human remains).
 - 6m (20') lockable combined office and steel container (c 2/3rds tool storage & 1/3rd office).
 - *(the above may be equivalent space with a different layout)*
 - Two lockable steel strongboxes for tool/records storage within the trench (able to be moved around the trench by hand as excavation progresses – if space permits).
 - NB all containers would need to be connected to the 110v supply and have lights for the late shift / early mornings.
- **providing safe access** to the site and the specified archaeological investigation areas via separately identified pedestrian routes, signing, safety guard-rails, secure ladders, staircases, etc. This includes segregating these areas from any vehicles and plant operating nearby eg via a robust physical barrier.
- **adequate ventilation** and protection from noise, fumes and dust where plant is in use, especially within small excavation areas (Area 5) and/or any confined spaces
- **temporary roofing and side screening to archaeological excavations where burials are exposed** (eg a roofing system as will be erected over Areas 2/3 and 1, or monoflex on scaffolding frame or similar) in order to screen any human remains from public view, including views from above – eg windows of buildings overlooking the site on Liverpool Street, Blomfield Street and Old Broad Street (see WSI Addendum 3.2.5). This will allow sufficient light through for archaeological work (eg translucent plastic sheeting/tarpaulin). The roof needs to have adequate stormwater drainage and ventilation. Temporary openings will need to be incorporated into the design to enable the safe removal of spoil from the trench. Any areas adjacent to the excavation areas where spoil containing human remains may be visible from surrounding buildings should also be screened from the public gaze.
- **managerial services** – nominated points of contact for Principal Contractor and other key members of development team.
- **welfare facilities with electricity and water.** To include office or desk space for MOLA site management team; separate male/female changing areas (with lockers or cages),

toilets and washing facilities with running water. Site welfare should be sufficient for the estimated number of MOLA operatives as summarised below:

- MOLA staffing levels:
- Approximately 14 female (c 50%) and 14 male.
- Otherwise, maximum is 28 persons (over 2 shifts) in Area 1.
- **accreditation and supervision of operatives, plant and equipment**, including supply of sufficient qualified banksmen and slinger/signallers to control plant movements and lifting, and adequate certification for plant and all operatives.
- **temporary works**: design, installation and maintenance of suitable temporary works to all appropriate excavations (this may include localised excavations, for example burial pits, within Area 1) where they extend deeper than c 0.5–1.2m (or as required in unstable ground). Expected temporary works may include:
 - Scaffold erected edge protection around exposed perimeters of the excavation area (to include adequate toe-boards, walkways, gates where necessary)
 - Lightweight stowable plastic barriers for localised edge protection
 - Heras fencing
- **other safety measures in deep excavations** Air quality will be monitored and rescue facilities and equipment will be provided in any areas defined by the Principal Contractor as a **confined space**. Beyond a depth of 1.5m within such areas gas monitoring equipment will be required to ensure appropriate air quality for those working there.
- **locating and making safe any live services or hazardous substances** (see also 20.7.8 20.7.9): known services have been diverted and cut off by the Principal Contractors prior to construction of the secant piled station box (Area 1). Outside this box, preliminary services searches have been carried out by the Principal Contractor via the statutory undertakers. On-site inspection and testing has been undertaken where required. Any identified hazards will be addressed in the health and safety planning. Any unexpected hazards encountered during the investigations will also need to be made safe by the Principal Contractor before archaeological fieldwork may continue. In the event of the accidental disruption of a live service by archaeologists or sub-contractors under archaeological supervision the MOLA supervisor will implement the procedures set out in section 20.7. Any remaining exposed services will be protected by the Principal Contractor prior to the works starting. Any utilities remaining live in excavation areas will be clearly demarcated, safely segregated and suitably protected by the Principal Contractor.
- **development of a safe method of working**: archaeologists will not be able to work within excavations whilst attendances (such as installing temporary support or removing spoil) are taking place, and when demolition, construction or heavy plant activity occurs adjacent or overhead.
- **First Aid**: provision of First Aid facilities, and an emergency plan. In addition to MOLA's first aiders, the Principal Contractor's qualified first aider(s) may also be required to deal with MOLA staff incidents if relevant or appropriate (eg during single person watching briefs).
- **removal of spoil from trenches and lifting operations**. This is planned to be by C502 labour using MOLA wheelbarrows, on Youngman's-type staging (provided by C502), from individual MOLA work areas within the trenches to temporary stockpiles (which will require protection for the underlying archaeology: eg tarpaulins and boards provided by C502). Spoil will then be removed from the stockpiles by C502 using a machine at ground level. The stockpiles will need to move as excavation progresses, to allow the

underlying archaeology to be excavated in sequence with the remainder of the area.

Equipment (eg machine/hoists, provide by C502) will be operated by a suitably qualified person supplied by the Principal Contractor, and checked at the intervals specified in the Principal Contractor's method statement/risk assessment for the use of the equipment. The PC will supply a banksman to control plant at all times and an experienced slinger/signaller to control the lift to ensure that the bucket is not re-lowered or suspended over the trench while staff are working below in the trench.

Should mechanical or electrical hoists be used, the area in which the hoist is in use must be clearly demarcated. **MOLA staff will leave the area before the bucket is raised or lowered (and in the interval between these operations) and not re-enter until completed (in accordance with MOLA H&S Policy).** The PC will ensure the provision of only certified lifting equipment and implement an approved Lifting Plan.

- **Any spoil which may contain human remains will be stored separately and dealt with by an exhumation contractor.** Such spoil will also need to be screened from public view both during transportation and temporary storage.
- **pumping-out:** if/when required, a suitable method to keep the trenches dry.
- **supply of plant and equipment:**; supplied with driver, banksman, and toothless ditching bucket. Apart from the machine for spoil removal (see above), a small machine will be required for the careful machine excavation during Phase 3, and potentially the later part of Phase 4) in Area 1 (see 5.3). This will need to be lifted between the props.
- **Protective materials** where archaeological remains are to be left in situ whilst the props are installed in Area 1: the C502 Principal Contractor will provide and install protective materials appropriate to the deposits, as agreed with the Project Archaeologist. Following consultation with the Regional Science Advisor at Historic England (formerly English Heritage), it is considered that for the period of c 1 month of the Phase 3b propping, it will be suitable to protect any burials with a combination of:
 - a water-porous material (eg geotextile such as Terram, or other porous/permeable material) over the remains, covered by :-
 - 0.30m of sand (ordinary sand is considered suitable for this short period).

NB: this thickness of sand may be partially or completely composed of the depth of material backfilling any individual graves that have burials more than 0.3m below the working surface (110.3m ATD). Therefore, a 0.3m-thick layer of sand is **not** required across the whole of Area 1, **if graves can be excavated to that depth or below.**

- Boards over the sand to spread weight and ensure that equipment does not penetrate the sand.

19.8.1.2 Unlikely to be required separately for MOLA

The following items are not likely to be required specifically for MOLA within the context of a general watching brief, although some may apply generally to C502 works:

- **technical advice** to be available if required (eg via client or Principal Contractor's consulting engineer) re protection of adjacent streets and buildings, removal of obstructions, depth of excavation, live services etc.

19.8.2 Equipment

Equipment will be supplied by the MOLA equipment central store:

- First Aid Kit
- Hand tools, dumpy levels, stationary, grid pegs, digital camera, etc.

Any specialised equipment such as power augers (not likely in this work) will have certification of maintenance kept at MOLA headquarters.

19.8.3 Basic PPE

All MOLA staff are supplied with and will wear or use the following PPE where required and as appropriate:

Safety Helmets (EN397)

Hi-visibility vests **and trousers** (EN471) - **Orange**

Ear Defenders (EN 352-3)

Safety spectacles (EN166)

Dust masks plain and valved (EN149 2001)

Gloves Nitrile and latex disposable, PVC, EN374

Safety footwear - steel toecap and mid-sole boots and Wellingtons EN345-47 (No riggers are allowed)

19.8.4 Additional PPE

Any PPE in addition to that included in section 20.8.3 will be provided by the Principal Contractor, rather than MOLA.

19.8.5 Staff

See detailed programme in section 25.

MOLA will regularly notify the Principal Contractor of MOLA staffing requirements as the excavations are progressed.

19.9 Briefing Arrangements

19.9.1 MOLA Staff Induction – New Starters

- All MOLA staff shall receive a full induction including Health and Safety on commencement of their first day of work with the organisation (normally at the MOLA offices). A record of the induction is kept.
- The MOLA Project Officers will be briefed by MOLA Project Managers on all relevant aspects of work before work commences. This briefing will include all SS-WSI, Method Statements (Principal Contractors' documentation and this document).
- The MOLA Project Officers will be responsible for briefing any other MOLA staff on site before they commence work on all aspects of the work and documents.

19.9.2 Site Specific Inductions, Weekly Briefings and Tool Box Talks

- Where a site is under the control of a Principal Contractor (as in this case), MOLA staff will attend all initial site inductions and subsequent toolbox talks as required and managed by the Principal Contractor.
- MOLA staff will also be briefed during their MOLA induction on the site-specific methodologies (especially burials), the criticality of the programme, and progress, time-keeping, photography, etc).
- Irrespective of whether the site is controlled by MOLA or a Principal Contractor, on larger projects eg those with more than 2 to 3 staff and of a week or longer duration, regular toolbox talks will be given by the MOLA site Supervisory team and other suitable members of staff using the CITB: construction site safety tool box talks manual and MOLA developed task specific toolbox talks. As a minimum requirement these talks will occur 1 to 2 times per week and be of 10 to 15 minutes duration.

For this excavation, these will include health and safety issues (including fatigue, see section 20.12), plus reinforcement of the site methodologies, especially for burials, photographic methods (for the site team photographers), confidentiality requirements (see 17.2), etc.

19.9.3 Daily Briefings

- The C502 Principal Contractor's daily briefings will include all MOLA personal on site.
- MOLA's daily 'task briefing' to MOLA staff by the Project Officer will include health and safety issues, work that day, progress, methodology issues, etc. For both shifts, this will take place after the general daily briefing by C502 Laing O'Rourke, and, for the Late Shift, will occur *after* the handover from the early shift.

19.10 First Aid

19.10.1 Trained First-Aid Personnel

With the possible exception of the watching briefs monitored by a single MOLA archaeologist, there will be at least one MOLA person who is a qualified First Aider (ie three day FA at work course) on site, and at least two such First Aiders where there are 50 staff or more on site.

If not, the Principal Contractor's first aider(s) responsible for the watching brief task(s) will be identified by MOLA at the Principal Contractor's Induction, and their services used if required.

19.10.2 First Aid Documents

The MOLA site safety documents will be located with the first aid kit in the MOLA site office. The safety documents will include a minimum of:

- Current Health and Safety Law Poster for display where legislation requires
- Accident Reporting Forms compliant with the Data Protection Regulations.
- MOLA Public Liability Insurance & Employers Liability Insurance for display
- Where To Get First Aid poster – to be displayed if required.

- Current MOLA Health and Safety Policy
- A copy of the site Welfare, Health and Safety Method Statement, extracted from the Site WSI, and modified as agreed during the course of the site.

19.10.3 First Aid Equipment

For one person watching briefs, a compact first aid kit will be carried by the MOLA Senior Archaeologist at all times. During larger scale work, a MOLA First Aid kit, of an appropriate size for the site, will be located in the MOLA site office.

19.11 Accident, Incident, Near Miss and Environmental Incident Reporting

19.11.1 Reporting of Accidents/Incidents and Dangerous Occurrences

The Reporting of Injuries, Diseases and Dangerous Occurrences (RIDDOR) Regulations, sets out requirements for the reporting of certain types of accidents. RIDDOR notifiable accidents will be reported immediately by the MOLA site supervisor as specified in Section 14.5 of the method statement, above. All accidents, incidents and near misses will be reported by MOLA staff to the MOLA PO or SA, who will forward that information immediately to the Principal Contractor.

19.11.2 Documentation

In order to identify quickly problem areas and allow corrective action to be taken all accidents, dangerous occurrences and near misses, including those that do not cause injury, will be reported immediately to:

MOLA Supervisor (Project Officer, or Senior Archaeologist who will report it to the Project Officer)

Principal Contractor's Site Manager

MOLA H&S Compliance Manager

MOLA Project Manager

Crossrail Project Archaeologist

Crossrail Incident Response Desk (if not reported by the Principal Contractor)

The site accident books/reporting forms for *both the Principal Contractor and MOLA* should be filled in giving details of the incident.

19.11.3 Investigation of Accidents and Dangerous Occurrences

MOLA will comply with the Principal Contractor's and Crossrail procedures.

MOLA will also initiate internal procedures as follows:

- Initial accident/incident report to MOLA Senior Project Manager and Field Manager and action taken as appropriate.
- Non Riddors investigated by Senior Project Manager/H&S Compliance Manager.
- Riddors investigated and reported on to Senior Management Consultant by MOLA H&S Compliance Manager.

19.11.4 Key Project Personnel

- Nicholas Elsdon, Project Manager, MOLA
- Nicholas Bateman, Director of Development Services, MOLA

19.12 Fatigue during shift-working

In order to combat fatigue in the site team, the following will be implemented during the excavation of Area 1:

- Consecutive six-day weeks will only be worked for the initial 3 to 4 week period of Phase 2 (and the 2 days of Phase 3a). This is considered acceptable as the duration is not more than a month, and also the Phase 2 excavation of burials is less physically demanding than later phases will be.
- Following a break of approximately 4 weeks for propping, Phases 3c and 4 will be worked with alternating 6-day and 5-day weeks, over a period of approximately 6 to 7 weeks. This is considered acceptable for this more physically demanding work, as staff will get a full 2-day weekend once a fortnight.
- Also, if the 31st August bank holiday falls with the MOLA work period, this single day (Monday) will **not** be worked.
- The paid break has been increased from 20 to 30 minutes.
- A second Project Officer has been assigned to Area 1, so that there is full Project Officer cover (instead of one Project Officer covering only parts of each sift, which would also increase their stress and fatigue).
- Lighting levels will be continually assessed (cf a target of 250 Lux), as this can also be a cause of fatigue on late/night shifts.
- MOLA staff will report symptoms of fatigue to their supervisors as soon as they start to experience them.
- MOLA supervisors will assess fatigue within the site team and tasks that may contribute to tiredness, and enact measures to combat this, in particular rotating tasks between those which are more and less physically demanding.
- In addition, MOLA will enact more frequent toolbox talks about shift-working and fatigue:
 - To increase awareness of issues surrounding tiredness.
 - To aid staff in identifying the signs of fatigue and fatigue-related stress.
 - To monitor colleagues for those signs.
 - To strongly encourage staff to report fatigue to their supervisors.
- Staff will be encouraged to use their annual leave allowance if they start to feel fatigued.
- If staff are excessively fatigued, MOLA will swap them with staff on other sites with a less arduous work pattern.

19.13 Emergency Procedures – Site General

All MOLA staff will comply with the Principal Contractor's procedures as outlined at the Site Specific Induction.

19.14 Emergency Services Contact Details

The Principal Contractor will confirm the hospital location:

Full A & E is at:

The Royal London Hospital

Whitechapel Road

London E1 1BB

Telephone 0207 377 7781 or 7000

Tube: Whitechapel (Hammersmith and City and District Lines)

Minor A& E at:

St Bartholomew's

West Smithfield Street, EC1

Telephone 020 7377 7000

Tube: St Paul's (Central Line)

The MOLA supervisor will dial 999 for fire, ambulance and police in the case of an emergency if the Principal Contractor's Site Manager or his deputy is not present on site.

19.15 Route to Hospital

The Principal Contractor will advise on route to hospital at their site specific induction (see C502 MS).



20 Risk Assessments

MOLA RISK ASSESSMENT REGISTER

For Site/Task: Crossrail, Broadgate Ticket Hall Excavation and Watching Brief (XSM10)				Type: Archaeological excavation and Watching Brief							
Persons Affected		No	Classification		No						
Employees		80	Experienced		80						
Other workers		10	Inexperienced		0						
Public		0	Disabled		0						
Known and Suspected Hazards on site with Remaining Risk (mark as appropriate) and include numbered risk assessment in WSI											
	L	M	H		L	M	H		L	M	H
1 Access	x			26 Dust	x			50 Glass Recording			
2 Ladders	x			27 Noise	x			51 COSHH: Sthil Lubricant			
3 Plant	x			28 Deep Excavations	x			52 COSHH: Sthil two stroke oil			
3a Plant (loading and unloading)				29 Power Tools				53 SHARPS (hypodermics)			
4 Dumpers	x			30 Vibration				54 Task Lighting (Ianiro etc)	x		
5 Scaffolding (inc Towers)	x			31 Vehicles (Driving)	x			55 Site Walk Over			
6 Excavations	x			31a Vehicles (Site)				56 Processing: Finds washing			
7 Work at height	x			31b Vehicles (loading/ unloading)	x			56a Processing: Environ samples			
7a Work at Height (Cherry Picker)				32 Lifting Equipment	x			56b Processing: Artefact marking			
8 Slips, Trips, falls	x			33 Plant (lifting)	x			56c Processing: Manual handling			
9 Underground services	x			34 Human Remains	x			56d Processing: Power hose			
10 Overhead Power Lines				35 Public Safety				56e COSHH: Paraffin (Processing)			
11 Electrical	x			36 Violence				57 Office Work			
12 Fire (inc LPG)	x			37 Chainsaw				58 DSE (Work Stations)			
13 Confined spaces				38 Power Auger (COBRA)				59 Young Person			
14 Breaking Out	x			38a Power Auger (Compressor)				60 Person Specific/Expectant Mother			
15 Hand Tools	x			38b Power Auger (Electric)				61 Light Duties			
16 COSHH: Spray paint				39 Hand Auger	x			62 Individual Stress			
17 Contaminated Land				40 Foreshore/water				63 Shift working			
18 Weil's Disease	x			41 Adverse Weather	x			Preliminary Risk Assessments (to be updated and signed before use)			
19 Psittacosis				42 Spoil Mounding	x			35b Lead Coffins	x		
20 UXO	I			43 LPG(Butane)				35c Crypt Structures, Tombs/Cists	x		
21 Asbestos				44 Waste	x			35d Soft Tissue and Fluids	x		
22 Welfare	x			45 Storage							
23 Lone working				46 Animals							
23a Empty Premises				47 Non-ionising radiation							
24 Manual Handling	x			48 COSHH: Petrol							
25 Fumes/Gas				49 Spot Dating							

General Controls

<p>Project Manager in overall charge of project is: Nicholas Elsdon Tel: 020 7410 2282, m. 07872 127296</p> <p>Project Officer(s) in daily charge of project is: TBC</p> <p>Number, training and experience of supervisors will be sufficient for the project</p> <p>Supervisor(s) holds IOSH/SSSTS Supervising Safely Cert</p> <p>All staff will comply with the: MOLA H&S policy, Principal Contractors site rules, all WSIs, Risk assessments, safe systems of work Permits to work.</p> <p>All staff will have sufficient training and experience for the tasks they undertake or be under close supervision</p> <p>All staff will be CITB H&S tested and hold a CSCS card appropriate to their profession</p> <p>All staff will be fit to undertake their work</p> <p>All staff will be inducted in advance (or where this is not possible, on the first day of work), briefed on the WSI and the specific hazards and control measures attendant on their work on site.</p> <p>The full site induction will be undertaken by the C502 Principal Contractor on site (MOLA will also induct and give toolbox talks and briefings).</p> <p>All staff will sign the induction and WSI register to confirm that they have received, understood and will comply with both.</p> <p>Tool box talks/staff briefing will be conducted on the hazards and control measures on a regular basis (at least weekly or more frequently if circumstances dictate)</p> <p>Appropriate PPE to be worn for each task.</p> <p>Minimum (Mandatory) site PPE (unless otherwise stated by supervisor): Steel Toe-cap/midsole boots, Safety helmet, Safety spectacles, Gloves, high visibility vest (orange) or jacket (orange) and trousers (orange).</p> <p>First Aid kit on site, First aider/appointed person on site. Nearest accident and emergency unit located and contact numbers obtained</p>		
<p>Competent Person(s) appointed to take action:</p> <p>MOLA Ian Grainger H&S Compliance Manager</p> <p>MOLA Project Manager: Nicholas Elsdon</p> <p>MOLA Project Manager: Simon Davis</p> <p>MOLA Project Officers: Alison Telfer, Andy Daykin(depending on Area and shift pattern)</p> <p>MOLA Senior Archaeologists (supervisors): Robert Hartle, Martin Banikov , (depending on Area and shift pattern)</p> <p>C502 Principal Contractor–Laing O’Rourke (below)</p> <p>Laing O’Rourke H&S Manager & Emergency Manager</p> <p>Laing O’Rourke Site Supervisors</p> <p>Crossrail Site Manager (Project Archaeologist)</p>	All Risk Assessments seen by (initials)	
	PM	Archaeologists
	SA(s)	
	Client	
	Contractor	
	Other	

MOLA RISK ASSESSMENTS					SITE: Crossrail: Broadgate Ticket Hall Liverpool Street (XSM10)			
APPROVAL (Name and Title)					SIGNATURE			DATE
Prepared by:		S Davis						19.01.2015
Approved by:		I Grainger						19.01.2015
RA N°	ACTIVITY	Hazard	RISK	Risk Class I/L/M/H	N° at Risk	Control Measures	Final Risk I/L/M/H	Action by
01	<p>ACCESS general site access routes</p> <p>Access into active excavation areas (Haki Stair) (ladder)</p>	<p>Fall of persons from height,</p> <p>Fall of objects from height,</p> <p>Vehicle/plant contact,</p> <p>Slips Trips falls</p>	<p>Personal Injury, Equipment Damage</p>	M	Staff Contractors Visitors	<p>Regular TOOLBOX TALK on current pedestrian routes Task lighting to pedestrian areas for later shift/low light areas Obey warning signs, verbal and written PC and traffic marshal instructions. Use only defined pedestrian access routes. Be aware of plant and vehicle routes and movements. Do not obstruct pedestrian routes – Good housekeeping Report unsafe routes. Take additional care/time in wet conditions or in low light</p> <p>Take extra care after installation of props: additional ladders may be required for either side of props, in order to allow access across the trench; additional safeguards may be required when excavation levels are reduced sufficiently for operatives to move below props</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>

02	<p>LADDERS</p> <p>Particularly Area 5</p> <p>Areas 4 and 6 (GWB)</p> <p>-</p>	<p>Fall of person from ladder,</p> <p>Fall of material from ladder,</p> <p>Collapse of ladder</p> <p>Movement of ladder</p>	<p>Personal Injury</p> <p>Equipment Damage</p>	M	Staff Contractors Visitors	<p>Use correct length and type, not painted timber (use steel scaffold ladder).</p> <p>Daily inspection when in use, do not use if damaged. Must project at least 1.50m above stepping off point. Daily check/Fix securely at top and base.</p> <p>Check/Install at an angle of 75 degree (1:4 ratio over length).</p> <p>Three points of contact</p> <p>Arrange stair access if possible.</p> <p>Use inertia release cable winch if significant depth</p> <p>Do not carry loads when using ladders.</p> <p>Take additional care/time in wet conditions</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>
03	<p>PLANT</p> <p>Attending MOLA</p> <p>Mini Excavator with breaker attachment (if required)</p> <p>Hand Held Breakers</p> <p>Compressor Generator</p> <p>1000L Bucket Skips</p> <p>13T 20T Excavator</p> <p>Lifting Accessories</p> <p>Muckaway Wagons</p> <p>Attending rest of site</p> <p>13T / 20T Excavator –</p> <p>Pile Cropper –</p> <p>Generators –</p> <p>Compressors</p> <p>Brokk Demolition</p>	<p>Persons Struck by Machine</p> <p>Shovel or load dropping</p> <p>Hydraulic fluid spray</p> <p>Overturning of machine</p> <p>Fire/explosion</p>	<p>Personal Injury, Equipment Damage</p>	H	Staff Contractors Visitors	<p>MOLA staff will not operate plant.</p> <p>Operational plant must have a trained banks person in attendance where required Operator must inspect plant before work commences and before each shift. Defective plant must not be used. Report defective machinery to C502 Service and repair by qualified contractor only. Excavation operations to be supervised in Phases 3 and 4 by MOLA staff (supervisor or deputy) [MOLA only monitoring PC's work in Phase 1 and GWBs] Plant to be switched off and secured when not in use.</p> <p>No work with or near plant operator under influence of drugs/alcohol or behaving erratically.</p> <p>Staff working near machine to ensure that the operator has seen them and that they are at a safe distance.</p>	M	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>

	Machine – Plate Compactor – Vibrating Roller – Concrete Wagons					Staff briefed on plant operations and changes to them. High visibility clothing. Separate routes and work areas for plant and pedestrians, warning signs to be displayed where practicable.		
04	DUMPERS eg 2.5 tonne dumper	Overturning or tipping. Falling into excavations. Falls of persons and load. Collision.	Personal Injury, Equipment Damage	M	Staff Contractors Visitors	Regular toolbox talks on Plant movements and operations MOLA will not drive dumpers Drivers must be over 18. Operator must inspect and certify dumper as fit to operate before use and carry out checks prior to each shift. A banksman will be used where driver's vision is impaired or operating in congested areas. Dumpers are not to be left unattended with engines running or keys in. Dump skips are to be kept clean A site speed limit will be imposed Separate pedestrian and vehicle routes and work areas will be established where practicable and warning signs will be displayed. No work with or near dumper driver operator under influence of drugs/alcohol or behaving erratically. MOLA operatives must use designated pedestrian routes where available. Caution: be vigilant of dumper movements in work area, maintain safe distance. Staff to be briefed on dumper movements and changes to them.	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
05	SCAFFOLD (Access)	Fall of persons Fall of material	Personal Injury, Equipment damage	M	Staff Contractors Visitors	MOLA staff will not erect or adjust scaffolding in any way. Only use scaffolding (inc	L	C257 MOLA MOLA PO/SA ALL MOLA

		Collapse of scaffold				stairs) that displays green scaffold tag with current weekly inspection record. Do not use if obviously damaged. Do not use in high winds and/or heavy rain. Maintain three points of contact, always have one hand free for guard rail when carrying load.		staff MOLA PM C502 PC Project Arch
06	EXCAVATION	<p>Collapse of sides</p> <p>Fall of persons</p> <p>Falls of plant equipment material</p> <p>Flooding</p> <p>Uneven surfaces</p> <p>Buried services</p> <p>Voids</p>	<p>Personal Injury, Equipment damage</p>	M	Staff Contractors	<p>Comply to any Permit to Work Systems that are in operation.</p> <p>For locally deep features review the depth/requirement for installation of shoring/ battering as outlined in MS. If required, shoring will <u>ONLY</u> be installed by competent sub-contractor and maintained by them. Shoring will be inspected by competent sub – contractor or competent MOLA supervisor instructed by them. Where temp plastic barriers are erected it must be at least 1m back from trench edge and warning signs displayed. If Heras fencing is erected it must be at least 1m or more back from trench and warning signs displayed. Robust scaffolding edge protection will be erected and warning signs displayed. Inspect all excavations before each day/shift and record results. Supervisor will report unsafe excavations to principal contractor. Staff will not enter any excavation they consider unsafe until it is declared safe by MOLA PO or SA. Staff will report unsafe excavation to supervisor. Use Pumps if authorised by the Principal Contractor</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>

						<p>required inspected and certified.</p> <p>Use supported Youngman boards over site surface, keep clean and do not use in wet conditions</p> <p>All exposed services and service voids (eg Sewers) to be immediately reported to MOLA supervisory team</p>		
07	<p>WORK AT HEIGHT</p> <p>Work near deep excavations</p> <p>Ladder access points</p> <p>Haki stair access points</p> <p>Remember:</p> <p><u>Work near deep trenches can constitute work at height.</u></p>	<p>Falls of Persons</p> <p>Falls of materials and equipment</p>	<p>Personal injury,</p> <p>Equipment damage.</p>	M	Staff Contractors	<p>Competent person to determine if work at height.</p> <p>Robust edge protection and warning signs.</p> <p>Safe access (ladder or stairs?)</p> <p>Safety harnesses and lanyards if required secured to fixed point.</p> <p>All equipment will be checked daily/before each shift by competent person</p> <p>Staff screening for task suitability – fear of heights etc.</p> <p>Temporary working platforms/staging to be erected by competent contractor.</p> <p>Exclusion zone for other workers/public if appropriate</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>
08	<p>SLIPS/TRIPS/FALLS</p> <p>Note use of Youngman boards in wet weather (where not covered by roof)</p>	<p>Falls of persons</p> <p>Dropping of equipment /material</p>	<p>Personal injury,</p> <p>Equipment damage</p>	M	Staff Contractors Visitors	<p>Assess work in adverse weather and suspend if appropriate.</p> <p>Keep all surfaces level and dry where practicable.</p> <p>Keep all areas free of unnecessary obstruction and debris.</p> <p>Keep all areas well lit.</p> <p>All safe pedestrian routes to be sign posted.</p> <p>Staff to be physically fit for the conditions on site.</p> <p>No running or horseplay.</p> <p>Avoid use of Youngman staging or exercise caution in wet weather</p> <p>Be cautious moving</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>

						about site. Take extra care when type/depth of archaeological features encountered changes Take extra care in general when undertaking shift-work and/or six-day week		
09	<p>UG SERVICES (UTILITIES)</p> <p>In particular Areas outside secant pile wall box: Area 4</p> <p>No live utilities likely in Areas 1, 2/3, 5, and 6, where they have been diverted before work starts</p>	<p>Electrocution</p> <p>Flooding</p> <p>Asphyxiation</p> <p>Fire/explosion</p> <p>Bacterial infection</p>	<p>Personal injury, Equipment and environmental damage, Annoyance to public</p>	M	Staff Contractors	<p>Comply to any Permit to work system in operation.</p> <p>Task briefing on known live utilities to be given to all staff by PC and MOLA.</p> <p>C502 Principal Contractor to undertake utilities scanning/assessment in areas where there is still a potential risk of buried services (Area 4)</p> <p>In areas of potential for live services: During machine clearance of first levels; and each machining level thereafter: C502 competent operatives will assess/scan can for live electrical services in compliance with any permit based safe system of work.</p> <p>All existing services exposed will be clearly marked, or removed/decommissioned prior the works starting.</p> <p>Any utilities remaining live in excavation areas will be clearly demarcated and exclusion zones put in place</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>
0011	<p>ELECTRICAL Equipment and supplies</p> <p>110v photo lights (MOLA)</p> <p>240v office equipment (laptops, chargers)</p>	<p>Electrocution</p> <p>Fire/explosion</p> <p>Trips (over flex etc)</p>	<p>Damage to equipment</p>	M	Staff Contractors	<p>MOLA staff will not install electrical supplies or repair or alter electrical equipment. Do not use if no current PAT certificate Visually inspect equipment before use for faults. Do not use if obviously defective.</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>

						Report faults. Route leads and cables to minimise the likelihood of damage and trip hazards. MOLA staff to be aware of the locations of dry powder/ CO2 fire extinguishers on site		
0012	FIRE	Hot works LPG Machinery Electrical equipment /supplies? Arson flammable materials Smoking	Burning of persons Asphyxiatio n (smoke) Damage/des truction of property	M	Staff Contractors	MOLA staff will not undertake hot works C502 Principal Contractor to Induct on fire precautions and procedures. Establish safe exits, assembly points, adequately signed and kept free of obstruction. Install smoke alarms if practicable. MOLA operative to be aware of fire alarm locations where appropriate. C502 to supply and inspect appropriate fire fighting equipment. Allow for access for emergency vehicles. All sites Inflammable materials will be stored in lockable fire -proof containers and warning signs displayed Keep site tidy – minimise combustible material build up (paper, wood etc). No smoking on site or outside designated areas. No naked flames. Obey fire safety instructions and signs. In the event of fire raise the alarm - verbally where necessary. Do not attempt to fight a fire unless trained, unavoidable, and safe to do so.	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
0013	CONFINED SPACES–	Collapse of sides/ structure Flooding Free flowing solids Fire/	Personal Injury, Disease, Death, Equipment damage	M	Staff Contractors	Permit to work (issued by Principal Contractor) will be required in areas designated as Confined Spaces. Project Officer/Supervisor to brief staff on task prior to	L	Supervisor and staff

		<p>explosion</p> <p>Electrical</p> <p>Gas, fumes</p> <p>Toxic atmospheres, oxygen deprivation</p> <p>Bacteria</p>				<p>commencement. Only staff trained in entry into confined spaces will undertake tasks. Only physically fit/suitable staff will be deployed. Visually monitor staff health. Report all ill health immediately to MOLA PMs. No smoking or naked flames/lights. Fire extinguisher to available. Only equipment specified in the permit will be used. Ventilate adequately. A top-person (lookout) will be in place at all times during the work. Top-person to undertake regular levels inspections of any gas monitoring equipment used. An escape plan for an unconscious/immobile casualty will be in place and the rescue party trained regularly. The following safety equipment will be used (retain as appropriate): gas monitoring equipment, breathing apparatus/escape sets, harnesses, winch/tripod, lanyards/life lines, life line</p>		
0014	<p>BREAKING OUT</p> <p>Consider the type of breaking operation</p> <p>Breaker attached to Excavator</p> <p>Smaller scale (kango)</p>	<p>Falling/flying objects</p> <p>Striking underground utilities</p> <p>Fire/explosion</p> <p>Collapse of structure</p> <p>Dust</p> <p>Noise</p>	<p>Personal Injury, Equipment damage</p>	M	Staff Contractors	<p>MOLA staff will not undertake demolition or breaking operations PC to Conduct buried Utilities risk assessment. Control dust –damp down, provide ventilation. Demarcate and barrier off work areas -Use warning signs. All sites Maintain safe distance from breaking out. Wear eye protection. Wear P3 dust mask if applicable. Wear correctly rated ear protection.</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>

15	HAND TOOLS Covers use of: Mattock, Shovel, spade, pick axe, trowel, draw hoe, garden fork, hand shovel, brush, lump hammer, sledge hammer, chisel, bolster and similar simple non mechanical tools	Manual handling Impact from tool Impact from flying debris	Personal injury, property damage	M	Staff	Regular TOOLBOX talks on use of hand tools All hand tools to be to industry safety standard. Inspect tools on delivery. Discard tool if not fit for purpose. Assess staff fitness to use tools. Task briefing where applicable. Training and supervision for inexperienced staff. Adequate breaks/rest periods, alternating manual work with paperwork	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
18	WEIL'S DISEASE (Leptospirosis) RATS	Rat faeces and urine	Personal injury illness	L	Staff Contractors Visitors	Brief staff on hazard. Carry HSE G 406 instruction card Wear gloves. Clean and cover any cuts or abrasions promptly with a waterproof plaster. Wash hands before eating, drinking, smoking. No eating drinking and smoking outside designated areas. Keep Welfare facilities dry, tidy and secure. Keep food covered and secure. Basic surveillance of staff for flu like symptoms. Report ill health.	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
0021	UNEXPLODED ORDNANCE Note UXO includes Bombs, shells mines, anti-personnel devices, grenades, bullets, ammunition of all sizes, as duds or fired, ordnance discarded/ dumped and stored, from any period, not just bombs from the two C20th world wars	Explosion Fire	Personal Injury, death, Equipment and property damage, Disruption to locality Public anxiety	L		Tool box talks to remind staff of hazard Report all discoveries of suspected UXO. Vacate and cordon off area immediately Inform MOLA PMs and Principal Contractor immediately Inform H and S Manager Do not re-enter area until given all clear	I	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
22	WELFARE Welfare	Fire/explosion	Personal Injury and illness,	L	Staff Contractors Visitors	Toilets, office, canteen, tool storage, drying	I	C257 MOLA MOLA

	facilities being provided by the PC	Electrical Filtth/bacteria Cold/damp	property damage			rooms, heating, hygiene facilities (hot & cold running water). Separate Male and female facilities. COSHH and DSEAR controlled substances will be not be stored in office/canteen. Welfare facilities to be kept clean and tidy. Cleaning Rota will be established where cabins not cleaned by contractor. No Smoking in welfare facilities. No eating or drinking in work areas.		PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
24	MANUAL HANDLING Consider finds loaded out of trenches. Carrying large bags of human remains Large bags of general finds	Too heavy, big, awkward load, Too prolonged Dropping load	Personal injury, Equipment damage	M	Staff Contractors	General Remove the need for manual handling where possible. Use mechanical aids where possible. Reduce horizontal and vertical distances. Reduce size and weight of individual load. Ensure team sufficient and fit for task. Ensure that route planned, well lit, obstruction free, and as dry as possible. Liaise with others to keep route safe, use lookouts. Brief and train staff. Rotate staff and/or sufficient breaks for prolonged tasks Use gloves Personal Assess weight before lifting, stay comfortably within personal lifting capacity. When picking up load: stand close with feet slightly apart, crouch do not bend at waist, keep head up and maintain natural curvature of spine, thrust/lift through hips, keep object close to body, maintain clear field of vision and do not run. Use MOLA Manual handling check lists for all significant manual handling tasks 0024a-e :	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch

						Planks, ladders and boards Drums/round containers Bags and sacks Finds/irregular shaped objects on site Office work – boxes etc		
26	DUST Prolonged dry conditions Plant movements	Breathing problems Reduced visibility Dirty office/canteen Public nuisance	Personal injury	M		First aiders to be aware of location of Eye Wash Stations/kits Vacate area where there is excessive airborne dust. Do not return until it is safe Wear eye protection Wear P3 rated dust masks. Dampen down dust making activities. Report all unwell symptoms immediately Keep facilities dust free, close doors, regular cleaning Provide sterile eye wash with first aid kits	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
27	NOISE Plant and breaking out operations, related to both MOLA and Principal Contractor works within the site.	Excessive , prolonged noise levels, Nuisance to public	Personal injury – temporary or permanent damage to hearing, loss of hearing Headache/ nausea	M	Staff Contractors Visitors	All MOLA staff to be aware of ear plug station locations TOOLBOX TALKS ON NOISE Minimise exposure– rotate staff, plan work to avoid noisy times/work areas if possible. Wear appropriate ear protection. Report unwell symptoms immediately. Vacate area if headaches/nausea etc.	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
28	DEEP EXCAVATIONS Consider Gas monitors for areas of deep excavation (eg Area 5) Areas 1, 2,3 and 5 within secant pile wall boxes, therefore shoring will be restricted	Collapse of sides Fall of persons Falls of Plant, equipment , material Flooding Hazardous atmosphere (see RA 13)	Personal injury, Equipment damage	M	Staff Contractors	Determine the depth of localised excavations (mechanical or hand excavation) and consider task specific risk assessment Install shoring/temp works or batter/step sides as outlined in MS. Shoring to be installed and maintained only by Principal	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch

	<p>to localised deep features within the excavation areas</p> <p>Area 4 (GWB) may comprise deep excavations which require temporary works for archaeology</p>					<p>Contractor.</p> <p>Shoring inspected by competent contractors or MOLA supervisor instructed by them.</p> <p>Access ladders/scaffolding installed and inspected by competent contractor.</p> <p>Edge protection – fixed scaffolding barrier –installed around trench by a competent person 'Danger Deep Excavation' Warning signs displayed.</p> <p>Plant operators will be briefed on MOLA works and operating procedures for deep trenches.</p> <p>The size and shape of the bucket or skip used for spoil disposal will be suitable for the size of trench, shoring, and other obstructions.</p> <p>Only staff physically fit and suitable.</p> <p>Basic visual health surveillance. report all unwell, symptom immediately.</p> <p>Gas monitoring equipment where appropriate.</p>		
0032	<p>VEHICLES (MOLA van)</p> <p>Site pick-ups and drops</p>	<p>Collision</p> <p>Overturning</p> <p>Fire/Explosion</p> <p>Loose loads</p> <p>overloading</p>	<p>Personal injury</p> <p>Equipment and property damage</p>	L	<p>Staff Contractors</p>	<p>Comply with the Highway code and all road traffic legislation</p> <p>Only authorised, insured and fully licensed drivers will drive company or hire vehicles.</p> <p>Drivers will be qualified to drive the class of vehicle to be driven.</p> <p>Assess driver or fitness as required</p> <p>Suitable rest periods to be taken</p> <p>No driving - within 12 hours of the consumption of alcohol</p> <ul style="list-style-type: none"> - under the influence of drugs or medication that affect judgement - while tired or made unfit to drive by illness - while eating drinking or smoking - whilst using 	L	<p>Driver</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p>

						mobile phone AA Membership. Current MOT cert Maintain and inspect regularly - each day/ before each significant journey. Report faults. Service by competent person. Load limits will not be exceeded. Secure All loads properly. Fire extinguisher and First Aid kit to be carried. Hazardous loads warning signs will be displayed where applicable and the driver briefed and trained to handle those loads		
0032b	VEHICLES (LOADING and UNLOADING)	Loose, heavy unsuitable loads Manual Handling Overturning/ collapse	Personal Injury, equipment or property damage	L	Staff Contractors	All loads will be properly secured. Brief driver and Display warning signs for hazardous loads Brief driver and staff on operation. Operation to be supervised Segregate from public and other site works - use Lookouts, physical barriers, and warning signs where necessary. Manual handling risk assessment where necessary	L	Driver, Supervisor and staff.

33	<p>PLANT LIFTING</p> <p>Machine used as hoist, steel bucket for spoil removal</p>	<p>falling bucket, material, collapse, Striking overhead obstruction</p>	<p>Personal Injury, equipment or property damage</p>	M	Staff Contractors	<p>MOLA staff will not operate plant Only trained plant operatives will operate plant. Plant used as crane must be correctly fitted to do so. loads/skips/buckets must be within the safe working load of the machine. A banksman will be present for all operations. Loads will not be slewed over staff below Exclusion zone in area of lift operation while the skip/bucket is being raised or lowered or in the interval between if operations are ongoing. See MOLA H&S Policy.</p> <p>As Phases 3 and 4 of Area 5 West are a restricted spaces, MOLA staff will need to VACATE THE TRENCH during lifting operations.</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>
34	<p>HUMAN REMAINS</p> <p>Possible Roman inhumations and cremations</p> <p>Early post-medieval cemetery inhumations, with potential for moderately well preserved coffins or possibly lead coffins.</p>	<p>Sharp bone/wood</p> <p>Lead: solid and dust (coffins)</p> <p>Parasite eggs, mould, spores</p> <p>Pathogens/ micro-organisms</p> <p>public outrage, affront to Staff personal/religious belief</p>	<p>Personal injury, psychological distress, disease</p>	L	Staff Contractors	<p>Follow national and local authority environmental health guidelines and rules, and requirements of Burial Licence. REGULAR TOOLBOX TALKS on the specific hazards and safe system of work Provide adequate hygiene facility hot/cold running water, paper towels, soap. No eating/drinking/smoking in work area. Report all unwell symptoms immediately. If soft tissue, sealed or unsealed lead coffins, sealed crypts are encountered, work will stop immediately, the excavation area will be vacated, and the specific individual circumstances will be assessed (as per Method Statement). Work will not recommence until a new task specific risk assessment</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p> <p>Project Arch</p>

						has been produced, and its requirements enacted, and method of safe removal and storage of remains). PO and SA to undertake staff surveillance for continued suitability willingness to work with human remains. Adequately screen and secured from public view. Professional attitude to human remains at all times. Be courteous - refer all public enquiries to MOLA supervisory team.		
39	HAND AUGER Consider back injuries assess staff to undertake augering	Manual handling Contact with underground services	Personal injury, equipment damage	L	Staff	Staff will be trained and supervised Inspect before use, obviously faulty equipment will not be used. Assess for physical aptitude for task Assess location to ensure that there is sufficient room for use, and that the deposits are suitable. Do not overstrain driving the auger into the ground or removing it. Rest breaks during prolonged periods of use. Cease work if an obstruction is encountered.	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
41	ADVERSE WEATHER Winter Spring	Cold weather Bright sunshine Wet/slippery ground surfaces Slips trips and falls Sudden rain/ electric storms-	Personal Injury, equipment damage, lost time	M	Staff Contractors Visitors	Monitor weather forecasts. Ensure staff can get to and from work areas safely in reasonable time – Assess site conditions before commencement. Advise staff of adverse weather risks TOOLBOX TALKS . Rotate staff/volunteer tasks Wear appropriate clothing Provide sunblock Provide shaded safety spectacles. Provide rehydration, and salt replenishment Staff to Report unwell symptoms.	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch

						Suspend on site work in excessive rain.		
0043	SPOIL MOUNDING	Plant and materials falling into trench Dust Mudslides Slippery barrow runs Overloaded barrows	Personal injury, equipment damage	M	Staff Contractors Visitors	Robust barriers around deep excavations. Identify areas of dedicated spoil storage and removal TOOLBOX TALK on areas of spoil and associated plant movement Mound spoil and materials at safe distance from trench, welfare facilities, occupied premises and site perimeter. Supervisor to determine safe distance. Do not block drains, sewers, manholes, water courses, with spoil. Spoil to be mounded - c45 degree slope maximum where applicable. Keep excavation edges clear of loose rubble, spoil, materials etc. Clear and secure barrow runs, staging to be used where possible, fitted with toe boards and guard rails as appropriate. Cover or damp down in dry dusty conditions. Large heaps to be closed in heavy rain or snow and monitored for slippages.	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC Project Arch
0045	WASTE	Contaminated soil Building and demolition waste Human and animal waste Flammable material Domestic refuse	Personal injury or illness, equipment property or environmental damage	L	Staff Contractors Visitors	MOLA is not a licensed waste carrier. MOLA vehicles will not carry domestic or commercial waste MOLA staff to adhere to C502 Waste disposal procedures for any controlled waste foreseen during the project. Top soil and similar to be stored separately from hazardous waste. Vehicles and containers secure and suitable for the purpose, cleaned and maintained. Comply with site	I	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC

						waste disposal procedure, use disposal skips and containers correctly		
0055	TASK LIGHTING (Stand alone)	Fire Electrocution Trip hazard Light falling on person	Personal injury, equipment damage	L	Staff Contractors Visitors	Current PAT test Visual inspection before use, do not use If defective, switch off and report immediately. Repair only by competent person. Use only for minimum amount of time to complete task. Position to minimise falling on operatives. Leads and extension cables routed to minimise trip hazards. Dry Powder fire extinguisher available Sufficient lighting to be provided for evening shift	I	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC
RA63	SHIFT WORKING Area 1	Fatigue Stress Lack of concentration	Personal injury or illness	M	Staff Contractors	MOLA to work not more than one month of 6 day weeks excavating burials in Phase 2 (& 3a). MOLA to work alternate 6-day and 5-day weeks in Phases 3c and 4. Paid break increased to 30 minutes. Project Officer coverage increased to all of both shifts. C502 to provide sufficient lighting to 250 Lux. Increased toolbox talks to increase awareness of symptoms of fatigue in self and in others and encourage reporting. MOLA to rotate tasks where possible in order to avoid long periods of heavier physical work	L	C257 MOLA MOLA PO/SA ALL MOLA staff MOLA PM C502 PC

0035b	<p>Preliminary Risk Assessment:</p> <p><i>To be updated to individual circumstances, and signed off, before use</i></p> <p>LEAD COFFINS (Sealed and or unsealed) HUMAN REMAINS within lead coffins Procedures for dealing with lead coffins when encountered at the Broadgate Site</p>	<p>Sharp objects bone/wood, torn metal (lead)</p> <p>Lead: solid and dust (coffins) Parasite eggs, mould, spores Pathogens/ micro-organisms public outrage, affront to Staff personal/religious belief Manual Handling (Heavy Lifting)</p>	<p>Personal injury Psychological distress Stress Illness, disease, infection</p>	M	Staff Contractors Visitors	<p>GENERAL CONSIDERATION S</p> <p>Follow national and local authority environmental health guidelines and rules particularly HSE Controlling risk of infection at work from human remains. All works to conform to safe system of Work as outlined in MOLA RA35 Human Remains (see above) When discovered avoid further contact with the coffin. Report discovery to supervisor for risk assessment. Unless obviously unsealed (truncated or punctured) assume that coffin is sealed and leave area. If the coffin is clearly unsealed: MOLA PO/Supervisor will where appropriate: Suspend work in the area until further assessment can be made ie Cordon off the area so that it is clearly demarcated for avoidance by other site staff. Brief staff on the specific hazard Ensure that the coffin's external features can be recorded safely – ie non-intrusive recording such as photography. Contact the appointed exhumation contractor where available to remove the hazard. Ensure all remains are adequately bagged and/or protected by the exhumation contractor</p> <p>If a potentially sealed lead coffin is encountered</p> <p>MOLA PO/Supervisor will where appropriate: Suspend work in</p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p>
-------	--	--	--	---	----------------------------------	---	---	--

						<p>and cordon off the area so that it is clearly demarcated for avoidance by other site staff Where not already present on site arrange via PM for suitably qualified exhumation contractors to implement safe system of work for removal of coffin.</p> <p>Brief staff on the specific hazard</p> <p>Ensure that the coffin's external features can be recorded safely – ie non-intrusive recording such as photography</p> <p>In all cases Staff will ensure contaminated PPE is isolated and disposed of via the exhumation contractor. That is PPE items should be bagged, clearly labelled and identified for controlled specialist disposal.</p> <p>REPORT ANY INJURY (esp cuts or puncture wounds) IMMEDIATELY TO MOLA PROJECT OFFICERS</p> <p>Consult medical advice where puncture wound is deep/results from contact with bone or coffin. Wear impermeable gloves at all times when working with lead coffins Wear FFP3 dusk mask if appropriate Wear Tyvek type 5-6 overalls if appropriate.</p>		
0035c	<p>Preliminary Risk Assessment:</p> <p><i>To be updated to individual circumstances, and signed off, before use</i></p> <p>Crypt Structures,</p>	<p>Sharp objects bone/ wood</p> <p>Collapse of structure</p> <p>Voids</p> <p>Lead: solid and dust</p>	<p>Personal injury</p> <p>Psychological distress</p> <p>Stress</p> <p>Illness, disease, infection</p>	M	<p>Staff Contractors Visitors</p>	<p>GENERAL CONSIDERATION S</p> <p>Follow national and local authority environmental health guidelines and rules particularly <i>HSE Controlling risk of infection at work from human</i></p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p>

	<p>Tombs/Cists (Sealed and or unsealed)</p> <p>HUMAN REMAINS within structures</p>	<p>(coffins)</p> <p>Parasite eggs, mould, spores</p> <p>Pathogens/ micro-organisms</p> <p>public outrage,</p> <p>affront to Staff personal/r eligious belief</p> <p>Manual Handling (Heavy Lifting)</p>				<p><i>remains.</i></p> <p>All works to conform to safe system of Work as outlined in MOLA RA35 and 35b Human Remains and Lead Coffins (see above)</p> <p><i>When discovered Do Not Enter any buried structure. Leave area and report discovery to supervisor for risk assessment.</i></p> <p>MOLA PO/Supervisor will cordon off the structure and seek advice from competent persons where necessary to ensure that the structure is assessed for:</p> <p>Height, width and depth</p> <p>Structural integrity and stability</p> <p>Water ingress</p> <p>Unsafe atmosphere – fumes, dust</p> <p>Biological agents</p> <p>Condition of human remains</p> <p>Lead coffins</p> <p>Confined space designation (see MOLA proforma RA)</p> <p>Once identified, MOLA PO/Supervisor to brief staff on the specific hazard immediately, and implement safe system of work.</p>		
0035d	<p>Preliminary Risk Assessment:</p> <p><i>To be updated to individual circumstances, and signed off, before use</i></p>	<p>Sharp objects bone/ wood</p> <p>Bio-Environmental (fluids)</p> <p>Parasite eggs,</p>	<p>Personal injury</p> <p>Psychological distress</p> <p>Stress</p> <p>Illness, disease, infection</p>	M	Staff Contractors Visitors	<p>GENERAL CONSIDERATIONS</p> <p>Follow national and local authority environmental health guidelines and rules particularly <i>HSE Controlling risk of infection at work</i></p>	L	<p>C257 MOLA</p> <p>MOLA PO/SA</p> <p>ALL MOLA staff</p> <p>MOLA PM</p> <p>C502 PC</p>

	<p>HUMAN OR ANIMAL SOFT TISSUE AND FLUIDS</p> <p>HUMAN or ANIMAL REMAINS (partially decomposed)</p> <p>Animal Hair</p>	<p>mould, spores</p> <p>Pathogen s/ micro-organisms</p> <p>Soft-Tissues</p> <p>public outrage,</p> <p>affront to Staff personal/r eligious belief</p>				<p><i>from human remains.</i></p> <p>All works to conform to safe system of Work as outlined in MOLA RA35 and 35b Human Remains and Lead Coffins (see above)</p> <p><i>Where discovered do not continue to excavate remains where soft tissues or fluids are suspected or identified, leave the area and report to the supervisor.</i></p> <p>Once identified, MOLA PO/Supervisor to brief staff on the specific hazard immediately, and implement safe system of work by where appropriate:</p> <p>Ceasing all work on the remains cordoning off the remains and arranging their removal by the exhumation contractor where available.</p> <p>If recording is necessary ensure non-intrusive recording only such as photography.</p> <p>Contact suitably qualified persons eg Environmental health if qualified exhumation contractor not on site for advice and procedure for removal of remains.</p> <p>Staff will at all times when working with soft tissue remains</p> <p>wear impermeable gloves</p> <p>wear FFP3 dusk mask</p> <p>wear Tyvek type 5-6 disposable</p> <p>Ensure</p>		
--	---	---	--	--	--	--	--	--

						<p>contaminated PPE is isolated and disposed of via the exhumation contractor. That is PPE items should be bagged, clearly labelled and identified for controlled specialist disposal.</p> <p>Exercise a high level of personal hygiene (wash thoroughly with soap and hot water) particularly After accidental contact</p> <p>REPORT ANY INJURY (esp cuts or puncture wounds) IMMEDIATELY TO MOLA PROJECT OFFICERS</p> <p>Consult medical advice where puncture wound results from contact with bone, soft tissues or organic material.</p>		
<p>All persons affected by these hazards must be made aware of the contents of this Risk Assessment</p>								

21 Annex: C502 Site Requirements

This section contains a summary of the site rules, provided by C502 Laing O'Rourke, which will be followed by all MOLA staff on the Broadgate site.

C502 Site Requirements

General Requirements

- All operatives involved with these works will have undertaken the full Site Safety Induction and D&A Testing.
- A Site Supervisor will supervise these works at all times.
- A 4day¹ (minimum) first aider will be in attendance for all works.
- All operatives and supervisors will be briefed on the requirements of this method statement, the limits and scope of works, the Site emergency, safety, environmental and first aid procedures and the risks as identified by the safe system of work.
- The Site Foreman will ensure that the site is managed safely and that all work is carried out in accordance with this Method Statement and planned safe system of work.
- The Site Foreman is to ensure that all site based staff are issued with the appropriate PPE, helmets, boots, high visibility vest or coat, gloves, glasses and ear defenders as a minimum.
- Approved temporary works designs will be in place prior to installation of temporary works and a permit to load / access / strike issued prior to use, loading or removal.

Any lifting required will be carried out under the direct supervision of a competent slinger / signaller to an approved lifting plan produced by the site Appointed Person

Delivery and receipt of materials

Deliveries will be booked onto LOR juggler and CRL's VMBS systems. The vehicles and drivers will be Crossrail compliant. The lorries will first report into the Crossrail Lorry Holding Bay on London Wall and await clearance to come into site. The deliveries will be staggered to ensure minimal congestion at the Crossrail Lorry Holding Bay and around the site entrance. The lorries will enter site via the entrance situated on Blomfield Street under the control of traffic marshals and loaded within the confines of the site boundary. All lorries are to come complete with edge protection. The route to site is to be confirmed by the LOR traffic marshal at the lorry holding bay and will be dependent on other construction activities taking place in and around Blomfield Street.

All lifts are to be detailed on the lifting plan and the lifting operation is to be managed by a certified banksman and a crane supervisor. Any small items are to be loaded into stillages prior to arriving onsite to ensure they can be easily offloaded. The supervisor is to ensure that when the lorry driver exits his cab he/ she is wearing full site PPE. They are to be under constant supervision of the foremen and are not to leave the vicinity of the vehicle as they are only working off a temporary induction.

¹ C502 have stated that the 3 Day courses used by MOLA are acceptable for MOLA staff.

Authorisation to start

All operatives will receive a recorded site induction before they start working on the project.

All operatives will also receive a relevant task briefing and will sign the briefing sheet to acknowledge understanding of the scope of works included and adherence to the safe systems of work in place. Prior to starting work in every shift, operatives will be given a Daily Activity Briefing (DAB) which includes a review of the previous day's activities in terms of health and safety and specific works being carried out during that days shift.

All relevant permits and certificates will be checked and a copy will be retained on site for record purposes.

All works must be in accordance with relevant Planning Permission and Listed Building Consent, ensuring that the correct, approved plans are being worked to.

Section 61 consent from the City of London (CoL) is a prerequisite to the works.

All subsequent works are to be complete and the area is to be declared safe to start works.

Pre start checks

The Construction Manager will ensure that all necessary approvals such as ITP's, Method Statements, Designs and Task Sheets are in place prior to commencement of works.

The Environmental Co-ordinator will ensure that all necessary environmental protection measures such as drip trays, bunded bowsers etc. outlined in the Environmental Management Plan C502-LAO-T1-STP-C101_WS102-50001 are in place.

The foreman is to ensure that all site based staff are issued with the appropriate PPE; helmets, boots, high visibility top and trousers, gloves, glasses and ear defenders as a minimum. Hearing Protection must be worn when working in the vicinity of noisy activities. Signage will be installed advising the mandatory use of hearing protection where required.

All personnel are to ensure that safety measures are in place i.e. work area segregation and segregation from any subcontractors operations.

The foreman shall ensure that all plant inspections have been carried out in accordance with the equipment maintenance and inspection schedule prior to any activities being undertaken.

The excavators and other associated plant onsite are to be fully compliant with the required exhaust emissions restrictions on the project.

The trigger levels for the building monitoring will be briefed to the engineers and monitored during the works in accordance with the Management Plan for Control of Ground Movements ref. C502-LAO-C-STP-C101-50001.

RESOURCES

Competency

In addition to the Site induction and briefings as detailed in the Authorisation to Start all operatives will be trained in a combination of the following;

- Valid CSCS for all operatives
- Valid CPCS Vehicle Banksman competency card
- Valid CPCS Slinger / Signaller competency card
- Valid CPCS Appointed Person for Lifting Operations
- Valid CPCS Plant Operators competency card
- Valid CISRS Scaffolders.

Copies of operative training records will be retained in the LORs office for inspection.

Personal Protective Equipment

All personnel will be issued with the following safety equipment, which will be worn at all times where applicable.

PPE	Req.	Grade	When	Additional information
Safety Boots	Y	BS EN ISO 20345: 2004	At All Times	Trainer / Rigger boots not allowed.
Orange High Visibility Jackets / Vests / Trousers	Y	BS EN 471	At All Times	Laing O'Rourke (sponsor) Logo on all vests and Jackets
Safety Hard Hat	Y	BS EN 397	At All Times	To be in date
Glasses	Y	BS EN 166	At All Times	Certain operations may require additional protection
Hearing Protection	Y	BS EN 352	At All Times	Suitable for each task
Gloves	Y	BS EN 420	At All Times	Suitable for each task
Flame retardant overalls	Y	EN ISO 11611 EN ISO 11612 BS EN 533 EN 531	When hand digging around UKPN / power cables.	

All personal protective equipment issued will comply with the relevant British Standards and European Conformity Standard. PPE is issued as a last resort and will be suitable for the work being carried out; i.e. when all other reasonable means of ensuring safe working methods have been assessed. This will be maintained or replaced as appropriate.

Training will be given on the use and fitting of personal protective equipment as and when required. It is the responsibility of the LOR Supervisor to ensure that PPE is properly used.

Materials Plant & Labour

Hereto is a list of LOR, materials, plant and labour requirements. Requirements of the trade contractors will be detailed in their Safe System of Work.

Materials:	
<ul style="list-style-type: none"> Scaffold Equipment 	
Plant & Equipment:	
<ul style="list-style-type: none"> 13T / 20T excavator Breaker attachments for excavators Gas monitor Shovels Compressor Wheelbarrows Youngman Boards Perimeter Lighting 	<ul style="list-style-type: none"> Lifting accessories (shackles, chains etc.) Hand Held Breakers Bucket Skips Secure Tool Boxes
Personnel	
<ul style="list-style-type: none"> 1 No. Site Foreman 1 No. Banksman 1 No. Crane Supervisor 1 No. Excavator Operator 	<ul style="list-style-type: none"> 1 No. Site Engineer 1 No. Slinger / Signaller 6 No. General Operatives
Permits (These are always a hold point in the method)	
<ul style="list-style-type: none"> Permit to Penetrate. Permit to load (trench boxes / trench sheets and propping systems) Area Handover Sheets - MOLA 	

General Site Safety Procedures

Leading edges will be protected in accordance with Laing O'Rourke Standards (LOR), this may be in the form of Kee Klamp or A-Frame scaffold installed a minimum of 1m from the top of the batter.

The excavation will be inspected daily and after any periods of inclement weather that may compromise their stability. These inspections will be recorded using LOR's ENG.T.03 Form and filed.

Excavation areas will be identified using red exclusion barriers and appropriate signage.

Spoil will be segregated as much as is reasonably practical and stockpiled at a safe distance from the top of the excavation and then removed from site at the earliest opportunity.

Clean clay material will be disposed of at the Docklands Transit Site (DTS) and all other material will be deposited at Ingrebourne Valley. The Works Information states that clean, virgin clay is that found below 105.000mAoD i.e. approximately 7m below current ground level. The spoil removed will require monitoring as site excavation works progress and materials testing /sampling will be carried out to determine the contents of the clay taken above this level.

Emergency Procedures

All accidents, incidents, fires, environmental incidents and near misses must be reported to the LOR Supervisor, who will follow the Emergency Preparedness Plan (EPP) Document ref. C502-LAO-O1-STP-C101_WS102-50003, as appropriate.

If a serious accident or incident occurs requiring the site to be evacuated and the alarm is raised, all site based LOR management, supervisors and operatives shall assemble at the C502 assembly point and shall not return to site until instructed to do so by an authorised person (LOR HS&E Manager, LOR Construction Manager or Police).

Emergency rescue by stretcher from the excavation will be by means of a Davit arm positioned on the north & south sides of the main excavation.

All incident reporting procedures are covered in the Emergency Preparedness Plan (EPP) which details the varying response levels based on the seriousness of the incident. If an incident, accident or emergency occurs, the first person on the scene who is to contact emergency services if required and inform the LOR emergency coordinator as detailed in the EPP incident response flow charts. The Emergency Response coordinator will then initiate the proportionate response. If the incident is serious enough that the Liverpool Street Station master is informed, they will inform the relevant parties.

At the site induction and at regular intervals throughout the duration of the project, all operatives will be briefed on the content of the Emergency Response Plan and the procedures to be followed in the event of an accident or emergency.

For any emergency concerning the works described in here refer exclusively to the phone numbers and persons stipulated for Liverpool Street Station in the Emergency Action Plan, which is revised continuously.

In the event of an environmental incident / spill, etc the site environmental control plan – Pollution control of spill response will be followed. Operatives will then be briefed on emergency arrangements.

Following an emergency / incident the SHE Manager will undertake a full investigation of the events as detailed in the LOR SMS and complete all required reports specified and gather all relevant supporting information to support a detailed investigation

First Aid

Any incident that requires First Aid must be reported to the LOR Supervisor and the LOR HS&E team.

A nominated and trained person(s) will be the first aider and shall be identified by a badge placed on the helmet or hi-visibility jacket. The name of the person will be clearly displayed at the site office and will be confirmed in the induction. An updated list of first aiders will be displayed on the site notice board.

Site first aid boxes are stored at various locations around site. Operatives are to check the notice boards for information on the closest first aid box. The accident book will be located in the site offices.

If an ambulance is required then the emergency services will be called by the first person on the scene and LOR management team informed in accordance with site rules and HSE regulations.

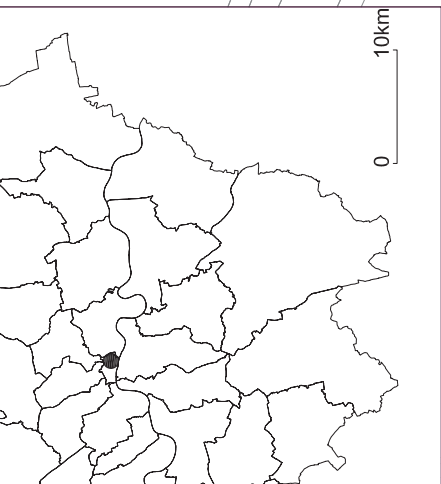
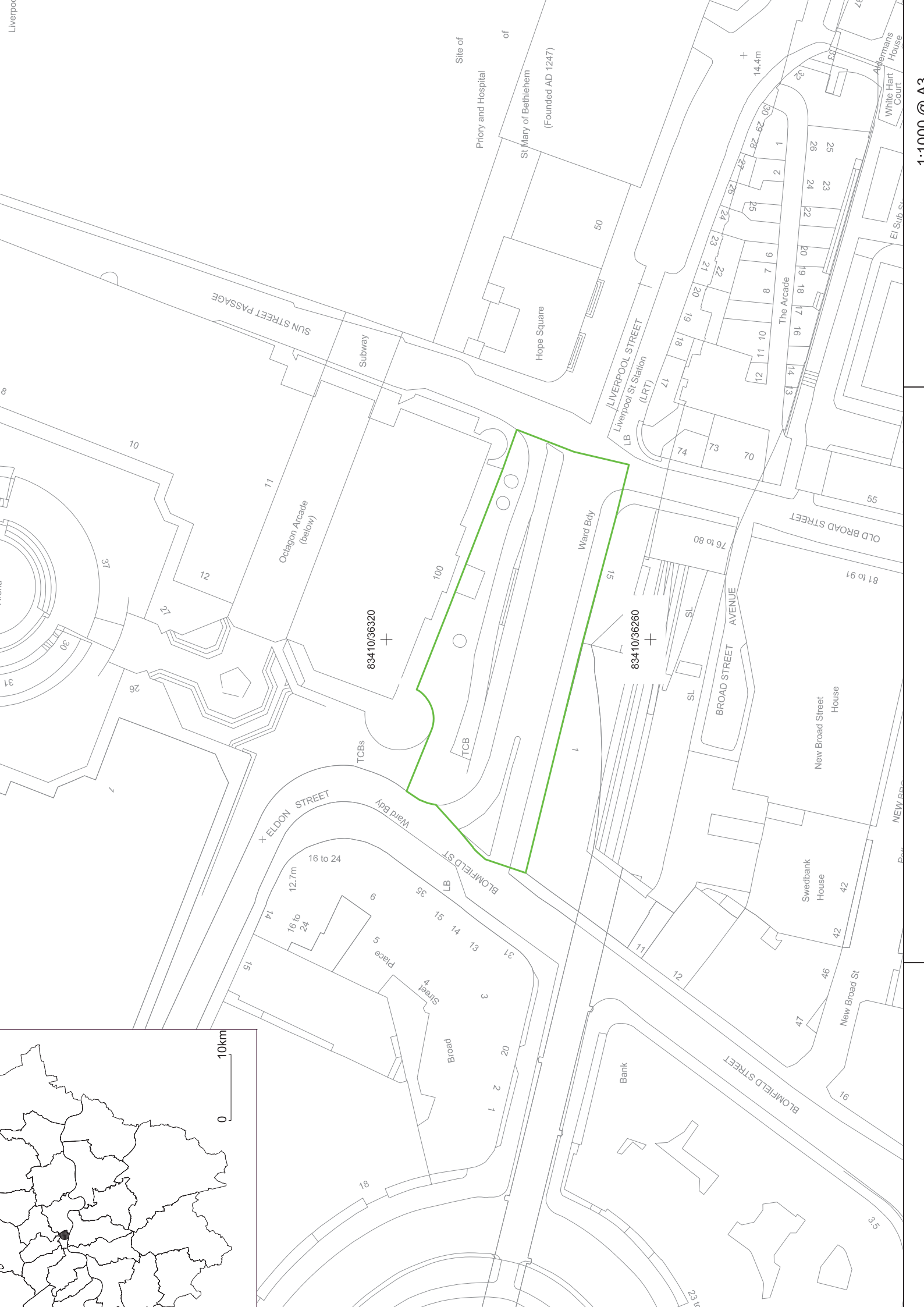
Environmental

Please refer to the C502 Project Environmental Plan (C502-LAO-T1-STP-C101_WS102-50001).

Note that there are no significant environmental concerns resulting from the works covered by this MS.

24 Programme









25 Figures

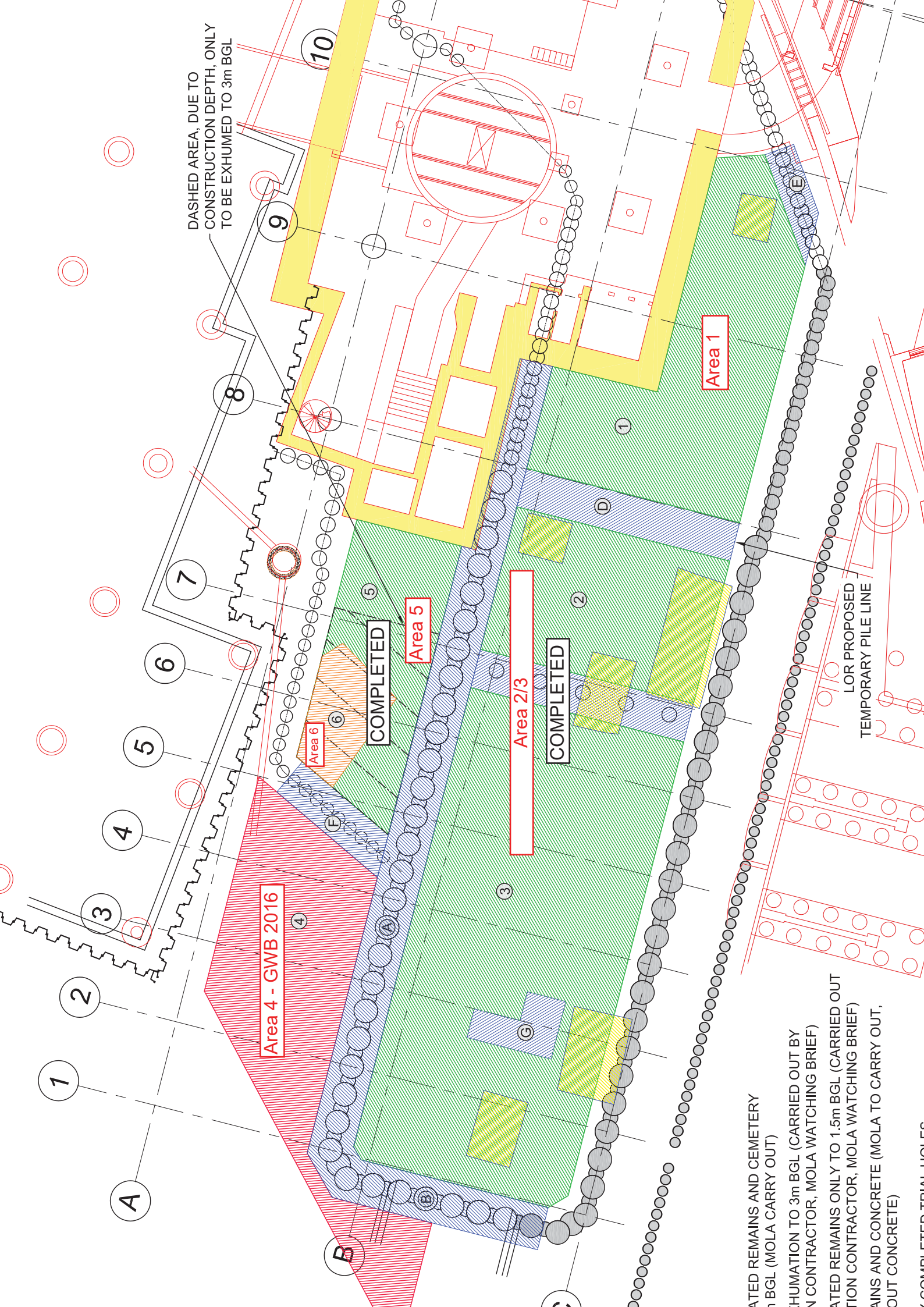


0 10km



Key

-  Proposed Sewer Shaft (to be completed by others)
-  Trial Trench location (completed by J P Riney)
-  Pit /Trench location (completed by Contract C503)
-  Archaeology at approx 1.5m to 6.0m below ground level
Human remains and Roman deposits
-  Archaeology at approx 3.0m to 6.0m below ground level
Roman deposits only
-  No archaeology
-  Bone & Concrete was encountered to at least 6.0m BGL
That deposit may extend south within the area marked
Roman Deposits will survive within the area of TP7 as
fully excavated
-  Bone & Concrete confirmed



DASHED AREA, DUE TO CONSTRUCTION DEPTH, ONLY TO BE EXHUMED TO 3m BGL

Area 4 - GWB 2016

Area 6

COMPLETED

Area 5

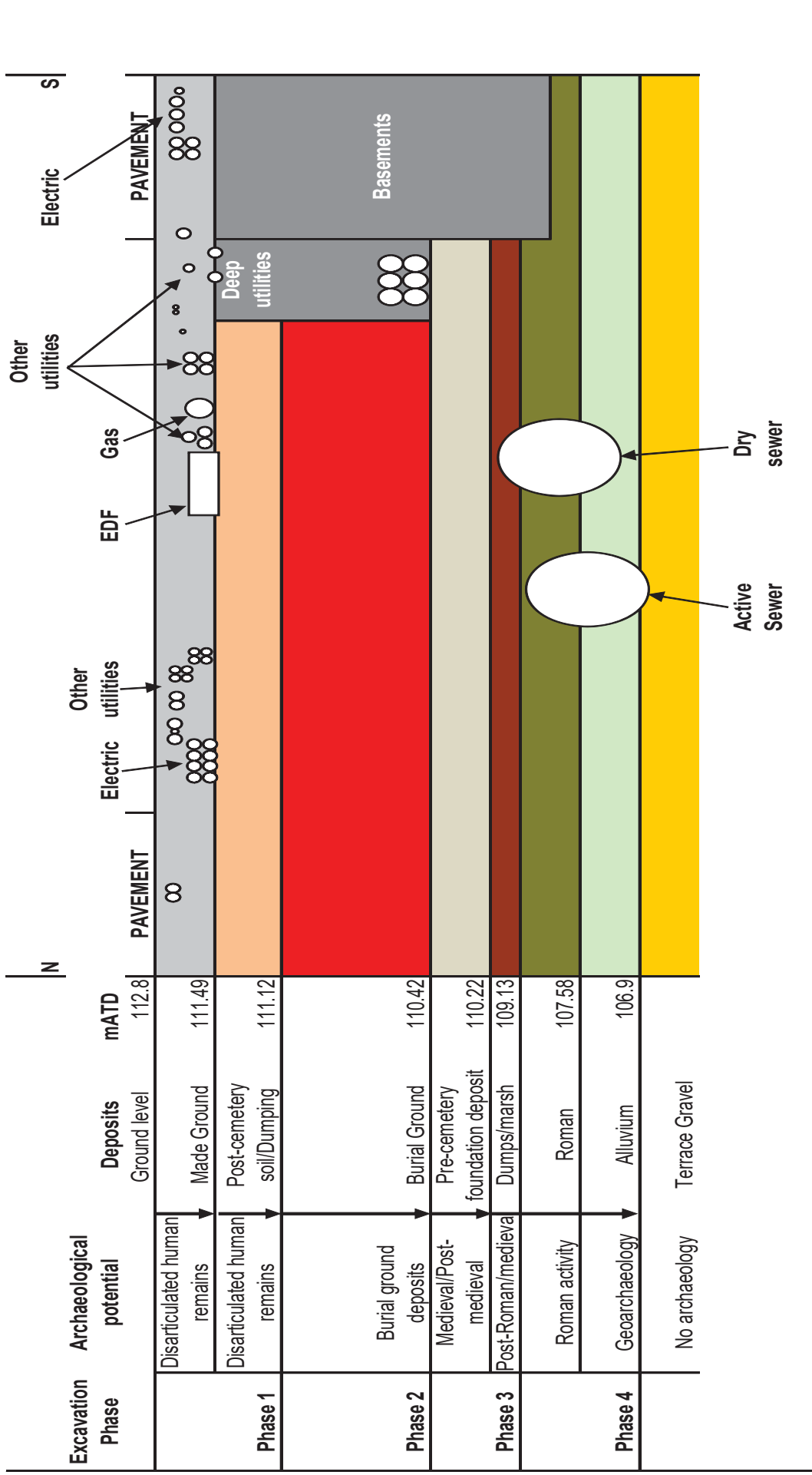
Area 2/3

COMPLETED

Area 1

EXHUMED REMAINS AND CEMETERY
 TO 3m BGL (MOLA CARRY OUT)
 EXHUMATION TO 3m BGL (CARRIED OUT BY
 CONTRACTOR, MOLA WATCHING BRIEF)
 EXHUMED REMAINS ONLY TO 1.5m BGL (CARRIED OUT
 BY CONTRACTOR, MOLA WATCHING BRIEF)
 EXHUMATION TO 1.5m BGL (CARRIED OUT
 BY CONTRACTOR, MOLA WATCHING BRIEF)
 EXHUMATION TO 1.5m BGL (CARRIED OUT
 BY CONTRACTOR, MOLA WATCHING BRIEF)
 EXHUMATION TO 1.5m BGL (CARRIED OUT
 BY CONTRACTOR, MOLA WATCHING BRIEF)
 EXHUMATION TO 1.5m BGL (CARRIED OUT
 BY CONTRACTOR, MOLA WATCHING BRIEF)

FOR PROPOSED
 TEMPORARY PILE LINE



nb. The above diagram is intended to be a simplified visual reference of the archaeological sequence. The diagram is not to scale and the locations of deposits, obstructions, and utilities are approximate.

Fig 4 Schematic typical section, showing archaeological sequence (WSI Addendum, Crossrail 2014, 11)



GROUND LEVEL (c.113.5 – 112.25m ATD) ▽

	Depth of Excavation	Activity and Contractor Responsibility	Archaeology
Phase 1	≈ 1.100m	C502 LOR EXCAVATE WITH MACHINE C502 EXHUMATION CONTRACTOR RECOVER REMAINS C257 MOLA WATCHING BRIEF	Disarticulated Human Remains
	≈ 0.300m	C502 LOR EXCAVATE WITH MACHINE C502 EXHUMATION CONTRACTOR – REMOVE HUMAN REMAINS C257 MOLA - WATCHING BRIEF	
	UNDULATING AREA (IF REQUIRED TO BE HAND EXCAVATED UNDER C257 MOLA DIRECTION. C257 MOLA TO INSTRUCT WHEN THE TOP OF CEMETERY AND IN SITU BURIALS IS REACHED)		
Phase 2	≈ 1.500m	C257 MOLA – HAND EXCAVATE TO EXPOSE/REMOVE IN SITU BURIALS C502 EXHUMATION CONTRACTOR – SCREEN MATERIAL REMOVED AND REMOVE HUMAN REMAINS FROM SITE	In Situ Burials (Cemetery Layer)
Phase 3	≈ 1.000m	C257 MOLA –SUPERVISED EXCAVATION WITH MACHINE/SOME HAND EXCAVATION C502 LOR TO PROVIDE MACHINE PLANT	Archaeology Layers Post-Roman and Roman Deposits
Phase 4	≈ 2.000m	C257 MOLA – HAND EXCAVATION TO REMOVE ROMAN REMAINS C502 SUPPORT AS REQUIRED	

Fig 5 Summary of Phases of work in Areas 1, 2/3, and 5, with approximate excavation depths and contractor responsibilities (WSI Addendum, Crossrail 2014)