



C261 ARCHAEOLOGY EARLY EAST

Method Statement

Archaeological Targeted Watching Briefs

Pudding Mill Lane Portal

Document Number: C261-MLA-T1-GMS-CRG03-50001

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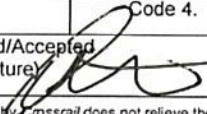
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Note for Readers

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	2.1, 2.3 3.1 4 5 15 16 17 21 22
Health, Safety, & Environment	15 17 21 22
Contractual	1.1 2 4 7 8 10 14 18 19 20
Archaeological methodology	1 3 5 6 9 10 11 12 13

Contents

1	Introduction.....	1
1.1	Site Description.....	1
1.2	Geological and Topographical setting.....	2
1.3	Archaeological and Historic Background.....	2
1.4	Deposit survival.....	3
2	Interfaces and Communication Plan.....	4
2.1	Interface with Project Archaeologist.....	4
2.2	Interface with C261 Contract Administrator.....	4
2.3	Interface with C350 Principal Contractor.....	4
2.4	Interface with Crossrail Archaeologists.....	4
2.5	Interface with External Consultees.....	4
3	Scope of Works.....	5
3.1	Planned Fieldwork Events.....	5
3.2	Confirmation of Methods and Standards.....	5
3.3	Aims and Objectives.....	6
3.4	Event Codes.....	8
4	Site Management Plan.....	9
4.1	Tools and Equipment.....	9
4.2	Training and Certification.....	9
4.3	Site Monitoring.....	9
4.4	Progress Reporting.....	10
4.5	Resource Plan.....	10
4.6	Programme.....	10
4.7	Working Hours.....	10
5	Fieldwork Methodology.....	11
5.1	Targeted Watching Brief Methodology.....	11
5.2	Survey and setting out method.....	12
5.3	Recording Methods.....	13
6	Geoarchaeological investigation and methodology.....	14
6.1	Sampling strategy.....	14
7	Deliverables and Submission Programme.....	18
8	Document Control and Record Keeping.....	18
9	Artefact Recovery and Conservation.....	18

10 Finds Collection	19
11 Treasure	19
12 Archaeological Science Strategy	20
12.1 Specialist Strategy	20
12.2 Excavation and Recording of Human Remains.....	20
13 Archiving and Dissemination Method	20
14 IT Capability – Digital Survey Recording, Data Capture and Curation	21
15 Additional Details	22
15.1 Standards and Guidance	22
15.2 Unexpected and Nationally-important remains.....	22
15.3 Progress Photographs.....	22
15.4 Management of Consents.....	22
16 Health and Safety	23
16.1 CDM Responsibilities and Reporting.....	23
16.2 Rail Sites	24
16.3 Highway Sites.....	24
16.4 Health and Safety Reporting.....	24
16.5 Liaison with Principal Contractor	25
16.6 Behavioural Safety BMOS	25
17 Emergency Response	26
17.1 Emergency Preparedness & Response Plan.....	26
17.2 Training.....	26
17.3 Emergency & Accident Equipment	26
17.4 Monitoring & Testing	26
17.5 Emergency & Accident Incident Reporting	26
18 Environmental Management	28
18.1 Contamination	28
18.2 Water Disposal	28
18.3 Site Waste Management Plan	29
18.4 Vehicles/Motorised Equipment	29
18.5 Other Requirements.....	29
19 Quality Assurance Plan	30
20 Community Relations	30
21 Responsible Procurement	30
22 Health and Safety Method Statement	31
22.1 Introduction and Purpose.....	31

22.2	Scope of Document.....	31
22.3	Responsible Persons and Site Management.....	31
22.4	Scope of Works	32
22.5	Methodology, Programme and Sequence	32
22.6	Health and Safety Control Measures	33
22.7	Safety of Excavations	33
22.8	Planning and Resources.....	34
22.9	Briefing Arrangements.....	37
22.10	First Aid	38
22.11	Accident, Incident, Near Miss and Environmental Incident Reporting	39
22.12	Emergency Procedures – Site General.....	40
22.13	Emergency Services Contact Details.....	40
22.14	Route to Hospital.....	40
23	Risk Assessments	41
23.1	Preliminary site risk assessment register	41
23.2	Specific Risk Assessments	43

Figures

(At back of document)

Fig 1 Location of Cut and Cover tunnel (phase 3) and covered ramp for targeted watching brief (C350 Morgan Sindall WPP).

Tables

Table 1 Task information

1

1 Introduction

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

- A Crossrail **Site-specific Written Scheme of Investigation (SS-WSI): Package C152 Puttying Mill Lane Portal, Archaeology Site-specific Written Scheme of Investigation, Doc. No. C152-SWN-C2-RSI-CR094_PT002-0001 Version 10, 12.05.10** (Crossrail 2010a)
- An **Addendum to the WSI: C152 – Puttying Mill Lane Portal, Addendum to WSI: Trial Trench Evaluation, Watching Brief & Detailed Excavation [sic] (XSK10), Doc. No. C152-SWN-C2-RSP-CR094_PT002-50001 Revision 2.0, 12.08.11** (Crossrail 2010b)

The tasks which this method statement covers are Targeted Watching Briefs (TWB) on main construction works, and currently comprise:

Task	Principal Contractor	Provisional Programme
<ul style="list-style-type: none"> • TWB Cut and Cover tunnel (Phase 3) and covered ramp below 102m ATD 	C350 Morgan Sindall	Estimated Start date 09.10.14 (now postponed) Estimated Duration: approx. 8-10 weeks

Table 1 Task information

The requirement for a Targeted watching brief during the bulk excavation of the Cut and Cover tunnel (phase 3) was set out in the Addendum to the WSI (Crossrail 2010b, Section 5.5). Since the Addendum to the WSI was issued, this requirement has been modified, and a Targeted Watching Brief is now only required below 102m ATD (Jay Carver, Project Archaeologist, pers comm, 18.08.14).

This Method Statement has been developed in conjunction with the Principal Contractor (PC), Morgan Sindall (C350), who will be responsible for ensuring that the archaeological works may be carried out as specified. The purpose of the targeted watching briefs is to mitigate the impact of the specified development works upon archaeological remains, by making an adequate record of them in during the construction ground works (a mitigation strategy of *preservation by record* in line with Crossrail requirements).

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 Project Archaeologist and CDM Advisor for approval, in accordance with the specified document control procedures (see 7).

1.1 Site Description

The Puttying Mill Lane Portal site is located south of the Great Eastern Main Line (GEML) railway embankment and lies mostly to the east of the River Lea (including

the area of the Cut and Cover tunnel (phase 3) and covered ramp), about 1km south-west of Stratford Station (Fig 1). The majority of the Crossrail works fall within the London Borough Newham, although a small number lie west of the Lea within the London Borough Tower Hamlets.

1.2 Geological and Topographical setting

The geological and topographical setting was covered in detail in the WSI (see section 1 above), and is summarised below.

Present ground levels vary considerably due to railway and other construction, from c 101m to 105m ATD in the floodplain to the east of the River Lea, rising up to 104m to 110m ATD on the gravel terraces west of the Lea.

The site lies mainly on alluvium within the floodplain of the River Lea. The gravel topography underlying the site comprises intercutting braided channels with raised gravel areas between them. The geo-archaeological assessment identified one such island in the central section of the site, with a high point at c 100.8–101.0m ATD, and indicates that the surface of the terrace gravel is likely to lie at between 100.6 and 101.0m ATD in the area of the Cut and Cover tunnel (phase 3) and covered ramp. The assessment also identified peats and organic alluvial deposits site-wide, but concentrated in areas of lower gravel topography in the eastern and western parts of the site.

1.3 Archaeological and Historic Background

The archaeological and historic background was covered in detail in the WSI (see section 1 above 1), and is summarised below.

The geo-archaeological deposit model of the site identifies a raised area of gravel (at c 100.8–101.0m ATD) across much of the central section of the site, including the area of the Cut and Cover tunnel (Phase 3) and covered ramp. Evidence for prehistoric activity has been recorded at other areas of raised gravel within the Lea Valley, and there is also potential for evidence of activity in marginal areas surrounding the gravel island. Immediately to the east of the Cut and Cover tunnel (Phase 3) and covered ramp, features of Late Bronze Age–Early Iron Age date were observed cutting into a relict land surface at 101.67m ATD, with a later prehistoric land surface observed at 101.84m ATD (MoLAS-PCA 2008, Olympics Planning Delivery Zone 8: a report on the evaluation, unpublished MOL report)

As the river channels dried, a more stable marsh environment of wet woodland developed (MoLAS-PCA 2008), that was generally unattractive to human activity. From the early post-medieval period onwards the area exhibits some evidence for human activity, including pastoral use (Trench PDZ8.04/5.35(C)) despite evidence for flood events.

In the 19th and 20th centuries layers of re-deposited alluvium demonstrate the early ground raising that occurred prior to the landscaping that resulted in the topography of the site today (MoLAS-PCA 2008).

1.4 Deposit survival

On the basis of previous investigations in the vicinity, the following deposits may be anticipated within the area of the Cut and Cover tunnel (phase 3) and covered ramp:

Deposit	Surface
Post-medieval and modern	Currently c 109.5m ATD in the area of the Cut and Cover tunnel (phase 3) and covered ramp.
Alluvium	101.16–104.61m ATD (source: WSI) Anticipated at c 103.75m ATD in the area of the Cut and Cover tunnel (phase 3) and covered ramp. (observed at 103.75m ATD in PDZ5.35(C)/PDZ8.04)
Late prehistoric activity	Potential for late prehistoric land surfaces below 102m ATD (observed at 101.67–101.84m ATD in PDZ5.35(C)/PDZ8.04)
Terrace Gravels (archaeologically sterile)	Anticipated at c 100.6–101.0m ATD in the area of the Cut and Cover tunnel (phase 3) and covered ramp (source: geo-archaeological deposit model)

2 Interfaces and Communication Plan

2.1 Interface with Project Archaeologist

The Method Statement will be submitted to the Crossrail Project Archaeologist and Crossrail Safety/CDM Advisor for approval. Any comments will be incorporated. Regular progress reports will be submitted to the Project Archaeologist and will be augmented by progress meetings and site visits when required, in order to optimise communications and feedback.

2.2 Interface with C261 Contract Administrator

MOLA shall submit costings and timesheet reports in accordance with the C261 Contract to the Contract Administrator.

2.3 Interface with C350 Principal Contractor

MOLA has liaised with the C350 Principal Contractor (Morgan Sindall) to prepare this Method Statement. The archaeological investigations will take place 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 Contractor's Permits to Dig. The majority of this information will be contained in this Method Statement. MOLA will liaise with the Principal Contractors regarding access, order of works, programme and commencement date. The Principal Contractor shall give MOLA 4 weeks' notice of start date(s) for each work area or phase.

2.4 Interface with Crossrail Archaeologists

MOLA shall liaise with CRL Principal Archaeologists, Jay Carver and Iain Williamson, to implement the correct archaeological design specification, described in the SS-WSI (Section 1 above).

2.5 Interface with External Consultees

The Crossrail Principal Archaeologist shall liaise with GLAAS/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 archaeological targeted watching brief work to be carried out during main construction works in advance of construction of the Crossrail Puttying Mill Lane Portal. These currently comprise the remaining targeted watching brief listed in Table 1 in section 1 (Cut and Cover tunnel (phase 3) and covered ramp). The mitigation strategy for the site is *preservation by record*.

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, BAAO/IFA paper no. 7
- 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, 2010a, Package C152 Puttying Mill Lane Portal, Archaeology Site-specific Written Scheme of Investigation, Doc. No. C152-SWN-C2-RSI-CR094_PT002-0001 Version 10, 12.05.10
- Crossrail, 2010b, C152 – Puttying Mill Lane Portal, Addendum to WSI: Trial Trench Evaluation, Watching Brief & Detailed Excavation (XSK10), Doc. No. C152-SWN-C1-RSP-CR094_PT002-00002 Revision 1.0, 12.12.10
- English Heritage, February 2014, Standards for Archaeological Work, London Region
- English Heritage Centre for Archaeology Guidelines, Environmental archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation (2002)
- English Heritage, 2004, Geoarchaeology: using earth sciences to understand the archaeological record
- Institute for Archaeologists (IFA) Standards and guidance for watching briefs and field evaluation (IFA 2001a and 2001b)
- Mays S, Brickley M, and Dodwell N, 2002, 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
- Museum of London Archaeological Site Manual, 3rd Edn (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 Research Aims

The original aims and objectives were listed in the WSI (Crossrail 2010a) and stated that 'data collected from archaeological investigation and mitigation may contribute to the following research themes':

- Understanding London's hydrology, river systems and tributaries and the relationship between rivers and floodplains;
- Understanding the relationship between landscape, river and settlement;
- Using the understanding that comes from reconstructing London's past to contribute to wider environmental studies about contemporary concerns such as: climate change; sea level fluctuations; flood defence initiatives; links between pollution, health and quality of life;
- Understanding the reasons for evolution of the road systems, street layouts, river crossings and ferries, and their importance as engines of development and change;
- Understanding the nature and meaning of the deposition of metalwork in the Thames and at the headwaters of river tributaries;
- Understanding how water supply and drainage provision were installed and managed;
- Studying the correlation between sites associated with watercourses and meander bends, so as to understand the origin of settlements; and
- Understanding the evolving character of development in central London, in comparison to other riverine settlements.

Furthermore, the potential at Pudding Mill Lane for geo-archaeological and palaeoenvironmental deposits to be recovered will contribute to the following themes:

- The development of models for understanding the significance of geomorphology, ecology, ecosystems and climate, hydrology, and vegetational and faunal development, on human lives;
- Characterising changing climatic conditions, and air and water quality and pollution, throughout the archaeological record, towards understanding its implications for how people behaved;

- The Mesolithic/Neolithic transition: understanding the significance of horticultural experimentation at this time, and the transition from hunter-gatherers into farmers; and
- Understanding what London's past environments meant to different groups and individuals.

Any evidence for Post-medieval industrial activity will contribute to the following themes:

- Charting how and why different parts of London developed as specialist producers, and understanding the implications of this for London as a world city;
- Establishing how daily work and life in London reflected and contributed to the rise of London as the commercial centre of the British Empire, and to its continued eminence as a world city thereafter; and
- Examining the success with which small towns in the London region adapted to the capital's growth.

3.3.2 Fieldwork Objectives

The Addendum to the WSI (Crossrail 2010b) states that the overall objectives of the PML targeted watching briefs are to:

- Excavate and record archaeological deposits for analysis and dissemination.
- To record evidence for post-medieval industrial buildings and structures noted in the DDBA and in particular the remains of a large building with landscaped grounds recorded on the 1867AD OS edition (within Section 1 of the cut and cover tunnel).
- To inspect, record and sample profiles in the geo-archaeological sequence of deposits present within the site to understand the site topography and date its phased development.
- To analyse the palaeo-environmental evidence recovered from the works and contribute evidence to inform the Lea Valley Pleistocene and Holocene archaeological resource.
- To inspect the sequence of post Pleistocene alluvial organic deposits and clay silt units for prehistoric, Roman and Medieval archaeological remains at channel edge and areas of higher ground (land and channel management, settlement and industry).
- To identify record and if appropriate recover, any archaeological artefacts (vessels, structural remains and small finds) preserved in the deeper channel areas

3.3.3 Task-Specific Fieldwork Objectives

The following task-specific research questions have been devised by MOLA for this work:

1. Are any **prehistoric land surfaces** identified, and what is their date? If prehistoric land surfaces are present, are they contemporary with surfaces

previously identified at Puttying Mill Lane (MoLAS-PCA 2008, Trench PDZ8.04/5.35(C))?

2. Can information about the location and extent of the **gravel island** identified during previous investigations and boreholes in the area of Puttying Mill Lane be refined?
3. Is there any direct or indirect evidence for **prehistoric activity** (such as artefacts and structures, or plant microfossil and macrofossil evidence)?
4. Is there evidence for the formation of **peat** in marginal areas, and at what date did it start and cease to form?
5. Within any **later** alluvial deposits, is it possible to identify evidence for **anthropogenic management** of the increasingly wet and marshy landscape?

3.4 Event Codes

The sitecode is **XSK10**.

4 Site Management Plan

4.1 Tools and Equipment

Tools and equipment appropriate for the archaeological works will be ordered by the Supervising Archaeologist and delivered to site by the MOLA Equipment Officer from the MOLA central store. See 22.8.2 for details of equipment.

Deliveries/pick-ups must be booked with C350 Morgan Sindall at least 24 hours in advance. Contact PML.Logistics@morgansindall.com

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 (see 4.3).

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, Chainsaw use, Confined Spaces and Power Auger use. However, it is not anticipated that this will be required on this site.

At present the profession of Archaeologist is largely covered by the CSCS, Construction Related Organisation CRO White Card for Archaeological Technician (Code 5363); other cards are available for site visitors etc. All MOLA staff have passed a CITB Health and Safety Test to operative level and carry the card on site at all times.

All staff will have their MOLA ID cards with them (see 22.6.1).

4.3 Site Monitoring

The MOLA supervisor (Grade 4 or 5) will be monitored by the MOLA Project Manager (Elaine Eastbury, BSc or Nicholas Elsdon, BSc) via site visits, as and when required, in order to provide advice and support to the MOLA Supervisor. The MOLA H & S Compliance Manager, Ian Grainger, will also regularly monitor the site, see 16.4.

4.4 Progress Reporting

MOLA has agreed a programme of weekly written progress reports and progress meetings (If appropriate) 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 16.6).

4.5 Resource Plan

The targeted watching briefs will be conducted by a MOLA Supervisor (Grade 4 or 5) assisted by members of the MOLA field team (Grade 6) with support from MOLA Geomatics and Photographic team members (Grade 8) when required.

Other archaeological specialists (Grade 8, eg geoarchaeologists or osteologists), may be called in if necessary.

Staff will be drawn from the pool of CVs submitted to Crossrail for approval.

The named Supervisor will be confirmed to Crossrail and the Principal Contractor in advance, and added to subsequent versions of this method statement, once a firm start date for the task(s) has been notified to MOLA. Other staff to be assigned when required.

Other staff and specialists are to be determined when required.

All archaeological staff are direct MOLA employees, ordinarily full time. The working hours are set out in 4.7 below.

4.6 Programme

The programme for the targeted watching brief is shown in Table 1 in section 1.

4.7 Working Hours

Works on site which require the watching briefs are likely to be limited to the core Crossrail working hours, which are between 0800 to 1800 on weekdays and 0800 to 1300 on Saturdays as specified in the Environment Requirements (Section 4 of Works Information Vol 2). Operations anticipated to cause disturbance are limited to these hours (or as specified within a Section 61 consent obtained by the Principal Contractor), in order to minimise disruption to local residents and the general environment.

MOLA shall provide a site attendance when required during these specified periods, so that all the relevant Principal Contractor's works defined in this MS are monitored and recorded.

5 Fieldwork Methodology

5.1 Targeted Watching Brief Methodology

5.1.1 Site-specific Targeted Watching Brief Methodology

Whilst watching brief methods need to be flexible and react to the deposits present (or absent), site conditions, construction methodology, and safety requirements, the following is put forward by MOLA, to be adapted during the course of the Targeted Watching Brief.

Summary of methodology for Targeted Watching Brief at Puttying Mill Lane Cut and Cover Phase 3 and Covered Ramp (*approximate area shown on (Fig 1)*)

- The C350 PC will carry out the bulk excavation of the Cut and Cover tunnel and covered ramp as set out in the WPP (C350-MRG-C-GMS-CR094_WS111-50174, section 4.4.3), down to **102m ATD**. From this point, excavation will be carried out under a Targeted Watching Brief with the observation of C261 MOLA Supervisor, who will **assess** whether any archaeological remains are present, and if so their **significance** (see below).
- Below 102m ATD, C350 will excavate the alluvial deposits with an excavator fitted with a **flat blade ditching bucket** in spits of 300mm to 500mm (or as directed by the C261 Supervisor) until the full sequence of archaeological deposits is recorded.
- C350 will provide the C261 Supervisor with positions from which to safely observe the excavation taking place. Access to the excavation by the C261 Supervisor shall only be with express permission of the C350 PC. C350 will provide the C261 Supervisor with safe and regular access to the excavation at convenient times to examine and record the deposits exposed during excavation (generally during C350 work breaks). If necessary, C350 will provide a member of staff to accompany the C261 Supervisor.
- The C261 Supervisor shall have the opportunity to signal to C350 if archaeological remains of moderate to high significance are observed at any point during the excavation.
- If archaeological remains of **low significance** are present, these will be recorded by C261 MOLA, and removed by C350 under similar conditions to a General Watching Brief (ie with archaeological monitoring, hand cleaning, investigation and recording, but no modification to the Principal Contractor's method of work).
- If archaeological remains of **moderate to high significance** are present, these will be investigated, recorded, and excavated (where necessary) by C261 MOLA. MOLA may request C350 to assist with excavation/removal of any extensive deposits, as appropriate. Additional C261 support/specialist archaeological staff may be required to work on site to record any remains found and take required samples.
- This is likely to require C350 to **temporarily stop work** at that location and safely demarcate and barrier a temporary working area for the archaeologists, and to provide safe access for MOLA staff. Such work may continue to the **base of the archaeological sequence** (surface of the river terrace gravels), or if underlying horizons are assessed as being only of low significance, work may proceed under similar conditions to a General Watching Brief (as above).
- The targeted watching brief will **cease** when the excavation reaches river terrace gravels, anticipated at **c 100m ATD**.

5.1.2 Generic Targeted Watching Brief Methodology

A targeted watching brief comprises the observation and recording of the Principal Contractor's or their sub-contractor's works with specific operations carried out under the supervision of a MOLA Senior Archaeologist. Targeted watching briefs are carried either out in areas where the density of archaeological features or deposits are not considered of sufficient significance to warrant investigation in advance of construction, or they may be carried out in areas where access prior to construction has been impossible and where, as a result, there is a possibility of unexpected discoveries (Crossrail 2009 Archaeology Specification for Evaluation & Mitigation (including Watching Brief) CR-PN-LWS-EN-SP-0001, version 3).

It should be noted that during a targeted watching brief, the Archaeological Contractor may impose constraints on, or require changes to, the Principal Contractor's or his sub-contractor's method of working to enable the archaeological investigation to take place alongside construction works. These constraints may include restrictions on the type of equipment used, the methodology employed, stopping excavation works to allow time for recording and the installation of temporary works or other attendances such as pumping out, in order that the archaeologists may enter the works excavations safely. In addition to man-made deposits, some assessment and basic recording of any naturally deposited levels will be necessary, eg alluvial deposits. This may require the attendance of a MOLA Geoarchaeology specialist to take samples of such deposits. Normally if the remains are localised the Principal Contractor's works may continue in other areas (subject to a safe method of working and monitoring. It is expected that the Principal Contractor will make allowance in their work programme to take account of the delays that a targeted watching brief may cause.

During a targeted watching brief MOLA staff will compile a basic record consisting of notes, measurements, drawings and photographs consistent with an observation role; eg depth, character, date and survival/truncation of deposit sequence, height of natural geology.

If potentially very significant (but localised) remains are exposed, such that they cannot be recorded adequately under the scope of the targeted watching brief, then subject to the Project Archaeologist's approval, additional archaeological resources and time may be required at that location (to allow for more detailed follow-up recording and perhaps limited excavation). Such work would be considered separately to the procedure for unexpected archaeological discoveries that fall outside the scope of the SS-WSI (Crossrail 2009, section 7.A2 and section 15.2 of this document).

5.2 Survey and setting out method

In some circumstances, **such as this watching brief**, it may be appropriate and more efficient for the Principal Contractor's surveyors (if they are available) to survey any MOLA temporary baselines. 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 (eg portal) as-dug.

Otherwise:

MOLA will obtain from either the Principal Contractor or Crossrail's survey department the locations and values of the project datums in the area of the site.

MOLA surveyors will normally survey to LSG grid MOLA's local baselines, or the features, as appropriate to the remains encountered. If Crossrail survey control is not available, then they will reference locations to OSGB36 co-ordinates, using GPS/GNSS, and these will then be converted to LSG. See also section 14.

If no archaeological remains are found, MOLA will obtain from the Principal Contractor or design archaeologist CAD plans to London Survey Grid with which to produce a plan of the areas monitored. See also 14.

5.3 Recording Methods

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

- The written record of individual context descriptions on appropriate pro-forma sheets.
- The drawn record: including, plans and section drawings of appropriate features, structures and individual contexts (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 (pits and ditches) may be located though co-ordinates, annotated with dimensions, and may be recorded digitally.
- A stratigraphic matrix of the sequence of deposits and structures encountered in each trench will be produced.
- The photographic record: photographs 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 features, appropriate groups of features, structures, and quaternary 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 OS datum.
- The location of all evaluation trenches, temporary grids and baselines will be electronically surveyed by MOLA Geomatics staff. After fieldwork a digital trench location plan will be produced.
- Other appropriate drawn and written records will be produced (for environmental sampling etc).

6 Geoarchaeological investigation and methodology

Geoarchaeology and Environmental Archaeology examine the plant, animal and human remains associated with past human activity and the past landscape context of this activity, in order to obtain a better understanding of the economic, social and environmental setting of archaeological evidence. They involve input from a wide range of specialisms to cover the varied spectrum of environmental remains (from microscopic pollen and diatoms, to snails, seeds, insects, bird and fish bone, large mammal bone and human remains) that might be preserved in the soils and sediments excavated on an archaeological site.

In addition, in order to understand how the archaeological deposits built up and to reconstruct their depositional environment geoarchaeologists examine the archaeological deposit sequence *in situ*. Geoarchaeology is the study of soils and sediments in either a natural or anthropogenic context, that either contain human cultural material or are contemporary with human habitation within the region being studied (ie the Pleistocene/Lower Palaeolithic and later).

Within the Crossrail Puttying Mill Lane site the focus of the environmental archaeology work will be geoarchaeologically driven. It will concentrate on the examination, recording and sampling of the Lea Valley alluvial sequence, which comprises fluvial and wetland sediments with potential for past landscape reconstruction.

This work will be conducted under the environmental archaeology sampling strategy (archaeological science strategy) for Puttying Mill Lane, see below.

Where such sampling is required, it will be conducted according to the methodology and approach in section 6.1, as far as is consistent with the Principal Contractor's health and safety and environmental requirements.

6.1 Sampling strategy

6.1.1 Overview

Sand and gravel deposits, which represent the baseline to archaeological deposits in the Puttying Mill Lane area, have been recorded previously lying at approximately 101m ATD falling to 100m ATD. This corresponds to the known topographic evidence of the prehistoric landscape of the lower Lea Valley where 'islands' of higher ground lie within a channel dissected landscape.

Upon these high areas, which were likely to have been dryer ground in prehistory, there is therefore potential for evidence of prehistoric occupation activity. Indeed, immediately to the east of the Cut and Cover tunnel (Phase 3) and covered ramp, a 0.25m layer of loose, mid bluish-grey clayey-sand with plant roots overlain by a layer of soft mid bluish-yellow sandy-clay that was observed from 101.67m ATD over the higher ground (MoLAS-PCA 2008, Trench PDZ8.04/5.35(C)). This appears to have formed a prehistoric land surface as it was truncated by several features including a pottery and struck flint filled ditch (from a height of 101.26m ATD) dating to the Bronze Age. Further evidence for later period prehistoric features were also found sealed by a grey blue slightly sandy clay with a surface elevation of 101.84m ATD. This suggests multi phases of human activity as alluvial and higher energy deposits encroached on the island. Islands with surfaces at elevations such of this would have

been essentially dry up to the Roman period, surrounded by wetland they would be a potential focus point for human activity from the Mesolithic onwards.

In the lower lying channel areas, silty clay and peat deposits were found to accumulate (to approximately 101.7m ATD) which represent river and marsh deposits, respectively. Such deposits provide valuable information in regards to the past landscape, both via the knowledge of the manner of their deposition and through their potential because of the excellent preservation of organic remains they provide. Plant microfossils and macrofossils found within these deposits can be used for environmental reconstruction, as well as radiocarbon dating which provides a chronological framework for the natural deposits as a whole.

Above these deposits, alluvial sediments comprising predominantly of clays were laid down at Pudding Mill Lane. These deposits extended to the base of the made ground (approximately 103.75m ATD). The sediment characteristics were found to vary spatially and through time, but were thought likely to represent a range of different depositional environments. It is probable they represent environments dating from the late prehistoric / Roman period onward. These clays will, like the silty clays below, hold plant microfossil and macrofossil evidence worthy of palaeo-environmental interrogation particularly in terms of mapping changes from a freshwater to saltwater environment within the Lea, as well as anthropogenic management of this increasingly wet landscape during this period.

The geoarchaeological potential of the alluvial deposits likely to be encountered during the watching brief therefore requires a geoarchaeologist to be on call to visit the site, advise and where necessary record and take samples from selected deposits.

The geoarchaeological strategy will focus on the recording of sediments on-site. Prior to work beginning, the geoarchaeologist will give due consideration to the previous work and sampling already undertaken in the Pudding Mill Lane area. This will make sure that any sampling is targeted towards deposits, features and environments that need further clarification.

In order to interpret the depositional environment of alluvial deposits, and hence their archaeological significance and meaning, it is necessary to examine the sequence of deposits in section (cut faces). This will enable recording of the interfaces between different deposit types and lateral changes within a deposit to be seen. The geoarchaeologist will liaise with the principal contractor / sub-contractor to maximize the opportunity for such recording, without holding up the groundworks programme.

Sampling (where appropriate) will involve cutting overlapping blocks of undisturbed sediment from the section faces and digging out bulk soil samples, as continuous slabs, from the adjacent section. Spot samples for radiocarbon dating will also be taken from suitable organic layers.

6.1.2 General Methodology

Throughout the targeted watching brief the Project Manager and MOLA Supervisor / Senior Geoarchaeologist will ensure:

- That a range of suitable samples and records 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 environmental procedures outlined in the *Archaeological Site Manual* (MoL 1994) and *Environmental archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage 2002) and *Geoarchaeology: using earth sciences to understand the archaeological record* (English Heritage 2007) are followed.
- The following sample types and processing methods will be employed:

Sample	Material	Processing
Column bulk (20 litre)	Freshwater and terrestrial molluscs, ostracods	Disaggregated and wet sieved
Monolith	Sediments	Laboratory cleaning
	Pollen and Diatoms	Sub-sampled for external Specialist
Kubiena	Soils/complex strata	External Specialist
Spot/Grab	Coprolites, unidentified organic materials	Specialist

- The sampling strategy will be monitored throughout the targeted watching brief and adapted in light of the preservation and the type of features encountered. Advice will be sought from the EH Regional Archaeological Science Advisor when necessary.
- Should any dateable (by palaeo-environmental materials) negative features be identified during the watching brief they 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.

6.1.3 Sampling approach to main features anticipated

- *Lea Valley alluvial deposits*: exposures of alluvial deposits will be cleaned and recorded by a geoarchaeologist. The LSG/OS location and TD/OD level of any recorded section face will be provided by the Principal Contractor or by MOLA Geomatics team, as appropriate. Selected cleaned sections will be sampled. Sampling would typically consist of overlapping monoliths for off-site sedimentary examination and micro-fossils, with an adjacent column of continuous bulk sample slabs, respecting context interfaces, for macro-remains and grab samples for dating as appropriate.

Processing will take place at the MOLA base during the targeted watching brief so that results can feed back onto site and inform any modifications needed in the sampling strategy.

A MOLA Senior Geoarchaeologist (if necessary the MOLA Head of Human Environment) 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/Geoarchaeologist will be on site during any visit made by the EH Regional Archaeological Science Advisor to discuss the alluvial sequence, its sampling and the results of any processing undertaken.

7 Deliverables and Submission Programme

MOLA shall provide the following reports in accordance with the C261 Contract and the Site Specific Written Scheme of Investigation (C136-SWN-C2-JLT-M123-00001) and Addendum (C136-SWN-T1-XAP-M123_WS098-00001) to the Project Archaeologist (Jay Carver) and Project Manager (Liz Field), or as otherwise instructed by the Project Archaeologist:

- Organisation of site monitoring visits, as and when requested by the Principal Archaeologist and or the CRL Project Archaeologist.
- A weekly illustrated progress report containing the information required at part 5.10 of the C261 Contract.
- A short illustrated interim statement within 1 week of the completion of fieldwork if required.
- A survey report within 2 weeks of the completion of fieldwork.
- A Fieldwork Report will be prepared within 6 weeks if required. 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 C261 contract (see 15.3).
- MOLA will complete an SMR (OASIS) Summary Sheet for the works (ie one per fieldwork event). This Summary Sheet will be included in the Fieldwork Report if required.
- A Summary report of no more than 500 words for the works shall be prepared by MOLA for subsequent publication within the London Archaeologist Annual Fieldwork Round-up.

8 Document Control and Record Keeping

MOLA will access the Crossrail document control system for transmitting reports and other deliverables. The primary report deliverables (as per 7) will be submitted to the Project Archaeologist (and Crossrail CDM Advisor in the case of Method Statements) in draft form (Version 1.0). Any tracked changes or comments added by the Project Archaeologist and/or Crossrail CDM Advisor will then be incorporated and future dated versions (2.0 etc) will be returned via the document control system accompanied with the appropriate Checklist with Contractor's responses.

9 Artefact Recovery and Conservation

Sampling strategies will be developed on a site specific basis to meet the objectives stated in the Crossrail Site-specific WSI (see 3.3); and the following professional standards, in consultation with appropriate specialists:

- MOL Archaeological Finds Procedure Manual (2006)
- Relevant English Heritage Centre for Archaeology Guidelines eg on Environmental Archaeology (English Heritage 2002)
- 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)

10 Finds Collection

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.

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. 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.

11 Treasure

All finds falling within the definitions of treasure (Treasure Act 1996) shall be reported immediately to the Project Archaeologist and all subsequent works must be undertaken in accordance with the relevant legislative requirements as set out in the Environmental Requirements (archaeology) section of the relevant package Works Information.

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.

12 Archaeological Science Strategy

Where necessary, the strategy for sampling archaeological and environmental deposits and structures (which can include soils, timbers, animal bone and human burials) will be developed by MOLA in accordance with English Heritage and IFA guidelines. Advice will be sought from appropriate MOLA specialists and if additionally required from English Heritage. 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 C14 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.

See 6.1 for the site-specific sampling strategy.

12.1 Specialist Strategy

An appropriate programme of ceramic dating and study of other excavated artefactual and environmental materials will be undertaken by MOLA Specialists as their contribution to the Fieldwork Report.

12.2 Excavation and Recording of Human Remains

The required methodology for human remains is set out in detail in the SS-WSI and the MOLA Framework Method Statement (Technical Submission 2.4, section 4.6) and is not repeated here.

It is not likely that human remains will be present on this part of the Pudding Mill Lane site. If human remains are found, the Project Archaeologist will be contacted, and a Ministry of Justice licence obtained by MOLA (if required).

Any *in situ and disarticulated* human remains will be recorded to targeted watching brief standard (cleaned, location recorded and photographed), and lifted, in accordance with the standards in section 3.2. The advice of a MOLA Osteologist will be sought where the nature of a deposit containing human remains is ambiguous.

13 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.

The site-specific post-excavation, 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).

14 IT Capability – Digital Survey Recording, Data Capture and Curation

The required methodology for IT (including site survey) will be carried out in accordance with the C261 Contract and project standard survey requirements.

- For Targeted Watching Briefs it is proposed that Principal Contractor's surveys assist with the location of temporary base lines and the plotting of significant archaeological features where appropriate. Where this is not possible MOLA will provide a geomatics team to come to site to survey in features etc.
- Where MOLA has conducted the surveying, upon completion of the fieldwork a Site Survey Report will be compiled.

15 Additional Details

15.1 Standards and Guidance

See Section 3.2.

15.2 Unexpected and Nationally-important remains

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.

15.3 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 C261 contract.

15.4 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 possible exception being human remains. In the event of the unexpected discovery of human remains on site, MOLA will obtain a Burial Licence from the Ministry of Justice (if required).

16 Health and Safety

16.1 CDM Responsibilities and Reporting

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

MOLA will provide:

- A current health and safety policy, including 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, including appropriate advice and support from office-based managers.
- Adequate safety information in the MOLA site accommodation including the WSI, current Health and Safety Policy, Health and Safety at Law Poster, Data Protection Compliant Accident Book, and copies of Public and Employers Liability Insurance. The 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 as a Designer; and the Principal Contractor's Health and Safety Policy, safety inductions and fire and emergency procedures.
- 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 principal liaison with the Principal Contractor.
- Services of a professional health and safety consultant to attend site when required; reporting to the Supervisory Archaeologist and Project Officer, with any concerns or recommendations copied to the Principal Contractor's site manager
- A safety monitoring/reporting procedure. This should include accident 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
- All necessary staff supervision, and training, including tool box talks and safety inductions for new staff.
- Personal protective equipment (PPE) as listed in 22.8.3, but not additional PPE required by the Principal Contractor's method of work or Health and Safety plans (see the section below).
- Review and compliance with the Principal Contractor's Construction Phase Plan under the CDM Regulations 2007.

- Trained First Aiders (as appropriate to a watching brief situation), 'Where to get First Aid' poster and a First Aid kit (to be located in the MOLA site accommodation). The Principal Contractor will also have first aid facilities on site.
- Additional PPE required in addition to that listed in the previous section, ie disposable overalls and P3 masks (and their fitting).

The Principal Contractor will provide:

- Overall control and supervision of the site and a safe working environment. The archaeological organisation will be unable to complete the specified works in any area where 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 other equipment such as handrails, shoring and ladders. These requirements are listed in detail in separate documents.
- Construction Phase Plan.

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.

16.2 Rail Sites

The watching brief area is not a designated rail site.

16.3 Highway Sites

The targeted watching area is not a designated highway site.

16.4 Health and Safety Reporting

Adherence to health and safety procedures will be monitored by the MOLA Health and Safety Consultant, Contract Manager, Project Officer and Site Supervisor. The consultant 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. 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.

16.5 Liaison with Principal Contractor

The MOLA supervisory archaeologist 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 supervisory archaeologist will be supported and advised by the MOLA Fieldwork Director and project management team as needed.

16.5.1 C261 MOLA Project Management Team Contact Details

- Nicholas Elsdon, Project Manager
nelsden@museumoflondon.org.uk
Direct Line: 020 7410 2282
Mobile: 07 872 127 296

16.6 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 H and S Advisor and reported on in the progress report (see 4.3).

17 Emergency Response

17.1 Emergency Preparedness & Response Plan

An Emergency Preparedness/Continuity Plan has been prepared by MOLA and has been approved by Crossrail.

MOLA staff will comply with the Principal Contractor's Emergency Plan, which has been submitted to MOLA. Supplier Document Number: 100211CR-PLN00031. CRL Document Number: C350-MRG-C-STP-CR094_WS11-50001.

17.2 Training

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

The MOLA Senior Archaeologist will attend all emergency training/inductions on Preparedness/Response Plan provided by the Principal Contractor.

17.3 Emergency & Accident Equipment

- MOLA Archaeologists when working singly on the watching brief tasks will carry a single person First Aid Kit and mobile phone.
- It is expected that the Principal Contractor will also provide basic first aid facilities on site.

17.4 Monitoring & Testing

MOLA staff will comply with Crossrail requirements.

17.5 Emergency & Accident Incident Reporting

All accidents and emergencies must be reported to the Principal Contractor (Morgan Sindall site emergency controller or site manager for the enabling works watching briefs), who will call the emergency services, if required. They will also be reported to the Crossrail Incident Report Desk: 020 3197 5000. In critical situations, MOLA staff will call for an ambulance immediately, and then inform the site emergency controller/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
- 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 2200, Int 2255

18 Environmental Management

The archaeological works will be carried out whilst the Principal Contractor is in possession of the site. MOLA will therefore 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 16 and 22.8.1). In addition an updated MOLA corporate Environmental Management Plan is currently being prepared for submission to Crossrail.

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

18.1 Contamination

A contaminated land assessment was previously carried out for the Puttying Mill Portal site (Document Number C152-SWN-C2-RSI-CR094_PT002-00002). This indicated a risk to construction workers through direct exposure to contaminated soils and contaminated shallow and deep groundwater. This included TPH, BTEX, PAHs, metals and solvents, and the inhalation of vapours from volatile contaminants (and possibly methane), with particularly elevated levels at several locations (hotspots) across the site. Contaminated soils were observed primarily within the Made-Ground, but also to a lesser extent within the alluvium and river terrace gravels. Additionally, a potential explosion risk was identified, based on the high concentrations of methane recorded at the site.

The following mitigation measures were proposed to reduce the risk to construction workers to low, and will be implemented by C350 Morgan Sindall:

- Provision of appropriate PPE. In addition to standard PPE (ie steel toe-capped boots, high visibility vests, hard hats), chemical resistant gloves and dust masks may be required, particularly when exposed to soils and working during dry, windy weather (see 22.8.3).
- Ongoing site monitoring of gas/volatile concentrations
- Watching brief and provision for encountering asbestos on-site
- Provision of appropriate hygiene facilities.
- Appropriate site control measures (ie dust suppression)

18.2 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.

18.3 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.

18.4 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 for occasional visits (see 4.1).

NAME	VEHICLE REG NO
M Cox	KC54 XTZ & DY59 YWB
A Chopping	KC54 XTZ & DY59 YWB
G Spurr	KC54 XTZ & DY59 YWB
M Nicholls	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
CONTACT (All)	020 7410 2200

18.5 Other Requirements

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

19 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 C261 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.

20 Community Relations

MOLA will co-operate with the Principal 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.

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

21 Responsible Procurement

An updated Responsible Procurement document was submitted to Alison Jackson, Crossrail on 6th August 2010.

22 Health and Safety Method Statement

22.1 Introduction and Purpose

22.1.1 Project Background

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

- A Crossrail **Site-specific Written Scheme of Investigation (SS-WSI)**: Package C152 Puttying Mill Lane Portal, Archaeology Site-specific Written Scheme of Investigation, Doc. No. C152-SWN-C2-RSI-CR094_PT002-0001 Version 10, 12.05.10 (Crossrail 2010a)
- An **Addendum to the WSI**: C152 – Puttying Mill Lane Portal, Addendum to WSI: Trial Trench Evaluation, Watching Brief & Detailed Excavation (XSK10), Doc. No. C152-SWN-C1-RSP-CR094_PT002-00002 Revision 1.0, 12.12.10 (Crossrail 2010b)

22.2 Scope of Document

This Method Statement sets out the specific MOLA safe methods of working to be applied to:

Task	Principal Contractor	Provisional Programme
<ul style="list-style-type: none"> • TWB Cut and Cover tunnel (Phase 3) and covered ramp below 102m ATD 	C350 Morgan Sindall	Estimated Start date 09.10.14 (now postponed) Estimated Duration: approx. 8-10 weeks

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

22.3 Responsible Persons and Site Management

22.3.1 Site Management

The MOLA Senior Archaeologist/Site Supervisor will ensure that a copy of the MOLA Welfare, Health & Safety Method Statement is made available to the Principal Contractor at the site. Where further changes or additions to the WH&S Method Statement are required and agreed these should be appended to the site master copy by the MOLA Senior Archaeologist/Site Supervisor.

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 .

22.4 Scope of Works

22.4.1 Proposed archaeological works

The scope of archaeological works is set out in 22.2 above, and in section 3 of the method statement, above.

22.5 Methodology, Programme and Sequence

The programme is set out in Table 1 in section 1 of the method statement, above, and the methodology in section 5 of the method statement, above.

22.6 Health and Safety Control Measures

22.6.1 Site Access/Vehicle Movements

On arrival at the site, MOLA staff will sign in, establish contact with the nominated Site Manager (or equivalent) attend any inductions etc. in accordance with the required access procedure for the site (to be notified to MOLA in advance by the Principal Contractor). All MOLA staff working on site will carry identification and CSCS cards.

Safe access routes from the site gate to work Areas and any offices and/or facilities will be erected and maintained at all times throughout the course of the archaeological monitoring of the works by the Principal Contractor.

22.6.2 Services

The location and making safe of live services before or during archaeological works is the responsibility of the relevant Principal Contractor in control of the site. MOLA staff will exercise care and due diligence and report any discovery of unexpected services or other ground hazards promptly to the Principal Contractor, Project Archaeologist and MOLA H & S Compliance Manager.

22.7 Safety of Excavations

22.7.1 Entering the Trench during the Targeted Watching Briefs

- Daily inspections will be carried out by the Principal Contractor before works commence.
- MOLA staff will not enter any area of the cut and cover tunnel excavation until the Principal Contractor has confirmed that it is safe to do so, and that there is safe access/ingress to the archaeological investigation areas.
- MOLA Staff will not enter a trench if it is declared unsafe by the Principal Contractor.
- The Principal Contractor will supply attendances as required in 22.8.1.

22.7.2 Shoring

- As the Targeted Watching Brief will be taking place within a diaphragm walled box, it is not envisaged that shoring will be required. If shoring is required (eg, locally) during a Targeted Watching Brief, the trench will be shored in a suitable manner by the Principal Contractor and safe access/egress arranged.

22.7.3 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.

22.7.4 Machine Excavation

- All machining described in section 5, as specified in the Addendum to the WSI, will be monitored by MOLA Senior Archaeologist/ Site Supervisor, but will at all times be under the control of the Principal Contractor.

22.7.5 Hand Excavation during Targeted Watching Brief

- Hand excavation 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.

22.7.6 Lone Working

- 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, which works are to be monitored. The MOLA Supervisor will only be providing an attendance to observe, monitor and record the defined Principal Contractors 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. Where the MOLA Supervisor requires access to the trench during the Principal Contractor's work breaks, the Principal Contractor will provide a member of staff to accompany him/her (see 5.1.1).

22.7.7 Contamination

- MOLA shall be issued with all relevant contamination test results for above and below ground hazards by the Principal Contractor prior to commencement. Any necessary remedial action will then be agreed with the Principal Contractor as part of the H & S Plan and supplied as an attendance item (9.1 below). Wherever possible such action must be undertaken by the Principal Contractor prior to MOLA commencement on site. If this is not done there may be operational constraints on the MOLA safe method of working that could restrict achievement of the archaeological scope of works set out in the SS-WSI.

22.7.8 Site Rules

- All MOLA Staff will comply with the Principal Contractor's site rules and with the MOLA single person watching brief rules (when applicable).

22.8 Planning and Resources

22.8.1 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 above. Those items in **bold (22.8.1.1) will be required** for this site – others may be required (22.8.1.2), depending on site conditions, which will be

reviewed on site by the MOLA Supervisor in conjunction with the Principal Contractor's nominated Site Manager (these requirements will be communicated to the Principal Contractor in the event that they are needed):

22.8.1.1 **Likely to be required**

- **site accommodation and welfare facilities with electricity and water.** To include furnished main base cabin as office/work space; separate male/female changing areas, toilets and washing facilities with water; drying facilities; plus additional steel cabin for secure storage of MOLA PPE, equipment, camera and paperwork and finds. For the basic monitoring component of a small watching brief, these facilities would normally be shared with the Principal Contractor's site establishment and separate work space is not normally required. It is provisionally estimated that accommodation etc for up to 1 to 3 people will be required for the watching brief. For the majority of the duration of the watching brief it is likely that there will only be 1 member of staff in attendance.
- **general site security** including hoardings, gateway, warning notices, etc; to create a secure site perimeter, sufficient to prevent unauthorised access. If the Principal Contractor has retained security guards, it is recommended that the archaeological investigation areas be added to their schedule for regular patrols, particularly out of hours.
- **providing safe access** to the site and the specified archaeological investigation areas via separately identified pedestrian routes, signing, safety guard-rails, secure ladders etc. This includes segregating these areas from any vehicles and plant operating nearby eg via a robust physical barrier.
- **locating and making safe any live services or hazardous substances (above or below ground):** preliminary services searches should be carried out by the Principal Contractor via the statutory undertakers etc, plus on-site inspection and testing where required. Where there is reason to believe from previous uses that the ground or adjacent buildings may be contaminated the Principal Contractor should make arrangements for advance inspection, sampling, testing and where necessary specialist remediation. The results of such surveys should be forwarded to MOLA *prior to commencement on site*. 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 inform both their project manager and the Principal Contractor and, when appropriate, call the relevant emergency number.
- **supply of plant and equipment;** principally a 360 degree tracked mechanical excavator of minimum 12 ton size; supplied with driver, breaker, and flat-bladed ditching bucket. Other plant such as dumpers, compressor/breakers, hoist and pumps may also be needed.
- **accreditation and supervision of operatives, plant and equipment,** including supply of sufficient qualified banksmen/supervisors to control plant movements and adequate certification for plant and operatives.
- **transport/mounding/storage of spoil** from archaeological investigation areas. This includes removal from site, if necessary.

- **temporary support:** design, installation and maintenance of appropriate temporary support to excavations, where deeper than c 1.2 m (or as required in unstable ground). This will principally be via the concrete diaphragm wall around the cut-and-cover tunnel/ramp, but locally within the this area may be via benching/battering back and/or shoring, depending on a depth and ground conditions.
- **other safety measures in deep excavations,** including monitoring of air quality and provision of rescue facilities and equipment in any areas defined by the Principal Contractor or MOLA as a Confined Space .
- **adequate ventilation** and protection from noise, fumes and dust where plant is in use, especially within confined spaces or standing buildings
- **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. On watching briefs with small numbers of staff, MOLA may not be able to supply a qualified first aider. In that case, the services of the Principal Contractor's qualified first aider(s) may be required.
- **Secure storage** for finds, and for tools and equipment.
- **managerial services** – nominated points of contact for Principal Contractor and other key members of development team.
- **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.

22.8.1.2 **Unlikely to be required**

- **specific site security:** it may be necessary to separately secure individual archaeological working areas via a physical barrier (such as Heras fencing) eg if there are public areas nearby or human remains are encountered.
- **site preparation and clearance.** Removal of structures, vegetation, rubbish, spoil heaps, demolition materials, slab, modern obstructions, infill, made ground, etc. as required, prior to and during the archaeological investigation. The majority will be mechanical excavator, under archaeological supervision, but occasional hand work by labourers may be needed (eg clearing individual obstructions or removing spoil from investigation areas if the machine cannot re-enter).
- **110v. site lighting and power supply** for access routes to excavations, plus individual task lighting within trenches (eg tripod-mounted spotlights) if required. The need for lighting depends on the depth, season and weather conditions or on ambient light level if working inside a shaft or standing building
- **pumping-out (dewatering/drainage):** a suitable method to keep the trenches dry, eg pumping into a previously investigated trench, to create a sump.

22.8.2 Equipment

Equipment will be supplied by the MOLA equipment central store:

- First Aid Kit

- Hand tools, dumpy levels, stationary, grid pegs, digital camera, etc.
- Power auger if required

Any specialised equipment such as power augers will have certification of maintenance kept at MOLA headquarters.

22.8.3 PPE

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

Safety Helmets (EN397)

Ear Defenders (EN 352-3)

Safety spectacles (EN166)

Dust masks plain and valved (EN149 2001)

Hi-visibility jackets and trousers (EN471) – orange

Heavy duty nitrile rubber gloves (EN420, 388)

Chemical resistant gloves Nitrile PVC, (EN374)

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

If required: Flame retardant overalls

22.8.4 Additional PPE

Any PPE in addition to that included in section 22.8.3 will need to be provided by the PC, rather than MOLA.

22.8.5 Staff

The timing and overall duration of the targeted watching brief listed earlier will be determined by the contractor's programme and the nature and extent of any surviving remains. It is envisaged that the Targeted Watching Briefs will be initially carried out by one MOLA Supervisor, with other support staff coming in to assist with any recording, sampling, surveying or photographic work if required.

It is *provisionally* estimated that up to 6 archaeologists and specialists might be required on site for the targeted watching briefs. MOLA will notify the Principal Contractor if more staff will be required.

22.9 Briefing Arrangements

22.9.1 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. A record of the induction is kept.

- The MOLA Supervisor will be briefed by MOLA Contracts Manager/Assistant Contracts Manager on all relevant aspects of work before work commences. This briefing will include all SS-WSI, Method Statements (PC's and including this document).
- The MOLA Supervisor will be responsible for briefing any other MOLA staff on site before they commence work on all aspects of the work and documents.

22.9.2 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.
- Irrespective of whether the site is controlled by MOLA or a Principal Contractor, on larger projects eg those with more than 2–3 staff and of a week or longer duration, regular toolbox talks will be given by the MOLA Supervisor or other suitable member of staff using the CITB: construction site safety tool box talks manual. As a minimum requirement these talks will occur 1–2 times per week and be of 10–15 minutes duration.

22.10 First Aid

22.10.1 Trained First-Aid Personnel

Where possible with the small numbers of MOLA staff during watching briefs, there will be at least one MOLA Archaeologist who is a qualified First Aider (ie 3 day FA at work course) 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.

22.10.2 First Aid Documents

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

- Current Health and Safety at 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.

22.10.3 First Aid Equipment

A MOLA First Aid kit, of an appropriate size for the site, will be located in the site office/hut etc. For 1 to 2 person watching briefs, a 'bum bag' will be carried by the MOLA Senior Archaeologist at all times.

22.11 Accident, Incident, Near Miss and Environmental Incident Reporting

22.11.1 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 17.5 of the method statement, above.

22.11.2 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:

Principal Contractor's Site Manager

MOLA supervisor

MOLA H & S Compliance Manager

MOLA Project Manager

Crossrail Project Archaeologist

Crossrail Incident Report Desk.

The site accident book for both the Principal Contractor and MOLA should be filled in giving details of the incident.

22.11.3 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 Project Manager and H & S Compliance Manager and action taken as appropriate.
- Non Riddors investigated by MOLA Site supervisor and/or Project Manager.
- Riddors investigated and reported on by MOLA H & S Compliance Manager.

22.11.4 Key Project Personnel

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

22.12 Emergency Procedures – Site General

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

22.13 Emergency Services Contact Details

The Principal Contractor will confirm the hospital location:

The Royal London Hospital
Whitechapel Road
Whitechapel
London
E1 1BB

Telephone **020 7377 7000**

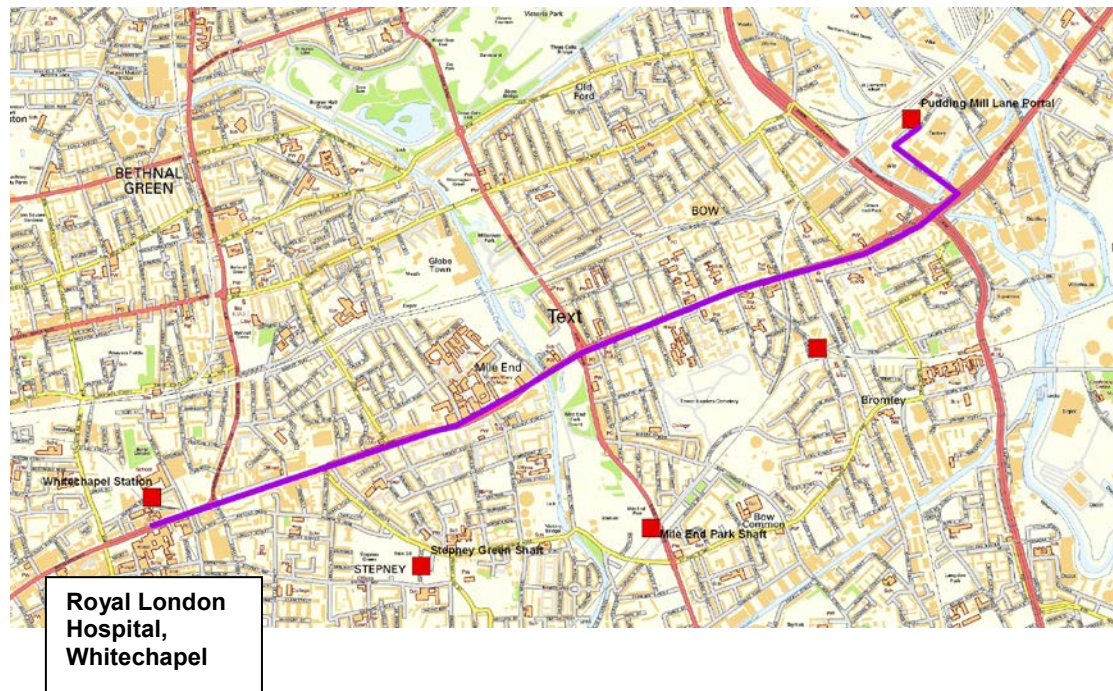
The hospital is off Whitechapel Road, opposite the LU Station entrance.

Note the new (2012) entrance location, from East Mount Street (off Whitechapel Road) or Raven Row (off Cavell street).

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.

22.14 Route to Hospital

The Principal Contractor will advise on route to hospital at their site specific induction. The location and directions will also be displayed in the site offices and canteen.



23 Risk Assessments

23.1 Preliminary site risk assessment register

The Site Supervisor will be responsible during the site work for monitoring whether (and what) *additional* updates, modifications or Specific Risk Assessments are required.



MOLA RISK ASSESSMENT REGISTER														
For Site/Task: PML Cut and Cover tunnel (phase 3) and covered ramp.						Type: Targeted watching brief								
Persons Affected				No		Classification				No				
Employees				3		Experienced				3				
Other workers						Inexperienced								
Public						Disabled								
Known and Suspected Hazards on site with Remaining Risk (mark as appropriate) and include numbered risk assessment in WSI														
	I	L	M	H		I	L	M	H		I	L	M	H
1 Access		X			25 Manual Handling		X			49 COSHH: Petrol				
2 Ladders		X			26 Fumes/Gas	X				50 Spot Dating				
3 Plant			X		27 Dust					51 Glass Recording				
3a Plant (loading and unloading)					28 Noise	X				52 COSHH:Sthil Lubricant				
4 Dumpers					29 Deep Excavations		X			53 COSHH:Sthil two stroke oil				
5 Scaffolding (inc Towers)		X			30 Power Tools					54 SHARPS (hypodermics)				
6 Excavations		X			31 Vibration					55 Task Lighting (laniro etc)				
7 Work at height		X			32 Vehicles (Driving)					56 Site Walk Over				
7a Work at Height (Cherry Picker)					32a Vehicles (Site)		X			57 Processing: Finds washing				
8 Slips, Trips, falls		X			32b Vehicles (load/ unload)					57a Processing: Environ samples				

9 Underground services		X			33 Lifting Equipment					57b Processing: Artefact marking				
10 Overhead Power Lines					34 Plant (lifting)					57c Processing: Manual handling				
11 Electrical	X				35 Human Remains					57d Processing: Power hose				
12 Fire (inc LPG)		X			36 Public Safety					57e COSHH: Paraffin (Processing)				
13 Confined spaces					37 Violence					58 Office Work				
14 Breaking Out					38 Chainsaw					59 DSE (Work Stations)				
15 Hand Tools		X			39 Power Auger (COBRA)					60 Young Person				
16 COSHH: Spray paint					39a Power Auger (Comp)					61 Person Specific/Pregnancy				
17 Contaminated Land		X			39b Power Auger (Electric)					62 Light Duties				
18 Weil's Disease	X				40 Hand Auger					63 Individual Stress				
19 Psittacosis					41 Foreshore/water									
20 Tetanus	X				42 Adverse Weather									
21 UXO					43 Spoil Mounding									
22 Asbestos (Buildings)					44 LPG(Butane)									
22a Asbestos (Ground Contam)					45 Waste									
23 Welfare	X				46 Storage									
24 Lone working					47 Animals									
24a Empty Premises					48 Non-ionising radiation									
General Controls														

<p>Contracts Manager in overall charge of project is: Nick Elsdon Tel: 020 7410 2282 / 07872 127296</p> <p>Supervisor(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 Supervising Safely Cert (TBC)</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 on 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 MOLA supervisor if no Principal Contractor present.</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 site PPE (unless otherwise stated by supervisor): Steel Toe-cap/midsole boots, Safety helmet, high visibility vest or jacket, and trousers.</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>Ian Grainger (H&S Manager) Project Manager Senior Archaeologist</p>	<p>All Risk Assessments seen by (initials)</p>	
	<p>PM</p>	<p>Archaeologists</p>
	<p>SA(s)</p>	
	<p>Client</p>	
	<p>Principal Contractor</p>	
	<p>Other</p>	

23.2 Specific Risk Assessments

<p>MOLA RISK ASSESSMENTS</p>	<p>SITE: PML Cut and Cover tunnel (phase 3) and covered ramp.</p>
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APPROVAL (Name and Title)					SIGNATURE			DATE
Prepared by:		L Fowler (Assistant Contract Manager)						
Approved by:		I Grainger HSCM						15.09.14
RA N°	ACTIVITY	Hazards	RISK	Risk Class L/M/H	N° at Risk	Control Measures	Final Risk: I/ L/M/H	Action by
0001	ACCESS Busy worksite with multiple plant (see 003 below) and vehicle movements.	Fall of persons from height, Fall of objects from height, Vehicle/plant collisions, Slips Trips falls	Personal Injury, Equipment Damage	M	1-6	Obey warning signs, verbal and written PC and traffic marshal instructions. Use pedestrian access gate. Keep to designated pedestrian routes. Be aware of plant and vehicle routes and movements. Do not obstruct pedestrian routes – be tidy. Report unsafe routes.	L	Supervisor and staff
0002	LADDERS Ladders may be used for access to localised areas of excavation.	Fall of person from ladder, Fall of material from ladder, Collapse of ladder,	Personal Injury, Equipment Damage	M	1-6	Use correct length and type, not painted. Daily inspection when in use, do not use if damaged. Must project at least 1.50m above stepping off point. Check/Fix securely at top and base. Check/Install at an angle of 75 degree (1:4 ratio over length). Three points of contact: make sure any load can be carried comfortably with one hand free for ladder.	L	Supervisor and staff
0003	PLANT Plant in use will include 360° excavators (inc.	Persons Struck by Machine Shovel or load	Personal Injury, Equipment Damage	H	1-6	MOLA staff will not operate plant. MOLA staff will use designated	M	Supervisor and staff

	long reach), dumpers, mobile crane (40-55 tonne) and crawler crane (100 tonne).	dropping Hydraulic fluid spray Overturning of machine Fire/explosion				<p>pedestrian routes, and not enter other work areas unless they are instructed that it is safe to do so by the C350 Principal Contractor.</p> <p>No work with or near plant operator under influence of drugs/alcohol or behaving erratically.</p> <p>Operations to be under supervision of MOLA supervisor or deputy and trained banks person also where applicable.</p> <p>Staff working near machine to ensure that the operator has seen them and that they are at a safe distance.</p> <p>Staff briefed on plant operations and changes to them.</p> <p>High visibility clothing.</p>		
0005	<p>Scaffolding (Towers and Access)</p> <p>Covers Haki stairs and similar</p> <p>Haki staircases to be used for access to main area of bulk excavation.</p>	<p>Fall of persons</p> <p>Fall of materiel</p> <p>Collapse of scaffolding</p>	<p>Personal Injury, Equipment damage</p>	M	1-6	<p>MOLA staff will not erect scaffolding.</p> <p>Only use scaffolding (inc stairs) that displays green scaffold tag with current weekly inspection record.</p> <p>Do not use if obviously damaged.</p> <p>Do not use in high winds and/or heavy rain.</p> <p>Maintain three points of contact, always have one hand free for guard rail when carrying load.</p>	L	Supervisor and staff
0006	<p>EXCAVATION</p> <p>Bulk excavation area within diaphragm walled box is likely to be c 7.5-9.5m deep during MOLA attendance. 2 access points via Haki staircases,</p>	<p>Collapse of sides</p> <p>Fall of persons</p> <p>Falls of Plant, equipment, material</p> <p>Flooding</p>	<p>Personal Injury, Equipment damage</p>	M	1-6	<p>Inspect all excavations before each day/shift and record results.</p> <p>Supervisor will report unsafe excavations to principal contractor.</p> <p>Staff will not enter any excavation they consider unsafe until it</p>	L	Supervisor and staff

	<p>and fallback access within a man riding cage. A stretcher cage will also be provided. It has not been designated a confined space by the PC, but gas detector monitors will be placed within the excavator cabs, the lowest point of the excavation, and at the bottom of the access stairs. Edge protection will be installed >1m from the edge of the excavation, with sides battered back.</p> <p>Localised areas may be safely demarcated and barriers, edge protection and shoring provided as necessary if remains that warrant archaeological hand excavation are found.</p>					<p>is made safe.</p> <p>Staff will report unsafe excavation to supervisor.</p> <p>Shoring installed by contractor under direction of the principal contractor.</p> <p>Edge protection installed by contractor under direction of the principal contractor.</p> <p>Warning and information signs in MOLA excavations.</p> <p>Pumps if required inspected and certified.</p>		
0007	<p>WORK AT HEIGHT</p> <p>The PC will provide the MOLA supervisor with positions of safety from which to observe the bulk excavation.</p>	<p>Falls of Persons</p> <p>Falls of materials and equipment</p>	<p>Personal injury,</p> <p>Equipment damage.</p>	M	1-6	<p>All sites</p> <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>	L	Supervisor and staff

0008	SLIPS/TRIPS/ FALLS	Falls of persons Dropping of equipment/material	Personal injury, Equipment damage	M	1-6	Assess work in adverse weather and suspend if appropriate. Keep all surfaces level and dry where practicable. Keep all areas free of unnecessary obstruction and debris. Keep all areas well lit. All safe pedestrian routes to be sign posted. Staff to be physically fit for the conditions on site. No running or horseplay. Be cautious moving about site.	L	Supervisor and staff
0009	UNDERGROUND SERVICES (UTILITIES) Electricity, Water, Sewage/foul water Gas. Fibre optic etc The location and making safe of live services before or during archaeological works is the responsibility of the Principal Contractor C350.	Electrocution Flooding Asphyxiation Fire/explosion Bacterial infection	Personal injury, Equipment and environ-mental damage, Annoyance to public	M	1-6	Briefing on live utilities to be given to all staff Competent person will use a cable location scanner calibrated within last 12 months to scan for live electrical services: before initial breaking out; before machine clearance of first level; and each machining level thereafter. Any utilities remaining live in excavation areas will be clearly demarcated and segregated. - 1m either side zone. Work will stop on discovery of unidentified service and not resume until confirmed/made safe. Inform utilities company or principal	L	Supervisor and staff

	MOLA staff will exercise care and due diligence and report any discovery of unexpected services. See 22.6.2, above.					contractor of discovery of any unrecorded service. Inform utilities company or principal contractor immediately of any contact with live utility.		
0011	ELECTRICAL Equipment and supplies	Electrocution Fire/explosion Trips (over flex etc)	Damage to equipment	L	1-6	Do not use if no current PAT certificate Visually inspect of equipment before use for faults. Do not use if obviously defective. Report fault. Obey Manufacturers guidelines and instructions for use. Route leads and cables to minimise the likelihood of damage and trip hazards. Dry powder/ CO2 fire extinguishers to be available	I	Supervisor and staff
0012	FIRE	Hot works LPG Machinery Electrical equipment/supplies? Arson flammable materials Smoking	Burning of persons Asphyxiation (smoke) Damage/destruction of property	M	1-6	MOLA staff will not undertake hot works 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	Supervisor and staff

0015	<p>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</p>	<p>Manual handling</p> <p>Impact from tool</p> <p>Impact from flying debris</p>	<p>Personal injury, property damage</p>	M	1-6	<p>All hand tools to be to industry safety standard.</p> <p>Inspect tools on delivery.</p> <p>Discard tool if not fit for purpose.</p> <p>Assess staff fitness to use tools.</p> <p>Task briefing where applicable.</p> <p>Training and supervision for inexperienced staff.</p> <p>Adequate breaks/rest periods</p>	L	Supervisor and staff
0017	<p>CONTAMINATED LAND Consult H&S manager</p> <p>Contaminated land assessment identified a risk to construction workers and suitable mitigation measures will be implemented by Morgan Sindall (see also 18.1 above).</p>	<p>solid/liquid contaminants</p> <p>Gas/fumes/airborne particles</p> <p>Ingestion, inhalation, dermal contact</p> <p>Pollution of water table, drains, water supply</p> <p>Pollution of atmosphere</p>	<p>Personal injury, illness, damage to the environment</p>	M	1-6	<p>Appropriate PPE to be worn (ie steel toe-capped boots, high visibility vests, hard hats), chemical resistant gloves and dust masks may be required, particularly when exposed to soils and working during dry, windy weather</p> <p>High standard personal hygiene: wash hands before eating drinking smoking.</p> <p>No eating, drinking, smoking, in contaminated areas.</p> <p>Wear gloves in the contaminated areas.</p> <p>Conduct basic health surveillance.</p> <p>Report all ill health.</p> <p>Report all suspected contaminants – strange smells, strange looking deposits. Cease work area until contaminant is identified and safe system of work in place.</p>	L	Supervisor and staff

0018	<p>WEIL'S DISEASE (leptospirosis)</p> <p>RATS</p> <p>Possible presence of rats.</p>	<p>Rat (and Cattle) faeces and urine</p>	<p>Personal injury Illness</p>	L	1-6	<p>Brief staff on hazard.</p> <p>Carry HSE G 406 instruction card</p> <p>Wear gloves.</p> <p>Clean and cover any cuts or abrasions promptly with a waterproof plaster.</p> <p>Wash hands before eating, drinking, smoking.</p> <p>No eating drinking and smoking outside designated areas.</p> <p>Keep Welfare facilities dry, tidy and secure.</p> <p>Keep food covered and secure.</p> <p>Basic surveillance of staff for flu like symptoms.</p> <p>Report ill health.</p>	I	Supervisor and staff
0020	TETANUS	Bacteria or spores in ground/animals/faeces	Illness as result of infected puncture wound	L	1-6	<p>Check staff vaccination status. ie as per NHS Childhood vaccination status 5 shots for lifetime immunity.</p> <p>Recommend staff check vaccination status with GP if unclear.</p> <p>Assess work areas for hazards and remove where possible. Eg animal faeces/manure used drug paraphernalia (Sharps), puncture wound hazards.</p> <p>Clean all puncture wounds thoroughly and apply waterproof dressing promptly.</p> <p>All deep puncture wounds should be referred to A&E</p>	I	Supervisor and Staff
0023	<p>WELFARE</p> <p>Welfare facilities will be provided by the PC (see 22.8.1 above)</p>	<p>Fire/explosion</p> <p>Electrical</p> <p>Filth/bacteria</p>	<p>Personal Injury and illness, property damage</p>	L	1-6	<p>Toilets, office, canteen, tool storage, drying rooms, heating, hygiene facilities (hot & cold running water).</p> <p>Chemical toilets to be emptied and serviced weekly or more often</p>	I	Supervisor and staff

		Cold/damp				<p>if necessary.</p> <p>Separate Male and female facilities where appropriate.</p> <p>COSHH and DSEAR controlled substances will not be stored in office/canteen.</p> <p>Welfare facilities to be kept clean and tidy. Cleaning Rota will be established where cabins not cleaned by contractor.</p> <p>No Smoking in welfare facilities.</p> <p>No eating or drinking in work areas.</p>		
0025	MANUAL HANDLING	<p>Too heavy, big, awkward load,</p> <p>Too prolonged</p> <p>Dropping load</p>	<p>Personal injury,</p> <p>Equipment damage</p>	M	1-6	<p>General</p> <p>Remove the need for manual handling where possible.</p> <p>Use mechanical aids where possible.</p> <p>Reduce horizontal and vertical distances.</p> <p>Reduce size and weight of individual load.</p> <p>Ensure team sufficient and fit for task.</p> <p>Ensure that route planned, well lit, obstruction free, and as dry as possible.</p> <p>Liaise with others to keep route safe, use lookouts.</p> <p>Brief and train staff.</p> <p>Rotate staff and/or sufficient breaks for prolonged tasks</p> <p>Use gloves</p> <p>Personal</p> <p>Assess weight before lifting, stay comfortably within personal lifting capacity.</p> <p>When picking up load: stand close with feet slightly apart, crouch do not bend at waist,</p>	L	Supervisor and staff

						<p>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.</p> <p>Use MOLA Manual handling check lists for all significant manual handling tasks 0024a-e :</p> <p>Planks, ladders and boards</p> <p>Drums/round containers</p> <p>Bags and sacks</p> <p>Finds/irregular shaped objects on site</p> <p>Office work – boxes etc</p>		
0026	<p>FUMES AND GAS</p> <p>Exhaust fumes from plant and machinery within bulk excavation area.</p> <p>Potentially also gases like methane from waterlogged/ marsh peat deposits.</p> <p>Gas monitors to be provided by the PC (see RA0006 above)</p>	<p>Toxic fumes/gas (CO etc)</p> <p>Fire/explosion</p>	<p>Personal injury, unconsciousness, illness</p>	L	1-6	<p>Inspect work areas before each shift.</p> <p>Vacate area where fumes or gas are known or suspected. Do not return until told safe.</p> <p>Use gas monitor.</p> <p>Report unwell symptoms immediately.</p> <p>No smoking or other naked flame in specified areas.</p> <p>Use face fitted respirators/BA when required.</p>	I	Supervisor and staff
0028	<p>NOISE</p> <p>Noise from machinery and plant.</p> <p>Noise levels will be monitored and recorded by the PC throughout the works.</p>	<p>Excessive, prolonged noise levels,</p> <p>Nuisance to public</p>	<p>Personal injury – temporary or permanent damage to hearing, loss of hearing Headache/ nausea</p>	L	1-6	<p>Minimise exposure– rotate staff, plan work to avoid noisy times/work areas if possible.</p> <p>Wear appropriate ear protection.</p> <p>Report unwell symptoms immediately.</p> <p>Vacate area if headaches/nausea etc.</p>	I	Supervisor and staff

<p>0029</p>	<p>DEEP EXCAVATIONS</p> <p>See RA 0006 above.</p>	<p>Collapse of sides</p> <p>Fall of persons</p> <p>Falls of Plant, equipment, material</p> <p>Flooding</p> <p>Hazardous atmosphere</p>	<p>Personal injury, Equipment damage</p>	<p>M</p>	<p>1-6</p>	<p>All temporary works will be designed, installed, maintained and inspected by the principal contractor (or their sub-contractor).</p> <p>If the MOLA supervisor has any concerns regarding temporary works or the safety of the work area, they must vacate the area and raise their concerns with the principal contractor's supervisor/foreman.</p> <p>Shoring installed and maintained by competent sub-contractor.</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</p> <p>'Danger Deep Excavation' Warning signs displayed ie on site boundary/entrance, trench edge protection</p> <p>Where appropriate a fixed hoist to remove spoil rather than a crane or mechanical excavator.</p> <p>Hoist and 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>Task specific briefing before</p>	<p>L</p>	<p>Supervisor and staff</p>
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						<p>commencement.</p> <p>Only staff physically fit and suitable.</p> <p>Basic visual health surveillance.</p> <p>report all unwell, symptom immediately.</p> <p>A mechanical pump(s) where necessary.</p> <p>Gas monitoring equipment where appropriate.</p>		
0032a	<p>VEHICLES – Site Muck-away lorries and other vehicles will be present.</p> <p>Also see RA0003 above.</p>	<p>Collision</p> <p>Overturning</p> <p>Fire/Explosion</p> <p>Loose loads</p>	<p>Personal injury, Equipment damage</p>	M	1-6	<p>Instruct drivers on site requirements</p> <p>Brief staff on vehicle routes and movements.</p> <p>Keep to dedicated pedestrian routes</p> <p>Obey traffic Marshals and signs.</p> <p>Be aware of and keep away from moving vehicles.</p> <p>Fit vehicle reversing alarm where necessary</p> <p>Wear high visibility clothing</p>	L	<p>Driver, supervisor and staff</p>
<p>All persons affected by these hazards must be made aware of the contents of this Risk Assessment</p>								

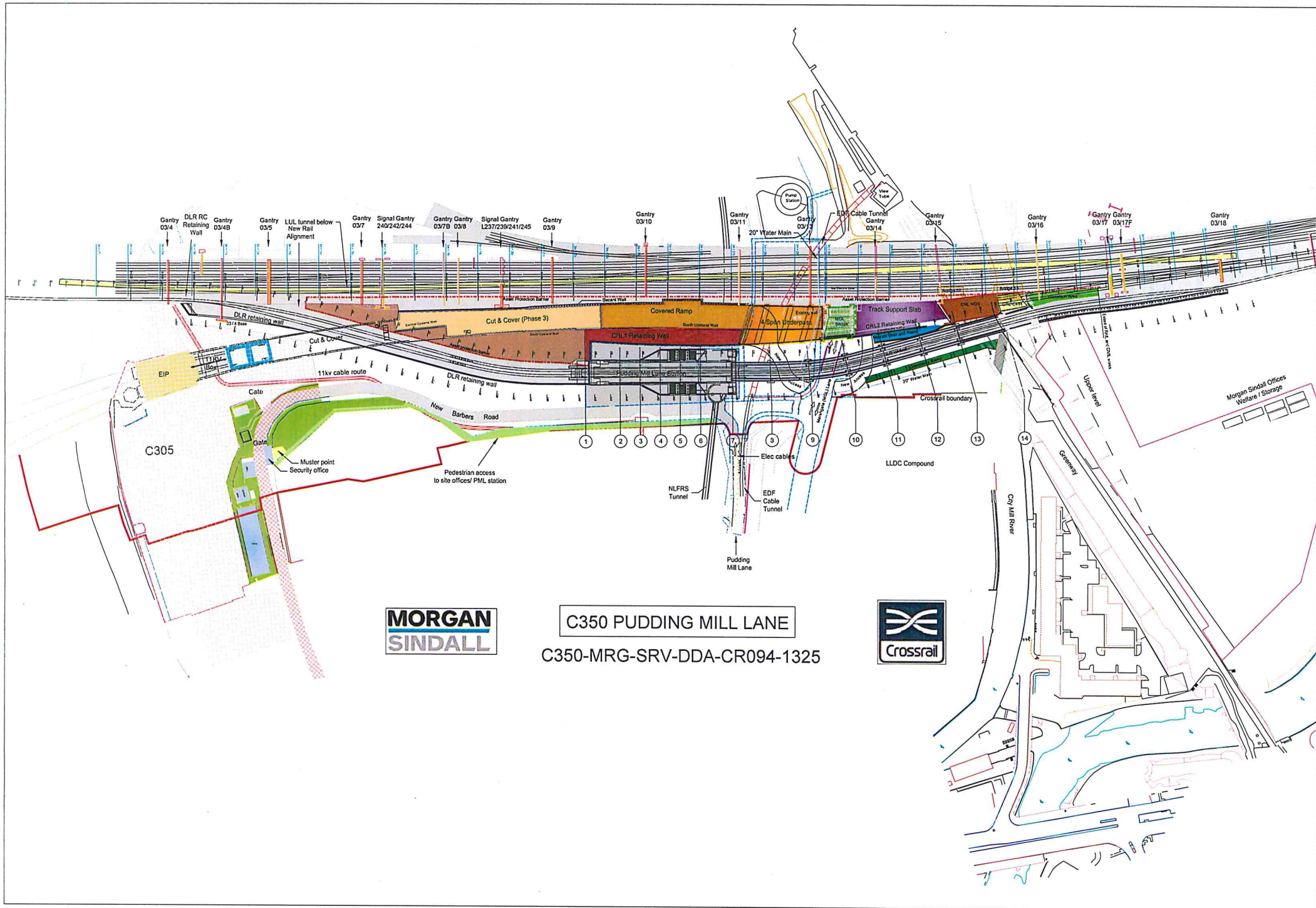


Fig 1 Location of Cut and Cover tunnel (phase 3) and covered ramp for targeted watching brief (C350 Morgan Sindall WPP).